Managing Unk Unks with Partners

Major projects are often, and increasingly, carried out by combinations of firms and public institutions, as they involve risks that few organizations are able to take alone.[1] This is all the truer if a project has novel aspects and involves unknown unknowns.[2] A partnership with an external party introduces relationship complexity (see Chapters 3 and 4): Control over external parties is often not direct, but only possible through contracts or persuasion; project participants from different organizations possibly have objectives and priorities that are different from, and sometimes even conflicting with, those of the project owner; and they may use different jargon and have different ways of dealing with collaborators (different cultures). In a coalition, a frequent consequence of unexpected events hitting a project is its unraveling; the project disintegrates.

The higher the number and interdependence of the parties involved, the more difficult is the management of the relationships. Obviously, in an age of increasing outsourcing and dispersed expertise, this is often correlated with the complexity of the project tasks; the more dispersed the task and the expertise, the more parties will be involved.

The project management infrastructure that we described in Chapter 9 is not sufficient to handle external partners. This is because the management infrastructure assumes that the relationship between project management and the project team is "open-ended": Essentially, the team does everything that management demands (within reasonable limits, of course), for as long as is necessary, in order to bring the project to a successful conclusion.

However, the principal instrument that is used to bring about cooperation and coordination with external parties is a form of contract. We discussed contracts in Section 3.3.2. They are not of the above-described open-ended nature;[3] rather, they outline what each party is supposed to do and what it is not supposed to do. Contracts cannot specify what the parties should do after an unk unk occurs, because unk unks cannot be foreseen. Contracts *can*, however, describe the *process* that is followed to handle an emerging unk unk. If the interaction among project participants is governed by a contract, other ways of adjusting to unk unks must be found.[4]

We demonstrate the limitations of contracts in Section 10.1. Then we describe five principles of partner management in order to ensure a constructive handling of unk unks in the project. We summarize the implications of these principles at the end of the chapter.

10.1 The Dangers of Project Contracts

10.1.1 The Eurotunnel Project

The Eurotunnel, running under the English Channel to connect the British Isles with the continent of Europe, near Calais, is famous for its budget overruns and subsequent shareholder tensions.[5] The idea for this tunnel was resurrected in 1984, after at least 26 previous schemes, the first in 1802 and the last in 1978, had fallen through.[6]

The tunnel traverses 26 miles under the channel between Folkstone on the British side and Calais on the continent of Europe. It comprises two parallel tunnels with a service tunnel in the center and two crossovers between them (Figure 10.1). The depth profile of the tunnel is shown in Figure 10.2.

The Eurotunnel example is not so much about major fundamental unk unks. Both the tunnel technologies and the passenger and freight transportation markets across the channel were basically known (as we further explain below). Rather, it is an example of the relationship between complexity and uncertainty. The system was so complex that significant residual

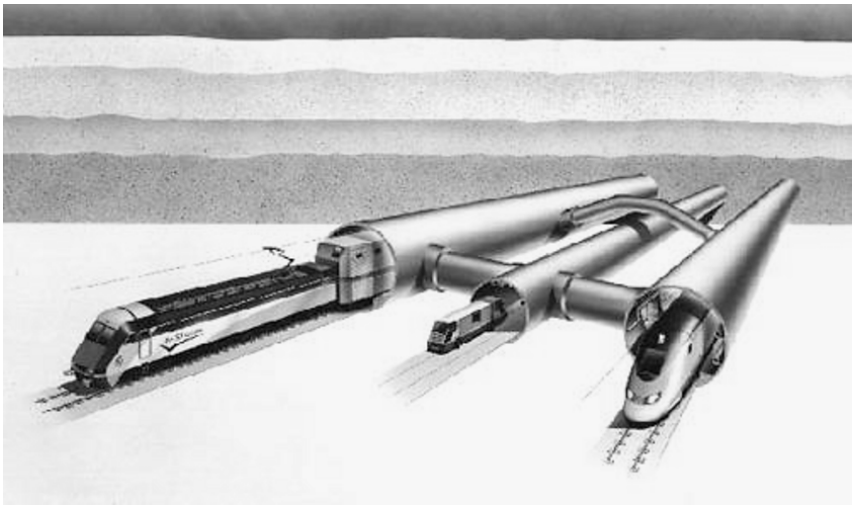

Figure 10.1 Tunnel architecture (Copyright: Eurotunnel; reproduced with permission.)

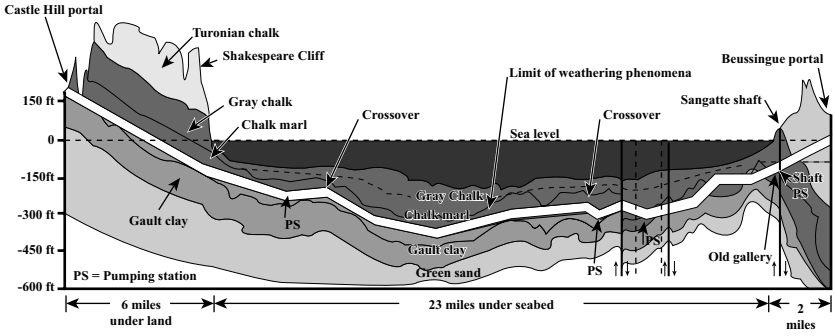

Figure 10.2 Tunnel depth profile[7] (Copyright: Eurotunnel; reproduced with permission.)

uncertainty[8] could not be excluded. In addition, the degree of relational complexity was so high, and the relationships so dysfunctional, that the partners were not able to deal with changes caused by residual uncertainty. Worse, the complex relationships even *caused* unk unks, in the sense that, later in the project, players were completely taken by surprise by the consequences of actions of other players. Contracts were completely inadequate to deal with the combined effects of unk unks and conflicts of interest.

The European Commission was keen on improving the European transport networks, the railway utilities wanted to increase their attractiveness with a connection from Paris to London, and the private sector was hungry for a major project. A group of contractors and banks set up the Channel Tunnel Group, together with a mirror contractor group on the French side. In 1985, the consortium submitted a bid in response to an invitation document issued by the French and British governments.

In short, digging started in 1987. The tunnel opened for freight transport in April 1994, and in June of the same year, for passenger trains, one year late. This schedule overrun is not the key problem (especially in the light of the fact that this reflected a six-month schedule tightening, midway, under external pressures). The key problem was a budget overrun from $7 billion to $13 billion. As a result, the outcome of the project has not been economically viable: Eurotunnel, the operating company that owns the operating license for 55 years, was loaded with such massive amounts of debt, plus some operating cost disadvantages resulting from shortsighted tunnel design decisions, that it has never been able to produce a profit and has undergone two refinancing crises, in which the current shareholders have essentially lost money.

What were the reasons for these problems? They were not market uncertainty: When we compare the original 1987 revenue estimates for 2003 (10 years into the operation) to the actual revenues of Eurotunnel in the company's 2003 annual report, they are within 10 percent of each other.[9] The market analyses correctly estimated the market potential, including the competitive response by the channel ferries, which drove prices down by 50 percent when the tunnel opened.

The technological challenge did indeed "push the state of the art" in size, although not fundamentally so. For example, the huge tunnel-boring machines were based on previous designs but had to be made more sophisticated to allow for varying boring widths. These were required because the concrete lining segments of the tunnel (each segment was a very wide, 9-meter-long pipe) had to be of varying thicknesses, depending on the surrounding ground pressure, and therefore, the excavation volume also had to vary. In addition, more water than expected was found under the chalk land of the channel, which necessitated modifications to the boring machines. This caused no more than a one-month delay. Otherwise, however, the tunnel design was based on existing technologies, only larger. In particular, the tracks, signaling, and trains were intended to incorporate standard TGV train technology and should not have posed any major unplanned challenges.

Overall, the technological challenge does not seem to justify the actual delays and overruns. Indeed, the project used sophisticated but standard scheduling and planning software, for which it was commended (see Figure 10.3).[10] The problems did not stem from inappropriate planning.

Subsequent studies have revealed that the problems overwhelmingly stemmed from the relational complexity of the web of actors, and their conflicting interests, being influenced by the contractual arrangements.[11] These contractual arrangements were never designed in the best interest of the overall project but were substantially fixed at the outset, in a context of political lobbying, even before Eurotunnel, the operator and owner, was founded. They then evolved over time as a result of ensuing power struggles. Moreover, there was no master project manager and no one who oversaw the entire complex web. Therefore, actions by some players had

completely unforeseeable consequences for other players; in other words, the unk unks resulted from the relationship complexity more than from market or technological novelty. Figure 10.4 summarizes the actors and their interests.

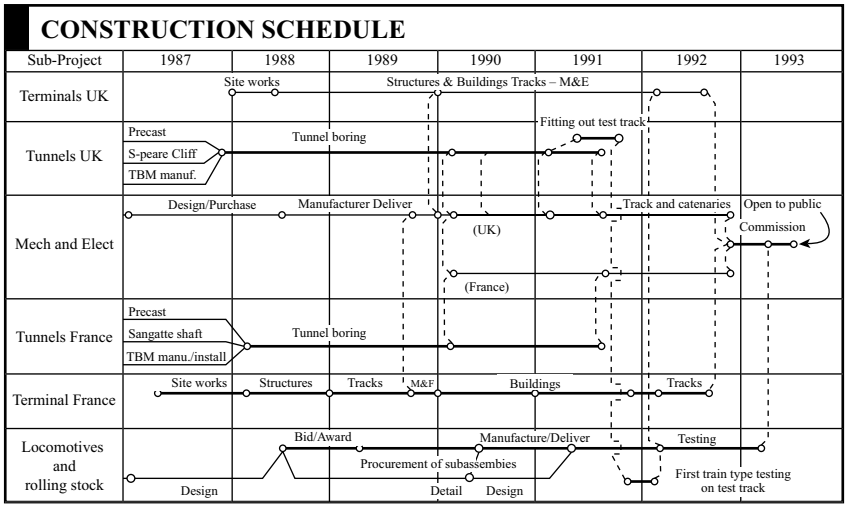

Figure 10.3 Overall project schedule and planning

(Source: VF, *Civil Engineering* 1989; reproduced with permission by ASCE.)

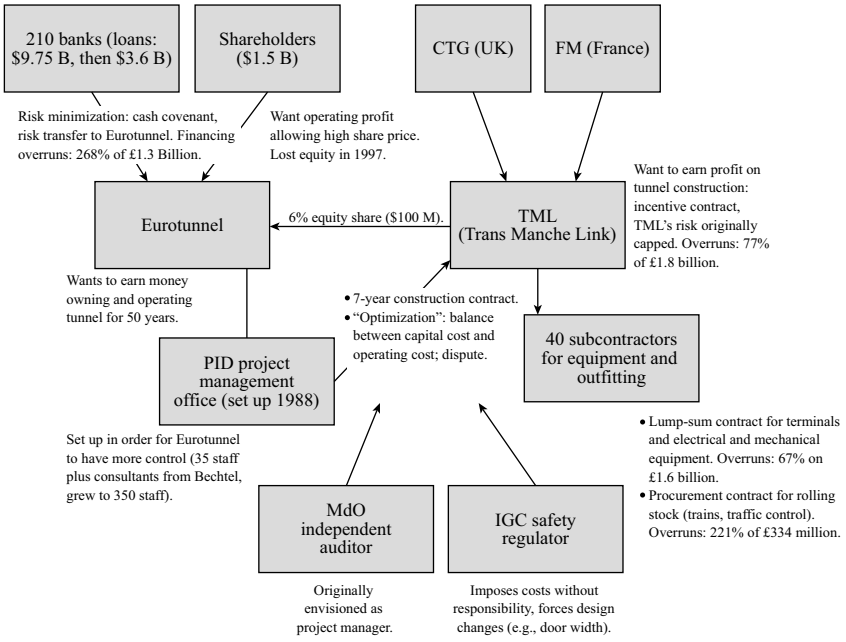

Figure 10.4 The actors in the Eurotunnel project and their interests

The two governments wanted the tunnel to happen but insisted (in the spirit of the 1980s) on private financing and ownership; in particular, they refused to give any guarantees to the banks, which inevitably increased their risk and reduced their enthusiasm. The governments promised to build a high-speed rail link in their respective countries to the edges of the tunnel but did not fully deliver. The French government finally did so, in time for the opening of the tunnel, but the British government failed to deliver at all; in fact, half of the link between London and Folkstone was opened only in 2003, and at the writing of this book, the other half is still missing (this still increases the travel time from Paris to London from two to two and a half hours today).

The first negotiations, and the design of the tunnel, were performed by TML ("Trans Manche Link"), the Franco-British consortium of construction companies. TML[12] won the bid to construct the tunnel. Eurotunnel was not formed until 1986 and was never fully accepted by TML, although Eurotunnel was the owner of the operating license and was formally the project owner and TML's client. TML saw Eurotunnel as a "Johnny-come-lately, whose responsibility was to pay TML's monthly bills and nod to the design."[13] TML wanted the design not to run over budget but was not concerned about Eurotunnel's later operating costs; a number of design decisions were made that increased Eurotunnel's maintenance costs (for example, the costs of three pumping stations that pump water from sumps to treatment plants at either end; ventilation and cooling systems; and the final train speed, which is further discussed below).

The original contract (negotiated before Eurotunnel was formed) foresaw that TML would be responsible for only 30 percent of overruns on the tunneling works, and with only a small upper limit. It took Eurotunnel a year to set up a competent project management office that could effectively oversee the construction works and start influencing detailed decision making as it happened. Relationships between Eurotunnel and TML remained adversarial throughout.

When Eurotunnel placed its first equity offering of $200 million in 1986,[14] the financial markets were reluctant to pick it up, and the Bank of England and the British government lobbied (interview sources later used the term "bullied") to persuade banks to take up the equity. As a result, the banks became extremely cautious and risk-averse. First, they placed a covenant in all loan agreements that required Eurotunnel to have enough cash on hand to pay for the entire project all the way to completion (to prevent any possibility of a default at a point when there was a half-complete hole in the ground that was good for nothing!). This caused a major crisis in 1990, when Eurotunnel's reserves fell short. This almost led to the project's demise and caused construction work to stop for a month. Eventually, the banks lent more money, and the risk balance between TML and Eurotunnel was changed to an equal sharing of overruns without an upper limit. However, risks were still predominantly on Eurotunnel's side. Interest and inflation risks were borne by Eurotunnel alone, and financing

costs experienced the biggest percent overrun of all cost categories (268 percent, i.e., from £1.3 billion to £3.5 billion, see Figure 10.4).

Subcontractor relationships also caused problems. TML's competence was in tunnel construction; they did not really want to carry responsibility for track construction and railway systems engineering. TML were forced into a general contractor role because the banks wanted to have one responsible counterpart to talk to (this was settled before Eurotunnel's formation). Consequently, TML minimized management attention to those unwanted parts of the project, a move that caused difficulties in two major areas.

First, the construction of the terminals and installation of electrical and mechanical equipment was thought to be straightforward because only proven technologies were to be used. Thus, TML accepted a lump-sum contract and, in turn, imposed lump-sum agreements on the subcontractors. This was "frankly naïve," as one observer called it, and led to claims by TML for the cost of changing designs and specifications, partly at the behest of the Inter Government Commission (IGC), but also because the complexity of the systems had been underestimated: There were interactions between the design of the fixed equipment and modifications in the tunnel and the trains. A court battle between TML and Eurotunnel ensued, which exacerbated the crisis in 1990.

The procurement contracts for the rolling stock (costs were rolled through, and TML received a fixed management fee) constituted an abdication by TML, who felt that they had insufficient expertise and were pressured into the overall responsibility by the banks. Reflecting the lack of expertise, subcontracts were signed such that there was little competition for the rolling stock work, which led to large overruns there as well.

Conflicts between Eurotunnel and TML simmered throughout, over "optimization," a provision of the original contract that stipulated the achievement of the "best balance between capital cost [which TML wanted to minimize] and operating costs [which Eurotunnel wanted to control]." Participants stated in interviews that "Eurotunnel and TML were in total disagreement on how to interpret the concept of optimization." A number of design changes worked in TML's favor; for example, when rolling stock costs spiraled out of control, the maximum speed of the trains was limited to 80 km/h in order to save costs. This doubled the tunnel passing time, reducing Eurotunnel's capacity and competitive advantage and adding to its operating costs.

The final player to be mentioned was the IGC, the government supervisory body, which had been set up to coordinate the British and French governments' policies concerning the tunnel's construction, operation, and safety. It imposed major safety-related changes to the fixed equipment (power supplies, tracks, mechanical systems, etc.) designs submitted in the 1987 agreement. It also caused major cost increases in the rolling stock. For example, it delayed the approval for a safety-related proposal of widening the passenger car doors from 60 to 70 cm. When the approval did not

come, TML continued manufacturing to keep on schedule. But later, the IGC decided that 60-cm doors were unacceptable, and the option had to be installed anyway, but at this point, the decision had caused a nine-month delay and a £45 million cost increase.

The IGC clearly prioritized safety over cost and speed. Eurotunnel and TML (this time in concert) complained that the IGC had "the authority to change and control things without commensurate responsibility," taking away necessary margins and reserves and causing delays that made costs skyrocket.

Summing up the Eurotunnel example, relational complexity of this project was high, and the contractual structure, which emerged through political haggling over time, pitted the parties against one another, so constructive problem solving during the project became very difficult. Worst of all, the complexity of both the technical systems and the relationships even *caused* unk unks, in the sense that players were completely taken by surprise by the consequences of actions of other players (e.g., the IGC's design changes; TML's claims regarding fixed equipment and rolling stock, which had been judged straightforward; etc.).

In addition to the interest conflicts, the parties were not able to build constructive relationships; there were clashes among the senior managers on the different sides, and the organizations, over time, assumed a "winners and losers" mentality.[15] This exacerbated the dysfunctional contract structure, precisely when problem solving and changes were required, and the parties dug in their heels to prevent adjustments. This example illustrates how contract structures that work in simpler projects can lead to failure in complex projects with considerable uncertainty.

10.1.2 Other Examples

In order to appreciate that the Eurotunnel example is not a grossly deviant exception, consider a second example, the South Trunk project,[16] an independent power plant project designed to burn waste coal from a nearby pile. The main risk that managers anticipated was technical difficulties with the boiler that used the relatively new and untested circulating fluid bed technology.[17] Their worries proved to be unfounded, and the boiler, for which a reputable supplier was selected, did not cause any significant problems during startup and operation.

However, the South Trunk project *did* experience significant problems related to the fuel-handling system and to a reversal in the trends for fuel and electricity prices, none of which had been anticipated by the participants. During startup, the project experienced repeated failures of the waste coal- and ash-handling systems. Participants started blaming one another. The owner blamed the turn-key contractor, who, in turn, blamed the owner because the coal received from the nearby waste pile contained higher humidity than specified in the turn-key contract. An unexpected decline in coal prices ultimately led to the demise of the project.

The payments that the project received from its utility client were tied to the cost of the coal-fired power generation in the utility's plants. Technical difficulties became pretexts for each party to jump upon for an opportunity to exit with minimal losses. After making costly modifications to the project and persuading the owner of the waste pile to change the contract and bring in higher-quality coal from the outside, the bank took over the project but failed to operate it efficiently. The bank finally sold the project to the client utility at a quarter of its cost. The utility shut it down, arguing that it no longer needed the capacity.

In summary, the participants were no longer able to overcome (seemingly) differing interests, and cohesion, or the capacity of the participants to collaboratively solve problems caused by unforeseen events, broke down. As a result, the project failed.

Examples of contracting problems in novel projects abound, and not only in the construction industry. To give an example in the electronics industry, the automated interstate highway truck toll collection system introduced in Germany in January 2005 was delayed by 18 months, an overrun of 50 percent. The system was highly complex, combining on-board GPS/infrared/radio units with in-built software (storing a digital map of the country's road network and interacting with the central system), a coordination satellite, road toll sensors, and central data processing, all of which would allow not only toll collection but also intelligent vehicle routing, according to traffic conditions. This complex combination of newly developed components became a massive problem because the contractual structure weakened the parties' motivation to coordinate and collaborate: The contractor itself (TollCollect) was a consortium of three firms, which made decisions by consensus. This setup led to an inevitably slow process, and when problems arose, the partners started to shift responsibilities and blame one another. Second, the contracts between the consortium and the government produced unclear incentives. Third, the politically motivated inclusion of a third party, one of the losing bidders for the system, in manufacturing the on-board boxes, allowed the consortium to escape contractual penalties. Again, the contractual structure significantly exacerbated the challenge of dealing with the unk unks that, in this case, arose from the complex combination of novel components.[18]

10.1.3 The Limitations of and the Need to Extend Contracts

The above-described problems are not exceptions; rather, they are commonplace.[19] The Circored project (Chapter 2) also suffered from contract confrontations, when the general contractor, Bechtel, rejected bids for the EPC construction contract because Bechtel thought it could be done at lower costs. Bechtel then performed the EPC contract itself, in a fixed-price structure, but found out that it had underestimated the costs. Subsequently, a legal confrontation ensued, during which Bechtel filed many claims demanding more money.

It is a quite widely used strategy of contractors to bid low and then file legal claims for minor changes to the activities (narrowly interpreting what the contract demands). This has been observed in multiple industry contexts of project management, leading some authors to conclude the following:[20]

> A contract is a dangerous instrument and should always be approached with trepidation and caution. . . . Theoretically, the aim of a written contract is to achieve certainty of obligation of each party, the avoidance of ambiguities, and such definiteness of understanding as to preclude ultimate controversy. In practice, construction contracts are generally formed not to definitely fix obligations, but to avoid obligations.

More generally, one hears the observation, "The more predictable construction environment of the past has given way to a massive number of unknown, unpredictable, and unquantifiable problems. This change has resulted, in part, from the growing number of relationships in modern projects. These new relationships tend to produce conflict, not cooperation."[21]

We therefore arrive at the inevitable conclusion that traditional contracts are insufficient to ensure collaboration of multiple parties in a project. Aligning behavior is difficult enough in projects with high relational complexity without unk unks. But as the examples and assessments by professionals show, unk unks make it hopeless to specify contracts on concrete activities and deliverables. When unexpected changes occur, partners are affected differently, invalidating carefully tuned contractual agreements, and the project inevitably falls apart.

The more carefully a contract attempts to foresee contingencies and regulate risks, awards, and behavior, the more dysfunctional it becomes when unexpected events change the project. The very measures taken in order to stabilize the future and avoid anticipated risks reduce the flexibility of a process that governs the problem solving in response to unk unks[22] because the players try to hold on to what they have; detailed contracts irresistibly prompt players to block change.

10.2 A Problem-Solving Process in the Face of Unk Unks

In novel projects subject to unknown unknowns, contracts must be embedded in a system of alignment and coordination measures. Only then has a novel project a chance of overcoming the inevitable tensions associated with major changes. Maintaining the ability for joint problem solving in the face of changes requires establishing a mutually agreed upon and shared *process* of problem solving.[23] The steps of partner management are as follows: Choose partners to assemble a collection of competences, clearly allocate risks and rewards and maintain flexibility in the details, apply fair process in problem solving during the project, install a transparent early warning system, and build relationships with the partners over time, enabling collaborative problem solving. We describe these five steps of partner management in this section.

10.2.1 Choose Partners for the Competences They Contribute

It is commonplace for project contractors and partners to be chosen based on price. In other words, the lowest bid gets the contract. This widely used practice has led to the equally widely used counter-strategy. "Usually, project management holds a beauty parade, and takes on the suppliers who bid lowest. The suppliers rely on glitches and delays to bump up the costs. Every time something goes wrong, legal haggling breaks out among suppliers and between them and the owner, work shuts down for weeks on end, and a huge slice of the costs ends up in the pockets of lawyers. Once the construction is late, time runs short for the final installation and testing of the electronic systems."[24] Such mutual gaming can work in projects with little uncertainty, but it will spiral out of control in novel projects where changes are inevitable. In novel projects with unforeseeable uncertainty, two criteria should be judged as important as price, or even overriding it, in the choice of project partners: competences and relational compatibility.

Competence Bundles

Throughout this book, we have discussed the fact that, in the presence of unk unks, the project plan cannot specify tasks; tasks are unknown and the plan is only a stake in the ground. Thus, contractor choice based on a bid purely on specific tasks is an illusion. Instead, once the project areas in which unk unks loom have been identified, project management should ask: *What are the competences that we need in order to "cover" the areas of concern?* What competences do we need to be able to effectively respond to unexpected events in the areas of concern, whatever they are?

After this clarification, the partner who has the *deepest competence in this area and a track record* of problem solving and performance should be the one chosen. Once project management knows that unk unks threaten, any initial price advantage is an illusion and is likely to be dominated by the costs of adjusting the project later. Effectiveness and costs of adjustments are driven by bundles of competence. The choice of a group of partners determines what competences the project management team later has at its disposal.

Of course, project management professionals have known this for a long time. And yet it is often not done because the temptation proves irresistible for upper management to choose cheaper bids, and go for immediately visible "savings," often by overriding project management.

Relational Compatibility

In addition to competences, the ability to work together has a big impact on project success (we will discuss this further in Section 10.2.4). Project management should meet important contractors face-to-face to understand the chemistry and mutual attitudes.[25] Four specific "initial conditions" that influence the chances of the partners achieving a constructive working relationship should be checked: the common understanding of the task definition, the partner's organizational routines, the interface structure, and

mutual expectations of performance, behavior, and motives.[26] We explain each in turn, illustrating them using the example of the Circored project from Chapter 2, specifically, for the initial conditions for a collaboration between Lurgi (the technology owner of the core plant), and Bechtel, the construction company of the facility (before startup).

1. *Task definition.* This is what the shared project is designed to achieve and what each side brings. Lurgi had bid to become the general contractor, but Cliffs chose Bechtel. Bechtel saw Lurgi strictly as a subcontractor for the core plant and attempted to minimize Lurgi's scope of activities as much as they could. Lurgi saw the entire first-of-a-kind facility as their baby. This resulted in continued disagreements when who strayed on whose turf.
2. *Organizational routines.* Different organizations have procedures, cultures, and "ways of doing things" that are executed automatically and not always consciously recognized. Significant differences across partners cause friction and make collaboration action more difficult. In the Circored project, Lurgi was a small engineering company that survived by offering clients facilities that were, at least, partly customized. In contrast, Bechtel was a large construction company that competed on standardization and cost reductions. Thus, Bechtel was accustomed to working by highly prescriptive processes, even the slightest deviation from which had to be authorized via a change request. Lurgi operated under the assumption that no two solutions were ever the same; thus, their personnel had the authority to tinker, even the front-line workers (all of them skilled). Lurgi accused Bechtel of inflexibility, incompetence, and causing unnecessary delays in granting work authorization. Bechtel viewed Lurgi personnel as unprofessional, never doing anything by the book, or in any consistent or reliable way. Interminable clashes and tensions during the project were the result of these incompatibilities.
3. *Interface structure.* The interface refers to how many people are involved on each side and how often they interact. If the interface is shallow and infrequent, any joint knowledge generation will be slowed down because the partners do not meet often enough to develop customized ways of collaborating. If the interface is disrupted, any tacit knowledge that has been built up, which cannot be written down in memos and minutes, is lost. In the Circored project, the Bechtel project manager was replaced three times over the two years, and Cliffs' overall project manager was on-site only one week per month. This made close collaboration difficult, to say the least.

   Often, the interface must work at different levels of the organization simultaneously: Senior managers must agree on the strategic

aspects of the project, while technical experts have to collaborate to solve operational problems. Thus, interfaces must exist at multiple levels. This can become difficult when the two organizations are of very different sizes or organizational designs. On the other hand, multiple interfaces can also make the collaboration easier, as tensions at the top (haggling over cost or benefit sharing) may coexist with close cooperation and problem solving at the operating level.

4. *Mutual expectations and compatible goals.* Each partner enters the collaboration with explicit and implicit expectations, and with hypotheses about the other side's motives. The goals and expectations of the two sides do not have to be common and shared, but they must be compatible—one side getting what it wants should not be incompatible with the other side also having its goals fulfilled. In other words, if the partnership is a zero-sum game, collaboration becomes much more difficult.

   Expectations sometimes become self-fulfilling prophecies. In the Circored project, Bechtel thought Lurgi was arrogant, as if Lurgi thought they were the only ones who understood circulating fluid beds. Lurgi, in turn, warned Cliffs that Bechtel always underbid and then went after change claims. The two companies had worked together on a previous project, with negative results. Although the parties involved had been a different Bechtel office and a different Lurgi department, the past experience caused negative expectations on both sides.

In the Circored project, the initial conditions were so negatively loaded for the collaborating parties, Lurgi and Bechtel, that they could not be overcome. Collaboration between these two contractors never recovered. To understand that goals do not have to be common, that compatibility is enough for a fruitful collaboration, consider the project of constructing INSEAD's Asian campus in Singapore between 1998 and 2000. An important partner in this project was Singapore's Economic Development Board (EDB), an organization that established connections between INSEAD and local constituencies and supported real-estate transactions and helped establish a research fund. The two organizations had different goals—the EDB wanted to contribute to a thriving and competitive academic environment in Singapore, while INSEAD wanted a commercially and intellectually fruitful beachhead for its organization. The basis for a successful collaboration lay in the fact that one party's set of goals could further the other's set of goals.[27]

Through background checks and personal contacts, it is possible for project management to sound out these initial conditions for important contractors at the beginning of the project and use them as a choice criterion in addition to the competence bundle desired.

10.2.2 Clear Risk and Reward Allocation and Flexibility

We started Chapter 10 by criticizing contracts and arguing that they do not suffice. However, we are, of course, not recommending eliminating contracts. They must be embedded in additional ways of encouraging collaborative behavior, while playing a central role in shaping the collaboration. The contract defines the business deal and sets the tone of the relationship. In this section, we argue that contracts must clearly allocate risks and rewards, be flexible, and be complemented by interest alignment via co-ownership if unknown unknowns are major.

Allocation of Risks and Rewards

Professionals commonly call for contracts to have three characteristics: "All risks should be considered as belonging to the [project] owner unless specifically assigned to another party by the provisions of the contract. . . . Determining who should be assigned a risk should be based on who has the competence and expertise to deal with that risk."[28]

The contract should not be a *political* document that clouds difficult issues in diplomatic language, but a document that supports PRM by clearly spelling out the risks.[29] As we discussed in Chapter 3, the contract defines the business deal, and the clearer the risks and responsibilities are spelled out, the more constructively the parties can behave later.

Indeed, one empirical study suggests that contract usage in many projects reflects the parties' ability to deal with the risks.[30] This study examined whether projects used outcome-based contracts (fixed-price, in which all performance deviations are borne by the contractor) versus "behavior-based" contracts, in which the price depends on other considerations (presumably, effort and process quality by the contractor). The study showed that behavior-based contracts were used more when the contractor was small (and thus not able to absorb large risks), when interests between client and contractor were highly aligned, when the client was highly competent (and thus able to closely monitor the contractor's behavior), and when the project was novel (and thus unforeseeable changes were to be expected, which were outside the control of the contractor). Outcome-based contracts, in contrast, were mostly used when the client was small and unable to absorb large risks.

Contract Flexibility

It is well known that a high likelihood of changing requirements, cost uncertainty, and difficulty to measure performance prevents parties from drawing up "complete" contracts that include all contingencies. In other words, complexity and uncertainty thwart complete contracts.

Therefore, contracts in novel projects need elements of "hierarchy," or de facto oversight and decision structures as if they were within the same organization.[31] In other words, detailed actions to be taken and detailed outcomes are *not* specified in the contract (although the general areas of responsibility and the general nature of the desired outcome are); rather,

the contract defines an "open-ended" characterization of work, analogous to an employment relationship, in which the contractor is expected to execute orders and contribute to the project activities in a way that the owner deems satisfactory. An open-ended agreement gives the flexibility to respond to unknown unknowns.[32] Specifically, this open-endedness applies to changes in the specifications, which are inevitable in a subproject with a potential for unk unks, provided that the contractor is reimbursed for costs of the changes.[33]

Finally, it is well known that the contract should always contain dispute resolution mechanisms as "ways in which the parties air and resolve differences about the interpretation and performance of the contract; . . . they may be thought of as 'grievance procedures.'. . . The purpose of dispute procedures internal to the contract is to prevent minor disputes from developing into expensive and disruptive legal battles."[34]

It must be emphasized that dispute resolution procedures in a project with unk unks must not only be intensified but must take on a whole different character. They must be elevated from the above-expressed spirit of a "depressurizing valve of last resort" to normal, everyday procedures of shared problem solving. If our plan is only a stake in the ground, and we have to evolve it as we proceed, we must be able to collaboratively make changes and solve new problems every day, without the threat of a dispute or legal action in the back of our minds. We must be able to resolve inevitable differences in our views and the interpretations of observations routinely and collaboratively. Thus, the term "dispute resolution mechanisms" should be replaced by "shared problem-solving mechanisms."

Co-Ownership

It is unrealistic to hope that classic client-contractor contracts can completely solve the challenge of unforeseen contingencies, such as a complete failure of the technology. These contracts simply fall outside the traditional supply contract toolbox. Under high uncertainty, *additional* interest alignment is necessary by sharing ownership of the project, for example, by running it in a joint venture co-owned by the contract partners. This is, of course, easier if the parties' goals are compatible from the outset.

Returning to the Circored example, the collaboration between Cliffs and Lurgi was facilitated by the fact that Lurgi owned 7 percent (and later 18 percent) of the joint venture, CAL. This, at least, gave both sides minimum incentives to keep working during the first major crisis in the summer of 2000, when the external consultant recommended shutting the facility down.

Even here, however, caution is warranted; co-ownership may leave the parties with different levels of exposure and priorities relative to the size of their respective businesses. The party for whom the project is less important may still decide to abandon the party that depends on it more. Coming back to the Eurotunnel example, TML's 6 percent ownership of Eurotunnel was simply insufficient as a motivation for TML to help Eurotunnel with its debt load and operating cost structure.

10.2.3 Fair Process

John, a project professional whom we know, was given a bad performance evaluation by his manager, which he angrily disputed. He had a meeting with the manager, in which, after a shouting match, the manager agreed to change his mind and to give John a higher performance rating. After he emerged from this meeting, John fumed, "It is amazing how this guy has the ability to, in the end, give you what you wanted, but in the process still make you pissed off." And from then on, John proceeded to undercut the manager, in subtle ways, wherever he could.

The outcome of the evaluation was what John had wanted. But he hated the process of getting to the outcome: He found it unfair. The example illustrates a general desire that people have: They want fairness. They like positive outcomes, but the positive outcome is galled if the process was perceived as unfair, and even a negative outcome can become palatable if the process was fair and just.

The desire for fairness is a universal and deep psychological human need. We are social animals, and we care about justice in our social group. If fairness has been violated, we feel anger and indignation if it has been done to us, and shame and guilt if we have done it to others. More than that, we even have an in-built "cheating module" in our brain: In situations where social cheating (violation of fairness by taking advantage of the other party) is possible, we automatically become highly alert and, unconsciously, scrutinize information very carefully to see whether an unfair act has indeed occurred.[35]

Often, we hear managers complain that their employees and business partners always second-guess them, even when they think they have communicated clearly. But gossiping and second-guessing are not signs of irresponsibility of the masses. On the contrary, they reflect a healthy, cautious attitude to situations of vulnerability, an "instinct" of wanting to scrutinize people with power whenever there is the slightest possibility of abusing that power. Thus, the following three behaviors are normal, rather than deviant: a concern for fairness, relentless suspicion about fairness being abused, and a readiness to act violently when an abuse of fairness has indeed occurred (most of the time, only in a figurative sense, but sometimes literally).

Fairness is very important for novel projects. If unk unks emerge and the management team is forced to modify the project plan, opportunities for taking advantage of partners are rampant. It is very difficult for the partners, who do not have complete information, to judge whether the modification had to be so drastic, whether so much of the change had to be shouldered by them, or whether the change had to come just now. If fairness is not convincingly demonstrated, the natural and understandable reaction is suspicion, protest, and possibly blockage, or at least a subtle withholding of the best effort. How can the project team prevent this reaction?

The Structure and Effect of Fair Process

Fair process has three principal parts.[36]

1. *Clarity of expectations.* This means the clarity of the rules of the game, of the overall purpose, and of the performance that must be achieved. When people clearly understand what must be achieved and where their contribution lies, political jockeying is reduced, and the participants can focus on the job at hand. This includes the credibility of the project owner in setting the expectations.
2. *Engagement.* This means involving the affected individuals in the decisions that concern them by asking them for their input and allowing them to refute the merits of one another's ideas and assumptions. It communicates management's respect for these individuals and their ideas. Engagement is embedded in a context of regular mutual communication, which allows the parties to know one another and to understand how they think and argue, and which prevents the discussion of the decision from coming out of the blue.
3. *Explanation.* The reasons for the change and why the project had to be modified this way must be laid out clearly. The explanation must make the reasons transparent and demonstrate that no hidden agenda or "secret deals" are involved. The clarity and transparency works against the automatic suspicion (the "cheating module") and engenders trust, even if the idea of a partner has been rejected. Engagement and explanation also serve as feedback loops that enhance learning, both on the project management's side and on the side of the partner or contractor.

The effect of fairness on behavior can be considerable. Studies have been performed on fair process not in project management, but in the context of organizational performance. One study analyzed the behavior of international managers in response to centralized decisions made by the head office. The study found that when fair process was followed, decisions were more easily accepted, the subsidiary managers collaborated more, and moreover, they volunteered their own initiatives and ideas that enhanced the decisions and improved the organization's learning.[37]

Why does fair process make such a big difference in people's behavior? The reason is not rational calculation of benefits, but it is an *emotional* affair. Paying people respect by asking their opinion, and deactivating the automatic subconscious "cheating module" by providing them with transparency allows them to trust instead of second-guessing, and it makes it possible to accept even uncomfortable changes with their head held high. This gives a small emotional push to *wanting to collaborate*, as opposed to *wanting to get even* if fairness is violated. Fair process does not override incentives. If I lose from the project change while others gain, I will be

against it and fight it, fair process or not. However, there is a large gray area of outcomes where fair process makes a great difference.

For example, in one offshore oil platform project in the mid-1990s, management invested heavily in collaborative partner relationships. But in early 1994, oil prices dropped by one-third, which made the entire project unprofitable. In order to rescue viability, everyone needed to make some concessions. And everyone *did* contribute. One contractor delayed the start of jacket fabrication by seven months, deferring expenditures of £10 million. The general contractor committed to staff reduction without compromises in performance, saving 10 percent on overhead costs. A construction subcontractor offered design cost reductions by reusing lifting beams designed for an earlier platform. And so on. This set a tone of collaboration and compromises, initiated a stream of changes and adjustments, and kept the project alive.[38]

While fair process sounds great and *does* make a difference when followed, it is difficult to put into practice, for two main reasons. First, fair process makes pursuing hidden agendas much harder. If an opportunity arises, the temptation of taking advantage of it at the cost of the other side may prove irresistible. After all, many situations in a project represent a zero-sum game in their immediate effects: Either I win and you lose, or vice versa (although in the longer run, win-wins are more sustainable). Therefore, the reluctance to open up is great, and a complete "opening up" is rare. For example, the Heathrow Airport T5 (terminal 5) project, which is ongoing as we write this book, has publicly stated that it wants to collaborate with its suppliers. The project owner, the airport company BAA, has agreed to carry all risks, putting a large contingency reserve of funds aside that will be shared among the suppliers. However, even here, this agreement applies only to a small subset of suppliers and has not yet been put to a real test.[39]

Second, engagement and transparency open up the possibility of being wrong, and that is threatening. If I allow engagement, I open myself up to the other side finding an error in my logic, and then I will have to agree to some modification, which may make elusive the solution that I would really like. Fair process requires honesty and the self-confidence to be able to admit to being in error, and then to look for an alternative with the other side. Frankly, many managers simply do not have this level of security.

10.2.4 Early-Warning Systems

We want to elaborate a bit more on one dimension of fair process: transparency. An important aspect of transparency is an early-warning system, or the systematic communication to the other party of the degree of uncertainty of information, and of early signs of unexpected events or problems. If unexpected changes emanating from a partner are indicated as they are emerging, and if their reasons are understood, trust building and stability of the relationship become greatly enhanced.

Early-warning systems place requirements on both partners: the willingness to release the information, and the willingness to receive the information and to respond to it. We discussed systems of exchanging preliminary information among subprojects in Section 9.4.3. In effect, such a system needs to include not only internally staffed subproject teams but also external partners. The effect of open preliminary information transfer lies not only in the effectiveness of PRM, as discussed in Chapter 9, but also the robustness of the partner relationship in the face of unexpected shifts in mutual interests.

10.2.5 Relationship and Trust Building

Even with a good contractor choice, a flexible contract, and decision making that follows fair process, changes in the plan being forced by emerging unk unks may be so painful that some parties give up. So, the project may still disintegrate. To maximize the chances of maintaining constructive problem solving, the relationship between the parties must be developed and invested in throughout. And this requires mutual adjustment, not only adjustment by one side (no matter how well backed up by fair process).

The power of mutual adjustment has been documented in a study of strategic alliances.[40] Strategic alliances are similar to novel projects, as they are well defined in their scope of collaboration, and they often have a defined end—the parties engage in the alliance in order to gain access to a certain market, or to acquire certain knowledge. Often, alliances are terminated after a few years when those objectives have been achieved (or when the parties realize that the objectives are not achievable). Moreover, alliances are almost always affected by unk unks, for several reasons: Usually, they are formed to tackle new markets (that neither partner can address alone), or one partner wants to learn something new. Moreover, the organizations discover each other and learn how to deal with each other. As a result, alliances always feature learning and modifications in response to unk unks.

Figure 10.5 summarizes typical differences between successful alliance projects and unsuccessful ones, by focusing on key dynamics of the *process* of the collaboration. The project starts with the initial conditions that we have discussed in the preceding sections. The initial conditions load the dice for the chances of success of the project. Then the parties enter the learning path of the project as unexpected findings emerge.

Learning comprises two aspects. The first aspect involves the learning that we have discussed throughout this book (referred to as "content learning"), knowledge about and responses to the environment, and the project's success drivers. Content learning also includes learning about (and interpreting) the partner's hidden motives in the project. Second, the ability to adjust one's behavior in the interaction with the partner matters. For example, does the partner manage to adjust its organizational routines to facilitate interaction? Is the partner willing to change reporting routines, or travel authorizations, or decision-making rules? Does the partner engage in reevaluations of the business plan? Are additional resources and people brought in if it helps the project? And so on.

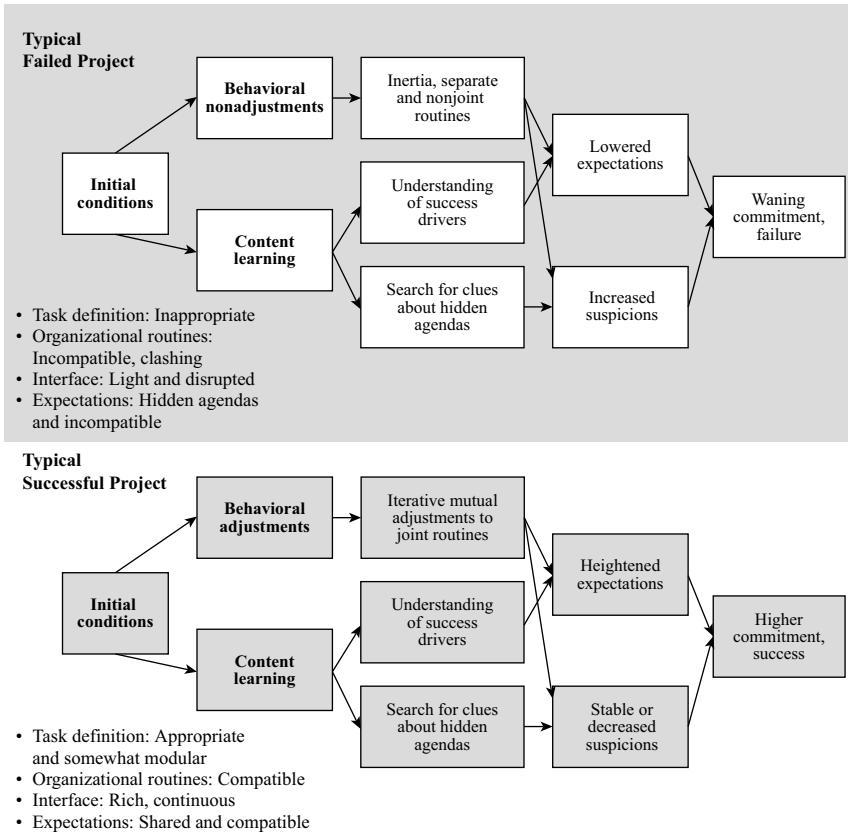

Figure 10.5 Path difference between successful and failed projects[41]

Interestingly, the above-mentioned study found that the key difference between successful and unsuccessful projects was not so much in the content learning. Rather, the behavioral adjustments influenced the effect and interpretation of the content learning. If the partner did not adjust its behavior, suspicion about its motives increased on the other side and expectations of success suffered. As an end result, this became a self-reinforcing cycle, and the project failed. If, however, the partner communicated commitment and a constructive attitude by adjusting its actions to the changing situation, information was interpreted positively, suspicion decreased, and expectations of success grew, again leading to a self-reinforcing cycle.

In other words, the *behavioral signals colored the interpretation of learning* on the part of the other party. This is, of course, related to the fair process discussion in Section 10.2.3; it is extended to a process of repeated fair process and collective action, which builds a positive (or negative) spiral of fairness, commitment, and trust. The relationship with the partner must be dynamically managed over the course of the project in order to withstand the stress of unexpected events and major modifications of the plan. Repeated cycles of mutual adjustment build personal commitment

and trust, which then form the basis on which the parties can engage in the necessary collaborative problem solving when an unexpected crisis emerges.

10.3 Summary: A Process of Partner Relationship Management

We have argued in this chapter that the owner of a novel project cannot possibly hope to impose the correct actions on outside partners or contractors by contractual means alone. Of course, a powerful client can force a detailed contract down a supplier's throat. But the supplier, even if not very powerful, can usually find ways to block or retaliate, especially if emerging unk unks force changes in the plan and require the supplier to contribute to new problem solving.

We are not arguing that contracts should be done away with. On the contrary, we argue that they must be shaped in a certain way that encourages constructive behavior, and that they must be complemented by supporting measures of trust and commitment building. Figure 10.6 summarizes these complementing measures. The first step concerns partner choice. In novel projects, contractors should be chosen not based on price but on two different criteria: first, what they contribute to the competence bundle that is necessary to cover the eras of looming unk unks, and second, the "chemistry," the initial conditions of compatibility that influence the subsequent chances of constructive collaboration.

The second step refers to the contract itself. The contract should set out clear responsibilities and allocate risks and rewards in a way that is commensurate with the respective parties' abilities to handle the risks. However, the responsibilities should not be set out in the form of detailed task descriptions (because tasks will certainly change when unk unks emerge), but in terms of contributions to the general mission of the project. The contract must be flexible in the details, to allow for change. Finally, the contract should specify regular ongoing collaborative activities, to ensure shared problem solving (although this is usually called "dispute resolution mechanisms," in novel projects, collaborative activity must become routine and normal, not triggered only by a dispute).

The third step is concerned with fair process. In a novel project, partners will almost certainly have to swallow undesirable changes of the plan or perform unwanted extra activities at one point or another during the project. It is human nature to be willing to accept such outcomes only if the process is fair—that is, if their opinions and objections are heard, the changes are transparent and clearly explained, and there is no suspicion of hidden agendas. Following fair process helps to prevent anger and blockage of change.

Finally, fair process must be embedded in an ongoing building of relationships. Mutual adjustment, the willingness to go the extra mile and change one's own way of operating in order to facilitate cooperation with

the partner, shapes the interpretation of events as they unfold, enhances trust in the partner's motives, and creates an attitude to helping out. If the parties successfully establish mutual expectations of collaboration and performance, a positive self-reinforcing cycle can arise that helps the parties to work through the inevitable unk-unk-caused crisis.

In summary, constructive behavior in a threatening situation, when uncontrollable events seem to take over, must be built on a *web of mechanisms* that prompt the partners to resist becoming opportunistic or abandoning the project. None of the steps alone is enough; specifically, contracts alone are not enough.

The CEO of a large engineering company expressed his intuition to us as follows: "To successfully collaborate with partners to not act opportunistically in the short term, but to be willing to contribute to the long-term goal of the project, you should do the following: (1) Create strong brand identification, (2) show your long-term game plan and create buy-in, (3) repeatedly articulate the long-term goals, (4) create emotional equity in the project, and (5) have your partners participate in fashioning the vision. And whatever you do, never compromise your credibility." In other words, he was saying that a successful collaboration requires a common interest (in this case, in a brand that all benefit from; this point reflects this company's situation and is not generally transferable), being credible and transparent, and managing a positive relationship that produces positive emotional energy. This CEO's intuition is consistent with our process in Figure 10.6, which is a bit broader and more systematic.

Even this web of motivating mechanisms has a limit, of course. If the conflicts of interest become too great, for example, if unexpected price changes disrupt the economics of the project such that one partner will inevitably lose money, the project may still fail. Highly novel projects are difficult. There is no panacea. The steps of engagement illustrated in Figure 10.5 will at least improve the chances of overcoming adverse surprises and achieving project success.

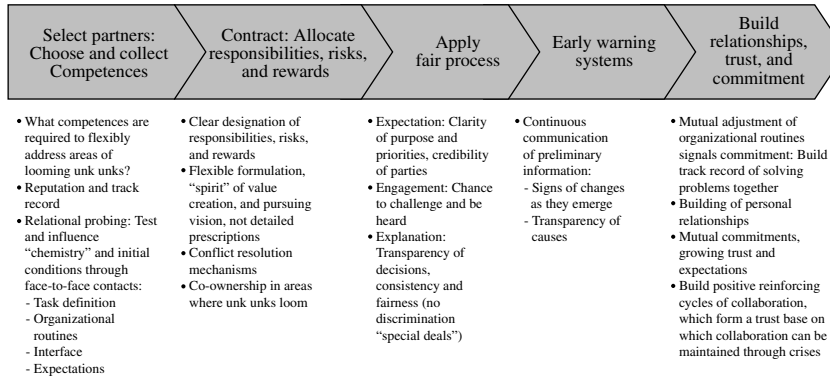

Figure 10.6 Steps of partner management in novel projects

Endnotes

1. See, for example, Floricel and Miller, 2001.
2. Indeed, a recent study of private-public partnerships concludes that they are appropriate if there is a combination of industry-specific competences required and public benefits, *and* a high level of uncertainty. Otherwise, a government could undertake the effort alone, or simply subcontract part of the work. See Rangan et al. 2005.
3. Contracts often have some aspect of "hierarchy," i.e., management ability to decide on the spot what needs to be done in a given situation, but the scope of such open-ended activities is usually very limited; see our discussion in Section 3.3.2, and see Stinchcombe and Heimer 1985.
4. Some authors call this a shift from contracts to "governability" in the face of unforeseen changes. For example, see Floricel and Miller 2001, and Miller and Lessard 2000.
5. This section is based on public sources, specifically, Smith and Walter 1989, *Economist* 1989, Palmer 1990, Channel Tunnel Special Report 1990, O'Connor 1993, Genus 1997a and 1997b.
6. In 1978, tunneling had actually begun when the project fell through, and the project that began in 1987 started as an existing hole in the ground on the English side at the Folkstone chalk cliffs.
7. Source: Channel Tunnel Special Report 1990, p. 31.
8. For the explanation of residual uncertainty, see Chapter 1.
9. The 1987 revenue forecasts for 2003 (10 years after planned start of commercial operations) were £642 million (see Smith and Walter 1989); actual 2003 revenues were £584 million. Not only are the total revenues well predicted but also their composition, with a bit more error. Eurotunnel's big problem lies in interest payments of £318 million (in 2003) on its debt, which makes it impossible to turn a profit.
10. This is further explained in VF 1989, which is also the source of the figure.
11. For example, Genus 1997a and 1997b.
12. To be precise, the predecessor entity of TML won the bid, CTG-FM, a consortium of contractors and banks. Then, TML, the contractors by themselves, split off in order to bid for and be awarded the construction contract.
13. Genus 1997b, p. 183.
14. The first round was taken up by the construction consortium and the promoting banks at the outset. A third equity tranche came from a public offering in 1987, after the stock market crash. It raised £770 million. A fourth public offering of £560 million was placed in 1990, after the crisis with the banks was resolved. It was a requirement that the project raise above 20 percent of total financing in equity.
15. Genus 1997b, p. 184.
16. The name of the project is disguised. It is cited from Floricel and Miller 2001.

17. The technically minded reader may note the similarity with the Circored project. There, the iron ore circulated in order to maximize reaction surface of the chemical reduction. At South Trunk, burning gases circulated to, again, maximize reaction surface and ensure efficient and complete burning. The two technologies are closely related, indeed: Lurgi has a different business unit that builds CFB power plants.

18. See Dohmen et al. 2004, Ulrich 2003.

19. Several more examples are cited in von Branconi and Loch 2004.

20. Greenburg 1975, cited from McDonald and Evans 1998, pp. 1–2.

21. Zack 1996, p. 29.

22. Floricel and Miller 2001, p. 448.

23. This is consistent with what Miller and Lessard 2000, and Floricel and Miller 2001, call "project governability."

24. The *Economist* (2004) offered this to-the-point formulation in the context of airport construction projects.

25. Floricel and Miller 2001, p. 449.

26. These initial conditions were identified, in the context of the management of alliances, by Doz 1996.

27. See Lasserre 2003.

28. Zack 1996, p. 29.

29. DeMarco 1997. This is a *novel* about project management, including contractual issues. It is fun to read and embodies the practical knowledge of an experienced professional.

30. See Floricel and Lampel 1998. The difficulty with this study is that the differentiation between behavior-based and outcome-based contracts is very indirect; the available data did not allow the authors to distinguish what types of behavioral conditions were actually incorporated in the contracts. The findings of the study are consistent with "agency theory" from economics.

31. See Genus 1997a, p. 421, and Stinchcombe and Heimer 1985.

32. See Simon 1951. Simon makes the argument that such flexible contracts overcome incentive problems in situations of uncertainty, and Loch and Sommer 2005 show that activity-based (as opposed to outcome-based) contracts help to encourage constructive behavior, provided that the owner can monitor what the contractor does.

33. This has become common practice in the automotive industry. Many car components today are codeveloped with suppliers, or the innovation even stems from the supplier. Supplier engineers work alongside the development engineers in many car manufacturers. The suppliers are responsible for prototyping and testing, and if changes occur (for example, because of change somewhere else in the car, or because of competitive responses in the car's design), the suppliers are reimbursed the costs.

34. Stinchcombe and Heimer 1985, p. 126.

35. The "cheating module" was established by psychologists; see Cosmides and Tooby 1989 and 1992, and Gigerenzer 1993. The empirical evidence supports the theory in biology (cf. Trivers 1971) that we, as humans, should have emotional mechanisms enforcing social cooperation because we are a social species and depend on one another in the group.

36. This is taken from Kim and Mauborgne 1997.

37. See Kim and Mauborgne 1991 and 1995.

38. This is recounted in Bakshi 1995.

39. *Economist* 2004, and personal discussions with managers.

40. See Doz 1996.

41. Source: Doz 1996, p. 75. The author uses the word "project" in describing the alliances, consistent with our view of a significant overlap between alliance management and project management.