

**Project Management Institute**  
**Case Studies in Project Management**

# The Chunnel Project

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This case study was adapted to make it a learning resource, and might not reflect all historical facts related to this project.

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## Case Study

# The Chunnel Project

### **Introduction**

The Channel Tunnel (Chunnel) project, undertaken to create a connection between England and France via an underground tunnel, represents one of the largest privately funded construction projects ever undertaken. It required the cooperation of two national governments, bankers underwriting the funding for the project, numerous contractors, and several regulatory agencies. Further, the construction and engineering of the tunnel required the use of new technology and required significant modifications during the project due to unexpected conditions and changes required by various interested parties.

The management of a project of this magnitude is a significant effort even if everything related to the project ran extremely smoothly. As this case study will demonstrate, numerous factors came into play during the course of the project that had significant effects on the overall course of the project. In the end, the Chunnel project was completed, but it was late and over budget. The causes for missing the key cost and schedule deadlines, along with other factors related to Project Management Knowledge Areas and processes, are discussed and analyzed throughout the case study.

The case study covers various Project Management Knowledge Areas (Project Management Institute, 2004) within four project phases: inception, development, implementation, and closeout. Within each project phase, the activities, accomplishments, and shortcomings of performance in the processes of Initiating, Planning, Executing, Monitoring and Controlling, and Closing are discussed. The case study is structured to allow an evaluation of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. An overall assessment of performance is then conducted, resulting in a numeric evaluation of the management of this project, including areas of strength, opportunities for improvement, and lessons learned.

In the inception phase, the discussion focuses on the historical background of the project, its

overall objectives, political climate, and pre-feasibility studies. In the development phase, the discussion addresses the overall planning, feasibility studies, financing, and conceptual design. In the implementation phase, the discussion addresses detailed design, construction, installation, testing, and commissioning. Finally, in the closeout phase, the discussion reflects on overall performance, settlement of claims, financial status, and post-project evaluation.

### **The Inception Phase**

During the inception phase, the initial scope of the Chunnel was to create a fixed transportation link between England and France. The expectation was that this would spur economic development, improve European trade, and provide an alternative high-speed transportation method to the existing modes (planes and ferry boats).

In 1984, the British and French governments agreed to some common safety, environmental, and security concerns prior to opening up the project to bidders. In 1985, the French and British governments asked for proposals. Various proposals were submitted, and in 1986 the project was awarded to the Channel Tunnel Group/FranceManche (later to become Eurotunnel). Their proposal included a 32-mile (51.5 km) double-rail tunnel to accommodate both through-trains and special car-and-truck-carrying shuttle trains. Their bid price was US\$5.5 billion.

From a project management perspective, it could be said that the high-level design and respective rough-order-of-magnitude estimates may have been appropriate. However, not enough time was provided to complete detailed design studies that would have identified the need for tunnel air-conditioning, a US\$200 million scope increase that was not included within the initial scope (Veditz, 1993, p. 20). In addition, the process created by the Intergovernmental Commission (IGC) for approving designs put additional pressure on project scope, as it approved design drafts that were not considered within the original concession agreement. This may indicate possible problems with scope initiation and planning. According to Colin J. Kirkland, Technical Director of the Eurotunnel from 1985 through 1991: “When governments announce an intention to have such a huge public utility built, leaving all the details to be determined in the course of the competition, it is rather like releasing a mouse at a Christmas party—the reactions of all those affected are unpredictable and uncoordinated, and everybody believes that he knows

what the end result should be” (Kirkland, 1995).

During the inception phase, cost estimates were established at US\$5.5 billion. As per the Channel Tunnel Treaty, the Chunnel project would have to be financed from private sources without government aid or loan guarantees. In return, the governments were prohibited from regulating prices except in potential monopoly situations. This would help in terms of estimating costs amid potential governmental economic pressures. Financing was pursued via equity and loan capital markets. Shareholders seeking equity interest were more readily found in France and eventually in Britain as well. Loan financing was raised through a consortium of 206 banks worldwide. This would have great ramifications later in the project, as refinancing would have to be pursued, should negative variances in time and cost estimates occur. Another cost consideration is that the Eurotunnel had secured a concession agreement for a period of 55 years. This gave them the sole right to operate the Chunnel for that time. Thus, any delay or cost increases throughout the project life would impact the planned cash flow for that period.

From a project management perspective, there is a direct correlation between scope definition and cost estimates. For a project this large, there are usually challenges with initial estimates, scope management, and (as will be discussed) the contract type. Thus, lack of defined scope makes resource planning, cost estimating, and budgeting difficult. In addition, return-on-investment (ROI) assumptions made in the planning stages may not prove accurate, which could leave a trail of unhappy investors and stakeholders. Given that the original cost estimate eventually increased to US\$14.9 billion, opportunities for improvement appear to exist in this area.

During the inception phase, various milestones were completed. Some may be considered false starts in the conceptual period, which included the following (Fairweather, 1998):

- 1974 – Initial tunnel ideas gathered, but efforts abandoned;
- 1978 – British and French discussions resumed;
- 1983 – French and British banks and contractors propose tunnel scheme;
- 1985 – French and British governments ask for fixed-link proposals;
- 1986 – Anglo-French Treaty signed, Transmanche Link (TML) awarded contract, and

Eurotunnel declared owner of 55-year concession for the link.

The schedule required planning all activities related to building three tunnels (north, south, and service). This was somewhat complicated due to the need to hire 46 contractors to complete the design requirements. As it turned out, the time estimate to complete the tunneling itself was materially accurate, finishing three months ahead of schedule. However, ongoing safety requirement changes sought by ICG continued to create negative schedule variances.

From a project management perspective, schedule planning did include activities related to activity definition, activity sequencing, and activity duration estimates to develop the baseline project schedule. This can be further illustrated by the fact that scheduled activities included 12 tunneling faces (six landward and six seaward) that were excavated by 11 tunnel-boring machines in both directions (Williams, 1993, p. 6). Thus, it can be suggested that the schedule complexity was significant and required maturity in logistical planning and experience in work breakdown structure (WBS) development.

During the inception phase, Eurotunnel entered into a construction contract with TML in 1987 having three cost categories:

1. Target cost for tunneling, done on a cost-plus fixed-fee basis, with a target cost above or below which there would be a sharing of the difference.
2. Lump sum for the terminals and the mechanical and electrical works for the tunnel.
3. The procurement contract for rolling stock and associated major equipment was procured on a cost-plus-percentage-fee basis.

Eurotunnel was responsible for roughly 70% of cost overruns on the original contract and TML was responsible for the remaining 30%, capped at a maximum 6% of the total cost. A revised agreement in 1990 provided a more equitable distribution of risks with Eurotunnel responsible for about £1.58 billion and TML responsible for 30% of everything above that figure. As will be discussed later, the types of contracts would prove to be challenging (i.e., ground consistency, fixed equipment claims).

From a project management perspective, contracts are a critical part of the procurement management process. They define the scope of work, cost, timeline, and rules of engagement (i.e., penalties). As it relates to this case, it appears that the procurement planning process was quite complex and being completed under vigorous time constraints. Thus, certain assumption errors may have been made regarding the ability to have enough resources to complete the contract and, in the case of a fixed-price contract, not enough was understood to limit the impact of known and unknown risks. In this case, contractual errors were made in the estimates and risk allocation method, leading to additional contract claims of US\$2.25 billion.

Relative to risk management, the management team appears to have reviewed the scope of the Eurotunnel for initial risks. However, it seems that the focus was on engineering risk as opposed to process and approval risks. Those involved appear to have been comfortable with the technical nature of this project, but less prepared to deal with the level of IGC oversight and change management controls. At the highest level, both countries were aware of the financial risk, requiring that funding be provided by non-governmental sources. Business risk appears to have been addressed to varying degrees via contractual agreements. However, these same contracts were the focus of subsequent scrutiny based on their inability to spread the risk among various stakeholders.

From a project management perspective, risk planning and mitigation needs to be an ongoing part of each project. The hope is that most material risks are identified, quantified, and prioritized early enough so that an effective risk response strategy can be established. The ability to address known and unknown risks requires careful assessment and understanding of the nature of each initiative. For this case, decisions made in the inception phase (contract choice and change-control methods) could have been more carefully assessed for risk impact.

From a quality perspective, the IGC (made up of civil servants from France and the U.K.) mandated that where there were differences in the standards of the two countries, the higher of the two should prevail (Fairweather, 1998). This was a good idea in theory, but contractors had difficulty interpreting differences related to a concrete pour.

In addition, quality and specification issues could be seen early on as they relate to railway width, voltages, and signaling systems. These incompatibility issues needed to be included within the initial quality requirements during the inception phase. Another example of quality impacts relates to the delay in communicating the requirement that passenger doors be widened from 600 mm to 700 mm. This was a safety concern with IGC. When IGC did not provide timely approval for this change, TML's manufacturing costs increased from US\$9 million to US\$70 million. However, the extent of quality planning for this initiative cannot be understated, given the scope of this initiative. State-of-the-art laser and computer technology was used to bore the tunnel and to test every part of the rail system. In fact, the most amazing feat is that the three tunnels could be excavated so close together and still meet in the right spot in both countries.

From a project management perspective, each team member has a responsibility for quality. Specific quality requirements must be defined up-front as part of an overall quality management plan. This should include quality planning, quality assurance, and quality control. Given the technical challenges related to this project, it can be suggested that quality management was successful.

During the inception phase, it was understood that the teamwork necessary to complete this project would be significant. The ability to plan and execute as a multinational team required cooperation and efforts at the highest level. Although the general complexity was known, it was not realized until this project was completed that 15,000 workers were employed on the project (Fairweather, 1998).

Teamwork can be looked at as it relates to those above and below the ground. Above the ground, there were politicians, governmental workers, bankers, lawyers, and analysts, all of whom leveraged the historical perspectives and economic challenges into an approved project plan and act. Below the ground, thousands of construction workers, machinists, and engineers worked very well boring three tunnels for 32 miles (51.5 km) from both borders across the Channel. The fact that it took 3.5 years to complete this activity, on time, speaks volumes to the level of cooperation and teamwork for this activity alone.

However, this feat was somewhat overshadowed by issues surrounding the contractual and financial obligations between various parties. Once all assumptions, assessments, and commitments are in writing, it can be very difficult to come to a mutually agreeable solution to material issues. Incomplete requirements, scope changes, and risk response strategies should have been considered within these efforts to reduce the likelihood of negative schedule and cost variances.

From a project management perspective, defining a project team is one thing, but getting agreement on ownership, activities, and timelines is another. Roles and responsibilities can be defined up-front to address activities within the WBS. However, the true test of teamwork is how well stakeholders move forward with the same objectives, given the inevitable issues that will seek to bend or break formal and/or informal agreements.

From a communications perspective, there was the usual give and take related to project planning, negotiations, and communication flow during the inception phase. This was amplified for the Eurotunnel project, given the need for communications and agreements at the highest levels of governments. This case offers extensive evidence of the importance of communications in preplanning, contract negotiations, financing, and technical issues. However, it appears that technical problems were solved rather smoothly, whereas those related to organizational structures, contracts, and finance were wrought with conflict.

This project involved 700,000 shareholders, 220 international lending banks (Genus, 1997, p. 181), British and French governments, many construction companies, and many suppliers. This complexity caused significant logistical and communication challenges. The interdependency of these stakeholders made it difficult to address issues to everyone's satisfaction. In fact, changes in scope due to requirement omissions or changes can be viewed in many ways depending on how it impacts cost, time, quality, and potential risk. It is here where the communication seemed to breakdown, as issues were not resolved in a timely manner, resulting in significant cost and time variances.

Project communications management is often one of the most important aspects to project

planning and execution. A communications plan needs to be put in place that will address horizontal and vertical communication channel needs. This communications plan could include information distribution, as well as issue tracking and performance reporting. It appears that issues in the Chunnel project may not have been given enough visibility and/or managed or escalated to a sufficient extent to mitigate their impact on the overall project plan.

During the inception phase, very little was mentioned in the way of formal project office activities, although it can be assumed that a project of this size had considerable back-office efforts to support it. Clearly, overall project activities and progress were being monitored, given the dependency on funding and accountability to the shareholders. The construction industry is known for its use of advanced project management tools and techniques. Thus, the project should be managed to industry-specific practices and agreed-upon international standards.

One of the challenges is that decision-making was somewhat fragmented, sub-optimizing the project for the sake of specific issues. This eventually pitted project champions against each other, as contractual obligations made mediation difficult. Thus, although project management techniques may have been in play, the ability of the project management team to address critical issues from a centralized position seemed insufficient.

It can be questioned if enough effort was spent on agreeing to the value of a project management office prior to the project gaining momentum. Given the international ramifications, it can be assumed that general protocols were deemed sufficient. However, given the nature of the conflicts and need for effective management, this may be considered a challenge to this initiative.

From a project management perspective, there is significant value of an effective project management office as it relates to supporting and promoting project management “best practices.” The larger the project, the greater the impact of proven methods and processes will be on the bottom line. It is assumed that during the inception phase, the roles and responsibilities of a project management office should be validated. This can be difficult to do unless agreed to early with key stakeholders.



## **The Development Phase**

The development phase of the Chunnel project consisted of detailed planning, communication agreements, and governmental approvals. This was an important phase for the project because of its sheer size, complexity, and breadth. There were many things that made this phase difficult, including the inflexibility of some of the characteristics of the projects, and the cross-cultural exchange between two countries that had to take place. Two different companies, on two different sides of the project, speaking two different languages, led by two different managing directors, did the planning. The company on the British side was Translink and the company on the French side was Transmanche. A large part of the struggles that the project incurred were due to failures in the development phase of this project.

The scope of this project was enormous. The decision to link France and England has been considered before, but never completed. The project had no hope of being profitable in the 20<sup>th</sup> century. This was the world's largest privatized project, and scope creep played a large part in the substantial increase from its initial cost estimates, and its completion behind schedule. During the development phase, the scope was not fully assessed and the proper precautions to prevent scope creep were not put in place. The Treaty of Canterbury and setting up of the IGC to coordinate the approach, construction, operation, and safety of the tunnel resulted in total loss of control when it came to scope (and huge cost increases).

The project team did a reasonable job when it came to planning the technical equipment that would be needed and understanding the complexity involved. They were able to use previous research on the soil, but, in the end, the lack of continued focus on scope resulted in the frustrations of trying to do too much. The mistake of allowing IGC to have scope control without the ability of IGC to approve additional funding for scope creep affected the management of this project so that success became extremely difficult.

The results of the Chunnel project point clearly to challenges when it comes to cost management in the development phase. The project finished substantially above budget and led to an additional significant claim. Although cost is one of the most difficult aspects to plan for when a project has such a huge magnitude, the project management team had serious challenges in

planning and detailing. The chief project executive at Eurotunnel from 1990 to 1993 stated, "... perhaps the central problem was the banks' early involvement in the renegotiation of the contract, and the multiple methods of compensation for different parts of the works.... The banks insisted on the least defined portions ..." (Fairweather, 1998, pp. 290–291).

The difficulties in cost planning during the development phase could be partly blamed for the US\$2.25 billion claim that was brought against Eurotunnel by the contracting company.

The schedule planning during the development phase seemed to be adequate. The project finished a year late but it was often due to things beyond the project management team's control. The IGC mandated that whenever a difference occurred in standards between the two countries, the higher of the two standards be kept. Theoretically this made sense, but when it came to the fine details of the project, it helped create schedule delays. There was much interpretation open for agencies like IGC that might have been better off detailed during the planning sessions for schedule analysis. The IGC's decision to force Eurotunnel to change its design from 600 mm doors to 700 mm doors by itself cost the project a nine-month delay. Every three months, a hefty status report was prepared for all the investors involved in this project, which contributed to keeping the project somewhat on track.

Contracts during the development phase of the project included agreements for the financial aspects of the project, as well as the logical aspects. The golden rule was followed: "He who has the gold makes the rules." The banks were given way too much leeway and control in this project. When banks are involved, they often focus on minimizing risk, which can be a good thing. However, when that is taken to the extreme, as in the Chunnel project, all the efforts to save money and minimize risk to the bank are thrown out the window because of things like the claim and award settlement that went against Eurotunnel. The agreement to create the IGC and give it so much control also contributed to the challenges in this area of the project. Risk was thought to be on the banks' side during the development phase of the project, but, in hindsight, the banks' plans backfired badly. The courts ruled in favor of the contractors' claims, and cost the project a lot of money.

Risk could have also been better researched and evaluated when it came to the technical side of the project. Due to French fears about being unable to grout on their side, much more sophisticated and advanced equipment was used. Later on, it was found that equipment as old as 1974 could have been used just as effectively. This is another example of overmanaging risk.

Because of the free reign given to the IGC, quality aspects of this project were handled well. Using the “better of the two methods,” the most advanced technological equipment and very little margin for error allowed for quality to be an extremely important attribute while planning during the development phase of this project.

Teamwork during the development phase was helped by the focus on fairness that was followed by the two governments involved. For every British team member, the French had a matching counterpart. However, there was no method of encouraging teamwork during the later phases of this project. The team could have designed methods by which teamwork across all the phases, teams, and team members of this project was emphasized. Although the momentum, elation, and pride created during the signing of the treaty approving this project gave it starting strength, proper provisions were not put into place to allow that momentum to continue through the life of the project. The two governments moved further away from the teamwork concept when they refused to guarantee the project financially. That put an additional burden on the privatized sector and forced its back to the wall. This caused some level of mistrust because the governments created the demands for safety and so forth, but the government guaranteed nothing financially.

Communication between the French and English sides of this project was limited. Putting the two teams on opposite ends and working toward the middle delayed communication until near the end of the project. Each side worked toward a common goal, and did not feel the need to communicate because the assumption was that they were both working toward meeting in the middle. Lack of communication during the development and design of this project in its early stages led to differences of opinion in its later stages. Although the status reports were helpful and consistent every three months, it was akin to a yearly prospectus that did not foster or accentuate communication within the team. It was a report for the financial world just to appease

them and allow the project to continue.

The project office did an adequate job during the development phase. It followed some of the planning, designing, and detailing phases required in the development phase of a project, but its work was far from superior. It did take data from past projects, but perhaps not the lessons learned when planning the Chunnel project. Project results point to the fact that there is room for improvement in this phase.

Project management in the development phase of the Chunnel project was generally hopeful. There was a clear understanding of the immensity of this project, but not enough research and detailed planning to back it up. The project management team, in hindsight, could have done a better job of detailing, planning, and designing this project. Once the project team gave up the majority of its control to the IGC—and had financial people breathing down its neck and emphasizing cost cutting and minimal risk, two different cultures, two different management teams, and various other challenges—the development phase of this project had already been made so difficult that the resulting cost and schedule overruns were just foregone conclusions.



## **The Implementation Phase**

The implementation phase of the Chunnel project started in the fourth quarter of 1987, with the awarding of a “Concession Contract” in response to the Channel Tunnel Group/FranceManche (CTG/FM) bid for US\$5.5 billion, and ended on December 15, 1994, with the project being handed over fully operational (Genus, 1997, p. 173; Veditz, 1993).

The winning proposal was made under a “build-own-transfer” (BOT) arrangement, granting CTG/FM the concession to run the project for a period of 55 years (Morris, 1994), after which ownership would revert back to the French and British governments. Having won the request for proposal (RFP), CTG/FM awarded a “design/build/commission” construction contract to TML. The actual contractor was a consortium of construction companies, some of which were investors (through joint ventures) with the original CTG/FM winner. Thus, although a normal client-contractor relationship was created, there were instances of real conflicts of interest as the contractors were, in many cases, direct or indirect investors. These conflicts of interest would cause problems as the project was implemented. When the construction contract was awarded, the cost estimate was US\$4.3 billion and the original completion date was May 15, 1993. When the implementation phase was completed, the project was 19 months late and had cost overruns of some US\$3 billion (total construction costs of US\$7.1 billion). The closeout phase explores the total cost impact not only of the construction cost overruns but also, more importantly, the lost revenue and carrying costs of the project during the 19-month period.

It is generally agreed that the Chunnel project presents excellent opportunities for lessons learned in project management, especially for capital-intensive projects, using new or proven technology, under unusual or new high-risk conditions.

Problems with politics started almost immediately, as the project was being fast-tracked with design and construction happening simultaneously. This in itself may not have been a problem, except that the promoters (CTG/FM) had to obtain approvals from the governments of both Britain and France. The very nature of democratic governments is to be deliberative, thereby causing delays and false starts from the beginning. Furthermore, CTG/FM, under pressure from the French and British governments to control costs, insisted that TML issue fixed-price

contracts to their subcontractors and vendors. As the scope was not well defined, using a fixed-price contract in a competitive bidding situation inevitably gave rise to claims, as the contractors, in order to have any chance of winning the bid in a competitive environment, assumed an optimistic case, and relied on “changed conditions” to justify claims as they arose. Since underground construction is rife with changed conditions, the use of fixed-price contracts (rather than some sort of cost-plus incentive fee) set the stage for a contentious relationship between the subcontractors and TML, and in turn, between TML and CTG/FM. These change orders, although many were resolved in favor of CTG/FM, nonetheless caused cost escalation. More importantly, as will be shown in the closeout phase, the impact of cost overruns was nowhere near as serious as the impact of delays to the functional completion of the project. It may be that governments, particularly those requiring deliberation in order to make decisions, have added challenges in managing projects, especially those that are time constrained.

Fast tracking, the process of overlapping design and construction in the hope of shortening delivery time is a risky approach under the best of circumstances. However, using this technique when the technology is new or unproven makes the risk exponentially greater. Added to this is the fact that underground construction is arguably the most risky of all construction, as changed conditions, if proven, stand as prima fascia evidence entitling a contractor, subcontractor, or vendor to compensation both in terms of actual costs plus extended overhead. This is in addition to an extension of time to complete. As the longest tunnel of its type in the world, the fact that tunneling is the most risky of all construction (and such a project had never been attempted previously with available technology), should have alerted the governments not to use the approach they did.

Several other issues stood out as warning signs:

1. Some of the rolling stock had not yet been designed (vehicle and freight cars).
2. No contingency was set aside to cover “unknown unknowns.” (In this case, the need for a ventilation system in the tunnels.)
3. The specifications for British rolling stock and French rolling stock were not the same.

All these issues should have been early warning signs that the details needed to be agreed to in advance, and that proceeding without resolution would only result in eventual delays and cost

overruns.

Using contract methods inappropriate for the scope definition was another issue (Kerzner, 2003, p. 826). As previously outlined, TML was attempting to use fixed-price contracting methods when scope was not sufficiently defined. Contractors who bid on fixed-price contracts under competitive bid (low price) “winner takes all” terms have only one choice if they are to win the bid—they must assume the “best case” scenario for that amount of scope, which remains vaguely defined, or risk losing the bid to the next lowest bidder.

Under these circumstances, there was no room for contingencies and margins were cut to the barest minimum. The contractor had no choice but to be aggressive in pursuing any and all change orders. Thus, anything that differed from the original scope (or that a reasonable person might infer was missing from the scope) had to be pursued. To do otherwise would risk forcing the contractor into bankruptcy. In setting up the RFP, the British and French governments set the stage for a contentious and adversarial relationship. The sponsoring governments may have avoided many of the problems by realizing the risks involved and setting up the original RFP with the objective of rewarding the “promoters”—and, in turn, the contractors at all levels—for achieving the goals determined by the governments to be important.

Another example was the fact that the original consortium (CTG/FM) consisted of construction companies and bankers whose primary objective was to make money on the construction and not on the operation. Remembering that this was a 55-year BOT, it may have been better to structure the consortium so that the construction was done at cost, and the only profit would come from completing the project at the lowest possible cost, within the framework of the quality and safety constraints established by the governments of France and Britain. This model may have stood a better chance of being successful.

Reflecting on the project, Jack K. Lemley, Chief Executive Officer of Transmanche Link from 1989 to 1993, highlights the importance of cultural matters, communications, and contract issues. He states: “There must be one contract, it must be developed and written in one language, and it must be based on one legal system. It must all contain clearly defined dispute resolution

procedures, procedures with which all parties are familiar and with which all parties have agreed to abide.” He concludes by stating: “The key element is communication.” (Lemley, 1995).

The objectives of a project need to be identified and communicated clearly from the beginning. This was perhaps the largest and most damaging failure of the governments of France and Britain. The financial model they created was far too optimistic given the risks involved, and the fact that the project was essentially run by bankers compounded the problem. By not having the real goals, objectives, and scope defined early, and by not implementing a contracting method that directly linked the rewards to contractors at all levels of the procurement chain to those objectives, the governments set the stage for the financial challenges of the Chunnel.



## **The Closeout Phase**

In the closeout phase, the project would not be expected to gain significant ground in key areas of project management. Most notably, the immense amount of litigation and the size of the claim against the project showed that even the best attempts at managing critical issues during the project did not have a significant effect on the overall outcome.

In terms of scope, the overall scope of the project was increased due to significant change requests throughout the life of the project. Even near the end of the project, the requirement for an air conditioning system to cool the tunnel during normal operation represented a significant scope modification. In fact, even when the tunnel was deemed to be complete, there were still outstanding scope items to be resolved. This meant that the overall scope of the project was still not fixed, even at the proposed completion. It should be noted that the completion of the project (which was delayed) was even rushed to allow operation to begin before the entire effort was completed.

Clearly, cost and schedule management represented significant challenges during the project. By closeout, the majority of the effort was focused on analyzing the sources of cost overruns and attempting to assign blame to one or more of the participating organizations. The focus during closeout was on attempting to minimize the amount of claims awarded rather than on truly analyzing the causes of cost overruns. Although certain portions of the project were completed early (the tunneling, for example), other areas such as the delivery of key mechanical systems (including key components of the rail car system) were delivered late and caused the project implementation to slip past its intended completion date and into the time allotted for closeout.

By the closeout phase of the project, teamwork and communication had broken down in several key areas. The financial backers of the project were keenly focused on minimizing their losses and, as such, refused to accept negotiated arrangements for settling some of the key contract disputes. Several arbitration bodies, including the International Chamber of Commerce, were involved to help bring the various competing sides to the bargaining table in an attempt to resolve key portions of the very complex claims existing at the end of the project. The concept of “win-win” negotiations was clearly far from the minds of the interested parties by the time the

project came to a close. Overall, teamwork during closeout was focused on each party meeting its own priorities and interests rather than working toward an acceptable solution for all parties involved. However, the parties involved in the project seemed to be quite willing to share in the project “success”—even as multibillion-dollar claims were being made against them. From a public relations perspective, it was clearly in the best interest of the owning parties and the contracting parties to show that success had been achieved and to provide as much positive information as possible to the public. The Chunnel project was something totally new, and a tainted view in the eyes of the public due to management issues would do nothing to help sales of crossings in the Chunnel.

The overall quality of the delivered project, as measured during closeout, was impressive. The final tunnel was an engineering feat that was extremely complex and there were immense hurdles to success. Despite these factors, the tunnel operated essentially as designed. Through an effective quality and safety program, even the workplace accident rates during the project were well below the industry average.

One of the greatest impacts on the project that did not materialize until closeout was the impact of the late delivery of the project on the project’s overall ROI. The initial cost models detailed an expected return based on use of the tunnel assuming that the tunnel was completed on time. The delivery delay and corresponding impact on the beginning of operations meant that the parties “owning” the tunnel were faced with numerous litigation items and no source of income from the operation of the tunnel. The “bare minimum” approach to cost estimating and contract awarding in the fixed-price model meant that there were no significant operational reserves available to provide additional funding in the interim. Thus, project shareholders could not expect to see a return on their investments until significantly longer than had been initially expected. From a project management point of view, there were numerous factors beyond the control of the project team that led to this situation. In a sense, bankers and other parties that demanded deviations from the proven methods of managing the project “shot themselves in the foot,” and set up a situation that was detrimental not only to the project itself, but also to the public perception of the project.

From a project management perspective, the closeout phase is an excellent example of why effective change management must be in place for projects. The ability of a party to make demands for changes in the design of the deliverable without corresponding funding for making those changes provides a perfect setup for challenged results. In the case of the Chunnel, the “health and safety” commission (known as the IGC) had broad authority to demand changes, but had no means to provide additional funding to implement the changes. This, combined with very slow decision-making, led to situations where significant budget overruns occurred not due to bad estimating or controlling, but rather due to out-of-control change management processes.

Summarizing his thoughts on the project, Kirkland (1995) states: “We should seek to advise future generations contemplating the creation of very large infrastructure developments not to get carried away by the excitement of the design and construction process before they have clearly established the rationale, the relationships among the key players, and the means by which the totality of the process is to be managed.”

The Chunnel can be viewed as “either one of the greatest engineering and political feats of the twentieth century, or, a project that never should have happened. However, irrespective of the opinion taken, it is clear that the Europeans are proud of their Chunnel” (Serich, Bale, Kwasny, Patneau, & Stack, 2001).



## Summary of Project Assessment and Analysis

1. Please complete your evaluation of project management for this project and calculate the average rating, using the following grid:

*Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor*

<b>Project Management Area</b>	<b>Inception Phase</b>	<b>Development Phase</b>	<b>Implementation Phase</b>	<b>Closeout Phase</b>	<b>Average</b>
Scope Management					
Time Management					
Cost Management					
Quality Management					
Human Resource Management					
Communications Management					
Risk Management					
Procurement Management					
Integration Management					
<b>Average</b>					

2. Please highlight the major areas of strength in the management of this project:
  
3. Please highlight the major opportunities for improvement in the management of this project:
  
4. Please highlight the major project management lessons learned from this project:

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*writing*, unpublished manuscript, Washington, DC: The George Washington University.

# **Case Studies in Project Management**

## The Chunnel Project

### Teaching Note

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# **The Chunnel Project**

## **Teaching Note**

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This case study was originally prepared as part of Project Management Applications, the capstone course of the Master of Science in Project Management in the Department of Management Science at The George Washington University, by the graduating students listed above with the supervision of Professor Anbari.

This case study was adapted to make it a learning resource and might not reflect all historical facts related to this project.

**Case Study**  
**The Chunnel Project**

**Teaching Note**

This case study is structured to allow the reader to evaluate the project management methods and processes used in this project. It covers a wide range of project management areas within four project phases: inception, development, implementation, and closeout. Discussion is provided within each project phase of specific activities, accomplishments, and shortcomings of performance in applicable processes of the five Project Management Process Groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing). The reader is asked to perform an assessment of performance in terms of the appropriate processes of various Project Management Knowledge Areas at the end of each phase. At the end of the case, the reader is asked to summarize his or her assessments and to provide a list of lessons learned from the case study.

In this teaching note, the following is provided:

1. Assessment of appropriate project management processes in terms of the Project Management Knowledge Areas. Suggested assessments are provided for each phase, and an average is calculated for each Knowledge Area.
2. A discussion of major areas of strength, opportunities for improvement, and lessons learned from the evaluation of the case study.
3. A brief description of project life-cycle phases, Project Management Process Groups, and Project Management Knowledge Areas, based on *A Guide to the Project Management Body of Knowledge* (Project Management Institute, 2004).

It is expected that the reader might reach somewhat similar conclusions to those provided in this teaching note. However, it is very possible that readers may conduct additional research, develop further insights, and reach other conclusions.

## Assessment of Project Management

The following table summarizes the assessment of appropriate project management processes in terms of the nine Project Management Knowledge Areas by phase:

*Rating Scale: 5–Excellent, 4–Very Good, 3–Good, 2–Poor, 1–Very Poor*

<b>Project Management Area</b>	<b>Inception Phase</b>	<b>Development Phase</b>	<b>Implementation Phase</b>	<b>Closeout Phase</b>	<b>Average</b>
Scope Management	2.00	2.00	2.00	2.00	2.00
Time Management	3.00	3.00	2.00	3.00	2.75
Cost Management	2.00	2.00	2.00	1.00	1.75
Quality Management	4.00	4.00	4.00	4.00	4.00
Human Resource Management	3.00	3.00	3.00	2.00	2.75
Communications Management	2.00	3.00	3.00	2.00	2.50
Risk Management	2.00	2.00	2.00	2.00	2.00
Procurement Management	3.00	2.00	1.00	1.00	1.75
Integration Management	3.00	3.00	3.00	3.00	3.00
<b>Average</b>	2.67	2.67	2.44	2.22	<b>2.50</b>

## Major Areas of Strength, Opportunities for Improvement, and Lessons Learned

As noted in the table, the major areas of weakness in this project surround cost and contract management. The major strengths for this project were in the areas of quality management and schedule management. As discussed in the case study, there were many areas of the project where contractual issues and cost management considerations could have been better addressed. A standardized change-control program that could not be circumvented by various parties involved in the project would have provided a more solid foundation for assessing the cost impact of changes on the project. This methodology could also have led to better risk and scope management as well, because the key changes to the project would have been subject to change control. The organizational issues surrounding the structure of the project and immensely complex funding scheme led to many interested parties with a vested interest in the success of the project. The negotiations of key components of the contract for the project did not yield the most favorable terms for effective delivery, but, rather, the most favorable terms for the bankers who were underwriting key portions of the project. This conflict of priorities was a major

stumbling block that had an immense impact on the final project outcome.

There were significant successes in terms of delivery quality and in terms of the project schedule. Although the project was delivered late, the immense amount of additional work required for completing the project, delays due to factors beyond the control of the project team, and organizational issues that hampered timely decision-making did not have an excessive impact on the overall delivery schedule.

Further, the project was delivered with a relatively high degree of quality. These areas are extremely important from a project management perspective. Schedule and quality are two of the key components that have a significant impact on the overall impression of the project in the eyes of stakeholders and the public at large. A significantly late project that has continual problems leaves a bad impression on many people and can attract significant attention. The fact that the project was delivered with a high degree of quality provides some reassurance that the project management practices in place did provide a mechanism for achieving success, but unfortunately the quality was achieved at a significant cost.

It should be noted that those project management areas that had lower ratings during the inception phase greatly affected project performance in the phases that followed.

Overall, the key lessons learned from the Chunnel project include:

- Large international projects like the Chunnel need to be carefully planned, leveraging proven project management tools and techniques.
- Functional requirements and technical specifications need to be defined and validated as early as possible to strengthen cost and time estimates.
- A strong change management plan needs to be established and maintained throughout the project life, providing an objective method for evaluation and approval.
- Project team roles and responsibilities should be defined and validated up front to maximize efforts to control and minimize risk.
- Project contracts and financing agreements should not be rushed and should provide for sharing of risk and contingency plans.

- The project management team must be given enough authority to act in the best interest of the project, and not be subject to undue influence from outside parties that are not qualified to make decisions in the best interest of the project.
- Politics and successful projects do not mix very well.
- Fast tracking projects when the technical problems are unknown compounds the risk factors.
- Using contracting methods that are inappropriate to the scope defined is a recipe for difficulties and challenges.
- The objectives of a project need to be made clear from the outset, and the rewards of all stakeholders need to be linked directly to achieving those rewards.

## **Project Life-Cycle Phases, Project Management Process Groups, and Knowledge Areas**

### **Project Life-Cycle Phases**

Project managers or the organization can divide projects into phases to provide better management control with appropriate links to the ongoing operations of the performing organization. Collectively, these phases are known as the project life cycle. The project life cycle defines the phases that connect the beginning of a project to its end. Phases are generally sequential and are usually defined by some form of technical information transfer or technical component handoff. Although many project life cycles have similar phase names with similar deliverables, few life cycles are identical. Some can have four or five phases, but others may have nine or more. (Project Management Institute, 2004, pp. 19–22). In this case study, the following phase descriptions are used.

#### ***Inception***

This phase may also be called initiation, conception, or preparation. It deals with project proposal, selection, and initiation. It considers alignment of the project within the organization's overall strategy, architecture, and priorities. It explores linkages of the project to other projects, initiatives, and operations. It addresses methods of identification of the opportunity or definition of the problem leading to the need for the project, and clarification of the project's general premises and basic assumptions. It considers the project concept, feasibility issues, and possible alternative solutions.

#### ***Development***

This phase may also be called detailed planning, definition and design, formulation, the formal approach, preliminary engineering, and preliminary design. It covers project organizing, planning, scheduling, estimating, and budgeting. It addresses development of plans for various project parameters, such as risk, quality, resources, and so forth, as well as plan audits (possibly pre-execution). It considers development of a project baseline and establishment of the detailed project WBS and master plan. It discusses finalizing the project charter and obtaining approval to proceed with the project.

### ***Execution***

This phase may also be called implementation, implementing and controlling, adaptive implementation, and deployment. It examines directing, monitoring, forecasting, reporting, and controlling various project parameters, such as scope, time, cost, quality, risk, and resources. It considers appropriate methods for change management and configuration control in evolving conditions. It addresses resource assignment, problem solving, communications, leadership, and conflict resolution. It also looks at documentation, training, and planning for operations.

### ***Closeout***

This phase may also be called closing, termination, finish, conversion, cutover, conclusion, results, and final documentation. This last phase advises on finalizing and accepting the project, product, system, or facility. It addresses transferring the responsibility for operations, maintenance, and support to the appropriate organizational unit or individual. With reassignment or release of project resources, this phase considers closing and settling any open project items. It addresses post-project evaluation (audit), and preparation of lessons learned. It covers documentation of areas of strength and opportunities for improvement. It frames the development of recommendations to support success in future projects.

### **Project Management Process Groups**

Project management is accomplished through processes, using project management knowledge, skills, and tools and techniques that receive inputs and generate outputs. These processes are divided into five groups, defined as the Project Management Process Groups: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group. Process Groups are seldom either discrete or one-time events; they are overlapping activities that occur at varying levels of intensity throughout the project. The Process Groups are not project phases. Where large or complex projects may be separated into distinct phases or subprojects, all of the Process Group processes would normally be repeated for each phase or subproject. The project manager and the project team are responsible for determining what processes from the Process Groups will be employed, by whom, and the degree of rigor that will be applied to the execution of those processes to achieve the desired project objective. (Project Management Institute, 2004, pp. 37–67). In this case study,

the Project Management Process Group processes are imbedded within each phase, as appropriate.

### **Project Management Knowledge Areas**

The Project Management Knowledge Areas organize the project management processes from the Project Management Process Groups into nine Knowledge Areas. These areas are: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, and Project Procurement Management (Project Management Institute, 2004, pp. 9–10). In this case study, the Project Management Knowledge Areas are considered within each phase and used for performance assessment, as appropriate.