Channel tunnel Cost-Benefit analysis

A Cost Engineering White Paper

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ABSTRACT

The cross-channel rail industry currently suffers from under-utilization of expensive infrastructure, financial losses and conflicting contractual relationships. In particular the high level of access charges paid by rail companies for the use of the channel tunnel is holding back traffic growth. Eurotunnels current financial structure leaves it with no scope to reduce these charges unilaterally.

Eurotunnel has conducted a detailed analysis of the industry for over a year in order to identify solutions for the complex issues underlying the industry's difficulties. The key elements of any solution must include the alignment of the interests of the cross-channel operators and clear incentives to increase traffic through the tunnel, within a stable financial structure.

Eurotunnel is proposing to significantly reduce access rates for train operators in a manner which will align the incentives of the cross channel operators and reduce their costs. Lower tunnel access rates will also considerably increase the size of the economically viable cross channel rail freight market. The reduced access rates should therefore be partly compensated for by increased traffic. [1].

To achieve these access charge reductions, Eurotunnel requires a more stable financial structure, which would involve a significant reductions in the amount of its debt and interest payments, as well as an extension of debt maturities. Eurotunnel and its advisers have developed a series of detailed proposals to meet these objectives. Euro tunnel now expects constructive engagement with its industrial and financial partners.

Eurotunnel is seeking to reach agreement in principle during 2004 with implementation in 2005. However, the issues are complex and there can be no assurance as to the eventual outcome at this stage.

Ten years after the opening of the tunnel, it is clear that our structural problems, which are due to the strictly private-sector funding of the project, and excessively high debt level and insufficient rail traffic, cannot easily be resolved without a comprehensive and innovative approach to the problems faced by all the stake holders of the cross-channel rail industry.

This project gives realistic hope of seeing Eurotunnel emerge from its financial difficulties once and for all.

Getting the tunnel built required courage, imagination and real political will. Today, we need a little more of each of these, plus the support of all concerned - our industrial partners and the authorities to turn the greatest civil engineering project of the 20th century into a profitable investment.

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1.0 introduction

Britain and France have been in need of an affordable means of transportation since the 1700s. Airlines, ferries, and automobiles dominated the market before 1994. Airlines are considered to Expensive, while ferries and automobiles are considered cost efficient but require too much time. In1984, the Eurostar began to help solve this problem.

1.1 The Eurostar

The Eurostar, found in Europe, is the only high-speed rail for that area. Its construction began in 1987 with the digging on the channel tunnel and ended in 1994. The Channel Tunnel was funded by a different group of financiers and cost them approximately $13Billion. The actual railway and trains cost about $31 million, not including operations or maintenance. This railway stretches from London to Paris and London to Brussels with stops in between. The railway is approximately 124 miles long, 31 of those miles being underground through the Channel Tunnel [2]

The Eurostar was built to provide an affordable means to get from place to place in a timely Fashion. It was not meant to replace airlines or ferries, rather provide a different way to travel. It is cheaper than regular airline travel but arrives slower to its destination and more expensive than ferry travel but arrives quicker at its destination. You can also compare it to automobile transportation as well. It costs roughly $80 to drive from London to Paris. It is about $35 for gas and $45 for tolls. The Eurostar is not cheaper than that, but does arrive much faster than all automobiles.

In 1994, operations for the Eurostar began. It travelled at a max speed of 186 miles per hour, but only travelled at 100 miles per hour through cities and through the Channel Tunnel. This reduction in speed was to reduce noise and to reduce the risk of damaging the tunnel. By 1995, the 1 millionth Passenger rode on the Eurostar. By 1996, the Eurostar had their five millionth passenger and by 1997 they had their 10 millionth passenger ride on the Eurostar [3]. This shows an increase in interest towards travelling on the Eurostar. It also shows a significant increase in profit per year. If the trend were to continue, the Eurostar would be making a profit in as few as ten years.

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Figure No.1 Retrieved from [4]

2.0 Solutions for the complex issues

Eurotunnel's trading position continues to look difficult. The company's 2004 results show a loss of £570 million. The losses are less than those in the 2003 results. The figures in those 2003 results are fairly mind-boggling but if you say them quickly they don't sound too bad! The company announced a loss in 2003 of £1.33 billion (€1.89 billion or $2.4 billion).

After the 2003 results, the company outlined a number of reasons for the losses and also discussed plans to restructure its financial position. The highlights of that statement included the following:

Reductions in access charges may allow Eurotunnel to be able to restructure its pricing strategies and increase the volume of passenger traffic using the tunnel.

Increasing freight use of the Tunnel may be an important factor in future revenue generation for Eurotunnel.

- The number of trucks using the tunnel up by 4%
- A rise in its market share from 41% to 43%
- A 2% fall in the number of cars using the tunnel but a retention of market share of 47%
- Coach volumes static but market share up from 32% to 36%
- Turnover down by 4% to £584 million
- Operating costs stable
- Operating profit down 18% at £170 million
- Interest payments on debt at £318 million
- A write down of the company's value (impairment charge) of £1.3 billion. (An impairment charge is the extent to which a company's value is less than the value of its stock)
- Total loss for the year of £1.334 billion

The company's financial statement also highlighted a number of problems facing the business and some suggestions on the way forward. The main problems stem from what were called a 'failed business model' by the Chief Executive, Richard Shirrefs. [5]

Eurotunnel was meant to be financed by private capital. The project had been discussed for some years but in deriving all its finance from private sources meant that it immediately had very high debts. Work on a channel tunnel had begun as far back as 1973 but was shelved due to political and economic crises.

The Chief Executive highlighted these as a lack of use of the infrastructure, an inability to attract business because of high access charges, too much debt (currently standing at £6 billion) meaning its interest payment burden was too high, a much lower volume of both passenger and rail traffic than forecast (passenger use was forecast at 16 million when it is actually 6 million, freight volume at 7 million tonnes when it is actually 1.7 million tones) and that the industry was fragmented and in conflict. Eurotunnel's shuttle business (for trucks, cars and coaches) has been a great success, and is the market leader for cross-Channel travel however the issue of access charges relates to other train operators that use the Tunnel, including Eurostar, EWS and SNCF and this is an area the the Company wish to tackle. It also faced increases in costs to counter the problems associated with illegal immigrants attempting to get to the UK. This problem also frustrated attempts to increase freight use through the tunnel, however this problem is now not considered a factor that is impacting on Eurotunnel's performance but highlights the difficulties faced, some of which have largely been out of the Company's control.

Its strategy is to expand its operations looking to secure routes to Switzerland, Holland and Italy, opening new leisure complexes and a variety of regional train links. But the serious side of the strategy rests on its ability to be able to restructure its debts and have greater control over its pricing. Eurotunnel believes that if it can reduce its access charges to both freight and passenger carrying companies, it can increase volumes and its revenue. It believes that it is caught in a vicious circle - it needs to levy high access charges to meet its interest payments,

this in turn causes conflict because it cuts volumes, meaning its revenues are less than they could be which means it cannot pay off its debts and so on. It believes that freight volumes would increase from 2.5 - 10 million tonnes if it could cut access charges by 50-60%. It is looking to present its proposals to its stakeholders over the coming year and hopes to gain agreement for its strategy by the end of the year, allowing it to implement its plans during 2005. [6]

3.0 Tools used to explain the financial debt and how to overcome

At the heart of the problems facing Eurotunnel is the issue of **break-even**. Any new business or existing company starting up a new venture has to incur costs in setting up the business before any customers 'walk through the door' and start paying for its goods or services. The early months and years of many businesses therefore will be one in which they will have debt. The success of the business might rely on how effectively the company is able to meet that debt. Break-even analysis can be seen as a planning tool to aid businesses in assessing when they will generate sufficient revenue from sales to cover the total costs of production and move into profit. [7]

At its simplest level, therefore, break-even occurs at an output/sales level where **total revenue = total costs**. More formally, we can use the following formula to calculate break-even:

Break Even Point = Fixed Costs ÷ Contribution

Where the contribution represents the selling price - variable costs.

Costs are therefore one crucial element in break-even. **Variable or direct costs** are those costs incurred during production, they vary with the amount produced, rising as output rises and falling as output falls. Eurotunnel's variable costs are relatively low since the cost of operating the tunnel now it is built is relatively low.

Fixed costs or overheads or indirect costs are those costs that do not depend on output. This does not mean that they do not change, they do, but they do not vary with the amount produced. These costs can be insurance, admin costs, advertising and marketing costs and, very relevant in the case of Eurotunnel, interest payments. In general, a firm must seek to cover its operating (variable) costs in the short term - after all, if it is not generating enough revenue from sales to cover the costs of producing its product it does not have much of a future! However, in the longer term it must, ultimately, cover both its fixed costs and its variable costs - in other words cover total costs**.** Once it does this, the business moves into profit**.**

4.0 Cost – Benefit Analysis

The Eurostar and Chunnel are two differently funded projects. The Chunnel has been estimated to be approximately $13 billion [1]. The Eurostar (without Construction and Maintenance costs) is roughly $31 million. Each project was financed by different groups. In my analysis, I only took into account the costs of the Eurostar. In my sensitivity analysis I will set up a base case including the Chunnel and a base case not including the Chunnel. For this section, however, I will only display an analysis of the costs for the Eurostar. Operation and maintenance costs more than the actual construction costs because of the unreliability that plagued its service. That created a huge social cost for the Eurostar.
As you can see, during its 18th year, the total yearly costs increased drastically and in the 19th year revenues dropped. This is due to the Hatfield crash. The Hatfield crash is basically a derailment of the train that injured several people but did not kill or severely injure anyone. It cost approximately $850 million to fix the rails, the trains, and in social costs as well. People were less inclined to travel on the Eurostar after this happened (that is why revenue dropped during the 19th fiscal year) [8].

4.1 Sensitivity Analysis

For my sensitivity analysis I will analyze ten possible scenarios for this project and estimate Using tables and graphs the outcome of that scenario. I will use the best possible scenario, the worst possible scenario, a few in between scenarios, then some radical scenarios just for comparison. [9].

4.2 Base Case (normal Cost-Benefit Analysis)

The first step to analyzing different variables is setting up the base case. The base case is simply the normal cost-benefit analysis without any changes in its variables. Below is a graph of how

the Revenues and Costs compare to each other.

Base Case

Interest Rate	12%
Costs	$3,800,000,000
Revenue	$3,770,000,000
NPV	($30,000,000)

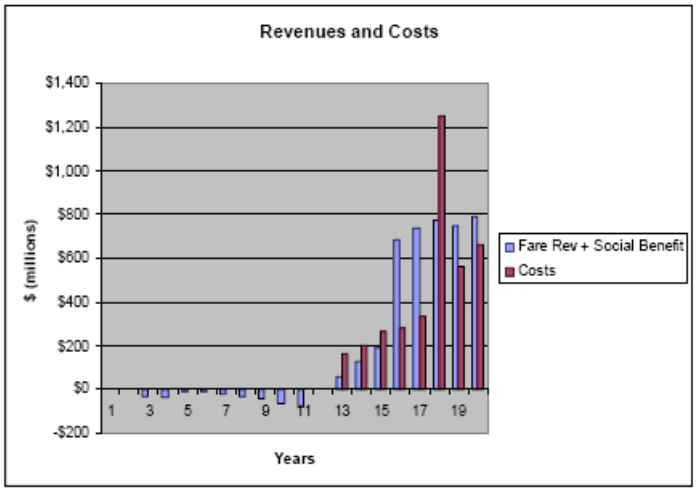

Figure No.2 Retrieved from [10]

4.2 Two Years behind Schedule

This case will show the Costs and Revenue of having been delayed two years. During these two extra years, construction, land acquisition fees, and engineering fees are added. You also lose two years of revenue and two years of positive social benefit. Here is how this case compares to the base case.

Behind 2 Years

Interest Rate	12%
Revenue	$2,270,000,000
Costs	(3,400,000,000)
NPV	(109,000,000)

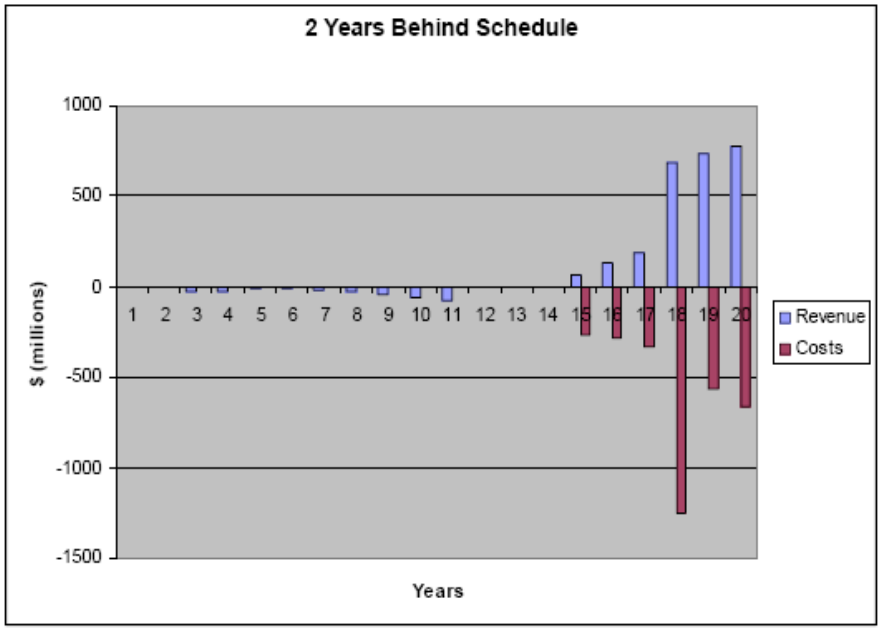

Figure No.2 Retrieved from [11]

This graph shows that the costs are much greater than the Revenue and social benefit. This makes sense because having a project's construction last a few years longer will create shortages in money and will put the project in more debt than it already is. The base case is preferred over this case because this project is two years behind and because the NPV is greater for the base case than this scenario.

4.3 Finishing the Project 1 Year Early

This is a scenario that will prove to be better than the base case. Less money will be spent on construction and will have one year extra of revenue than the base case. The NPV is expected to be greater and positive because the first year of profit for the base is year 21. If we were to take off a year from the base case (a 20 year long project), there would be one extra year of revenue that will provide just enough to reach a profit. [12]

1 Year Early

Interest Rate	12%
Revenue	$4,595,000,000
Costs	(3,933,000,000)
NPV	$8,350,000

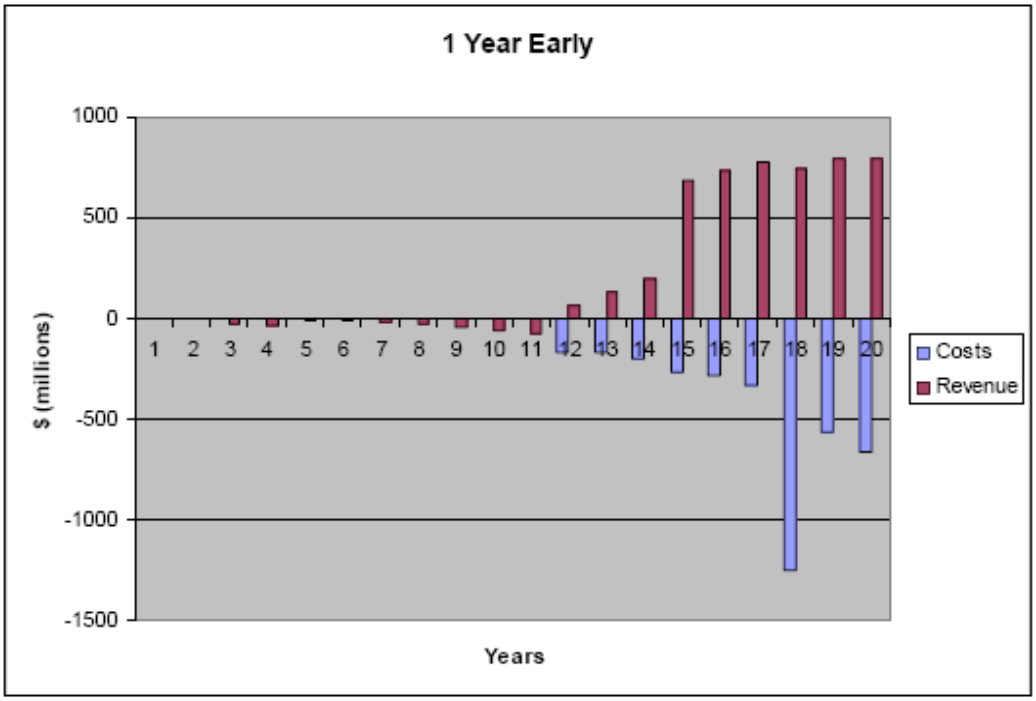

Figure No.3 Retrieved from [13]

As you can see through the graph and the table, the Revenue outweighs the cost this time around. This means that it would be ideal to finish the project ahead of time. This is better than the base case this time around because it has a positive net present value. [14]

5.0 Conclusion

There is little doubt that in engineering terms Eurotunnel has been an extremely successful project. Thus the 1999 Annual Report refers to the Channel Tunnel being awarded first prize amongst the top 10 construction projects of the 20th century by an international construction panel in the United States14. However, it seems that there are a number of lessons which can be drawn from this episode. Firstly, projected capital costs (on an annual basis) over the construction period 1988 to 1993 were omitted from the original November 1987 *Offer for Sale* document. The history of large capital projects suggests that almost invariably capital costs tend to be underestimated (and revenue costs overestimated). Including more detailed estimates of the phasing of capital expenditure at the outset might have given shareholders an opportunity to monitor more closely the actual expenditures compared to predicted expenditures. [15]

Secondly, Eurotunnel is evolving from a high risk to a low risk project. Somewhat paradoxically, it's financing structure (about 80% geared) at the outset was more appropriate for a low risk project. And its eventual financing structure in the future (probably low geared) will be less suitable for its future status as a utility. Equity (given that dividends can be withheld when necessary) is arguably more appropriate when there is considerable uncertainty attached to a project. However, if a larger proportion of equity had been sought at the outset then perhaps the project would never have started. It should be remembered that the project received no direct government funding, yet a case for some government backing could be argued on the basis of the wider benefits to the economy of an improved transport infrastructure. It is possible that the promoters of Eurotunnel were forced to accept a level of financial gearing higher than they would have preferred and, in order to push the project ahead tended to err on the side of optimism rather than caution in their prediction.[16]

References

[1] Under-utilization of expensive infrastructure, financial losses and conflicting contractual relationships *Strategy unfolding* by Charles MacKay and Richard Shirrefs
Referred website (http://www.theotherside.co.uk/tm-heritage/background/tunnel.htm)

[2] http://web.mit.edu/afs/athena/course/1/1.011/www/finalppr/hereford-TheEurostarChannelTunnel.pdf

[3] **The Eurostar and The Channel Tunnel** By Patrick Hereford

[4] http://www.o-keating.com/hsr/eurostar.htm

[5] http://www.bized.ac.uk/current/mind/2003_4/160204.htm

[6] http://www.bized.ac.uk/current/mind/2003_4/160204.htm

[7] http://www.bized.ac.uk/current/mind/2003_4/160204.htm

[8] **The Eurostar and The Channel Tunnel** By Patrick Hereford

[9] http://web.mit.edu/afs/athena/course/1/1.011/www/finalppr/hereford-TheEurostarChannelTunnel.pdf

[10] http://web.mit.edu/afs/athena/course/1/1.011/www/finalppr/hereford-TheEurostarChannelTunnel.pdf

[11] The Eurostar. <http://www.o-keating.com/hsr/eurostar.htm> Accessed 2003, March 23rd

[12] http://www.bized.ac.uk/current/mind/2003_4/160204.htm

[13] The Chunnel. <www.franklincoll.edu/bioweb/stclaid/london/chunnel.ppt>Accessed 2003, May 1st.

[13] Eurostar Services. <http://www.eurostar.com/dctm/jsp/index.jsp> Accessed 2003, March 23rd.

[14] Eurostar results for 1999 & business update. http://www.brail.be/press/E/nieuws/result_eurostar.html Accessed 2003, March 23rd

[15] **THE FINANCING AND FINANCIAL RESULTS OF EUROTUNNEL: RETROSPECT AND PROSPECT by**

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[16] http://www.essex.ac.uk/AFM/Research/working_papers/WP00-13.pdf