

## Analysis of the Channel Tunnel Project

Da Li<sup>1,a,\*</sup>, Xiaoyan Lin<sup>2</sup> and Xiaofeng Wu<sup>3</sup>

<sup>1,2,3</sup> School of Economics and Management, Beijing Jiaotong University, Beijing 100044, China

<sup>a</sup> E-mail address: Linda31@163.com; Contact address: No.3 Shangyuancun,

Haidian District, Beijing 100044 P. R. China

\*Corresponding author

**Keywords:** Channel Tunnel, Financing structure, Organizational structure, Construction operation, Market structure.

**Abstract.** This paper introduces the development process of the Channel Tunnel project, and analyzes the construction and operation of the Channel Tunnel project from three aspects: project organization management system, construction operation and market structure. It draws the experience and shortcomings of the project, which provides a useful reference for the construction and operation of High-Speed Rail project.

### Project Overview

#### Project Introduction

The Channel Tunnel, also known as the English-French Cross-Harbour Tunnel or the Eurotunnel, is located under the Dover Waterway in the English Channel, connecting the Folkestone in the United Kingdom with the Coquelles in the French province of Calais. The Channel Tunnel was opened on May 6, 1994. It consists of three 51-km parallel tunnels with a total length of 153 km. From February 12, 1986, the Treaty of Canterbury [1], which signed the tunnel connection between Britain and France, was officially opened to traffic on May 6, 1994. It lasted for more than eight years and cost about 10 billion pounds (about 15 billion US dollars). It is currently in the world. The largest engineering project built with private capital.

Dover water channel in the English Channel, connecting the Folkestone in the UK and the Pas-de in the French province of Pas-de-Côte d'Azur (Pas-de). -Calais) Coquelles, as shown in Figure 1. The Channel Tunnel was opened on May 6, 1994. It consists of three 51-km parallel tunnels with a total length of 153 km. From February 12, 1986, Britain and France signed the Treaty of Canterbury on tunnel connections. It was officially opened to traffic on May 6, 1994. It lasted more than 8 years and cost about 10 billion pounds (about 15 billion US dollars). It is currently the largest engineering project built using private capital in the world.

The tunnel spans the English Channel, greatly reducing the time it takes to travel to Britain and France. The length of the tunnel is 51km, second only to the Japanese Green Letter Tunnel with a length of 54km. The seabed is 38km long and is the longest undersea tunnel in the world [2]. The types of vehicles passing through the tunnel include long-distance trains, section trucks that carry road trucks, and section trains that carry other road vehicles (such as buses, cars, motorcycles, and bicycles). The one-way train takes 35 minutes.

#### Development Process

From the point of view of the relevant governments of the European Union, there are three factors related to the construction of the British and French subsea tunnels: First, the transportation policy, that is, through the construction of a high-speed railway network, to conserve energy and

protect the environment. This will greatly expand the reach of the Channel Tunnel and increase its long-term benefits. The second is regional policy. Britain and France hope to promote the prosperity of the two sides of the strait through tunnels. Third, from a political point of view, the opening of the tunnel is obviously of great significance to regional cooperation. It has played a significant role in promoting the development of the European Union, the formation of a single European market, and international economic and cultural exchanges. Since its official operation in 1994, the evolution of the British-French subsea tunnel project has been both a product of the European integration process and a driving force for it. The two complement each other and develop almost in parallel.

The Channel Tunnel project is the greatest infrastructure construction project of the 20th century. The main historical events of the project are shown in Table 1[3]:

**Table 1. Main historical events of the Channel Tunnel Project**

Time	Historical event
11-Sep-81	Britain and France held a summit meeting and announced that the project must be funded by the private sector
2-Mar-85	The invitations of the British and French governments to issue tenders for the financing, construction and operation of the Channel Channel project
12-Feb-86	The two governments formally signed the Straits Tunnel Treaty, also known as the Treaty of Canterbury
15-Dec-87	The British section of the Channel Tunnel was officially excavated
10-Dec-93	After the construction of the project is completed, TML will transfer the project to the European Tunnel Company
6-May-94	The Channel Tunnel was officially opened
19-Dec-97	The British and French governments agreed to extend the franchise period to 2086;
7-Apr-98	Financial restructuring completed;
2-Aug-06	The Commercial Court of Paris stated that it has approved the application for bankruptcy protection by the European Tunnel Company
2-Jul-07	The Groupe Eurotunnel S.A. (GET SA) was first traded on the Paris and London stock exchanges, replacing the European tunnel company responsible for the operation of the British-Strait Channel Tunnel.
3-Mar-09	The European Tunnel announced a net profit of £35 million in 2008, announcing that the company will pay the first dividend for the long-suffering shareholders – 4 euro cents per share. This is the first time the group has paid dividends in 22 years.
4-Dec-13	The UK Treasury said it plans to sell government-owned shares, including the "European Star" shares, with a view to raising 20 billion pounds for infrastructure construction by 2020.

## **Management Operation System**

### **Organizational Structure**

In February 1986, British Prime Minister Margaret Thatcher and French President Francois Mitterand signed the Canterbury Treaty on the joint development of the Channel Tunnel [4]. The treaty stipulates that the connection of the Channel Tunnel will adopt a financing method that cannot be pursued by government funds or government financial and commercial guarantees. Therefore, the Channel Tunnel can only be built and operated using private capital.

The Channel Tunnel was jointly proposed by The Channel Tunnel Group Limited (CTU) and France Manche S.A (FM). CTU has established a wholly-owned subsidiary, Eurotunnel PLC, for the project in the UK. FM has established a wholly-owned subsidiary Eurotunnel SA in France. The

two companies have established a partnership company, Eurotunnel General Limited. All gains and losses are shared equally between the UK and France.

In August 1986, the European Tunnel Company and TransManche Link (TML) signed an engineering construction contracting agreement. The TML joint venture was responsible for the construction, installation, testing and handover of the Channel Tunnel. The planned construction cost was 4.7 billion pounds. The cost is about 9.5 billion pounds, about twice the previous plan [5]. In September 1986, the European Tunnel Company signed an agreement with the British and French railway authorities to use the tunnel railway.

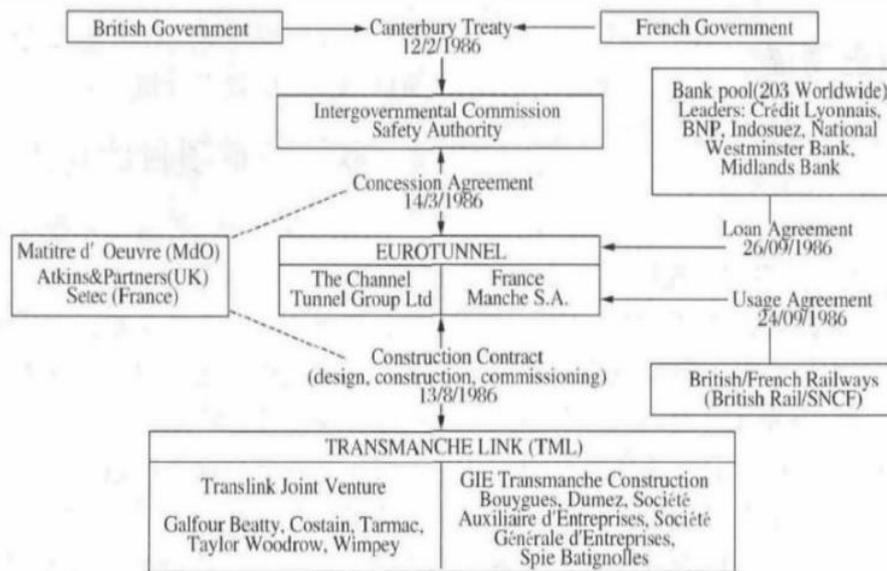


Fig.1 The structure of the Channel Tunnel project [6]

### Financing Structure

At the beginning of the construction of the European Tunnel Company, it was planned to build the tunnel system of 4.7 billion pounds, of which the construction cost was 2.8 billion pounds, the other cost was 500 million pounds, the spread reserve was 500 million pounds, and the net financing cost was 1 billion pounds. In order to meet the above cost requirements and to cope with possible cost overruns, the European Tunnel Company plans to raise £6 billion. The financing structure is: equity financing of 1 billion pounds; debt financing of 5 billion pounds. Prior to the start of the tunnel operation in 1994, the European Tunnel Company had raised a total of 2.434 billion pounds of equity capital in seven ways, and some potential equity capital of 270 million pounds was available when necessary. Equity Capital Raising of European Tunnel Projects was shown in table 2. In addition to equity capital, the European Tunnel Company has also borrowed 9.147 billion pounds from syndicates led by the top five banks.

**Table 2. Equity capital raising of European Tunnel Projects**

Project		Amount (million pounds)	Completed Time (expiry date)
Equity capital	Equity 1	47	September 1986
	Equity 2	206	October 1986
	Equity 3	770	November 1987
	Equity 4	566	November 1990
	Equity 5	793	May 1994
	Trust Fund	35	June 1994
	Option	17	June 1994
	Total	2434	
Potential equity capital	Total	268	

## **Construction Operation**

### **Construction Period**

When the franchise agreement was signed in 1986, the cost of the European tunnel was 4.74 billion pounds. In 1987, it was raised to 5.065 billion pounds. In 1990, it was raised again to 8.212 billion pounds. When it was put into operation in 1994, the total construction cost was 94.5 pounds.

### **Operation Period**

The Anglo-French Cross-Harbour Tunnel is located between Port Dover, England and Port of Calais, France. The two ends of the tunnel connect the UK's Folkston and the northern Cole's Coquelles. The transport services include le Shuttle and Eurostar.

### ***Passenger Traffic.***

The Channel Tunnel carries an average of 400 trains per day, transporting 50,000 passengers, 6,000 vehicles, 180 mass buses and 54,000 tons of cargo. Since the opening of the Channel Tunnel in 1994, the number of passengers transported reached 18.4 million in 1998, but in 2003 the number of passengers fell to 14.9 million. After that, the number of passengers rebounded again, reaching 21 million in 2014 [7].

At the beginning of the Eurostar operation, the UK side of the tunnel connection lacked a high-speed rail connection, making the connection between the Anglo-French tunnel and the inland traffic in the UK unsmooth, resulting in lower passenger traffic. With the gradual completion and operation of the British High-Speed Rail Line 1 (HS1 line), the connectivity between the Channel Tunnel and the inland has been significantly enhanced. Because of the impact of the tunnel fire [8], the passenger flow in 2008 has shown a downward trend. The passenger traffic of the Channel Tunnel has gradually picked up since 2003, and by 2014, the passenger traffic reached 21 million. The passenger traffic of the Anglo-French tunnel from 1994 to 2017 is shown in figure 2.

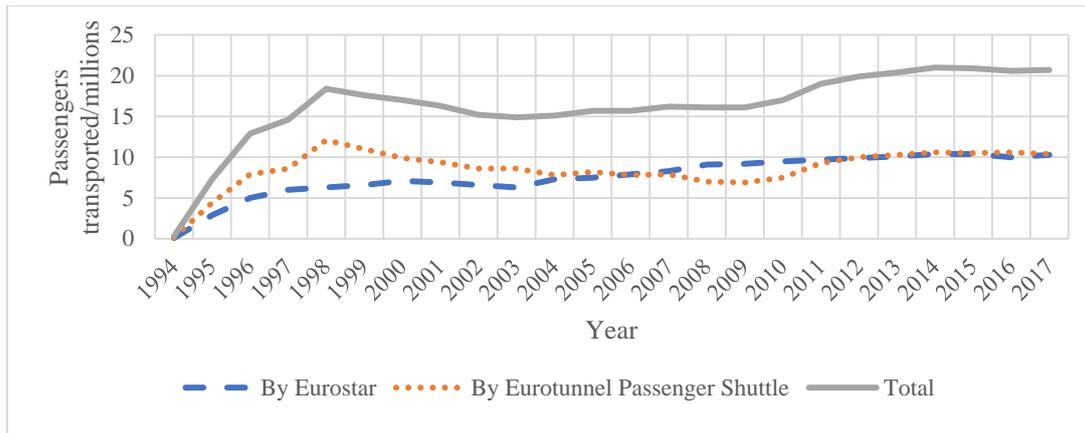


Fig.2 Passenger traffic volume of the Channel Tunnel from 1994 to 2017  
 Data Sources: "Traffic figures". Eurotunnel. Retrieved 6 February 2011-2018.

**Freight Volume.**

The freight volume of the Channel Tunnel has been on the rise since its operation in 1994. It was not until 1997 that a fire broke out in the Le shuttle service that caused the service to be shut down, reducing the cargo volume to 6.2 million tons. Although the submarine tunnel cargo transportation and the marine transportation such as ferry have fierce competition, tunnel transportation has become the main substitute for ocean transportation and has a dominant market share. However, its actual cargo volume is far lower than the forecasted freight volume at the beginning of construction. It is predicted that the freight volume of freight trains in 1995 will reach 7.2 million tons, and only 1.3 million tons of freight will actually be produced. The freight volume of freight trains reached a peak of 3.1 million tons in 1998, and then continued to fall back to 1.21 million tons in 2007. Considering the shuttle cargo volume of the vehicle, the cargo volume continues to grow, with 6.4 million tons in 1995, 18.4 million tons in 2003 and 19.6 million tons in 2007. Due to the 2008 fire incident [9], the freight volume began to fall back, the freight volume in 2009 It fell to 11.2 million tons. After 2009, the total freight volume continued to rise. In 2017, the freight volume reached 22.55 million tons. The cargo volume of the Channel Tunnel from 1994 to 2017 is shown in figure 3.

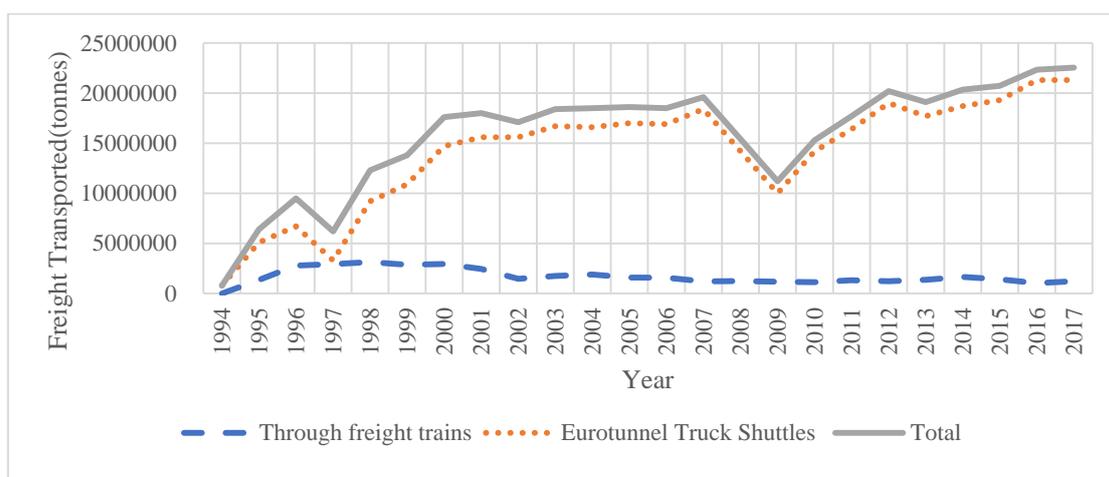


Fig. 3 Freight volume of the Channel Tunnel from 1994 to 2017

Data Sources: Eurotunnel. "Traffic figures". eurotunnelgroup.com. Retrieved 29 August 2003-2018.

## **Transportation Market Structure**

In the Channel Tunnel project, the project company has insufficient estimates of the market competition risk of the industry, the price risk of the project products and the demand risk. During the operation, there was no appropriate industry competition analysis for competitors such as ferries and aviation, ignoring the possible market share changes and the impact of competition from ferry prices.

As the completion date approaches, the amount of additional cash required continues to rise, reaching £1.8 billion. In 1994, the ferry company cut the fare drastically, forcing European tunnel companies to follow the price cuts. In 1995, the European tunnel company faced more intense market competition, as the airlines that opened the London-Paris route began a round of advertising and price cuts to increase their competitiveness. At the same time, the British ferry company carried out the "same to the end" Price reduction. The price competition in the European tunnel project in the strait transport market was passive, which greatly reduced the profit margin.

## **Project Summary**

### **Project summary**

#### ***Correct Financing Method.***

The Channel Tunnel project successfully financed the project through the issuance of stocks, benefiting from the mature and developed capital markets of Europe. The maturity and development of the capital market are not only reflected in sufficient funds, but also in investors' perception of investment risks and strong risk tolerance. The difference between the construction of bonds and stocks is that the risks borne by the investors in the two are completely different, building bonds to protect the capital, and the stocks are not guaranteed.

#### ***Proper Financing Opportunity.***

The successful recruitment of social capital requires an appropriate timing. Using the developed capital markets in Europe, the European Tunnel Company successfully raised three large amounts of equity capital. During the public offering of "Equity Capital 3", the European Tunnel Company announced the construction of a high-speed railway connecting the Paris, Lille and Belgian borders, thereby shortening the time from Paris to London to three hours; the European Investment Bank participated in the project as a financial coordinator. The release of Europe's crucial signal for project support; the bank's syndicated credit agreement was signed in September 1987. It can be seen that the issuance time of new shares is always around the time node that is beneficial to the British-French subsea tunnel project, which guarantees the successful issuance of stocks and guarantees ample funds for project construction to a certain extent.

#### ***Open Financial Supervision System.***

The relative transparency of the company's financial management is conducive to project financial supervision. Since the European Tunnel Company obtained equity capital through private placement 2 and obtained equity capital through public offering of shares 3, it is a publicly traded private company whose entire finances must be placed under the supervision of the government, shareholders and the public. After the tunnel was put into operation, the European tunnel company had to reorganize and file for bankruptcy due to insufficient transportation and insolvency. However,

under the strict auditing system of Britain and France, investors and the public have basically reasonable explanations, so they have to repeat Risky over the financial crisis.

### ***Quality of Service is the Key.***

In the course of its operation, the Channel Tunnel has increased its operating costs and increased its financial budget expenditures in terms of service quality to ensure customer loyalty and attract more new customers. In 2016, operating income increased by 4% from the previous year, and EBITDA increased by 7% from the previous year to 514 million euros. The substantial improvement in service quality and the strengthening of safety control work are one of the main reasons for the considerable benefits. In the year of 2018, new operating costs of 6 million euros were increased to improve the quality of service of the Channel Tunnel, especially the quality of passenger services, FlexiPlus services and maintenance services for infrastructure and rolling stock.

### **Lack of Project**

#### ***Lack of Government Support.***

The Channel Tunnel, which runs through the English Channel, is an important transportation infrastructure. It has an important role in promoting the long-term development of Britain and France. The beneficiaries are the public in Britain and France and the European continent. Therefore, the project owners should be the British and French governments. However, the British Prime Minister, Mrs. Thatcher, who was in power at the start of the project, vigorously promoted the “privatization” policy. The Canterbury Treaty limited the government’s financial support for the project and stressed that the government did not provide any guarantee for the project.

#### ***Highly Leveraged Financing.***

As a project legal person, the European Tunnel Company is a partnership company established by the British CTG and the French FM. The rights to invest, finance and operate the Channel Tunnel project belong to the European Tunnel Company. The creditors can only recover the debt of the European Tunnel Company. According to the requirements of the Canterbury Treaty, the Anglo-French government does not provide any financial support for the Channel Tunnel and cannot guarantee it, and all debts can only be repaid by the balances it operates. As of the end of 1994, the European Tunnel Company had raised a total of 2.434 billion pounds of equity capital in seven ways, and some potential equity capital of 270 million pounds was available when necessary. In addition to equity capital, the European Tunnel Company also borrowed 9.147 billion pounds from the banks of the top five banks, and the debt-to-equity ratio was as high as 3.38. The European tunnel project also shows the financial crisis brought about by highly leveraged financing. When the expected cash flow is not realized, the interest paid on the debt will be in trouble.

#### ***Complex Organization.***

The complexity of the project's contracts has led to a rise in the total amount of financing. The project construction party was jointly taken over by a large consortium called TransManche Link (TML) and five banks. The Channel Tunnel project signed the contractor's contract directly from TML without bidding, making TML both an issuer and a contractor. The members of the TML consortium are themselves shareholders of the European Tunnel Company. First, the lack of bidding competitiveness when selecting the construction contractor resulted in high construction contract quotations. Secondly, for the TML joint venture, the project company European Tunnel Company was not a tough, independent owner, which made it difficult to make claims and construction negotiations; In addition, as the construction contractor of the British and French Channel Tunnel

Project Company, the main purpose is to obtain considerable profits in the construction process, rather than the long-term stable income of the project itself[10].

### **Acknowledgements**

This paper is based on research funded by Chinese National Social Science Fund Major Project "Research on the Framework and Evolution Path of China's High-speed Railway Economic Theory" (17ZDA084).

### **References**

- [1] On February 12, 1986, the British Prime Minister Margaret Thatcher and French President Mitterrand participated in the signing ceremony of the treaty of Tunnels between Britain and France at the Canterbury Cathedral in the southeast of England, thus officially confirming the two governments' Commitment to build a tunnel project.
- [2] Ruiliang Wang. *The Miracle in the History of Human Engineering-The Undersea Tunnel of the English Channel*[J]. Public Science, 1994, (5): 23.
- [3] Groupe Eurotunnel. Our History [OL] <http://www.eurotunnel.com/ukcP3Main/ukcCorporate/ukcAboutUs/ukcOurHistory/ukpHistory.htm>
- [4] British and France Government. *Treaty between the United Kingdom of Great Britain and Northern Ireland and the France Republic concerning the construction and operation by private concession of channel fixed link*[S]. London: Her Majesty's Stationary Office,1986.
- [5] O'Connell, Dominic (8 January 2006). "Channel tunnel project has made Britain £10bn poorer". *The Times*. Archived from the original on 12 June 2011. Retrieved 17 December 2013.
- [6] POMPEE P J. Channel tunnel project overview [EB/OL]. [http://www.batisseurs-tunnel.com/amicale/doc%20UK/1%20Le%20Project%20Tunnel%20sous%20La%20Manche\\_C.pdf](http://www.batisseurs-tunnel.com/amicale/doc%20UK/1%20Le%20Project%20Tunnel%20sous%20La%20Manche_C.pdf).
- [7] "Traffic figures". Eurotunnel. Retrieved 6 February 2011.
- [8] "Eurotunnel 2008 traffic and revenue figures". Eurotunnel. 15 January 2009. Retrieved 15 January 2009.
- [9] Anguera, Ricard (May 2006). "The Channel Tunnel—an ex post economic evaluation". *Transportation Research Part A: Policy and Practice*. 40 (4): 291–315. doi:10.1016/j.tra.2005.08.009.
- [10] Smith A J. *Privatized Infrastructure: the role of government*[M]. New York: Thomas Publishing Company,1999