



NTNU – Trondheim
Norwegian University of
Science and Technology

Project Investment and Project Financing

A study on Business Case and Financing

Models

Simiao Wang

Project Management

Submission date: July 2012

Supervisor: Bjørn Andersen, IPK

Co-supervisor: Agnar Johansen, SINTEF

Norwegian University of Science and Technology
Department of Production and Quality Engineering

Master Thesis in Project Management

Norwegian University of Science and Technology
Trondheim, Norway 2012

Master of Science in Project Management

Written by Simiao Wang

Responsible supervisor at NTNU: Professor Bjørn Andersen

Co-supervisor at SINTEF: Agnar Johansen

Abstract

The importance of the front-end decision-making phase in projects is being increasingly recognized. Project front-end phase management is believed important. Even few studies focus on this area; many themes in project front-end phase are discussed extensively. The dissertation has two aims: the first aim is to integrate the current studies in project front-end phase, link and organize the different themes altogether in a systematical approach and present the output as a whole in the form of business case. Business case, which is a process that orderly covers most themes in project front-end study, is integrated and presented to guide the project sponsors for their decision making process on whether to finance a project or not. The second aim is to look at the next immediate step after business case which is financing the project. Project financing is a special financing method which is seen as a well-establish tool that helps project sponsors initiate a project when they lack of money in the outset of the project. However, project financing can lead to big problems. At worst the project company would go bankrupt if project financing is used improperly. I am going to dive into these two areas, find problems and give the solutions or suggestions to these problems. I use literature review as the method to study business case. Solutions are given based on the previous studies in different disciplines. Literatures and case are used in studying project financing. Solutions are based on the theoretical work and the case study. The solution to the problems in business case is to establish a dynamic business case development process to response to the changing environment. This process with the added elements could therefore reflect the changes and uncertainties in the project. Extensive suggestions to the problems in project financing are given. A general conclusion is that project financing is more suitable to projects with low uncertainty ahead. When deciding to use project financing, the project sponsors must be very discrete about the nature of the project and its potential profitability.

Key words: *Project front-end phase, Business case, Project financing, Uncertainty*

Acknowledgment

I would like to express my gratitude to those who helped me with the preparation for this master dissertation. Thanks to my supervisor Mr Agnar Johansen, he has given me a lot of precious advice on this master thesis. Without his advice and efforts, I would not have finished this master thesis. I would also express my gratitude to my supervisor, Mr Bjørn Andersen; he gave me some good advice when I was faced with problems during writing the thesis. I would not forget your advices and kind help to me in my last year study in NTNU.

Contents

Abstract.....	I
Acknowledgment.....	II
Contents.....	III
List of Figures.....	V
List of Tables.....	VI
Chapter 1. Introduction to Business Case and Project Financing.....	1
1.1 Background of the Study.....	1
1.2 Statement of Problems.....	3
1.3 Research Questions.....	4
1.4 Research Objective.....	5
1.5 Significance of the Research.....	5
1.6 Structure of the Dissertation.....	6
Chapter 2. Methodology.....	9
2.1 Research Methodology and Research Methods.....	9
2.2 Research Philosophy.....	10
2.2.1 Positivism.....	10
2.2.2 Interpretivism.....	10
2.3 Rationale for Choice of Approach.....	11
2.4 Research Design Studies.....	11
2.4.1 Exploratory Research Studies.....	11
2.4.2 Descriptive and Diagnostic Research Studies.....	13
2.4.3 Hypothesis-Testing Research Studies.....	14
2.5 Research Strategy.....	14
2.6 Data Selection Methods.....	17
2.6.1 Collection of Primary Data.....	17
2.6.2 Collection of Secondary Data.....	18
2.7 Research Design of the Dissertation.....	20
2.8 Strength and Weakness of Research Methods.....	23
2.9 Research Limitations.....	24
Chapter 3. Literature Review on Project Front-end Phase Management.....	26
Chapter 4. Literature Review on Business Case.....	31
4.1 Why Use Business Case?.....	31
4.2 What Is Business Case?.....	33
4.3 Business Case Development Process.....	34
4.4 A Step by Step Explanation of the Process.....	37
4.4.1 Problem Statement and Objective.....	37
4.4.2 Alternatives.....	38
4.4.3 Strategic Alignment.....	38
4.4.4 Cost & Benefit Analysis.....	40
4.4.5 Project Risk Assessment.....	47
4.4.6 Recommendation.....	50

Chapter 5. Literature Review on Project Financing.....	54
5.1 Project Financing and Its Benefits.....	54
5.2 Project Financing Methods.....	56
5.3 Financing Models.....	59
5.4 Project Financing Risk Management.....	62
5.5 Business Case and Project Financing.....	65
Chapter 6. Case Study.....	68
Chapter 7. Discussion and Solutions.....	77
7.1 Business Case – Is It Trustable?.....	77
7.2 Suggestions to Business Case Problems.....	82
7.3 A Proposed Business Case Development Process.....	88
7.4 Project Financing-How to Borrow the Money?.....	94
7.5 Case Discussion-Eurotunnel Project.....	98
7.5.1 Project Ownership Structure.....	98
7.5.2 Project Contractual Structure.....	100
7.5.3 Financing Eurotunnel Project.....	102
7.7 Eurotunnel Project -What was Wrong?.....	102
7.8 Lessons and Suggestions.....	107
Chapter 8. Conclusion.....	114
8.1 Research Questions Review.....	114
8.2 What I Have Done in the Dissertation.....	114
8.3 Results and Findings.....	115
8.4 Evaluation of the Research Methods.....	117
8.5 For Planners and Project Sponsors.....	118
8.6 Recommendations for Further work.....	119
Reference.....	122
Appendix 1. Work Plan for Master Thesis.....	128
Appendix 2. Meeting Minutes.....	132
Appendix 3. Examples of Costs.....	133
Appendix 4. Example of Benefits.....	134
Appendix 5. Risk Check List.....	135
Appendix 6. Quantitative Cost & Benefit Analysis.....	136
Appendix 7. Qualitative Cost & Benefit Analysis.....	137
Appendix 8. Eurotunnel's Conflicts.....	138
Appendix 9. Eurotunnel Financial Data.....	139

List of Figures

Figure 1.1 Project Management Process Groups.....	2
Figure 1.2 Project Boundaries.....	2
Figure 1.3 Structure of this Dissertation.....	7
Figure 2.1 Chapter Guide.....	9
Figure 2.2 Research Design for Dissertation.....	21
Figure 2.3 Data Analysis Process in the Dissertation.....	23
Figure 3.1 Project Front-end Phase Management.....	26
Figure 3.2 Correlations between Cost of Changes and Uncertainty.....	27
Figure 3.3 Uncertainty vs. Available Relevant Information in a Project.....	28
Figure 3.4 Risk Development through Project Lifecycle.....	28
Figure 3.5 A-Cost Overruns (N=258). B-Cost Overruns of U.S. Projects.....	29
Figure 4.1 Chapter Guide.....	31
Figure 4.2 Business Case Development Process.....	35
Figure 4.3 Project Strategy Development.....	39
Figure 4.4 From Corporate Strategy to Project Strategy.....	39
Figure 4.5 Costs and Benefits Analysis Process.....	40
Figure 5.1 Simplified Project Financing and Contract Structure.....	55
Figure 5.2 BOT Project Financing Process.....	61
Figure 5.3 Asset Securitization Process.....	62
Figure 5.4 Business Case and Project Financing.....	65
Figure 6.1 Location of "Channel Tunnel" (Left) and the 3-D sketch (Right).....	70
Figure 6.2 French Terminal at Coquelles Site (Left) and British Terminal at Folkestone (Right).....	72
Figure 6.3 Eurotunnel's Financial Evolution.....	76
Figure 7.1 A-Cost underestimate. B-Benefits Overestimate.....	81
Figure 7.2 Project Strategy Ongoing Checking Process.....	83
Figure 7.3 Successive Calculation Process.....	84
Figure 7.4 Changes and Decision Making of Project Sponsors.....	87
Figure 7.5 Business Case Checkout in BOT Project.....	88
Figure 7.6 Business Case Development Phases.....	89
Figure 7.7 Project Feasibility Dimensions.....	96
Figure 7.8 Ownership of Eurotunnel Project.....	98
Figure 7.9 Ownership of Eurotunnel Main Contractor TML.....	99
Figure 7.10 Eurotunnel Contractual Structure.....	101

List of Tables

Table 2.1 A Taxonomy of Research Methodologies.....	15
Table 4.1 Cash Flow Forecasting.....	43
Table 4.2 Industrial Beta to Evaluate the Project.....	46
Table 4.3 Risk Identification.....	48
Table 4.4 Risk Matrix.....	50
Table 4.5 Project Selection Factors.....	51
Table 4.6 Weighted Scoring Model.....	52
Table 5.1 Project Financing Methods Comparison.....	58
Table 6.1 Loans and Lending Countries.....	73
Table 6.2 Timing of the Loans and Their Lending Banks.....	74
Table 6.3 Timing of the Equities Issuance.....	75
Table 7.1 Risk Factors in Project Costing.....	86

Chapter 1. Introduction to Business Case and Project Financing

In project front-end phase, business case development and financing the project are seen as two important tasks to be fulfilled before the project is to be implemented. Business case captures the reasoning for initiating a project and provides the rationale for the project to be approved. A compelling business case adequately captures both the quantifiable and unquantifiable characteristics of a proposed project, convincing the project sponsors to invest in the project. Thus, business case can be seen as the cornerstone of a project, more specifically, business case is the basis on which a project is established.

What is closely connected to business case is financing the project. In the situation where project sponsors lack of money to finance the project, they may adopt a means called "project financing" to finance the project. "Project financing" serves as a tool to finance the project. Hence "project financing" is usually adopted by private companies when they lack of fund in the outset of a project. The key elements that constitute project financing must be considered when business case is developed. Different project financing models have different project financing costs and risks in the project, therefore project financing indirectly impacts the project final results.

Considering the significance of both business case and project financing in project front-end phase, I would like to implement a deep study on project front-end phase by focusing on the main activities: business case development and project financing.

1.1 Background of the Study

A project can be used to resolve the problems or discover the opportunities for the corporations. A promising project will bring huge benefits to the companies, however

projects also have risks; a risky project could lead to losses or even bankruptcy. More and more companies are aware of the importance of project front-end phase. Business case and project financing management are key tasks to study in this phase. Business case and project financing study provide the decision-makers with the information on the project feasibilities and the project fundamentals. In Figure 1.1, it is clear that both business case and project financing are in the front-end phase of a project (In PMBOK enter phase is used instead of front-end phase).[1]

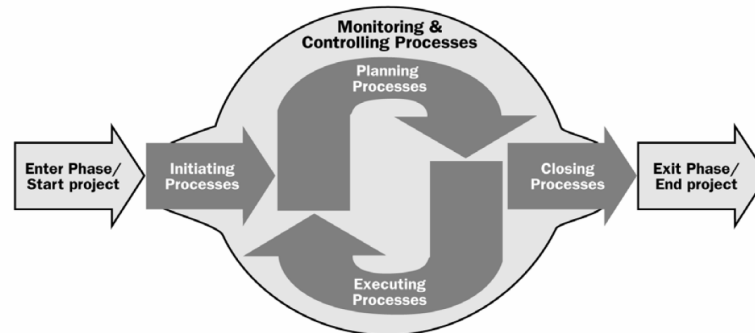


Figure 1.1 Project Management Process Groups

(Source: PMBOK, PMI, 2008)

It is the necessary to study project front-end phase as a part of project whole life cycle management, because it gives the preliminary evidence to the project stakeholders about the project feasibility for them to make decisions. However few project management literatures cover this area, probably because project front-end phase is more concerned by the project sponsors rather than project managers. To better understand the rationale of the project startup, I am going to dig into project front-end phase in the dissertation. In Figure 1.2,[1] the focus of the dissertation is indicated by the red square: project front-end phase from project sponsors' perspective.

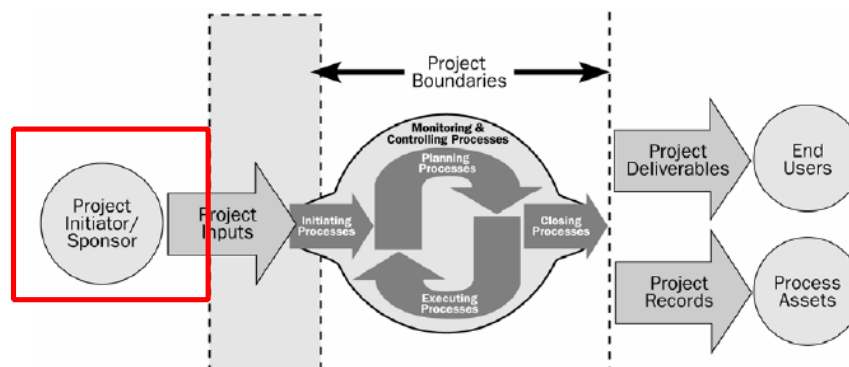


Figure 1.2 Project Boundaries

(Source: PMBOK, PMI, 2008)

1.2 Statement of Problems

A project means differently to different project sponsors. For public projects the project sponsors are more concerned about project strategy, project impacts and project sustainability than the money they will make via the projects while for private projects the project sponsors concern the projects' economic value more than their social impacts and sustainability. This is because different project sponsors have different project objectives. Due to the different focuses of the project sponsors, the focuses of business case are distinct for different sorts of projects. Business case is thus providing the project sponsors' attitude to the project to other parties. However it is proved that the business case is not always the basis on which the project sponsors can make decision. Because the estimation from business case is always inconsistent with the final result, project sponsors are suffering from potential losses if they make decision on an inaccurate business case. Hence business case must be as accurate as possible to make sure the proposed recommendation is to a great extent the right one. In addition, there has been a rise in number of companies that need innovative financing to satisfy their capital needs, in a significant number of instances they have viable goals but find that traditional lenders are unable to understand their initiatives. And so the need merged for project finance. Project financing has its special benefits as well as risks; some projects that are financed by means of "project financing" are proved successfully avoiding the risks. Some are proved as failures due to low solvency of the project. Hence to finance a project by means of "project financing" in a optimal way is highlighted by project sponsors.

A number of research reports conclude that unsatisfactory project results often are caused by insufficient or inadequate use of resources in the front-end phase, and that there is a need for studying project front-end phase. However, little has been done to develop know-how and methodology for front-end management (Berg1999, Kharbanda and Pinto 1996, Morris and Hough 1991, Torp 2001).^[81,82,83,84] Knut Samset in his book *Project Evaluation: Making Investments Succeed* states that

projects front-end phase is important for project sponsors; such projects as Oslo airport high-speed shuttle train (not financially viable); Oslo Opera House (no strategic perspective) and Northern onshore torpedo battery (useless) are considered as failures from different perspectives (Operational, tactical, strategic).[36] Even I could not fully agree with his conclusions, I believe that project front-end is very important for the project. A good front-end phase is contributive a lot to the project success. A certain amount of practical cases have proved that a poorly managed project front-end phase would probably lead to inferior project performance and even lead to the failure of the project. Thus a good management of the front-end phase is of importance before any project is going to be established. Business case development and financing project are two core tasks that should be fulfilled carefully to give a reliable reference for project sponsors to make decision on whether to initiate the project and an appropriate financing model for project sponsors to finance the project.

The dissertation therefore will look at how to manage a project front-end phase through managing business case and project financing models. I would find the relationship between project results and business case; the reasons that make the project final result always deviate from its predictions in business case and the problems relevant to project financing. I expect through the answers to these problems, project front-end phase could be easier to be managed to give basics for project sponsors to judge the rationality of a project initiation and to select an adequate project financing method to the approved project.

1.3 Research Questions

Based on the problem statement, the dissertation is designed to know how project front-end phase can determine the project success or failure by digging into the two key tasks in project front-end phase: business case and project financing. I expect to know the causality between project front-end phase management and project success, and the understanding of to what extent the project front-end phase can influence the

project results. There are several questions proposed and are going to be solved in the thesis:

1. What is a good business case development process?
2. What factors can make business case development difficult and sometimes incorrect?
3. What are the challenges when a project is financed by means of project financing?
4. What are the suggestions or solutions to the challenges and difficulties when the companies are developing business case and using "project financing" to finance projects?

1.4 Research Objective

Although a lot of themes of project front-end phase were studied, there is no systematical approach to describe business case and project financing which are the core tasks in project front-end phase. One of the aims of the dissertation is trying to find the difficulties that make business case hard to be developed and managed and then elaborate a good process of business case development so that this process can be referred to as a formal means of business case development. The reason why I introduce project financing is because project financing is more and more used nowadays; projects which are financed by means of project financing are proved to have extra risks and difficulties to manage and handle. Project financing hence should be studied to avoid and handle the risks and difficulties. The other aim of the dissertation is to figure out what challenges the project sponsors have when project sponsors use "project financing" to finance project and how to deal with these challenges. My work on business case and project financing is to better understand the rationale of project startup so that projects can be established based on clear justifications.

1.5 Significance of the Research

Standing on the first line of the project, project managers must be sensitive to all the

factors that have impacts on the project, these factors can make a project deferred, stopped, expanded or continued. By studying business case and project financing models, project managers will better measure the project performance (cost, time and quality) and bring more values to the shareholders of the project company. To project sponsors, it is also necessary to understand the rationale behind business case and project financing; by knowing the rationale they will not be deceived by the figures in the business case. Once the project is approved to be initiated, project sponsors have to think about maximizing the profits and reduce the risks. Usually project financing is a good way to reach the goals.

It could be significant for both project managers and project sponsors to understand the rationale of business case and project financing, the reasons are:

- (1) Understand the business case development process to judge the accuracy of the business case as project sponsors and measure the project performance as project managers.
- (2) Understand the factors that make business case difficult to develop. The planners could limit the inaccuracy of business case to a low level to ensure the project is viable to be implemented hence decrease the potential of loss or project failure.
- (3) Understand the project financing models as project sponsors. Projects that are financed by means of "project financing" have extra risks and factors to take into account for project sponsors. It is beneficial for project sponsors to study project financing in order to reduce the possibility of project failure and bankruptcy.

1.6 Structure of the Dissertation

Figure 1.3 in the next page outlines the structure of this dissertation. In addition to the first two chapters of introduction and methodology and the last chapter of conclusion, theories and case description part and discussion and solutions part are the core parts in this dissertation. Theories and case description part includes four chapters, three of them are about the presentation of the existing theories of project front-end phase

management, business case and project financing, the other chapter describes a case regarding project financing. Discussion and solutions part is a chapter that integrates the problems of business case development and usage of project financing and their solutions and suggestions to these problems.

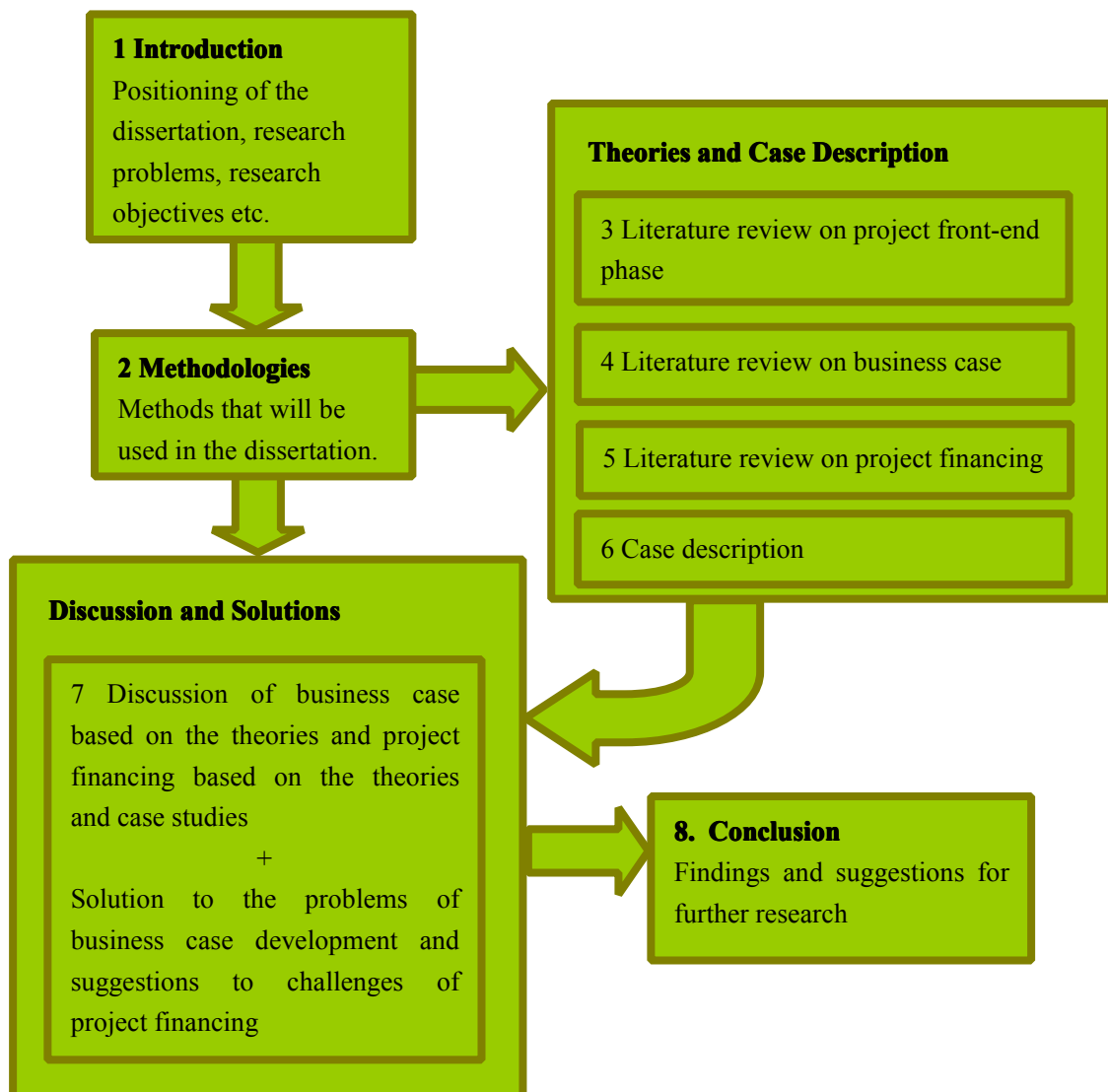


Figure 1.3 Structure of this Dissertation.

Chapter One: Introduction of the reasons that why I want to initiate my dissertation in business case and project financing areas, the significances of the research topic, the research questions and the objectives of the dissertation are given in this chapter.

Chapter Two: Methodology theories is introduced. Based on the theories, I choose the

methods that I use to write the dissertation. The selected methods' strength, weakness, limitations is discussed exhaustively.

Chapter Three: Theories of project front-end phase are introduced in this chapter. A lot of factors that are important to taken into account in project front-end phase are discussed. Uncertainty is especially emphasized as an important factor.

Chapter Four: A general business case development process based on the different definitions is introduced. The step by step explanation of this process is exhaustively discussed based on the theories of multiple disciplines.

Chapter Five: The theoretical framework of project financing methods and project financing benefits is presented. Risk management in project financing is discussed.

Chapter Six: Followed the chapter five, a case relevant to project financing is introduced. Information of the case regarding its background, ownership structure, contractual structure and project capital structure is given in this chapter.

Chapter Seven: Discussion is implemented based on the theories and the case information given in chapter six. The problems and challenges in developing business case and using project financing to finance the project are extensively discussed. Based on the theories and case study, I present my solutions and suggestions to these problems.

Chapter Eight: Conclusion is presented based on my findings. The chapter begins with the repetition of the research questions. Then the summary of the findings and their significance is presented. In addition, a short evaluation of the methods I use to write the dissertation is described. In the end, suggestions for practitioners and further study in the relevant area are presented.

In the following chapter, I will introduce the methodologies I use to write this dissertation as well as the logic behind these methodologies. Combined with the constraints of writing this dissertation, the strengths and weakness of the selected methods will be discussed. In addition the limitations of the methods used in the dissertation will be described for any further improvement in this dissertation.

Chapter 2. Methodology

The purpose of this chapter is to present the rationale of research methods I use to write the dissertation as well as their strengths, shortfalls and limitations. The figure below outlines the chapter structure that is followed in writing this chapter.

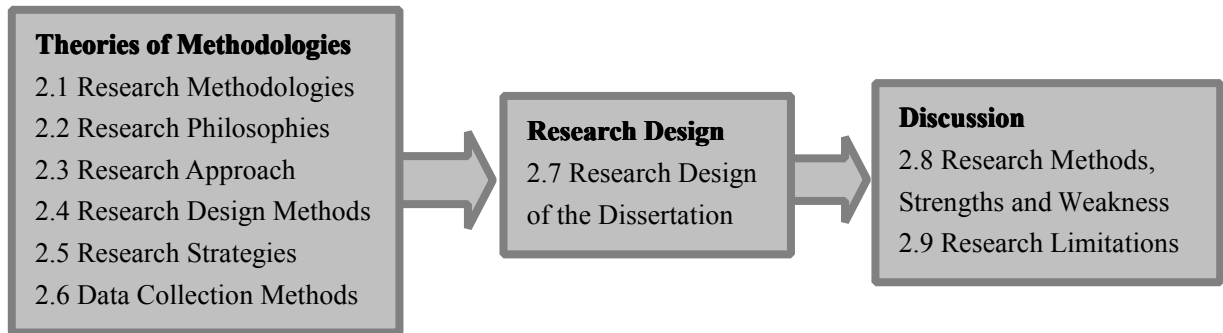


Figure 2.1 Chapter Guide

2.1 Research Methodology and Research Methods

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. Research methodology includes various steps that are generally adopted by a researcher in studying research problems along with the logic behind them. It is necessary for the researcher to know not only the research methods but also the methodology. Researchers not only need to know how to develop certain indices or tests and how to apply particular research techniques but they also need to know which of these methods or techniques are relevant and which are not and what they mean and why. Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques and procedures will be applicable to certain problems and others will not. This means that it is necessary for the researcher to design his methodology.[2]

2.2 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed and used. The term epistemology (what is known to be true) as opposed to doxology (what is believed to be true) encompasses the various philosophies of research approach. The purpose of science, then, is the process of transforming things believed into things known: doxa to episteme. Two major research philosophies have been identified in the western tradition of science, namely positivist and interpretivist (Galliers 1991).^[3]

2.2.1 Positivism

Positivists believe that reality is stable and can be observed and described from an objective viewpoint (Levin 1988).^[4] They contend that phenomena should be isolated and that observations should be repeatable. This often involves manipulation of reality with variations in only a single independent variable so as to identify regularities in, and to form relationships between, some of the constituent elements of the social world.^[2]

Predictions can be made on the basis of the previously observed and explained realities and their inter-relationships. "Positivism has a long and rich historical tradition. It is so embedded in our society that knowledge claims not grounded in positivist thought are simply dismissed as ascientific and therefore invalid" (Hirschheim 1985).^[5] Alavi and Carlson (1992) indirectly supported this review. They found that all the empirical studies were positivist in approach in a review of 902 IS research articles. Positivism has also had a particularly successful association with the physical and natural sciences.^[10]

2.2.2 Interpretivism

Interpretivists contend that only through the subjective interpretation and intervention

in reality can that reality be fully understood. The study of phenomena in their natural environment is key to the interpretivist philosophy, together with the acknowledgment that scientists cannot avoid affecting those phenomena they study. They admit that there may be many interpretations of reality, but maintain that these interpretations are in themselves a part of the scientific knowledge they are pursuing. Interpretivism has a tradition that is no less glorious than that of positivism, nor is it shorter.^[2]

2.3 Rationale for Choice of Approach

It has often been observed (Benbasat et al.1987)^[6] very accurately that no single research methodology is intrinsically better than any other methodology, many authors calling for a combination of research methods in order to improve the quality of research (Kaplan and Duchon 1988).^[7] Equally, some institutions have tended to adopt a certain "house style" methodology (Galliers 1991);^[3] this seems to be almost in defiance of the fact that, given the richness and complexity of the real world, a methodology best suited to the problem under consideration, as well as the objectives of the researcher, should be chosen (Benbasat 1984; Pervan 1994b).^[8,9]

2.4 Research Design Studies

Different research designs can be conveniently described as: (1) research design in case of exploratory research studies; (2) research design in case of descriptive and diagnostic research studies and (3) research design in case of hypothesis-testing research studies.^[2]

2.4.1 Exploratory Research Studies

Exploratory research studies are also termed as formulative research studies. The main purpose of such studies is that of formulating a problem for more precise investigation or of developing the working hypotheses from an operational point of view. The major emphasis in such studies is on the discovery of ideas and insights. As

such the research design appropriate for such studies must be flexible enough to provide opportunity for considering different aspects of a problem under study. Inbuilt flexibility in research design is needed because the research problem, broadly defined initially, is transformed into one with more precise meaning in exploratory studies, which fact may necessitate changes in the research procedure for gathering relevant data. Generally, the following three methods in the context of research design for such studies are talked about: (a) the survey of concerning literature; (b) the experience survey and (c) the analysis of ‘insight-stimulating’ examples.^[2]

The survey of concerning literature happens to be the most simple and fruitful method of formulating precisely the research problem or developing hypothesis. Hypotheses stated by earlier workers may be reviewed and their usefulness be evaluated as a basis for further research. It may also be considered whether the already stated hypotheses suggest new hypothesis. In this way the researcher should review and build upon the work already done by others, but in cases where hypotheses have not yet been formulated, his task is to review the available material for deriving the relevant hypotheses from it.^[2]

Experience survey means the survey of people who have had practical experience with the problem to be studied. The objective of such a survey is to obtain insight into the relationships between variables and new ideas relating to the research problem. The respondents selected may then be interviewed by the investigator. The researcher must prepare an interview schedule for the systematic questioning of informants. But the interview must ensure flexibility in the sense that the respondents should be allowed to raise issues and questions which the investigator has not previously considered.^[2]

Analysis of ‘insight-stimulating’ examples is also a fruitful method for suggesting hypotheses for research. It is particularly suitable in areas where there is little experience to serve as a guide. This method consists of the intensive study of selected

instances of the phenomenon in which one is interested. For this purpose the existing records, if any, may be examined, the unstructured interviewing may take place, or some other approach may be adopted. Attitude of the investigator, the intensity of the study and the ability of the researcher to draw together diverse information into a unified interpretation are the main features which make this method an appropriate procedure for evoking insights.[2]

Whatever method or research design outlined is adopted, the only thing essential is that it must continue to remain flexible so that many different facets of a problem may be considered and when they arise and come to the notice of the researcher.

2.4.2 Descriptive and Diagnostic Research Studies

Descriptive research studies are those which are concerned with describing the characteristics of a particular individual or a group, whereas diagnostic research studies determine the frequency with which something occurs. The studies concerning whether certain variables are associated are examples of diagnostic research studies. As against this, studies concerned with specific predictions with narration of facts and characteristics concerning individual, group or situation are all examples of descriptive research studies. Most of the social research comes under this category. From research design standpoint, the descriptive as well as diagnostic studies share common requirements. In descriptive as well as in diagnostic studies, the researcher must be able to define clearly what he wants to measure and must find adequate methods for measuring it along with a clear cut definition of 'population' he wants to study. Since the aim is to obtain complete and accurate information in the said studies, the procedure to be used must be carefully planned. The research design must make enough provision for protection against bias and must maximize reliability, with due concern for the economical completion of the research study. [2]

In a descriptive/diagnostic study the first step is to specify the objectives with

sufficient precision to ensure that the data collected are relevant. If this is not done carefully, the study may not provide the desired information. Then it comes the question of selecting the methods by which the data are to be obtained. In other words, techniques for collecting the information must be devised. Several methods (viz., observation, questionnaires, interviewing, examination of records, etc.), with their merits and limitations are available for the purpose. While designing data-collection procedure, adequate safeguards against bias and unreliability must be ensured. Whichever method is selected, questions must be well examined and be made unambiguous; interviewers must be instructed not to express their own opinion; observers must be trained so that they uniformly record a given item of behavior. It is always desirable to pretest the data collection instruments before they are finally used for the study purposes.[2]

2.4.3 Hypothesis-Testing Research Studies

Hypothesis-testing research studies (generally known as experimental studies) are those where the researcher tests the hypotheses of causal relationships between variables. Such studies require procedures that will not only reduce bias and increase reliability, but will permit drawing inferences about causality. Usually experiments meet this requirement.[2]

2.5 Research Strategy

A large number of research methodologies have been identified, Galliers (1991) for example listing fourteen.[3] While Alavi and Carlson (1992)[10] reported in Pervan (1994b),[9] use a hierarchical taxonomy with three levels and eighteen categories. In Table 2.1 in next page, Galliers (1991) identified the methodologies, indicating they typically conform to the positivist or interpretivist paradigms.[3]

Table 2.1 A Taxonomy of Research Methodologies

(Source: Nissen et al., 1991)

Scientific/Positivist	Interpretivist/Anti-positivist
Laboratory Experiments	Subjective/Argumentative
Field Experiments	Reviews
Surveys	Action Research
Case Studies	Case Studies
Theorem Proof	Descriptive/Interpretive
Forecasting	Futures Research
Simulation	Role/Game Playing

Laboratory experiments permit the researcher to identify precise relationships between a small amount of variables that are studied intensively via a designed laboratory situation using quantitative analytical techniques with a view to making generalisable statements applicable to real-life situations. The key weakness of laboratory experiments is the "limited extent to which identified relationships exist in the real world due to oversimplification of the experimental situation and the isolation of such situations from most of the variables that are found in the real world" (Galliers 1991).^[3]

Survey method is used to gain a clear picture of practices, procedures, situations and views at a single point in time. This method may be implemented through questionnaires and/or structured interviews. After the data has been gathered quantitative statistical analysis techniques are then utilized to gain understanding and highlight findings. Through the use of the survey method it is possible to collect data on more variables than would be possible using an experimental based method (Davison 1998).^[16]

Case studies involve an attempt to describe relationships that exist in reality, very often in a single organization. Case studies may be positivist or Interpretivist in nature,

depending on the approach of the researcher, the data collected and the analytical techniques employed. According to H. Odum,^[11] “The case study method is a technique by which individual factor whether it be an institution or just an episode in the life of an individual or a group is analyzed in its relationship to any other in the group.” Burgess has used the words “the social microscope” for the case study method.”^[12] Pauline V. Young describes case study as “a comprehensive study of a social unit be that unit a person, a group, a social institution, a district or a community.”^[13]

Simulation is slowly gaining popularity as a method of choice for organizational researchers (Dooley 2002).^[14] The method allows researchers to assume inherent complexity of systems as a given and thus answer the question around the themes of ‘what if’. The three main approaches to simulations are discrete event simulation, system dynamics and agent based simulation.

Subjective/argumentative research is conducted through the use of such techniques as hermeneutics and phenomenology. Often these methods employ a process of textual analysis concerned with the discovery of the meaning underlying a body of text that is by itself unclear.

Forecasting is designed to help predict trends and therefore assist future planning and decision making. Typically forecasts are made using a form of trend extrapolation where patterns in historical data are used to predict and extrapolate future occurrences. The most recognize mathematical models used in this method are weighted smoothing, decomposition, turning point analysis, simple linear regression and curve fitting (Walonick 2004).^[17]

Action research is according to Watts ^[15], a process in which participants examine their own educational practice systematically and carefully, using the techniques of research. It is based on the following assumptions:

- Teachers and principals work best on problems they have identified for themselves
- Teachers and principals become more effective when encouraged to examine and assess their own work and then consider ways of working differently
- Teachers and principals help each other by working collaboratively

2.6 Data Selection Methods

The task of data collection begins after a research problem has been defined. While deciding about the method of data collection to be used for the study, the researcher should keep in mind two types of data, namely primary and secondary data. The primary data are those which are collected afresh and for the first time, and thus happen to be original in character. On the other hand, the secondary data are those which have already been collected by someone else and which have already been passed through the statistical process. The researcher would have to decide which sort of data he would be using for his study and accordingly he will have to select one or the other method of data collection. The methods of collecting primary and secondary data differ since primary data are to be originally collected, while in case of secondary data the nature of data collection work is merely that of compilation.^[2]

2.6.1 Collection of Primary Data

Primary data can be collected during the course of doing experiments in an experimental research but in case the research is of the descriptive type and perform surveys, whether sample surveys or census surveys, then the researcher can obtain primary data either through observation or through direct communication with respondents or through personal interviews. This means that there are several methods of collecting primary data, particularly in surveys and descriptive researches: (i) observation method, (ii) interview method, (iii) through questionnaires, (iv) through schedules, and (v) other methods which include (a) warranty cards; (b) distributor audits; (c) pantry audits; (d) consumer panels; (e) using mechanical devices; (f) through projective techniques; (g) depth interviews, and (h) content analysis.^[2]

2.6.2 Collection of Secondary Data

Secondary data means data that are already available (i.e. they refer to the data which have already been collected and analyzed by someone else). When the researcher utilizes secondary data, then he has to look into various sources from where he can obtain them. In this case he is certainly not confronted with the problems that are usually associated with the collection of original data. Secondary data may either be published data or unpublished data. Usually published data are available in: (a) various publications of the central, state and local governments; (b) various publications of foreign governments or of international bodies and their subsidiary organizations; (c) technical and trade journals; (d) books, magazines and newspapers; (e) reports and publications of various associations connected with business and industry, banks, stock exchanges etc.; (f) reports prepared by research scholars, universities, economists etc. in different fields; and (g) public records and statistics, historical documents, and other sources of published information. The sources of unpublished data are many; they may be found in diaries, letters, unpublished biographies and autobiographies and also may be available with scholars and research workers, trade associations, labor bureaus and other public/private individuals and organizations.^[2]

Reliability of Data

The reliability can be tested by finding out such things about the said data:

The reliability of data can be judged from different perspectives: (1) the person who collect the data should be able to do this job; (2) the source of the data should be reliable; (3) the time when the data is collect should be paid attention to by the collectors, data may not be correct when it was invented long before the research; (4) the original data when they were collected should not be biased; (5) the original data collecting methods should be paid attention to by the researchers; (6) the researcher should know to what extent the data reliability is desired.^[2]

Suitability of Data

The data that are suitable for one inquiry may not necessarily be found suitable in another inquiry. Hence, if the available data are found to be unsuitable, they should not be used by the researcher. In this context, the researcher must very carefully scrutinize the definitions of various terms and units of collection used at the time of collecting the data from the primary source originally. Similarly, the object, scope and nature of the original inquiry must also be studied. If the researcher finds differences in these, the data will remain unsuitable for the present inquiry and should not be used.^[2]

Adequacy of Data

If the level of accuracy achieved in data is found inadequate for the purpose of the present inquiry, they will be considered as inadequate and should not be used by the researcher. The data will also be considered inadequate, if they are related to an area which may be either narrower or wider than the area of the present inquiry.

According to what is described above, the already available data should be used by the researcher only when he finds them reliable, suitable and adequate. The already data can be used only when they are authentic. At times, there may be wealth of usable information in the already available data which must be used by an intelligent researcher but with due precaution.

The most desirable approach with regard to the selection of the method depends on the nature of the particular problem and on the time and resources (money and personnel) available along with the desired degree of accuracy. But over and above all this, much depends upon the ability and experience of the researcher.^[2]

2.7 Research Design of the Dissertation

In this dissertation, I have tried to avoid what may be characterized as methodological monism (i.e. the insistence on using a single research method). This is not due to an inability to decide between the various merits and demerits of the various alternatives. Instead I believe that all methods are valuable if used appropriately. The concern is that the research I undertake should be both relevant to my research questions, as are set in chapter one and rigorous in its operation. Overall I believe that interpretivism philosophy is required for this purpose (i.e. the studies of business case development and project financing through literature review and case studies). This requires me to find shortfalls and defects based on the existing materials and give solutions based on these materials too. However due to the lack of subjectivity associated with positivism philosophy, I would admit that the study result lacks of the practical proof and test.

In chapter one, I have indicated the positioning of the dissertation. Based on the nature of the particular problems and the time and resources (money and personnel) available along with the desired degree of accuracy, Figure 2.2 in next page shows the research design of this dissertation. It can be explained as follows:

The dissertation is a descriptive and diagnostic research and part of explorative research. The dissertation describes the each element that constitutes business case and presents the theories that are relevant to project financing, which is a descriptive process. I dive into these two areas and try to find the defects or shortfalls in business case development and project financing based on the existing theories, which is a diagnostic process. The formulation of the research problems based on the intensive study on the research topic could be seen as explorative study based on survey of the literatures. The solutions given to the problems of business case development can be seen as the results of the explorative study. The lessons learned and findings from case study in project financing can be seen as the result of the diagnostic study.

In this dissertation interpretivism is the main philosophy I apply into writing the dissertation. Under this research philosophy, the research strategy is that using case study and literature review to formulate the problems and find the solutions and suggestions. The figure below outlines the path I follow to write my dissertation: literature review is used in business case study as well as in project financing study, while case study is used in studying project financing. The results of both studies are presented in chapter seven.

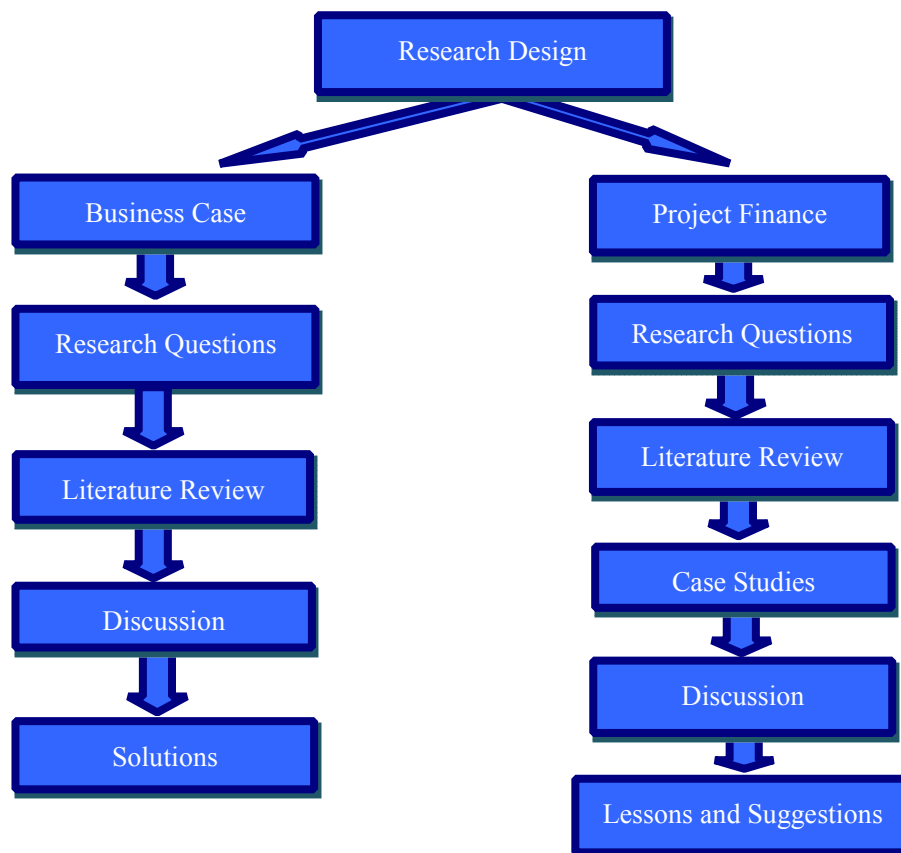


Figure 2.2 Research Design for Dissertation

Data collection: considering inaccessibility of the key data in practice in the research topic, no primary data is collected. In according to the research areas, I collect the books, articles, journals reports etc. in the fields of project management, uncertainty management, corporate finance, accounting management and project financing. I mainly get the data from NTNU library, NTNU e-library, Google books, MIT e-library, PMI official website and relevant books I brought from China. To make sure the adequacy and accuracy of the data collected, when collecting the data, I pay

Chapter 2. Methodology

attention to the publishers, most of the books I select are from the well known publishers like John Wiley & Son Ltd. On top of that, I pay attention to the background and academic achievement of the authors by checking their information on line. When I collect the data, I also check the consistency between the data and my research objectives to make sure the data are adequate for the dissertation. Using this double check, I would say to a great extent, the materials I collect to write the dissertation are reliable and accurate. By implementing the pre-study of the research topics, I have had a general idea of what disciplines of my research topics are covering and the nature of them. Hence when I look for the materials, I target at the relevant references to make sure the materials I collect is suitable to the topics I am working on.

Data analysis: Literature review and case studies are used; literature review makes me have a general view of the assumptions, hypothesis, definitions and components that are relevant to the research questions. Based on the preliminary studies of the theories, deep studies of the research topics help me discover the problems and find the solutions based on extensive reading. Case study, according to the theories in Table 2.1 can either be positivism or interpretivism. Case study based on participation in the practice by interviews, surveys, questionnaires and so on is positivism. Case study based on collecting the existing information without involvement in the real case is interpretivism. Due to the limitations and constraints, I use the case study based on the information collected from book, articles, journals and internet without participation, which is interpretivism. Case study confers me the direct view of what is happening in the real world even the case used is based on the existing information collected by other people. Combing the findings from case study and the literature review, I give my solutions to the problems in business case and suggestions to the challenges in project financing. Figure 2.3 shows the process of data analysis.

Data collected from existing theories (ch 3, 4, 5); Data collected from case (ch 6)

Discussion of the data from the theories and case (ch 7)

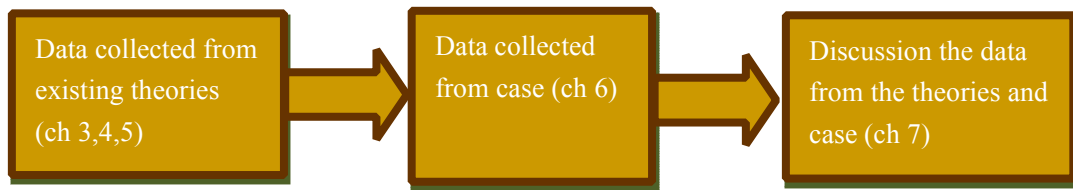


Figure 2.3 Data Analysis Process in the Dissertation

Chapter 3 is discussing the theories of project front-end phase, chapter 4 and 5 are discussing the theories in business case and project financing, chapter 6 is describing the background of the case in project financing. Chapter 7 is discussing the data collected from the theories and the data from the case and giving solutions and suggestions to the research problems.

2.8 Strength and Weakness of Research Methods

The Strength and Weakness of Literature Review

A clear benefit of using secondary data is that much of the background work needed has been already been carried out, (i.e. different themes in project front-end phased and project financing have been studies before). This wealth of background work means that secondary data generally have a pre-established degree of validity and reliability which do not need to be re-examined by the researcher who is re-using such data. Furthermore, secondary data can also be helpful in the research design of subsequent primary research and can provide a baseline with which the collected primary data results can be compared to. Therefore, it is always wise to begin any research activity with a review of the secondary data. The weakness is that accuracy and authority. The information from some so-called professional and insignificant scholar could be immoral or be biased. In order to have a good literature review, besides necessary reviewing skills, having high quality literature is of significance as well. Therefore, having reliable sources of literature and then choosing high quality literatures are critical for me to finish my dissertation successfully.

The Strength and Weakness of Case Study

The term case study usually refers to a fairly intensive examination of a single unit such as a person, a small group of people or a company. As I stated above, the case study used in this dissertation is based on the philosophy of interpretivism without my participation in the real case in person. Interpretivism-based case study enables me to explore, unravel and understand problems, issues and relationships. Case study method enhances my understanding of the real world beyond the theories in the book and this in turn increases my analyzing ability and skills. Interpretivism-based case study cannot, however, accumulate a real record of my personal experience or allow me to generalize the results, findings or theory from one case study and apply them to other cases. The case studied may be unique and therefore not representative of other instances. It is, of course, possible to look at several cases to represent certain features, while it is a time-consuming process. The case study approach is often done to make practical improvements, contributions to general knowledge may be incidental. The case study enables rich information to be gathered from which potentially useful hypotheses can be generated. Case study is also inefficient in studying situations which are already well structured or where the important variables have been identified.

2.9 Research Limitations

There are several limitations to this study that need to be addressed. Given the broad scope of the study, the limitation of my ability and the limitation of time, the research does not include an in-depth review of all the relevant theories that describe the elements of the business case and project financing. The emphasis on the key elements of business case and project financing gives the integral value to the project practitioners and sponsors. Since the elements discussed in business case are generalized and the case used in studying project financing has its specialties, some special projects or projects in special environment may need more elements to be analyzed when discussing business case and the lessons learned and suggestions

proposed in this case study may not be applied fully to other project financing cases.

The inaccessibility to the key data in analyzing the business case limits the research methodologies. In analyzing business case, the only method used is literature review. The fact that no primary data is collected impact the cognition and understanding of the phenomenon. Furthermore, all the reflection and discussions are derived from the literature review. In absence of the empirical studies, the solutions might be void of cogency.

The lack of participation of the real case impacts the validation and verification of the findings and conclusions. The interpretivism-based case study somewhat deter my minds to deeply understand the essence of project financing. Efforts are being made to increase the originality and creativity in exploratory work, the lack of involvement of outsiders constrains the applicability of my findings.

This chapter shows the way I write my master thesis: the research philosophies, the research methodologies, the research strategies and so on. Even limitations stated above can constrain the dissertation to some extent; I try to reduce the influence of these limitations to the minimum by collecting a large amount of literatures, eliminating the data with low quality and retaining the data with high quality. In the next chapter, I will first look at the existing theories of project front-end phase.

Chapter 3. Literature Review on Project Front-end Phase Management

Front-end management is management of the projects in the front-end phase and includes front-end assessments. A front-end assessment is an evaluation of the project in its earliest phase. The purpose of front-end assessment is to produce thorough and credible project concepts for evaluation before final decision to finance the project or not is made. Unsatisfactory project results can be caused by insufficient or inadequate use of resources in the front-end phase. Some Norwegian scholars define project front-end phase as below (Lædrein Ola et al. 2009):^[64]

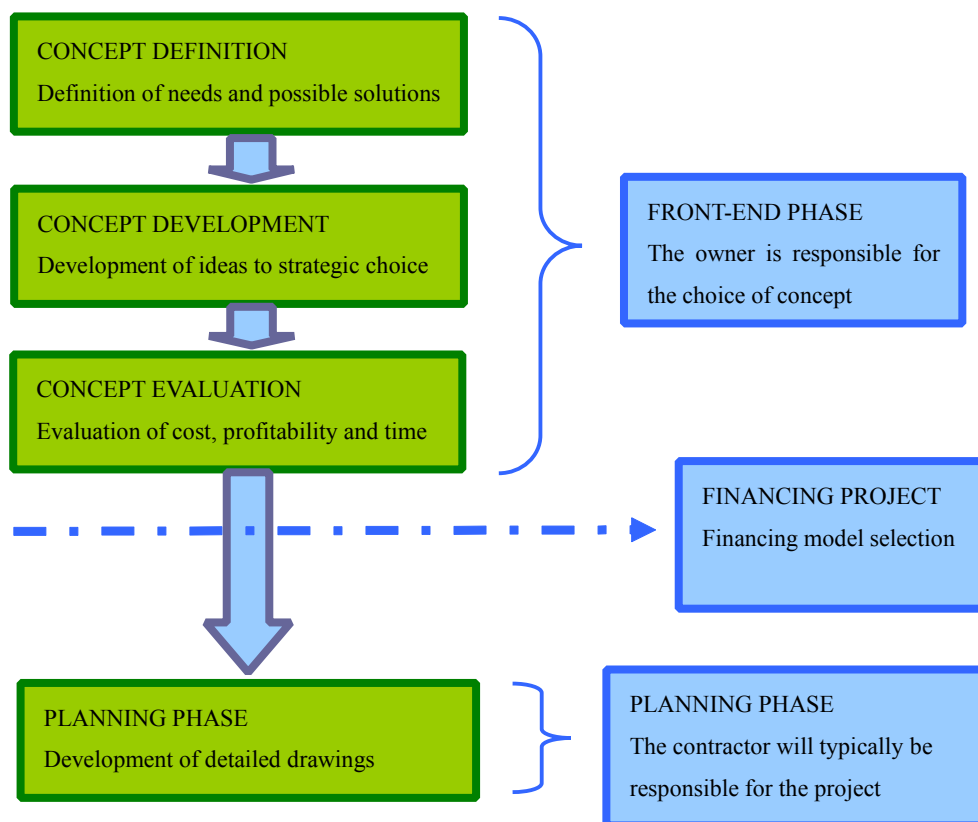


Figure 3.1 Project Front-end Phase Management

(Source: Lædre Ola et al., 2009)

It is remarkable from the figure above that concept study (which is called business case in PMBOK) is the main task in project front-end phase which incorporates problems and business needs statement, strategic alignment analysis and cost &

benefits estimation. Financing project happens immediately after the decision is made to implement the project. It is noticeable that both business case and financing project happen before the project is implemented.

Project alternatives need to be evaluated before the final decision to finance. Too often, front-end assessments have concentrated on evaluating one single project alternative, and not on identifying and comparing several relevant alternatives. Good project alternatives may not even be considered, or they are turned down before a thorough evaluation is carried out. The essential knowledge that will subsequently be the basis for decisions is collected during the concept definition phase. The information is analyzed, and the resulting outcome provides the basis for the development of the concept as well as the final decision to finance. Front-end assessments in commercial projects tend to focus narrowly on project results and less on the longer term realization of the project's purpose and goal. This is the case in projects where economic viability is the main concern. Public investments such as infrastructure projects may take a broader perspective. In order to provide the best possible basis for decision in the earliest phase, the uncertainty that is likely to affect the project performance need to be scrutinized.^[64]

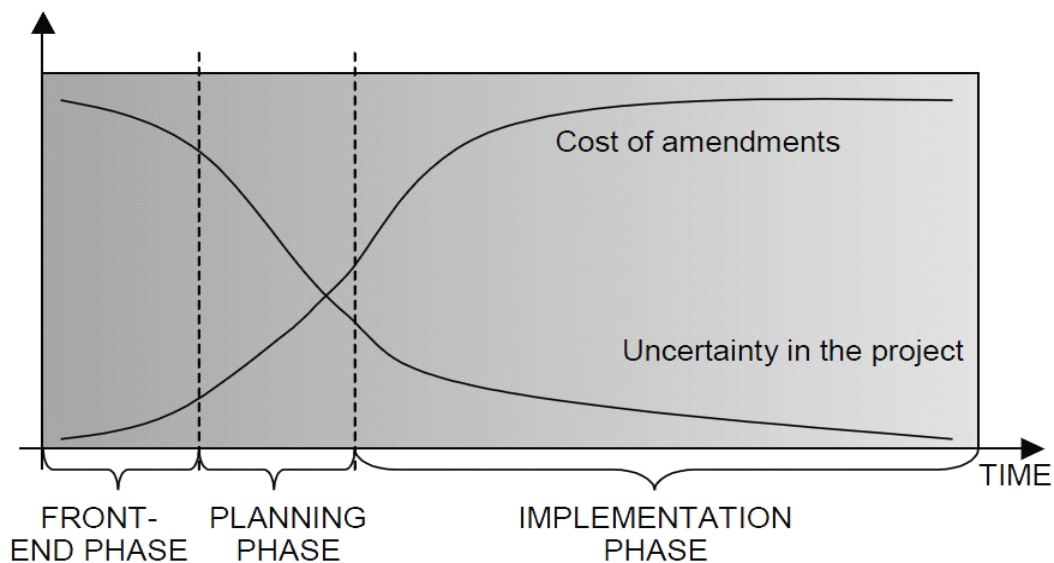


Figure 3.2 Correlations between Cost of Changes and Uncertainty

(Source: Lædre Ola et al., 2009)

Figure 3.2 shows the uncertainty in project front-end phase is extremely high, as the project matures, the uncertainty become lower and lower. Lack of information will result in decisions burdened with uncertainty (Wright and Ayton 1987).^[65] If key personnels actively strive to generate lessons of a generic nature from the project start to its finish, they will contribute to the process of keeping vital information known in the organization. Generally, the chance of making the right decisions increases as uncertainty decreases. Figure 3.3 shows the relationship between information and uncertainty with time horizon.^[66]

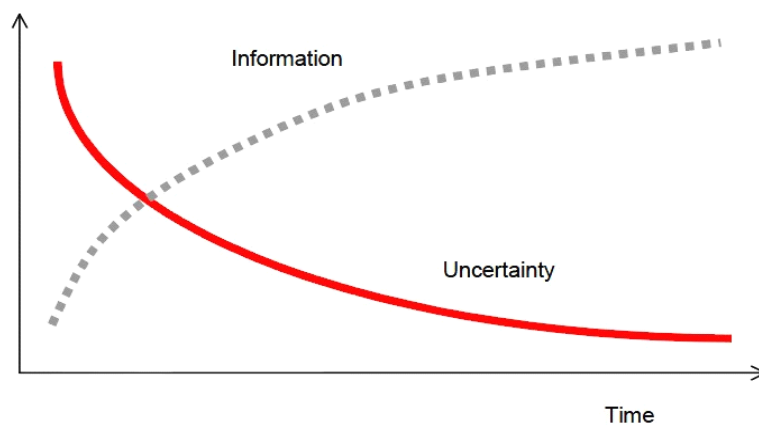


Figure 3.3 Uncertainty vs. Available Relevant Information in a Project

(Source: Terry Williams and Knut Samset, 2010)

Agnar Johansen & Asbjørn Rolstadås (2008) in the their article *From Protective to Offensive Project Management* summarized three types of uncertainty and link them to project life cycle, suggesting that total risks are high in project front-end phase.^[67]

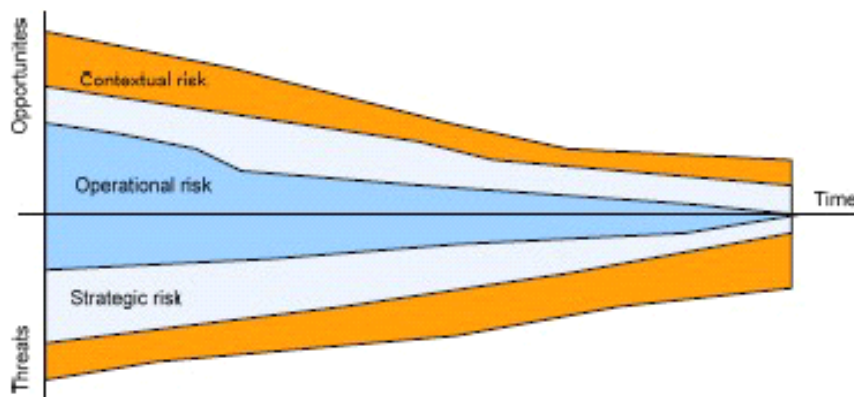


Figure 3.4 Risk Development through Project Lifecycle.

(Source: Rolstadås Asbjørn & Johansen.A, 2008)

Decisions are made on the basis of both biased and unbiased information. A front-end assessment needs to take an impartial view in order to be able to provide the most appropriate information basis for the final decision to finance a project. It is of great value to verify what the basis for collection of information is in the concept definition phase. This will help explain the fundamental choices that were made initially and during the process when the project concept was developed. (Baldry 1998).^[68]

Experience indicates that the available resources in a project, including the known reserves, often will be spent (Galbraith 2001).^[69] For project-based organizations this can be unnecessarily expensive. In some projects the initial budget is increased in order to avoid future overruns. An alternative is to reduce the initial project budget with the intention of lowering total costs. The effects of either increasing or reducing the original budgets are complex, and probably not fully understood.

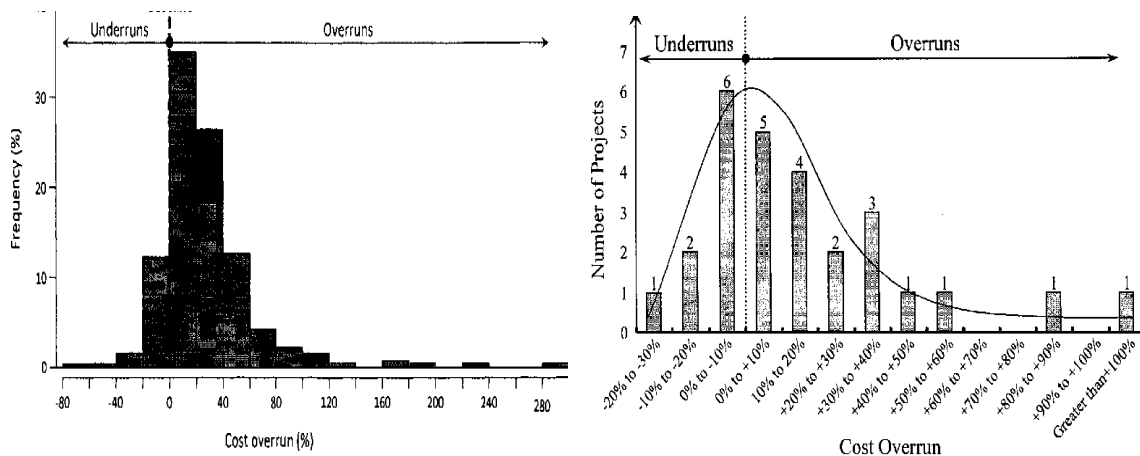


Figure 3.5 A-Cost Overruns (N=258). B-Cost Overruns of U.S. Projects

(Sources: Flyvbjerg et al. (2003) left. B - General Accounting Office (2005) right)

Figure 3.5 above shows that cost overrun happens much more than cost underrun.^[70]

Due to the existence of uncertainty, project cost and benefits are extremely uncertain in project front-end phase. In some organizations with large portfolios, project budgets are deliberately set low, but for each project a reserve is added to a common fund. Project managers can apply for additional resources from the fund in case of budget overruns. The added reserves and the management of the reserves must be appropriate, so that under- and over-expenditure in projects balance within the portfolio and the fund remains constant.^[71]

The information that forms the basis for decisions must be clearly communicated to decision makers (Harrison 1995).^[40] Communication is important in the project front-end phase. The cost and viability of a new project are of prime interest to the financing party. In reality, not all decision makers want all project alternatives to be thoroughly evaluated. Key stakeholders may often wish to create support for one particular project alternative. In a political and cultural setting, a thorough front-end assessment might represent a potential threat to some stakeholders since a properly executed front-end assessment should give a fair evaluation of all relevant project alternatives, and not be influenced by the interests of particular stakeholders. Communication in the light of stakeholders' differing priorities is an important issue in front-end management of projects.

Top management must open-mindedly address the uncertainty associated with the key parameters involved and be able to correctly generate and analyze the necessary information. Planners need to get a correct understanding of the uncertainty associated with the key parameters constituting the different concepts. Apparently, the communication of actual and anticipated uncertainties associated with different project alternatives deserves more attention from planners. In addition, the project purpose and project goal should be settled in the front-end. It is not possible to succeed if not all stakeholder interests are known before detailed planning starts. Project front-end phase management should be prioritized in project lifecycle management.^[64]

In the next chapter, I will discuss the existing theories of business case development, a general business case development process is developed based on the existing theories, and a step by step explanation of the general business case development process will be discussed carefully for further discussion.

Chapter 4. Literature Review on Business Case

This chapter is discussing definitions of business case and relevant theories of business case development. The figure below shows the literature review process in this chapter. I will follow this flow chart to demonstrate the theories.

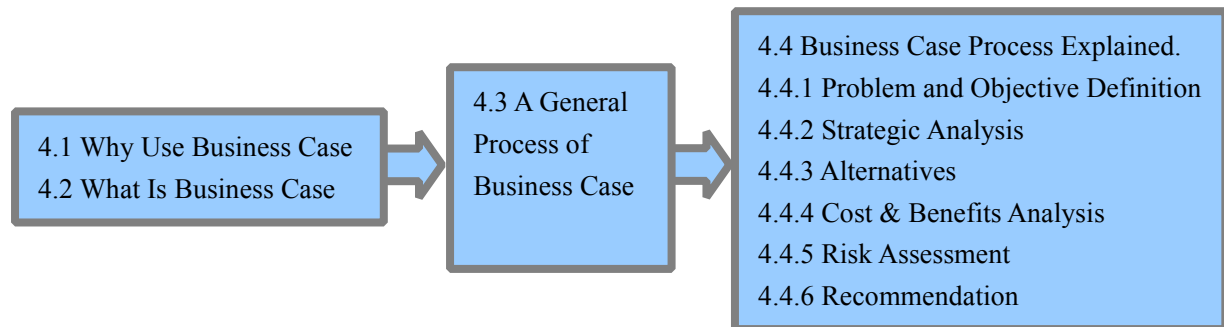


Figure 4.1 Chapter Guide

4.1 Why Use Business Case?

It is estimated that only one in fifty business ideas are actually commercially viable. Therefore a business case study is an effective way to safeguard against wastage of further investment or resources (Grifon 1997).^[18] Project planning starts only the result of business case proves the project is feasible. The research and information uncovered in the business case study will support the business planning stage and reduce the research time. A thorough business case analysis provides an abundance of information that is also necessary for the business plan. (Bangs 2000; Hoagland & Williamson 2000; Truitt 2002; Thompson 2003b)^[19, 20, 21, 22] The result of business case is the basis on which the project sponsors make decision about whether to finance the project or not. Recommendations will be reliant on a mix of numerical data with qualitative, experience-based documentation. Business case study highly depends on the market research and analysis in order to provide the stakeholders with varying degrees of evidence that a business concept will in fact be viable (Hoaland & Williamson 2000; Thompon 2003c; Thompson 2003a; Wickham 2004)^[20,23,24,25].

A convincing business case is a useful tool to get project approved by the powers that be. In business case, reasons are justified for proposing the project in terms of the measurable benefits to the organization, the costs and the return on investment and how the project will be strategically aligned with other projects and the corporate strategy. Business case is backed up with information on team resource requirements and assumptions about the project environment that is necessary for project success.

Business case justifies the startup of a project. It includes a description of the business problem or opportunity, the costs and benefits of each alternative solution and the recommended solution for approval. Completing a business case template is usually the first step in the project lifecycle. Once the business case template has been completed, it is presented to project sponsors for approval. The business case is referred to frequently during the project to check whether the project is currently on track. At the end of the project, success is measured against the ability to meet the objectives defined in the business case. So the completion of a business case is critical to the success of the project.^[26] Business case is to verify that the solution substantiates or meets the needs of the business and is the vehicle for receiving funding and approval to move forward. It provides a vehicle for the team to step back and subjectively review their facts and assumptions. In addition, it is vital that the planners document what would happen to the business if they keep the state quo. By documenting everything together in one story, it is easy to link the issues to the solution and the benefit and identify where the business would be without the project. The development of the overall business case implies the development of the financial justification and will usually identify holes or problems with the solution. Moreover the project sponsors now have a way to measure their success. This analysis also is useful to prioritize this project against the many other initiatives in the business that may require capital investment.^[27]

Business case is to provide a consistent message to many different stakeholders. It is a high level view of the entire project and enables all organizations affected by the

effort (customers, management, operations, research & development, service, sales, accounting, finance etc.) to be knowledgeable about the project.^[27] Business case is not only to be accomplished to get approved by the sponsors, more importantly, business case is needed for other important project stakeholders (the shareholders, debt holders, investors, top administrators and other people whose interests would be strongly affected by the project to be done). For money lenders, business case is the key document they should read before making decision to lend the money to the project sponsors. For key shareholders, business case is the key document considered to influence the company's fate, hence they must have a prudent verdict on whether the business case should be adopted or overruled.

4.2 What Is Business Case?

The term "business case" is widely used in a formal way as it appears in PMBOK. However different organizations may have different names for business case. Some organizations call business case as project feasibility study, while some call business case as concept study. In the dissertation, I use the term "business case" more often, while it is noteworthy that the content of business case and concept study are to a great extent same. Some definitions of business case are:

(1) Business case is a form of advice to executive decision-makers. It is a substantiated argument for a project, policy or program proposal requiring a resource investment, often including a financial commitment.^[28] (2) Business case is a management tool that supports planning and decision-making for an investment by positioning the investment decision in the context of business objectives. The business case is a proposal and provides an analysis of all the costs, benefits and risks associated with the proposed investment and offers reasonable alternatives.^[29] (3) It explains what the idea, problem or opportunity is about, how and who it will impact, what others are doing, each of the alternatives, the associated impacts, risks and cost & benefit of each alternative and recommendations.^[30] (4) A decision support and

planning tool that projects the likely financial results and other business consequences of an action^[30]. (5) Business case is a document that defines the proposal, layouts its objectives, deliverables, estimated cost and effort and scope.^[31] (6) Business case is a decision support and planning tool that projects the likely financial results and other business consequences of an action”.^[32] Generally Speaking, business case is a controlled process for identifying problems and opportunities, determining objectives, describing situations, defining successful outcomes and assessing the range of costs and benefits associated with several alternatives for solving a problem. Business case is used to support the decision-making process based on a cost & benefit analysis of the actual business. It is an analytical tool that concludes recommendations and limitations, which assists the decision-makers to have a sensible judgment. (Drucker 1985; Hoagland & Williamson 2000; Thompson2003c; Thompson 2003a)^[33, 20, 23, 24]

4.3 Business Case Development Process

In this section, I will first look at the general business case development process, illustrate each element that constitute the process and then dive into each element and explain them step by step based on the theories of different disciplines.

A General Business Case Development Process

From the definitions above, it is notable that all the definitions emphasize financial estimation of the project. Hence it is necessary that the business case should incorporate cost & benefits analysis. It is also remarkable that risk assessment is mentioned several times, similarly the alternatives should be analyzed and recommendation should be given. In addition, according to the definition 2, the business should include the context in which the project is going to be implemented, thus a strategic alignment is needed to make sure that the project proposed is not derailed from the corporate strategy. Integrating the whole definitions and the theories in chapter 3 (refer to Figure 3.1); I develop a general business case development process which is outlined in the figure below:

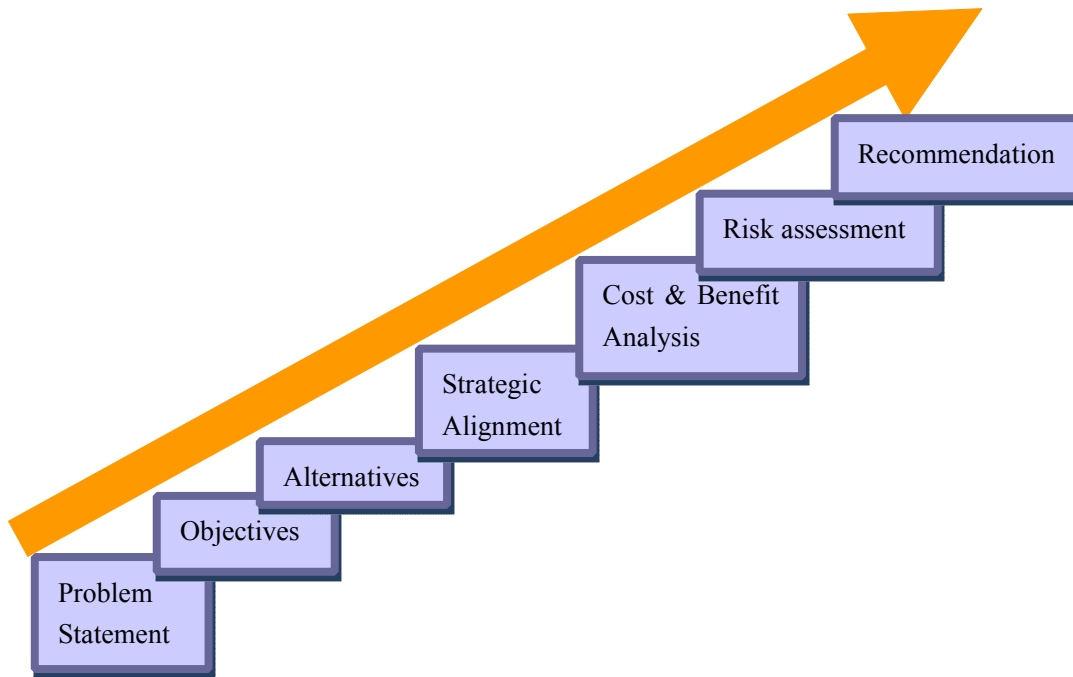


Figure 4.2 Business Case Development Process

It is noticeable from the definitions that cost & benefit analysis is presumed to be an important element. In addition problem statement and business objectives, which are the foundations of developing business case, should be identified before any alternatives are given. Recommendation is the final solution to the proposed problems to meet the business needs. In the following, I will discuss the general business case process in a short manner and then a step by step explanation will be introduced.

Problem Statement

A problem statement basically is a list and description of problems. There are some key elements to be addressed in problem statement:

Firstly there should be a detailed description of what the problem actually is. Secondly problem statement should state who has the problem, in other words, who is the business client or customer. This section should also tell project sponsors who needs the solutions and who will be the person to decide whether or not the problem has actually been solved. Thirdly there is a need to state in which form of the solution should be (should the problems be solved by initiating a project?), although this ultimately depends on what the problem is.^[34]

Business Objective

After the problems are clearly identified, the planners need to think about how the project will work to address the problems. The goals and objectives of the project should be achieved when the project is finished. The planners need to know to what extent the project performance level must be reached to solve the problems as well as the project constraints and assumptions.

Alternatives List

All the alternatives should be listed including doing nothing. All this alternatives should be able to achieve the business objectives. But cost, benefits, risks and other factors are not considered in this section.

Strategic Alignment

It is necessary to know if the project contradicts with the corporate strategy. With the alternatives listed, the planners need to compare the strategy of each alternative with the corporate strategy. The projects whose strategy matches with the corporate strategies should be picked up and selected into the next stage. The projects whose strategies do not conform to the corporate strategies should be eliminated.

Cost & Benefit Analysis

This element is one of the most important elements in business case, as it is shown from the definitions listed above. The analysis assesses the costs and benefits of the chosen option in achieving the desired outcomes. Evaluation should include tangible and intangible factors and quantitative and qualitative factors. When the project is funded from external parties, the financing cost must be included in the total cost.

Risk Assessment

The purpose of risk assessment is to compare the risks and impacts of implementing a particular feasible option with the risks and impacts of not proceeding. The outcome

of a risk assessment is a risk profile that includes a description of the risk, potential causes and probability of occurring. It indicates the potential effect or consequences, and ranks the severity of risk. Finally, an evaluation assesses the acceptability of the risks of proceeding with that option [35].

Recommendations

Repeat the methods above for each alternative. With a range of alternative solutions identified, the next step is to select a preferred solution for recommendation. To select a preferred solution, the planners need to define a set of criteria upon which each solution will be assessed. For instance, the criteria may be related to the solution; benefits, costs, feasibility and risk level. The planners need to identify a mechanism for scoring each alternative solution. After defining assessment criteria and scoring mechanism, simply take each alternative solution and assign it a score based on its ability to meet the criteria set, then the planners need to summarize the scores across all criteria, to identify the total score for each alternative solution. The solution with the highest total score should become preferred solution for implementation.[48]

4.4 A Step by Step Explanation of the Process

According to the general process, I will elaborate the business case development process step by step in this section.

4.4.1 Problem Statement and Objective

Problem statement describes the business problems that the project was created to address. The problem may be processes, technology or product/ service oriented. Problem statement should not include any discussion related to the solutions. When perform a problem statement, firstly the planners need to describe the problem and the motivation of the problem, the problem can be either from inside or outside; secondly specify the context of the problem; thirdly define the scope of the problem which is to define how many aspects are needed to address to solve the problem.

Business objective is a way for an organization to define its goals and direction. A company uses a combined strategy at every level of its operation to achieve its objectives. It determines how a company will allocate its resources and what strengths, weaknesses and opportunities it may have. A business objective is usually not altered once implemented, unless changes in circumstances arise; setting a clear course for the organization is key to its success. The business objectives in business case are to meet the demands from external customers or internal environment. The objectives are to solve the problems that are proposed. In order for a company to establish a business objective, it must first understand where it stands and where it has been. It then determines what its goals are and how it will attain them.^[44]

4.4.2 Alternatives

Once the problem and objective are set, the company needs to find all the possible solutions to the problems to meet the objectives. The alternatives can be in the form of project to address the issues or in other kinds of forms. Doing nothing is also an alternative that should be included. In case the company will initiate a project to solve the problem, all the projects that can solve the problem should be listed in this step. In the next step-strategic alignment, the planners can filter out some projects whose strategies are not consistent with the corporate strategy, in doing so the planners can reduce the workload in the latter steps.

4.4.3 Strategic Alignment

Concerning the levels of project management (Morris 1982), a project strategy should concern not only operative and tactical levels, but also the institutional level and thereby enable a project's significant interaction with its context.^[37] This broader viewpoint would allow the project to define and implement a strategy of its own in alignment with the project's unique environment. Therefore, a more holistic project strategy concept should be developed to take into account a project's possibility to

operate as an autonomous organization, to seek survival and success in an uncertain and complex environment. Figure 4.3 shows that the project can develop its strategies from different levels.[61]



Figure 4.3 Project Strategy Development

(Source: PMI global standard, 2006a-3-13)

Turner (1999) illustrates how organizations undertake programs and projects to achieve their objectives.[38] According to the result of this research; he built a model to include corporation strategy and project portfolio strategy as shown in Figure 4.4.

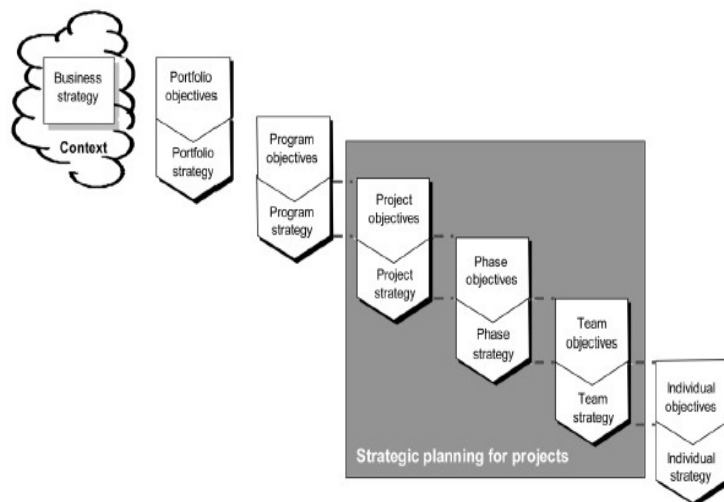


Figure 4.4 From Corporate Strategy to Project Strategy

(Source: Turner.J.R, 1999)

Based on the Figure 4.3 and 4.4, to align projects with corporate strategy, the planners should first review lessons learned from projects currently underway or completed over the past years to uncover possible success criteria and to determine project

prioritization issues. For example, if many projects were unsuccessful because of a lack of resources then resources required to complete future projects should be considered a criterion for determining project viability; secondly develop criteria against which all projects can be prioritized. To do this, the planners can list all projects along with their goals and strategic alignments, and then try to identify criteria necessary for determining the expected impact that each project will have on the organization, its departments and its customers. Finally the planners should align projects to corporate and departmental strategic plans, thereby demonstrating how each project's successful execution will support the corporate and/or departmental strategic plan. The planners should terminate projects that are of low priority or not somehow linked to corporate and/or departmental strategy and retain the projects that have strategic link to the corporate strategy into the next step of business case development process.

4.4.4 Cost & Benefit Analysis

Cost and benefit analysis is important in project front-end phase management. As is shown from the different definitions of business case, the cost & benefit analysis plays an important role in the development process.

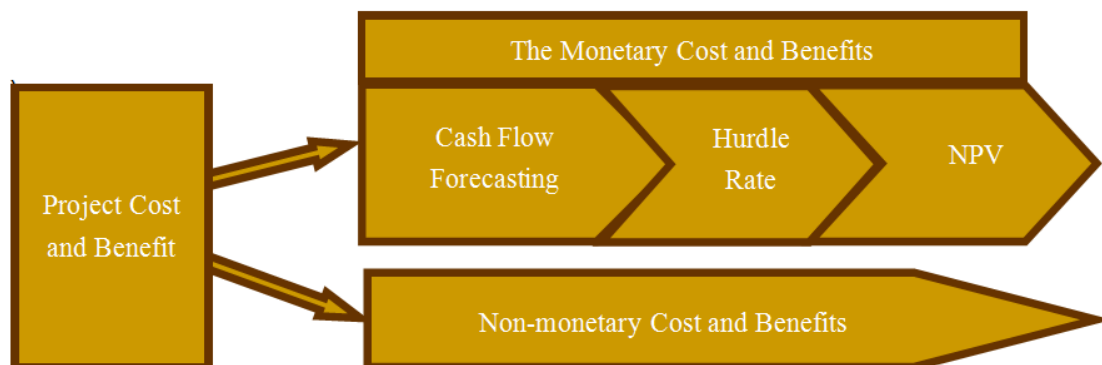


Figure 4.5 Costs and Benefits Analysis Process

The figure above shows the process of a cost & benefit analysis in business case. I would follow the figure to elaborate cost & benefit analysis.

Project Cost

There are five types of costs in a project: fixed cost, variable cost, direct cost, indirect cost, and sunk cost. Fixed costs are those that do not change throughout the project. Variable costs as the name suggests, are costs that change during the project life cycle. Viable costs are highly influenced by the uncertain environment. Direct costs are expenses that come out of the project budget directly (i.e. employee salaries). Indirect costs are those that are shared across multiple projects. Indirect costs are sometimes also referred to as oversight costs. Sunk costs are those that have been incurred in a project, but have not produced value towards the project's objectives. For example, in order to build a mall on the land where the residents are living, the developer needs to pay the residents to move out. This cost can be considered as the sunk cost for this project.^[39]

When developing the project cost, the first step is to identify and quantify all costs associated with a proposed action. In order to successfully identify all potential costs of a project, the planners must follow the subsequent steps:^[39]

(1) Make a list of all monetary costs that will be incurred upon implementation and throughout the life of the project. These include start-up fees, licenses, production materials, payroll expenses, user acceptance processes, training, and travel expenses, among others. (2) Make a list of all non-monetary costs that are likely to be absorbed. These include time, lost production on other tasks, imperfect processes, potential risks, market saturation or penetration uncertainties and influences on one's reputation. (3) Assign monetary values to the costs identified in steps one and two. To ensure equality across time, monetary values are stated in present value terms. If realistic cost values cannot be readily evaluated, consult with market trends and industry surveys for comparable implementation costs in similar businesses. (4) Add all anticipated costs together to get a total cost value.

Project Benefits

The next step is to identify and quantify all benefits anticipated as a result of successful implementation of the proposed action. To do so, the planners should complete the following steps:^[39]

(1) Make a list of all monetary benefits that will be experienced upon implementation and thereafter. These benefits include direct profits from project products outcome, increased contributions from investors, decreased production costs due to improved and standardized processes, and increased production capabilities, among others. (2) Make a list of all non-monetary benefits that one is likely to experience. These include decreased production times, increased reliability and durability, greater customer base, greater market saturation, greater customer satisfaction and improved company or project reputation, among others. (3) Assign monetary values to the benefits identified in steps one and two. Be sure to state these monetary values in present value terms as well. (4) Add all anticipated benefits together to get a total benefits value.

Cash Flow Forecasting

In the context of corporate finance, cash flow forecasting is the modeling of a company or entity's future financial liquidity over a specific timeframe. For a project, the future cash flow is based on the estimation of the future cost and benefits. In some projects whose revenue can be generated only when the project under operation. The cash flow estimation of a project in business case is different from corporate cash flow forecasting, without historical data from income statement and balance sheet, cost and benefit can be estimated by the experienced experts by using subjective estimation. When calculating the costs, the planners need first break down the cost into different units, in each unit the planners can estimate the fixed cost, viable cost, direct cost, indirect cost and sunk cost. When estimating the benefits, the planners can firstly estimate the items that constitute the source of cash flow (i.e. Project product

revenue can be calculate by price multiplying the volume); secondly give the value into the items estimated; thirdly calculate the direct benefits like cost decrease and apply this new estimated cost into the next round cost estimation. Table 4.1 below shows a simple cash flow forecasting example.^[41]

Table 4.1 Cash Flow Forecasting

(Source: *Business Case Guidelines*,2002)

Quantitative Analysis Viable Alternative	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Benefits:						
Revenue	\$	\$	\$	\$	\$	\$
Costs:						
Analysis	\$	\$	\$	\$	\$	\$
Design	\$	\$	\$	\$	\$	\$
Implementation	\$	\$	\$	\$	\$	\$
Ongoing Operational Costs:						
Human Resources	\$	\$	\$	\$	\$	\$
Administration	\$	\$	\$	\$	\$	\$
Net Benefit or Cost of Viable Alternative	\$	\$	\$	\$	\$	\$
Net Present Value	\$					

Discounted Cash Flow Analysis^[42,53]

In order to know the present value; the planners need to discount the cash flow by the project cost of capital (discount rate). Discounted cash flow techniques are available to facilitate the evaluation process. The objective is to find projects that are worth more than their costs—projects that have a positive net present value (NPV). In the following, I discuss the way to calculate NPV step by step in detail.

The Hurdle rate

Hurdle rate is a rate of return the project sponsors requires to invest in the project to compensate a particular degree of risk. A required rate of return can be thought of as an opportunity cost. Investors will require a rate of return at least as great as the percentage return they could earn in the most nearly comparable investment

opportunity. But suppose there's no comparable opportunity, how can the planners estimate required rate of return? What factors determine a required rate of return? In the following, WACC method is introduced as the popular way to calculate project discount rate.

The weighted average cost of capital (WACC) serves as the hurdle rate for a project. It can be described in terms of financing rates. More importantly, it can always be represented as the weighted average cost of the components of any financing package that will allow the project to be undertaken. For example, such a financing package could be 20 percent debt plus 80 percent equity; 55 percent debt plus 45 percent equity; and so on. The cost of capital is the rate of return required by a group of investors to take on the risk of the project.

Cost of Capital Formula

The weighted average cost of capital (WACC) can be expressed as the weighted average of the required rate of return for equity, R_e , and the required rate of return for debt, R_d

$$WACC = (1 - \theta)R_e + \theta(1 - \tau)R_d$$

where τ represents the marginal income tax rate on the project's income. Equation reduces the task of estimating the WACC to a calculation of the cost of debt and the cost of equity and an appropriate weighting of these component costs. WACC is expressed as an after-tax rate of return. Because the returns to equity investors are paid after corporate taxes, R_e is also an after-corporate-tax rate of return (to equity). The return to debt, R_d , is a pretax rate of return; it must be multiplied by $(1 - \tau)$ to convert it to an after-tax basis.^[53]

Estimating the Cost of Debt

The pretax cost of debt can be calculated by solving the following equation for R_d :

$$NP = \frac{C_1}{(1 + R_d)} + \frac{C_2}{(1 + R_d)^2} + \dots + \frac{C_n}{(1 + R_d)^n}$$

where NP represents the net proceeds from the debt issue (i.e. gross proceeds minus flotation expenses, such as underwriting fees, legal fees), and C_i represents the pretax cash debt service requirement payable in period i (i.e. interest plus principal). Typically, project debt must be repaid in installments. When this is so, C_i includes the portion of principal that must be repaid in period i .^[42]

Estimating the Cost of Equity: The Capital-Asset-Pricing Model

Debt involves contractual payment obligations; equity does not. Thus, the procedure for estimating the cost of equity differs from the procedure for estimating the cost of debt. The capital-asset-pricing model is useful for estimating the cost of equity for a project. An investor will purchase a risky asset only if he or she expects to get a rate of return that makes it worthwhile to take on the risk. The greater the risk is, the higher the required rate of return is. The capital-asset-pricing model (CAPM) expresses the required rate of return as the risk-free rate plus a risk premium. It has the following form:

$$\text{Required rate of return} = \text{Risk free rate} + \text{Beta} * (\text{Expected return on market} - \text{Risk free rate})$$

Beta measures the asset's incremental contribution to the riskiness of a diversified portfolio. As a measure of the asset's riskiness, beta reflects the correlation between an asset's returns and those of the market portfolio. The difference (the expected return on market portfolio minus the risk-free rate), called the market risk premium, can be thought of as the additional return investors require to compensate for bearing each additional unit of risk. β_j can be gotten by applying the technique of linear regression from historical data. That procedure involves collecting a sample of simultaneous observations of R_j (the historical return of equity), R_m (historical return of market), and R_f (risk free rate), and fitting Equation to the historical data to estimate the value of the regression coefficient β_j .^[42]

Estimating the Project Cost of Capital

When the project is financed with a mixture of debt and equity, the project cost of capital can be written as

$$WACC = (1 - \theta)R_e + \theta(1 - \tau)R_d$$

In the equation above, it is assumed the project has the same risk level with the company's asset. However, when the project has additional risk involved that is bigger than the company asset (i.e. the operating risk, political risk, environmental risk and etc); WACC then is not a good estimate of project cost of capital. The corporations usually use industry asset betas to evaluate our project, doing so is extremely useful, as it will reduce the error and improve the accuracy of the estimated beta for the project.

(1) Obtain estimates of common stock betas for a sample of firms with the projects of the same type. (2) Estimate the unlevered β for each of these firms by applying the equation: $\beta_U = (1 - \theta)\beta_L / (1 - \tau\theta)$ where θ is the firm's debt ratio, β_L is the leveraged beta, and τ is the firm's income tax rate. The unlevered betas (β_U) reflect operating risk only. (3) The average of all of the firms' unlevered betas serves as an estimate of the unlevered beta for the project (4) Adjust the unlevered beta to reflect the riskiness of the project by applying the equation: $\beta_L = \beta_U(1 - \tau\theta) / (1 - \theta)$

Table 4.2 Industrial Beta to Evaluate the Project

(Source: Finerty. John D., 2007)

Sample Firm	β_L	θ	τ	$\beta_U = (1 - \theta)\beta_L / (1 - \tau\theta)$
A	1.7	0.29	0.4	1.37
B	1.85	0.45	0.4	1.24
C	1.95	0.37	0.4	1.44
D	1.90	0.43	0.4	1.31
E	2.00	0.42	0.4	1.39
F	1.60	0.35	0.4	1.21
G	1.65	0.26	0.4	1.36
H	1.80	0.34	0.4	1.38
				Average beta=1.34

Table 4.2 shows the way to calculate project beta to evaluate project cost of capital. For the example in Table 4.2: $\beta_U = 1.34$ and $\theta = 0.6$, so: $\beta_L = 1.34(1 - (0.4)(0.6)) / (1 - 0.6) = 2.55$. The riskless rate is 6% and R_M is 14%. The cost of capital for the project is: $R_e = R_f + \beta (R_M - R_f) = .06 + 2.55 (.14 - .06) = 0.264$. Hence the project discount rate is $WACC = (1 - \theta) R_e + \theta (1 - \tau) R_d = (.4)(.264) + (.6)(.6)(.1) = .1416$ or 14.16 percent.

Net Present Value Analysis

The net present value (NPV) of a project is the present value of the projected cash flow discounted as a today's value. However, the project sponsors will not know its true market value, or what it is really worth, until the project is completed and the returns are collected. The NPV of a capital investment project is the present value of the cash flows (CF), all the costs and revenues of the project now and in the future:

$$NPV = CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n} = \sum_{t=0}^n \frac{CF_t}{(1+r)^t}$$

where r is the WACC. The decision rule to follow when applying NPV is: Undertake the capital investment project if the NPV is positive. The planners should estimate the value of a project by using discounted cash flow (DCF) analysis and computing the present value of all the cash flows connected with ownership. [42]

4.4.5 Project Risk Assessment

Project risk assessment is an important part in business case development process. Project risk assessment report provides the project sponsors with the information of the potential risks and their significances of each alternative. Risks can highly influence the project's success. It is necessary to take risks into account and figure out their impact and possibility to occur. The planners may find a project with high NPV may have higher risk that is beyond the tolerance of the organization. Project risk assessment should include risk possibility and risk impacts. In order to obtain these data, the planners need to identify the risks first and then quantify them.[43]

Risk Identification

Risks can be identified from five angles: social risks, technological risks, ecological risks, economical risks and political risks, Sukulpat.K et al. (2007) collect the subsets of each risk category based on the work of the scholars from different disciplines, the collections covers most of the existing studies on risk sources. Using this table, one can easily find the elements that constitute each risk category. They summarize their findings in Table 4.3^[45]

Table 4.3 Risk Identification

(Source: Sukulpat. K. et al, 2007)

Criteria	Sub-Criteria	Evaluation methods	References
1.Social uncertainty	Community acceptability	Degree of benefits for local communities (%)	Danter, 2007
	Community's participations	Degree of discourse of partnership and empowerment to community	Atkinson, 1999
	Cultural compatibility	Degree of business & lifestyle harmony with the context of London Metropolitan Area (%)	Danter, 2007
	Public hygiene	Degree of impacts to local public health &safety(%)	CHAI, 2006
	Social needs for new development	Degree of balancing between physical development and social need (%)	Jones and Watkins, 1996
	Workforce availability	Degree of the project sponsor' s satisfaction to local workforce market (%)	Danter, 2007
2 Technological Uncertainty	Accessibility & evacuation	Degree of easy access and quick emergency evacuation in use (%)	Moss,etal, 2007
	Amendments	Possibility of amendments in design and construction	Flyvbjerg, et al, 2003
	Constructability	Degree of technical difficulties in construction (%)	Khalafallah, et al, 2002
	Duration of development	Total duration of design and construction per 1,000 days (%)	Khalafallah,et al, 2002
	Durability	Total duration of design and construction per 1,000 days (%)	Chen, 2007
	Facilities management	Probability of refurbishment requirements during buildings lifecycle (%)	Brown & Pitt, 2001; Moss, et al, 2007
	Project integration & communication	Degree of complexities in facilities management (%)	PMBOK, 2004

Chapter 4. Literature Review on Business Case

	Project procurement	Degree of conflict between project sponsors and vendors (%)	Wolstenholme, et al, 2008
	Quality of construction works	Degree of performance of construction works toward potential quality standard (%)	GTAA, 2005
3. Ecological Uncertainty	Adverse environment impacts	Overall value of the Environmental Impacts Index (EII)	Chen,etal, 2005
	Land contamination	Price of the contaminated land plot	CERCLA, 2000
	Pollution during development	Degree of pollution measured by CO2 level	Harrop& Nixon, 1999, Lister 2008, Brown & Pitt, 2001
	Site conditions	Degree of difficulties in site preparation for each specific plan (%)	Danter, 2007, Khalafallah, et al, 2002
4. Economic Uncertainty	Capital exposure	Rate of estimated lifecycle cost per 1 billion pound (%)	Smith, et al, 2006; Adair& Hutchison, 2005
	Demand and Supply	Degree of competitiveness with other airports in UK (%)	Adair & Hutchison, 2005
	Development fund	Amount and sources of funding injected to mega project construction	Adair, et al, 2000
	Interest rate	Degree of impacts of the increment of loan rate (%)	Sagalyn, 1990; FSA, 2005; Nabarro& Keys,2005
	Investment return	Expected Internal rate of return & Capitalization rate (%)	Sagalyn, 1990; Watkins, et al, 2004
	Job creation	Numbers of Jobs created and loss for entirely Project lifecycle (%)	Jones & Watkins, 1996
	Lifecycle value	Degree of Net Present Value achieve from the investment (%)	Smith, et al, 2006; Adair& Hutchison, 2005
5. Political Uncertainty	Political groups/activist	Degree of protest by the urban communities	Arthurson, 2001
	Council approval	Total Days of construction, design approval process by Planning committee	Crown, 2008
	Public inquiry	Total Days of public inquiry and affect to operating time	Pellman, 2008

Risk Quantification

Risks need to be quantified in two dimensions. The impact of the risk needs to be assessed. The probability of the risk needs to be assessed. For simplicity, rate can be on a 1 to 4 scale. The larger the number is, the larger the impact or probability is. By using a matrix, a priority can be established. Risk quantification provides the project

sponsors with information that which risks are needed to be paid more attention to in order to better handle these risks.^[46] The table below is an example of risk matrix.^[47]

Table 4.4 Risk Matrix

(Source: Hooper Paul K., 2008)

Risk Assessment							
Project Risk Assessment		Alternative 1			Alternative 2		
		Probability	Impact	Risk Factors	Probability	Impact	Risk Factors
Financial risks	Risk 1	4	4	16	1	4	4
	Risk 2	1	4	4	2	3	6
Ecology risks	Risk 1	3	1	3	3	3	9
	Risk 2	1	1	1	2	2	4
Political risks	Risk 1	1	4	4	4	4	16
	Risk 2	2	4	8	2	3	6
Social risks	Risk 1	2	2	4	3	2	6
Technology risks	Risk 1	2	3	6	2	4	8
Risk in Total		42			59		

Table 4.4 above shows the critical risks are financial risks for alternative 1 and political risk for alternative 2. The figures in green represent low perils and the figure in red represent high perils. Alternative 2 has a number of 59 in total risk, which means alternative 2 is more risky than alternative 1.

4.4.6 Recommendation

In this section, I discuss the project selection methods, the selection methods can either focus on project profitability alone or on the project as a whole.

Profitability Selection Method

1. Payback period: the project with shortest payback period will can be selected out in the end. 2. Average rate of return: average annual rate is calculated by result of average annual profit divided by annual cost. The project with highest average rate of return will be selected out. 3. NPV method: the project with highest net present value

will be selected out. 4. Internal rate of return (IRR): internal rate of return is the discount rate which makes the net present value equals to zero. The project with highest IRR should be selected out.

To overcome some disadvantages of the profitability models that they focus on one criterion, a number of evaluation models that use multiple criteria to select the project have been developed. Weighted score model is the one that takes several factors into consideration in determining the final solution. Project profitability is not necessarily the only criterion based on which the project sponsors make decisions.

Table 4.5 Project Selection Factors

(Source: Meredith Jack R. and Mantel Samuel J., 2012)

Production Factors	Marketing Factors
<ol style="list-style-type: none"> 1. Time until ready to install 2. Length of disruption during installation 3. Learning curve—time until operating as desired 4. Effects on waste and rejects 5. Energy requirements 6. Facility and other equipment requirements 7. Safety of process 8. Other applications of technology 9. Change in cost to produce a unit output 10. Change in raw material usage 11. Availability of raw materials 12. Required development time and cost 13. Impact on current suppliers 14. Change in quality of output 	<ol style="list-style-type: none"> 1. Size of potential market for output 2. Probable market share of output 3. Time until market share is acquired 4. Impact on current product line 5. Consumer acceptance 6. Impact on consumer safety 7. Estimated life of output 8. Spin-off project possibilities
	Personal Factors
	<ol style="list-style-type: none"> 1. Training requirements 2. Labor skill requirements 3. Availability of required labor skills 4. Level of resistance from workforce 5. Change in size of labor force 7. Impact on working conditions
Financial Factors	Administrative and Miscellaneous Factors
<ol style="list-style-type: none"> 1. Profitability, net present value of the investment 2. Impact on cash flows 3. Payout period 4. Cash requirements 5. Time until break-even 6. Size of investment required 7. Impact on seasonal and cyclical fluctuations 	<ol style="list-style-type: none"> 1. Meet government safety standards 2. Meet government environmental standards 3. Impact on information system 4. Reaction of stockholders and securities markets 5. Patent and trade secret protection 6. Impact on image with customers, suppliers, and competitors 7. Degree to which we understand new technology 8. Managerial capacity to direct and control new process

Table 4.5 shows the common criteria used in evaluating the projects for the optimal solutions instead of focusing on the financial performance alone. When using the criteria in Table 4.5, it is not necessary to use all of them to judge, and the criteria listed are not complete. The planners can use different criteria based on the nature of the project as well as the result of cost & benefit analysis.^[48] The favored weighted factor scoring model, which consider both the factors and their importance. In general, it takes the form:

$$S_i = \sum_{j=1}^n S_{ij}W_j$$

Where S_i is the total score of the i^{th} project, S_{ij} is the score of the i^{th} project on the j^{th} criterion, and W_j is the weight of the j^{th} criterion. The weights, W_j , may be generated by any technique that is acceptable to the organization's policy makers. There are several techniques available to generate such numbers, but the most effective and most widely used is the Delphi technique. The Delphi technique was developed by Brown and Dalkey of the Rand Corporation during the 1950s and 1960s (Dalkey 1969). It is a technique for developing numeric values that are equivalent to subjective, verbal measures of relative value.^[48]

Table 4.6 Weighted Scoring Model

	Weight	Alternative 1	Alternative 2	Alternative 3
Financial Factors(total)	70%			
NPV	80	60	50	40
Payback time	20	10	15	18
Risk Factors(total)	20%			
Financial risks	50	20	30	40
Project risks	40	20	30	40
Political risks	10	5	5	5
Personnel requirements	10%			
1. Training requirements	70	20	40	50
2. Labor skill requirements	30	20	20	20
TOTAL		62	65	64

Table 4.6 explains the weighted scoring model which includes several factors to take account in determining the final solution. It suggests that the project with highest NPV is not necessarily selected as the final solution.

Weighted scoring models are strongly favored for three fundamental reasons. First, multiple objectives of all organization is to be reflected in the important decision about which projects will be supported and which will be rejected. Second, scoring models are easily adapted to changes in managerial philosophy or changes in the environment. Third, they do not suffer from the bias toward the short run that is inherent in profitability models that discount future cash flows. This is not a prejudice against discounting and most certainly does not argue against the inclusion of profits/profitability as an important factor in selection, but rather it is an argument against the exclusion of nonfinancial factors that may require a longer-run view of the costs and benefits of a project.^[48]

This chapter is discussing a general process of business case. This process is not consummate, since the process does not consider uncertainty. However, in a changing environment, elements that constitute the business case will also change. Thus the static business case process is not adequate to be the basis on which the project sponsors should make further decision after the project is approved. There is a need to establish a dynamic process to cope with the changing environment, which will be discussed carefully in chapter 7.

In the next chapter, I will go through the theories of project financing, trying to understand the basics that underpin project financing. Risks relevant to project financing will be covered altogether.

Chapter 5. Literature Review on Project Financing

Financing the project is an important task in project front-end phase. Once the business case is approved, next step is to finance the project. The term "Project financing" is different from "financing project". In order to grasp the difference and apply it into the real cases, I will look into the area of "project financing" in this chapter: at first definition and benefits of project financing will be introduced; secondly a various financing models will be discussed based on the existing theories; thirdly project financing risk management will be introduced; fourthly the link between project financing and business case will be discussed.

5.1 Project Financing and Its Benefits

Project financing is different from corporate financing. Project finance is financing projects through a project company (legally and economically self-contained legal entity whose only business is the project) with different fund sources. Usually, a project financing structure involves a number of equity investors, as well as a syndicate of banks or other lending institutions that provide loans to the operation. The loans are most commonly non-recourse (the project sponsors are not obligated to pay the loan back if the project fails), which are secured by the project assets and paid entirely from project cash flow, rather than from the general assets or creditworthiness of the project sponsors. The financing is typically secured by all of the project assets, including the revenue-producing contracts. Project lenders are given a lien on all of these assets, and are able to assume control of a project if the project company has difficulties complying with the loan terms.^[49] Figure 5.1 shows a typical project financing model.^[50] In this model money providers and those who sign contracts with project company (the supplies, government, customers (offtakers), contractors and operators) are listed. The contracts signed between project company and different parties will to some extent work as the warranties to comfort the money providers.

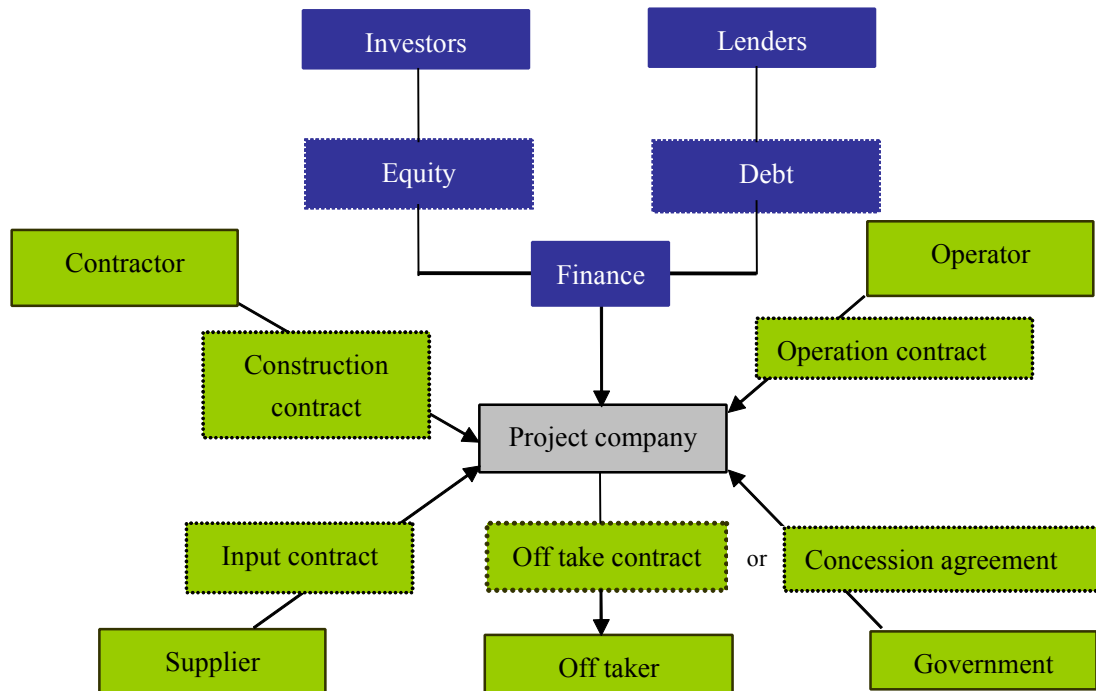


Figure 5.1 Simplified Project Financing and Contract Structure

(Source: Yescombe.E.R, 2002)

There are a lot of reasons that the project sponsors choose to use project financing:

- ◆ Project company usually does not want to suffer a big loss in case the project fails in the end. Using project financing, the sponsors could avoid bankruptcy even the project fails. Since project company is independent of its parent company.
- ◆ Project financing allows the company to provide funds to other projects at the same time, which is not subjected to the covenants of limited indebtedness restrictions on granting guarantees or on creating liens.
- ◆ By project financing, the credit rating of the sponsors is not negatively affected by the various and usually significant risks associated with a project finance venture. Sponsors may undertake several large and sometimes highly risky projects without jeopardizing their overall credit standing.
- ◆ Project financing allows the company to avoid the tax in a legal way, the more the debt is, the less the tax is, hence the shareholders interest increases.

Project financing allows the company to spread the risks among different parties. Joint venture could be a good way for project sponsors to share the risks by sharing

the interest at the same time. In addition, project financing through issuing the corporate bond or other methods brings a large number of stakeholders inside the project. In doing this, political risks could be scaled down.[50,51]

5.2 Project Financing Methods

Project financing methods may include the following: bank loans, equity financing, bond financing, financial leasing, foreign financing and financing pawn. There are two ways of financing in light of capital source --- internal financing and external financing. Internal financing rely on internal cash flow to meet production and operation, and investment in new capital requirements. Internal financing is the enterprise retained profit after tax and depreciation as a source of funds. External financing is funds obtained outside the enterprise, including direct financing and indirect financing. Direct financing is collecting money through the stock market, corporate bonds and trust products. Indirect financing is a means of financing through banks and other financial institutions to obtain funds. Bank loans has become an important way of indirect financing.[52]

Project Financing Strategy

According to the Pecking Order Theory, the first choice of financing is the internal funds of enterprises, namely the retained after-tax profits of an enterprise. The second choice is external financing. In external financing, the company should: first select the low-risk types of debt financing, then the issuance of new stock. There are three reasons to follow this order: internal financing has relatively low cost, minimized risk and the flexible and independent use of money. Financial risks can be effectively controlled by internal financing. The debt ratio especially the improvement of high-risk debt ratio will increase the financial risks and the risk of bankruptcy. Preferences for equity financing of enterprises easily lead to reduced efficiency of the use of funds, some companies invest in projects which they are not familiar with, which lead to reduction of the investors' profits. New equity financing used in an

unfamiliar field will dilute and reduce earnings per share so as to damage the interests of investors.^[53]

Factors to Account in Project Financing^[54]

(1) The impact of macro economy. When the economy goes down, the company should consider deferring the project or canceling the project if the project is influenced by the economy very much.

(2) The cost of capital. The project company should consider the cost of the financing, the lower the financing cost is, and the bigger the profit is. Due to different cost of capital of project financing methods, the project company needs to take consideration into the cost & benefit ratio for each project financing method before they initiate the project.

(3) Financial risk. Different financing methods have different risks. Debt financing has the bigger risk due to the possibility that the project company may not be able to pay the debt when it is due. The equity financing has a lower risk because the project company does not need to pay the principle and interest to equity holders. Using debt financing has both positive and negative effects on corporate. The positive side is that the higher the debt ratio is, the lower the company needs to pay the tax. In this way, the debt is theoretically the more the better. However, when bankruptcy risk is taken into account, debt is not the more the better. There is a need to find an optimal financing structure in order to make the profits and lower the risk.

(4) The profitability of the company. General speaking the bigger the company's potential profit is, the more risk the company can bear. When the potential profits are high, debt financing is a good choice. When the potential profits are low, the company should avoid debt financing or use a little debt.

(5) The asset structure and capital structure of company. Under normal circumstances,

project company adopts debt financing when they have high fixed asset ratio, and they adopt equity financing when they have high liquid asset ratio.

(6) The tax rate and interest rate. The company can adopt debt financing methods when the tax rate is high so that the company will benefit from “tax shield” (decrease the tax to be paid to government), and if the tax rate is low then the company may adopt equity financing methods in order to reduce the financial risk. Interest payment is another issue. If the project will last for several years and the interest rate is low now and will be high in the next few years, the project company can adopt long-term debt financing methods in order to decrease the interest to be paid to debt holders. And if the interest rate is high now, the project company can choose to adopt equity financing to fund its project.

Table 5.1 Project Financing Methods Comparison

(Source: Berk Jonathan and DEmarzo Peter, 2010)

Money-Raising Methods	Advantage	Disadvantage
Bank loan	Low cost of capital, the fund can be collected within short time	Many constraints for bank loans
Preferred stock	No specific due date, no repayment of principal; improve the company's reputation.	The cost of capital is higher than that of bank loan, leading to a higher financial risk
Common stock	No specific due date, no specific interest, low financial risk	High cost of capital, dispersion of the management control
Bond	Low financial risk, no transition of control power to the third party, Financial leverage benefit	The more the bond is, the more financial risks the company has, the risk is bankruptcy.

Companies will be faced with the choice of project financing approach; they should consider the impact of different financing options, depending on the circumstances they are in. Based on the theories above, Table 5.1 shows the cons and pros of each option to finance a project. The widely used financing methods of stock issuing and bank loans have their shortfalls inherently, when project sponsors decide to use these methods to raise money, they must be careful of the potential risks.[53]

5.3 Financing Models

Debt Financing

(1) Bank loan. Generally speaking, there are two periods in loan agreement: loan period and repayment period. In loan period, the loan maybe deferred by transferring the interest into principle or paying the loan by the new issued loan before repayment period. In some cases, the project lenders ask a higher interest rate than normal rate to compensate the risk.

During repayment period, project sponsors will use the sale revenue or cash flows generated by the project as the repayment. In this period, the lenders bear with a high risk that their money could not be paid back. The project sponsors also bear the risk that they could not pay back the money with the revenue, in this case they project company may go bankrupt.

(2) Corporate bonds. The project company may issue corporate bonds to raise money. Usually a project company issues bonds based on its credit standing. A low-rated project company has limitation to raise bonds or is allowed to issue a small amount of bond which has high interest return. A higher- rated project company may be allowed to issue a large amount of bonds which has the lower interest rate. The project company has a lower financing cost by issuing bond (interest is tax-free) and the shareholders' control over the company is not diluted. The interest is the only payback during the project; more revenue is left for the shareholders.

Equity Capital

Equity capital has three forms: (1) Direct investment can be from individual investors, legal person and from government agency. (2) Common stock and preferred stock are good for raising the discrete money. (3) The surplus reserves and undistributed profits are the main sources of retained earnings. The project company can make use of retained earnings to finance their projects.^[55]

Based on debt financing and equity financing models, there are many financing methods derived. In the following I will introduce some commonly seen project financing methods.

Build-Operate-Transfer (BOT)

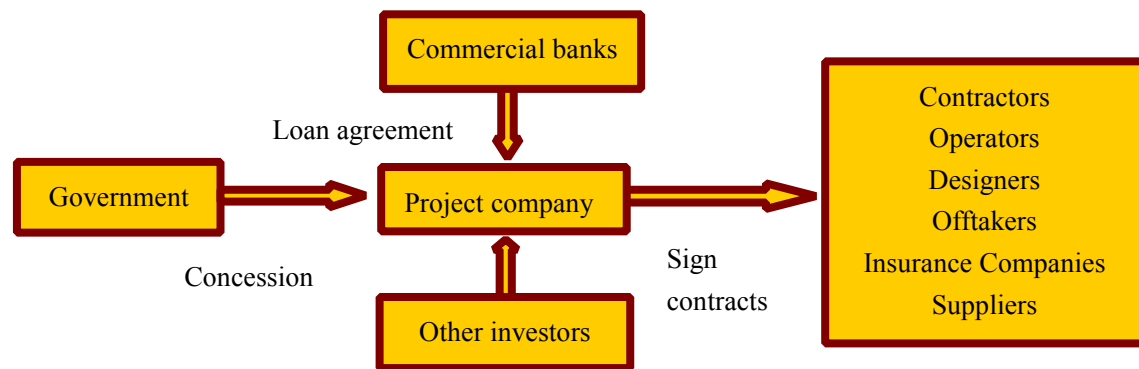
Build-own-operate-transfer (BOOT) or build-operate-transfer (BOT) is a form of project financing, wherein a private entity receives a concession from the private or public sector to finance, design, construct, and operate a facility stated in the concession contract. This enables the project investors to recover their investment, operating and maintenance expenses in the project. Due to the long-term nature of the arrangement, the money is usually raised during the concession period. The return rate is often tied to a combination of internal and external variables.[56]

Figure 5.2 shows the general BOT financing model based on the definition. In concession phase, the project company gets the concession from the government and signs the contract with the government. This contract can be seen as the warranty for the project company to borrow the loans and use the money from other investors. In financing phase, the project company gets the money and signs the contracts with parties such as contractors and suppliers and pays them with the money gained from the bank and investors. In the project operation phase, the project company uses the money gained from operating the project product to pay bank and investors back. When the concession is over, the project product will be transferred to the government.

A. Concession



B. Project financing



C. Project operation and transfer

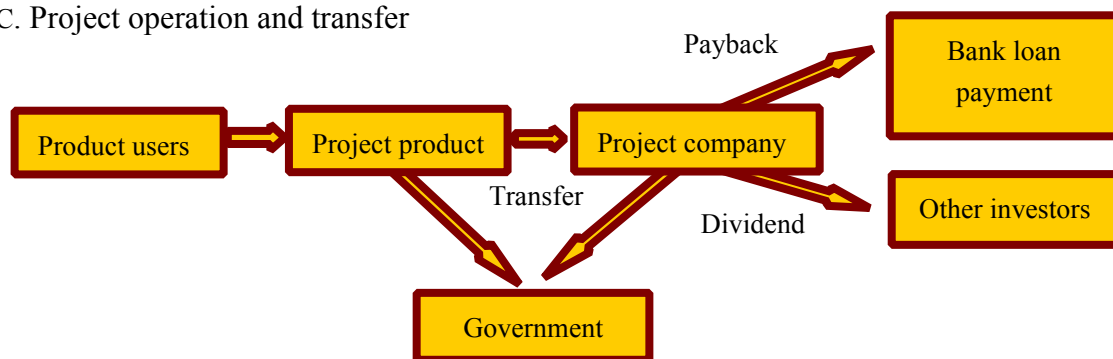


Figure 5.2 BOT Project Financing Process

Asset Backed Securities (ABS) [57]

An asset-backed security is a security whose value and income payments are derived from and collateralized (or "backed") by a specified pool of underlying assets. The pool of assets is typically a group of small and illiquid assets that are unable to be sold individually. Pooling the assets into financial instruments allows them to be sold to general investors: a process called securitization, and allows the risk of investing in the underlying assets to be diversified because each security will represent a fraction of the total value of the diverse pool of underlying assets. The pools of underlying assets can include common payments from credit cards, auto loans and mortgage loans, to esoteric cash flows from aircraft leases and royalty payments.

Often a separate institution, called a special purpose vehicle (SPV), is created to handle the securitization of asset backed securities by the commercial banks. The

special purpose vehicle which creates and sells the securities, uses the proceeds of the sale to pay back the project company whose future cash flow has been sold to SPV. Figure 5.3 shows the process of ABS financing methods, the receivables of the project company as the collaterals are sold to SPV, and then mortgaged to the investment bank; the investment bank sells the securities to the public investors. In order to protect the benefits of the public investors, SPV establishes "Trust institution" to manage the project future cash flow (receivables). The project company hence gets the money from public investors. When the project is finished, the project company returns money to the investors through trust institution.

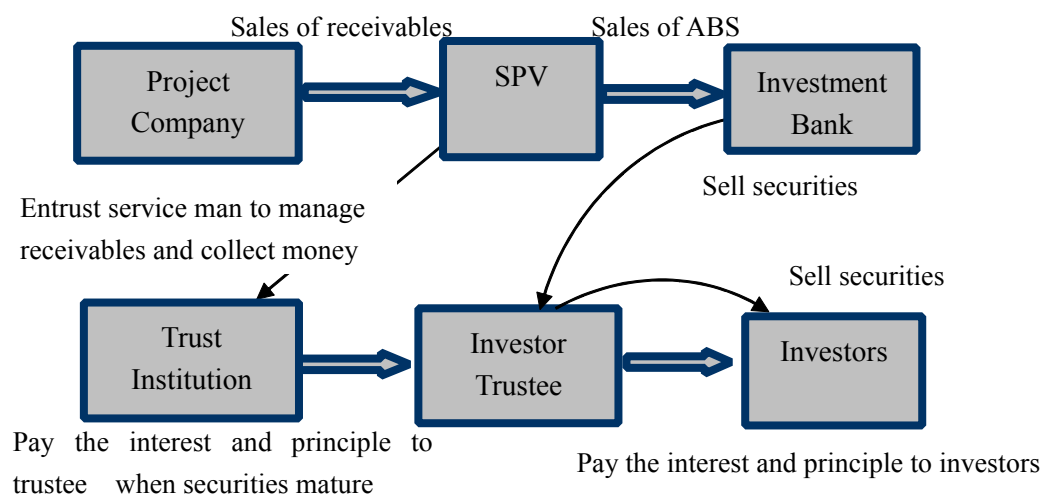


Figure 5.3 Asset Securitization Process

5.4 Project Financing Risk Management

Until now, project financing models have been introduced. In this section, I will look at project financing risks, different kinds of risks are introduced. Their causes and perils are illustrated. Furthermore, the methods of handling the risks are discussed briefly.

Completion risks: the risk is that the project might not be completed. Lenders are particularly sensitive to becoming creditors of a "dead horse". They will therefore insist on taking back their investment if completion fails to occur. Completion risk has a monetary aspect and a technical aspect. The monetary element of completion risk

concerns the risk either (1) that a higher-than-anticipated rate of inflation, shortages of critical supplies, unexpected delays that slow down construction schedules, or merely an underestimation of construction costs might cause such an increase in the capital expenditures; or (2) that a lower-than-expected price for the project's output or a higher-than-expected cost for a critical input might reduce the expected rate of return to such an extent that the sponsors no longer find the project profitable. The other element of completion risk relates to the technical processes incorporated in the project. In spite of all the expert assurances provided to the stakeholders, the project may prove to be technically infeasible. Subsequently, it may require large expenditures, in order to be technically feasible so that the project may become uneconomic to complete within the original plan.^[42]

Political risks: the political risks could be seriously influential to big investment projects. The cancel or delay of a project due to the political changes could lead to the bankruptcy of a project company. Political risk has been shown to be particularly large TO very big investment projects. This is because such projects are especially visible and are often used for political purposes. It is difficult to mitigate all risks pertaining to a specific project. One way to avoid entering into high political risk situations is to borrow through, or in conjunction with, multilateral agencies such as the World Bank and other regional development banks such as the Africa Development Bank (ADB). The rationale behind this is that when one or more of these agencies are involved in a project, the risk of an uncooperative or unhelpful attitude from the host country is reduced since the host government is unlikely to offend any of these agencies for fear of cutting off a valuable source of credit in the future. Being in conjunction with national export credit agencies tends to probably enjoy a similar "protected" status since there is a government element in addition to purely commercial element.^[52]

Economic risks: the risk is that demands for the project's products or services will not be sufficient to generate the revenue needed to cover the project's operating costs

and debt service and provide a fair rate of return to equity investors. Such a development might result, for example, from a decline in the price of the project's output or from an increase in the cost of an important raw material. A typical method of hedging the economic risk is through forward contract and futures. A forward contract obligates the contract seller to deliver to the contract buyer (1) a specified quantity (2) of a particular commodity, currency, or some other item (3) on a specified future date (4) at a stated price that is agreed to at the time the two parties enter into the contract.^[43]

Financial risks: If a significant portion of the debt financing for a project consists of floating rate debt, there is a risk that rising interest rates could jeopardize the projects' ability to service its debt. The traditional method of eliminating such risk exposure is arranging fixed-rate debt for the project. However, floating-rate lenders, typically commercial banks, are often more willing to assume greater completion or other business risks than fixed-rate lenders, such as life insurance companies and pension funds. The availability of interest rate risk hedging vehicles enables project sponsors to eliminate interest rate risk without having to accept a trade-off involving other risk exposures. The typical interest rate hedging method is through a financial derivative called interest rate swap. A swap contract obligates two parties to exchange specified cash flows at specified intervals. In an interest-rate swap, the cash flows are determined by two different interest rates in the same currency. In a currency swap, the cash flows are based on interest rates in two different currencies. The two parties usually exchange the currencies on which the interest rates are based.^[43]

Force majeure risk: the risk that some discrete event might impair, or prevent the operation of the project for a prolonged period of time after the project has been completed and placed in operation. Such an event might be specific to the project, such as a technical failure, a strike or a fire. Alternatively, it might be an externally imposed interruption, such as an earthquake that damages the project's facilities or an insurrection that hampers the project's operation. Lenders normally insist on being

protected from loss caused by force majeure. Certain events of force majeure, such as fires or earthquakes, can be insured against. Lenders will require assurances from financially capable parties that the project's debt service requirements will be met in the event force majeure occurs. If force majeure results in abandonment of the project, lenders typically require repayment of project debt on an accelerated basis.^[43] Project sponsors can sign the insurance contract with the insurance company to protect themselves from force majeure risk. In case that the force majeure events happen, the project company will be paid for their loss by the insurance company.

Risks will happen anyway; by means of guarantees, contractual arrangements and other supplemental credit support arrangements, project financing risks can be allocated among the various parties involved in the project (i.e. purchasers of the project's output, suppliers of raw materials, governmental agencies), which provides the indirect credit support to comfort the lending banks.

5.5 Business Case and Project Financing

Business case and project financing are closely connected with each other. In order to know project front-end phase better, it is necessary to understand the relationship between business case and project financing.

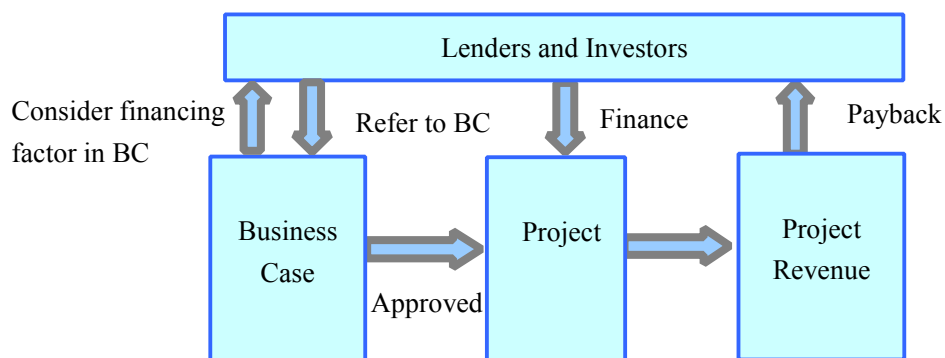


Figure 5.4 Business Case and Project Financing

Figure 5.4 shows the relations between business case and project financing. Business case and project financing happen before a project is implemented; they are both in

the front-end phase of a project. More specifically, business case happens before a project is approved and project financing happens after a project is approved.

1. According to the theories described in the section 3.2, project financing cost must be incorporated in the cost & benefit analysis in business case. Project financing cost could influence the project NPV to a great extent; a project with a high project financing cost may not be viable economically.

2. Project financing risks should be taken into account in risk assessment in business case. The risks related to project financing such as financial risks, economic risks, political risks etc. will have big impacts on the project feasibility. Thus it is necessary that the planners consider these risks in the risk assessment.

3. Project financing also increases the project benefits. Both non-monetary (debt ability, company fame, relationship building with different parties etc.) and monetary benefits (shareholders value increase, risk decrease) that are brought by project financing need to be considered in project cost & benefits analysis.

4. Business case is not only the document that is presented to the project sponsors to get the project approved but also to the various stakeholders that involve in the project. Stakeholders like government, suppliers, contractors, insurance companies and so on will refer to business case before they are going to make any decisions. Business case is of importance to the lenders and investors, project profitability and relevant risks of the project are interesting parts to those who will give the money to the project. Based on business case, lenders and investors decide whether to finance the project or not and government decides whether to give concession to the project or not.

For a project that can be implemented only if there is an external fund provided, the business case has to include project financing risks and relevant stakeholders. The project financing problems would make business case difficult to be developed;

Chapter 5. Literature Review on Project Financing

likewise the business case based recommendation can make investors dubious about the authenticity of the project profitability.

In the next chapter, I will go through a case regarding project financing. The typical case is well known for its majesty and its strategic significance. However, from the project owner's perspective, it may be considered as a fiasco, I will discuss the reasons in chapter 7 and give my own suggestions.

Chapter 6. Case Study

Project financing are widely used in a number of projects (i.e. Eurotunnel Project, Euro Disney project, Hong Kong Disney project, Italy Water project, India Town Cogeneration project and so on). Eurotunnel Project is a symbolic project that is not only well known for its majesty, strategic success and special project financing model, but also characterized by its cost overrun, time delay and the serious subsequent results. Through study of the representative project, one can have more insights into (1) project success from different perspectives (Eurotunnel is a perfect example that is considered as a fiasco by project sponsors but a success from strategic, tactical and operational perspectives) (2) project financing risks and risk management (Eurotunnel is quite a nice example that exhibits almost all the different kinds of risks relevant to project financing) (3) the importance of project management (Eurotunnel shows that cost and time management are in the top rank in management of projects that are financed by the means of "project financing") (4) project financing related problems (Eurotunnel is a perfect example that exhibits the challenges that the project sponsors are faced with when they use project financing) (5) the project front-end management (Eurotunnel Project is a cogent example that tells the project front-end phase cannot be the basis on which project sponsors make further decision on the project). On top of these insights that can be obtained by studying Eurotunnel Project, one can learn more such as project contract management, project organization structure, stakeholder management and conflicts management through this typical BOOT project. Eurotunnel Project was selected as one of the Seven Wonders of the Modern World by American Society of Civil Engineers and Popular Mechanics in 1996.

Eurotunnel Project Background

The idea of a fixed link between Britain and the European mainland was first seriously considered in Napoleonic times. Since then, plan after has been suggested. A tunnel was even started in 1880, but it was stopped two years later after British fears

of invasion. Nearly a century later, in 1975, another start was canceled due to political reasons. In 1978, a group of European constructors combined to resurrect the promotion of a subterranean link between England and France. By 1982, several other groups were in existence with a variety of other schemes including bridges, tunnels, and even a combination of the two. The British and French government was still hesitant but they accepted the offer of a group of banks from both countries to carry out a study of the feasibility of a privately funded scheme. A historic meeting between banks and contractors took place on 9th March 1983, and the decision was taken to put forward a tunnel scheme with equal British and French involvement. As a result, the Channel Tunnel Group and Franche Manche were formed, each includes five contracting companies. The banks reported to the two governments on feasibility and favored a tunnel solution. However, it was not until the beginning of 1985 that the governments called for proposals for a concession to both construct and then operate the fixed link. During the same year, the Channel Tunnel group and France Manche assembled their team and developed their scheme. The need for non-contractor partner was also recognized. By the time the proposal was submitted in October 1985, the national Westminster and Midland Banks, Bank Indo-Suez and Credit Lyonnais had join as full partners and Mobiloil and Granada were associates. The consortium's bid was successful and in January 1986, at a Ceremony in Lille, Prime Minister Margaret Thatcher and President Francois Mitterand, announced their backing for the present scheme. A month later, Britain and France signed the treaty of Canterbury. The formal concession agreement was subsequently signed in March 1986, From then on, the contractor was progressively separated from the prospective owner and both Eurotunnel and Transmache-Link or TML were formed. Eurotunnel was thus able to concentrate on raising the finance. On the 22nd April 1987, the French parliament gave its approval to the present project. The final hurdle was the British Channel Tunnel Bill, the passing of which was delayed when a general election was called in June 1987. However, it received Royal Assent on July 23rd and six days later the Anglo-French treaty was ratified at the Elysee Palace by Prime Minister Margaret Thatcher and President Francois Mitterand. (Link Magazine,1994)^[58] Figure 6.1

shows the project location and the 3-D channel tunnel sketch.[59]

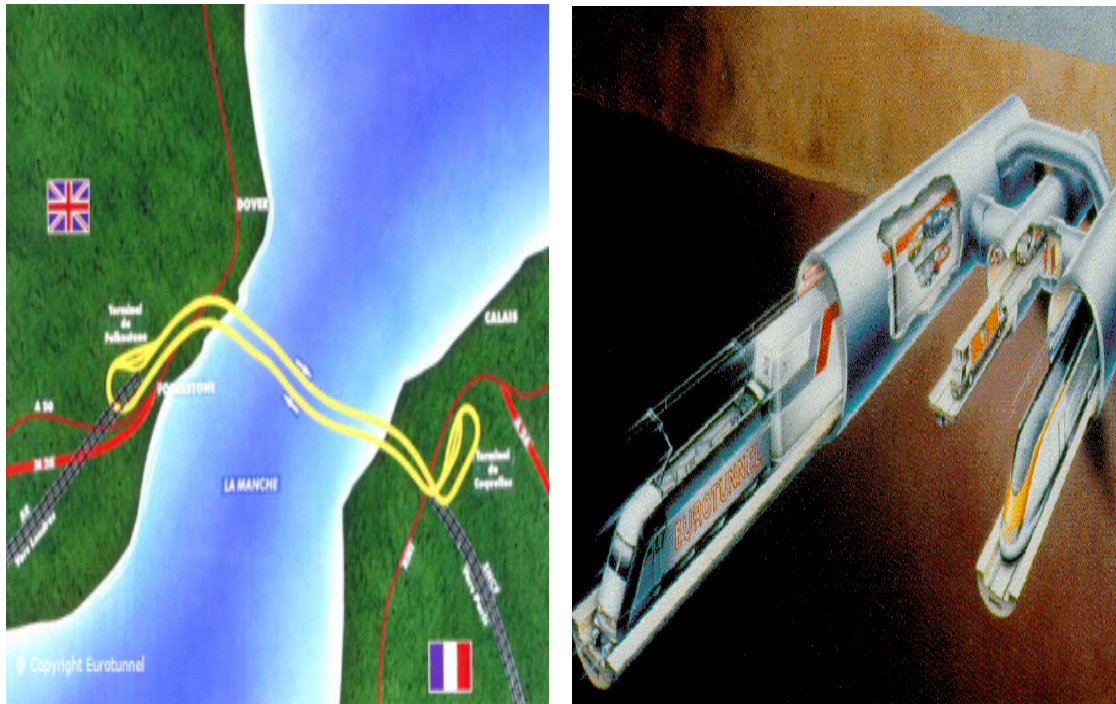


Figure 6.1 Location of “Channel Tunnel” (Left) and the 3-D sketch (Right)

(Source: Pierre-Jean Pompée, 1995)

The important events of the project is listed below:[60]

a) Project Launch

1985	March	Initiation of the project by the British and French governments
1986	January	Proposal of a rail tunnel system is chosen by the governments
	February	Franco-British Channel Tunnel Treaty is signed
	March	Signing of the Concession Agreement by the French and British governments, Channel Tunnel Group Ltd. and France Manche S.A.: BOOT-Project, concession period until July 2042
	August	Eurotunnel group is founded / Construction Contract is signed (commissioning date scheduled for May 1993)
	Sep./Oct.	First tranche of equity: £46 million provided by the founding consortium, Second tranche of equity: £206 million provided by institutional investors
1987	July	Ratification of the Treaty; Railway Usage Contract signed with British Rail and SNCF
	November	Credit Agreement: £5 billion; over 200 participating banks IPO: £770 million

b) Construction

1987	December	Start of tunneling
1989	July	First violation of covenants of the Credit Agreement
1990	October	Additional £1.8 billion bank loan, £300 million European Investment Bank (EIB) facility

Chapter 6. Case Study

	November	Seasoned equity offering (SEO): £568 million
	December	Breakthrough in the service tunnel In exchange for waiving Eurotunnel's claims against the governments, the concession period is extended to July 2052
1991	November	Additional loan facility of £200 million by European Coal and Steel Community (ECSC)
1992	March	Violation of covenants
1993 -1994	Dec-May	Completion of the tunnel, fitting out, testing

c) Operation

1994	May	Official inauguration, Additional credit facility £647 million, SEO £858 million
	July	First rail freight trains, truck shuttles
	November	First Eurostar service
	December	First passenger shuttle
1995	June	First coach shuttle
	September	Standstill: Eurotunnel stops interest payments on junior debt
1996	October	Eurotunnel and banks outline financial restructuring
	November	Fire in the tunnel caused by a truck on a freight shuttle
1997	July	Shareholders agree with financial restructuring in extraordinary general meeting, Governments grant extension of the concession period until 2086 against 59%, (incl. taxes) of pre-tax income starting 2052
	November	Lenders agree with financial restructuring plan
1999	November	SEO for funding debt repurchases
2002	May	Restructuring claims of creditors: Buy back of subordinated debt below face value in exchange for new bonds
2003	September	Opening of the first part of the high speed line between Folkestone and London (UK terminal to Fawkham Junction, North Kent)
2004	February	Eurotunnel subsidiary is granted a rail operator's license in France
	Spring	Revolt of shareholders leading to a change in management and demanding financial support by the governments
2005 until 2006		
	April	Eurotunnel obtains the waiver to the Credit Agreement required and starts the renegotiation of its capital structure

The Eurotunnel Project

The Eurotunnel system is composed of three tunnels and two terminal stations. It has been conceived to offer two different services: shuttle and railway system. Road vehicles carrying passengers and freight will travel between UK and French Terminals on specially designed shuttles operated by Eurotunnel itself. The shuttle trains will

consist of a number of specially designed wagons. These wagons will be well ventilated and will incorporate modern design and safety features. Different types of shuttles will carry passengers and freight vehicles. The ferry-trains that are shuttles will depart every 12 minutes. Each train will be composed of 12 or 24 wagons. The figure below is the terminals oversee in French and England.^[59]



Figure 6.2 French Terminal at Coquelles Site (Left) and British Terminal at Folkestone (Right)

(Source: Pierre-Jean Pompée, 1995)

Project Financing Package

The total financing requirement of the project was estimated at £4.6 billion. This was to be funded by equity and credit facilities. It has been decided to raise this amount plus an addition 25% in order to cover the exposure to inflation and construction risks.

The total amount to be raised was £6 billion. The banks demanded a capital at least equal to £1 billion. The goal was to commit the stockholders to the project. The shareholders require the approval of the loans by the banks before investing in the project. The solution was that the banks would sign the credit agreement before the stocks were issued but no drawings on the credit were allowed before the subscription of the total capital (Roger, 1990)^[58]

The equity and debt of the project were structured in a way to support one another.

The bank loan was arranged before the equity financing was raised so that investors had enough confidence that the remainder of the capital required for the project was available. Similarly, the equity raised gave the lenders confidence that the project was capitalized. The credit convention gives Eurotunnel loans and letters of credit in six parts for a total of £5 billion of which 20% are a standby credit. The loan can be broken down as follows: 2.6 billion British pounds, 21 billion FFR, and 450 million USD. Drawing was allowed in other currencies. The countries of origin of the banks involved are listed in the following table.^[58]

Table 6.1 Loans and Lending Countries

(Source: Stephaine.Roger,1990)

Country	Percentage of the total loan
France and UK	27%
Rest of Europe	39%
Japan	23%
Rest of the world	11%

The debt financing was arranged by the five major banks: UK Banks (Midland, Natwest) and French Banks (Credit Lyonnais, Banque Natiionale de Paris, Banque Indosuez). Through these five banks, Eurotunnel got the money from up to 225 banks. The total loan was 5 billion pounds. 80% of the loans were used to pay the cost and 20% to pay the stand-by reserve. In order to get the loans from the syndicate banks, Eurotunnel must fulfill the conditions: (1) total equity must be £1 billion. (2) £700 million equity should be paid for the capital cost. (3) the progress should be satisfactory (4) the project must be sure of the future cost of the project is reasonable.^[42] The loan facility was seven years. Repayment was by the cash flow when the project was in operation; the last repayment was no later than 18 years after signing the loan agreement. However, considering that 90% of the revenues must be paid as interests, Eurotunnel planned to refinance the loan before maturity. Figure below shows the loan amount, loans style, lending banks and the time of the loans.^[62]

Table 6.2 Timing of the Loans and Their Lending Banks

(Source: Michael Grant, 1997)

£6.8 billion Junior debt	Syndicated Bank and Underwriting Banks (cash and letters of credits)	1987-1994
£300 million	European Investment Bank (cash) Ceiling line up to 1 billion under letters of credit from syndicate banks	Oct 1990
£200 million	European Coal and Steel	Nov 1991
£647 million Senior debt	Syndicated Bank and Underwriting Banks (Cash)	May 1994

In the agreement between Eurotunnel and the banks, a repayment schedule was prepared. Refinancing was allowed in the agreement, it was agreed that the interest will be computed on the basis of the market rates of the currency and the market involved and a premium will be added. This premium is a function of the progress made in the constitution and the amount of the loan already drawn; the credit convention states that banking cases should be made periodically to check on the project and its existing and foretasted cash flows. Cash flow previsions have to be based on various factors such as expenses, traffic and revenues, taxes, inflation, interest rate and other economic factors. The banks compute debt coverage ratio. According to the agreement, Eurotunnel is not able to draw on its credits if this ratio is lower than 1.2 and is not able to refinance if this ratio is lower than 1.3, and is not able to pay the dividends if the ratio is lower than 1.25. If the ratio is lower than 1 during 90 consecutive days, the bank have the right to take the project over.[42]

Commission fees are high. Eurotunnel must pay 1/8 percent of the total amount of funds raised to the five banks. To underwriting banks (around 200 banks in the beginning), Eurotunnel must pay 7/8 of the underwritten amount. In addition, Eurotunnel had to pay pre-loan commitment fee, regular commitment fee, and additional commitment fees. The interest payment could be in different ways with different interests. If Eurotunnel would use of the stand-by fund, the interest rate

would be higher. The entire asset in Eurotunnel is the collaterals including the concession, the performance bond from the contactors and so on. Eurotunnel bore the risks of defaults if (1) the default cover ratio is not met. (2) the project opening is delayed. (3) an irremediable breach of the obligations occurs. (4) the cash flow during the project operating phase could not cover the debt to be paid. The bank have risk management for the money they lent, default cover ratio must be below 1.2 so that the money can be lent. In addition to the syndicate banks, European investment bank offered money as well to Eurotunnel.^[42]

Another important agreement was between Eurotunnel and European Investment bank. This bank provided £1 billion loan which is guaranteed by the banks that have signed the credit convention. The European bank of Investments bore fewer risks than the private banks since its loan is guaranteed by other banks until the refinancing (if it occurs). Equity financing was divided into five steps: equity 1, equity 2 and equity 3 were designed to finance the project; Equity 4 and Equity 5 were designed to finance the debt.^[62]

Table 6.3 Timing of the Equities Issuance

(Source: Grant Michael, 1997)

Equity 1 (Founders)*	47 million	Sep 1986
Equity 2 (Private institute placement))	206 million	Oct 1986
Equity 3(IPO)	770 million	Nov 1987
Equity 4(Right Issues)	566 million	Nov 1990
Equaity5(Right Issues)	793 million	May 1994
Issues to Bombardier	17 million	June 1994

*The founders include 5 banks and TML which is comprised of 10 construction companies.

The governments of the two countries do not want to be financially or legally involved in the project. They decided not to give economical or financial help to the

project. Different major issues had to be considered by the government of the two countries. (Roger, 1990)^[58]

The figure below shows the evolution of Eurotunnel's major financial events.^[63] Increasing expenditures and delayed opening led to further difficulties and in Sep 1995, Eurotunnel announced suspension of interest payments for 18 months. In 1997, the debt restructuring was accomplished. In 2007, Eurotunnel was in plague that it applied for bankruptcy in France. As a result, the second debt restructure started again and predicted to reduce the debt to £1.5 billion. However, debt restructure was not into play. Eventually, with the 2007 debt crisis, 87% of the equity was sold to Goldman Sachs and Deutsche Bank in return for debt waiver. Hence Eurotunnel was renamed as Group Eurotunnel listed in France Stock Market and Goldman Sachs became the biggest shareholder of Group Eurotunnel.

Channel Tunnel

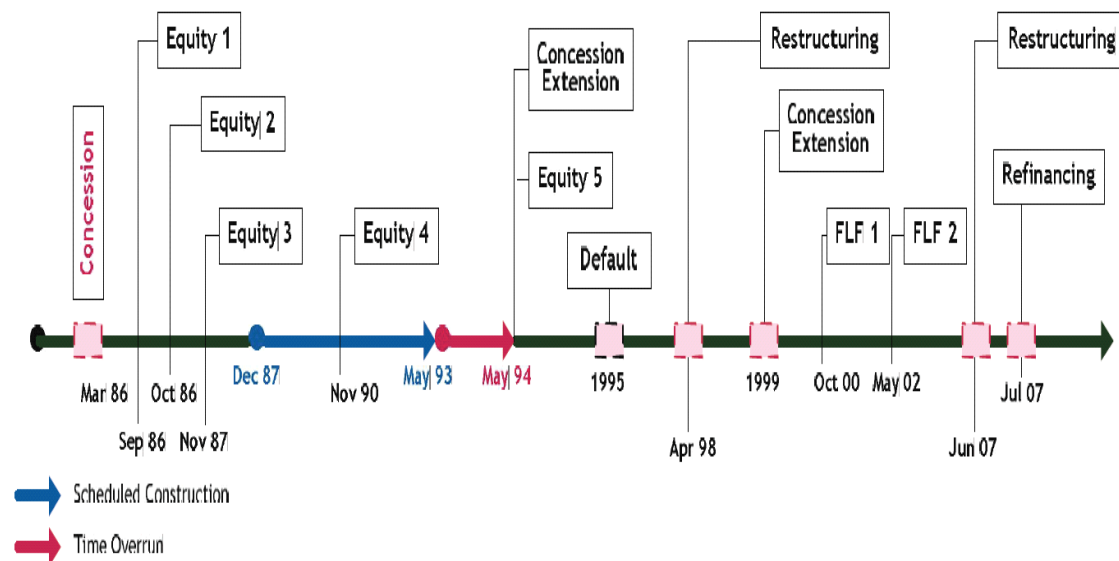


Figure 6.3 Eurotunnel's Financial Evolution

(Source: Fitch, Rating, Global Infrastructure & Project finance)

This chapter describes the information of Eurotunnel Project, regarding its background, financing structure, ownership structure and so on. In the next chapter, I will discuss and analyze business case and Eurotunnel Project. Solutions to problems of business case and suggestions to challenges of project financing will be presented.

Chapter 7. Discussion and Solutions

Based on the aforementioned theories, I try to reflect these theories in detail and find the problems in business case development process and challenges of using project financing to finance project.

In the first part, I will look at the business case in project front-end phase. Based on the theories in chapter 3 and 4, I will discuss the shortfalls of the general business case development process and give my solutions to compensate these drawbacks by adding more elements to the process. Specifically, uncertainty is well incorporated into the process. Last, based on the problems I have found, I will give my solutions to improve the business case development process.

In the second part, I will look at project financing in project front-end phase. Based on the theories in chapter 5, I will first summarize the problems that project sponsors may be faced with when they finance the project by means of project financing. Second I will discuss Eurotunnel Project from different perspectives and find the problems or challenges of this project. Third, combining my findings and the theories, I will explain my suggestions to these problems and challenges.

7.1 Business Case – Is It Trustable?

Based on the theories I present in chapter 3 and chapter 4, in this section I will discuss the existing business case development process, find the defects of the process and give a new process that is more flexible, responsive, dynamic and convincing.

Factors that Make Business Case Inaccurate

A post project evaluation usually evaluates the gap between the initial prediction of the result and the realized results of a project. It turns out that few predictions of the

project result in the project front-end phase would be as same as the final result. There always are some factors that can make the project result deviate from its prediction. Can the project sponsors trust the business case to invest the project and the project investors trust the business case to lend money to the project sponsors? Looking back to chapter 3, I could say, the biggest factor that lead the project to deviation from the business case is uncertainty. Most scholars point out uncertainty will impose the original plan to derail. Thus how should the planners deal with the challenge when every element in business case process can change? This question will be discussed by matching elements in business case development process with uncertainty.

Goals Setting

The goals of the project - the benefits to be reaped - form a vital part of the business case. Cooke- Davies (2005) shows that many companies have difficulty stating that projects are “approved on the basis of a well-founded business case linking the benefits of the project to explicit organization goals (whether financial or not)”. Many more are unable to state that they had a “means of measuring and reporting on the extent to which benefits have been realized at any point in time”.^[72] Projects, public or private, in a typical management environment may frequently be in such a situation. “Projects are complex, ambiguous, confusing phenomena wherein the idea of a single, clear goal is at odds with the reality” (Linehan and Kavanagh, 2004).^[73] Indeed, Engwall (2002) describes the establishment of the perfectly correct goal as a “futile dream”.^[74]

The front-end phase commences when the initial idea is conceived, proceeds to generate information, consolidates stakeholders’ views and positions and arrives at the final decision as to whether or not to finance the project. In order to succeed in strategic terms, planners need to have a broad and long-term perspective and allow different concepts to be considered. However, this broader perspective requires planners to look further into the future, where uncertainty is high and conclusions are more hypothetical and tentative. Recognizing the fact that the front-end phase in large

investment projects, particularly large public schemes, can extend over several years, there is a need to identify corporate goals and objectives and align them to projects. The complexity in the underlying problems is exacerbated by issues of different stakeholders having different perceptions of reality, different understandings of the problem, different assumptions, values and objectives.

Strategic Alignment

It is essential to identify explicitly the strategy of the organization and ensure that the goals or objectives of any project will “further the sponsoring organization’s chosen corporate strategy and contribute to its overall goals”. This is the recommendation of Cooke-Davies (2009), which looks at the front-end alignment of projects.^[72] Morris (2009) also considers the strategy of the organization and the importance of developing projects to pursue this strategy with emphasis on the value the project produces for the organization rather than simple efficiency of execution.^[75] Samset (2009) points out the seriousness of “when a project fails in strategic terms, even if it successfully produces intended outputs. Strategic failure means that the choice of concept turns out to be the wrong one.”^[76] Project management has been developing in this area for some time. Morris (2009) points out that it is important projects fit within their business/sponsor’s context.”^[75]

The relationship between strategy and project management is not one-way. Morris describes how strategy implementation is accomplished with project management, but project management can also contribute to strategic management. He points out that project management’s contribution “can add value to the emerging strategy and ensure that benefits are reaped from its realization.” Project strategy can be derived from the corporate strategy; however, project strategy can influence corporate strategy. For profitability oriented projects, a project with high NPV can be the priority of the organization sometimes. The project strategy can even change the corporate strategy. When implementing such a project, the planners need to consider this point.

Cost & Benefit Analysis

The difficulties of cost & benefit analysis is embodied in two dimensions. The first is that the process of cost & benefit analysis is difficult to develop. The planners must consider both monetary and non-monetary costs and benefits of the project. To gain the monetary value of the project, NPV is a main factor to be considered. Considering the uncertainty is high in the project front-end phase, both costs and benefits can't be estimated precisely. Risk may overlay with each other so that the cash flow is more difficult to forecast. Thus the predicted cash flow can't be accurate at all. In addition, considering various uncertain factors like inflation rate, interest rate, bond return rate and equity return rate, it is very difficult to obtain an accurate project return rate. Considering the operational risk and technological risks, if the project of the same kind is seldom done before in other organizations, the project overall risks can't be estimated easily. Thus estimating the project required return under the risks to be taken is an extremely difficult thing for the organization. With so many difficulties to get the right NPV of the project, no wonder that the prediction in the outset can't be as same as the result.

Secondly, it is pointed out that private projects have normalization of deviance, which underestimation happens more than overestimation; while systematic underestimation is often seen particularly in public investment projects.^[66] Cost estimates typically develop as illustrated in Figure 7.1a. Cost estimates are low in the initial period before the first systematic estimates of costs are undertaken. With time, the information basis improves, the cost estimate rises rapidly to the level at which it should have been at the outset. Thereafter, minor modifications are made until the final budget is approved. The dashed line at the top illustrates the development of cost in the front-end phase as it should have been, had the process started with an estimate at a realistic level. Another problem is overestimating benefits at an early stage, as depicted in Figure 7.1b. The initial forecast is high, and may be scaled down during the front-end phase. After the project is completed, benefits, which may be expressed in terms of sales figures or market demand, prove to be much less than expected. ^[66]

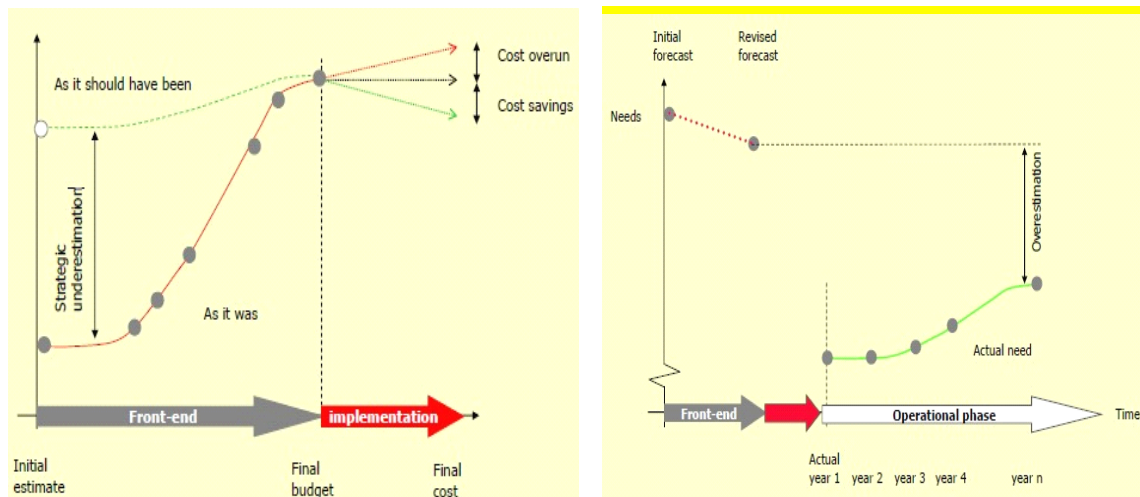


Figure 7.1 A-Cost underestimate. B-Benefits Overestimate

(Sources: A - Cost underestimation (2003). B - Benefits overestimation (2005))

The costs underestimate and benefits overestimate are common in public projects, while some private projects prove that these phenomena may happen as well. The involvement of different stakeholders in private project may lead to the miscalculation of cost and benefit. Some parties which can benefit a lot from the project as long as the project can be approved may strategically mislead the planners who are responsible for the business case development.

Risk Assessment

Risk assessment could be an extremely difficult thing for the planners. First, the risks can be everywhere; risk identification is a hard work under grave uncertainty factors in the project front-end phase. With many stakeholder and uncertain context, the risks are impossible to be identified fully. Some critical risks, if not recognized, then will influence the final recommendation. The calculation of uncertainties and likelihood of risks is very difficult also. Wright (2009) discusses the difficulties that humans – including so-called “experts” – encounter in making such assessment. This difficulty is particularly acute in projects, where much uncertainty is epistemic (due to a lack of knowledge), rather than aleatoric (due solely to probabilistic uncertainty).^[77] Bedford (2009) in this paper prove that lack of understanding about the major uncertainties

and their interactions and the degree of project uniqueness results in the high difficulties of business case development.^[78]

Alternative Selection

Alternative Selection is based on the previous steps. When only one single parameter is used to measure the project, the difficulties are dependent on the calculating the factor that is prioritized. (i.e. Payback time, NPV or IRR). However, if the final solution is based on the overall factors, then alternative selection could be not accurate even under the weight scoring model. When every element in business case can change when the environment changes, the final recommendation from business case could never be as same as what the project sponsors desire.

Until now, the difficulties of business case development are stated above based on my understanding and the relevant theories. Generally speaking, the reasons of the difficulties are mainly due to high uncertainty in the project front-end phase. In the next section, I will try to give my suggestions to the problems proposed above.

7.2 Suggestions to Business Case Problems

In terms of the problems of the goals setting, stakeholders management is important to be involved. In assessing how judgments are made about the future, consideration must also be given to the many aspects of the group of decision-makers within an organization. This includes different levels of power, interest, credibility, difference between expressions and perceptions, the various aspects of social geography and etc. The project concept should meet the needs of many stakeholders, both those within the project organization, and those in the wider environment. Hence communication is vital for stakeholders to understand each other internally and externally. To have a common goal for the project, stakeholders must be able to concede to each other, in order for their individual goals to converge to become a unified goal of the project.

In terms of the problems of strategic alignment, it is important to recognize the turbulence of the environment and build in the capability to cope with this turbulence at the start of the project. With ambiguity, uncertainty and complexity ahead of the project, the planners when developing business case must take these factors into consideration. The project strategy should be examined at each stage of the project in order to cope with the impact that the changing of environment might have on the corporate and project strategic fit. Figure 7.2 explains an ongoing process for strategic fit check. The ongoing checking process shows that the project strategy is derived from corporate strategy but also influence corporate strategy. The changing of the environment has impact on the corporate and project strategy. Hence checking business purpose and objectives should be consistent and continuous over the project lifecycle. The checking points include stakeholders analysis, uncertainty analysis and reflection of the work done. The checking results should be reflected in business case update.

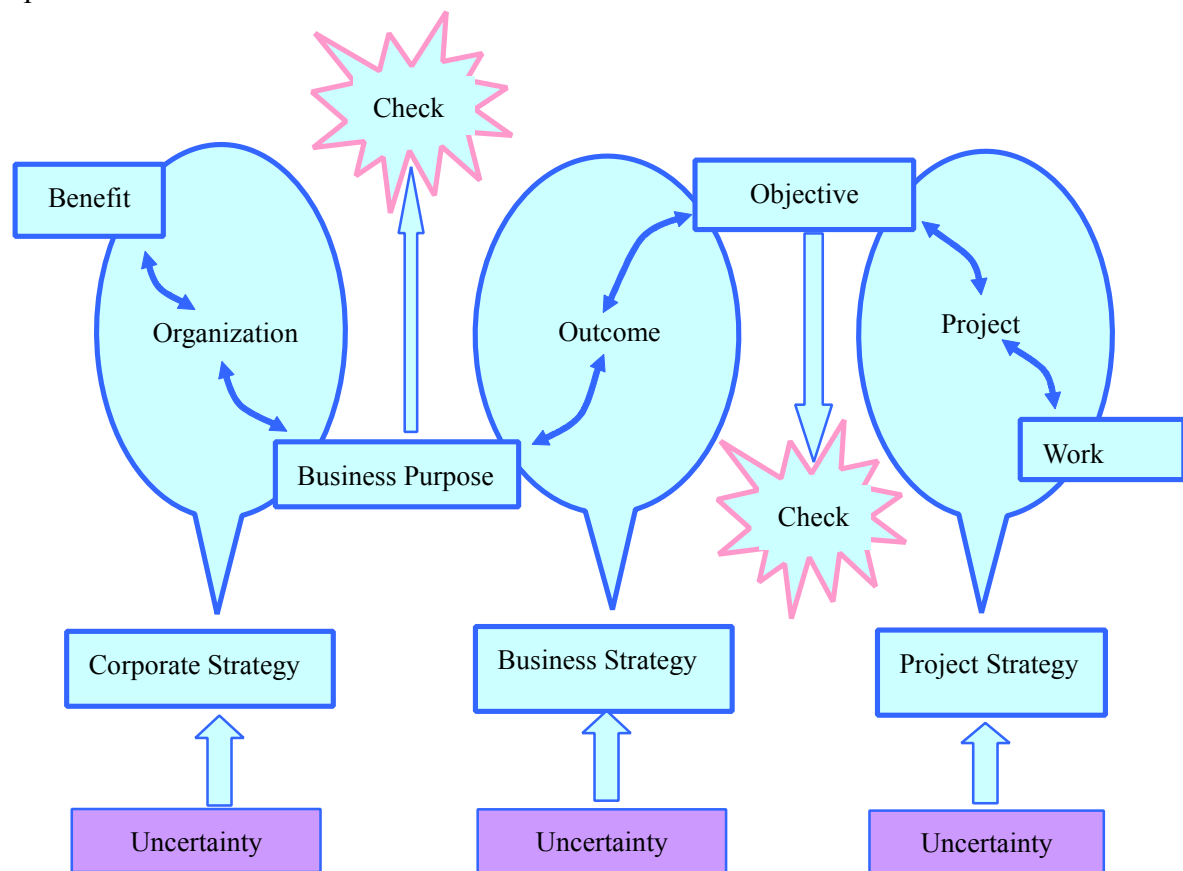


Figure 7.2 Project Strategy Ongoing Checking Process

In terms of cost and benefits analysis, to overcome cost underestimation and benefits overestimation and the potential that the uncertainty will influence the precision of the cost & benefit analysis, I would use the method called "successive calculation". This method can be used in calculating the future cash flow for each year. The figure below shows the process of successive calculation; I developed this process based on Frode Drevland, Kjell Austeng and Olav Torp's work.^[79]

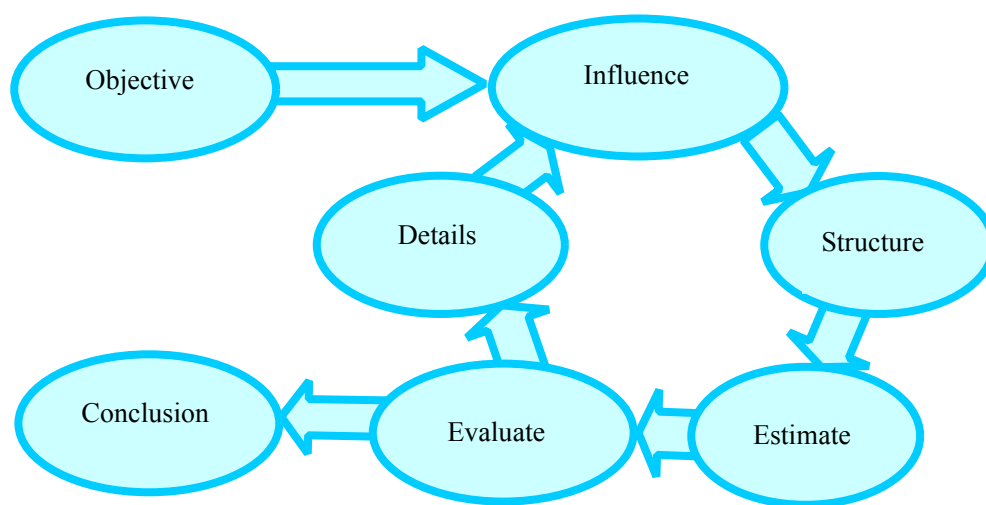


Figure 7.3 Successive Calculation Process

Objective: the planners need to have a comprehensive understanding of the project scope, objectives, assumptions and so on.

Influence: the planners need to take the factors that may influence the project into consideration. Factors like finance, policy, environment, technology and force majeure should be incorporated. Experts involvement in this stage is necessary.

Structure: the planners need to build a cost breakdown structure in each work package in order to cover all the possible cost.

Estimation is to determine the cost and benefits, estimation can be produced by use of

a large number of data, simulations or subjective estimations. To include the uncertainty in this section, using simulations or a large of number of data is necessary. The use of the historical data to evaluate the cost and benefits needs the knowledge of statistics and might not be accurate in a very turbulent environment. Three points estimation is also widely used in estimation. Based on the expert's three estimation numbers for low, mean and high value of a factor, the planners could get the mean and deviation of this factor.

Evaluation is about calculating the uncertainty. The planners need to consider the deviations of different cost or benefit factors. These factors can influence each other. When using statistical distribution, the sum of the most possible mean value of cost and benefit can be seen as the basis of the project cost and benefit. This figure plus one deviation (sigma) is the expected costs and benefits. The possibility of the final result below the mean value plus two sigma will be 95%. Conclusion should present the expected value of the costs and benefits in each year.

Details are about the probabilities and significance. Priority is given by the result of total variance divided by the variance of each factors. Total variance is obtained using the formula: $\text{Variance}_{(\text{total})} = \text{Variance}_{(1)} + \text{Variance}_{(2)} + \dots + \text{Variance}_{(n)}$, for example: a tunnel project total cost = construction cost + design cost, total variance_(total) = Variance_(construction) + Variance_(design), the if Variance_(construction) is 1000, and Variance_(design) is 500, then the priority is given by 1000/1500 and 500/1500, which means the change of construction cost would influence the total cost more. The higher the priority is, the higher the possibility is. The significance means the factor's impact on the project. In the example, the change of design will add more cost of construction and leads to time delay. Hence design is more significant than construction. Significance level is given by the experts based on their experience. Table 7.1 shows the result of the example.

Conclusion is to identify the uncertainty factors and their significance. In the example,

construction has priority, so risks that can influence construction have higher possibility to happen, while risks that can influence design have higher significance. The impact and possibility will be determined by the experts more specifically. The conclusion is useful for the final decision since it does not only shows the future costs and benefits of each project but also shows the risk factors.

Table 7.1 Risk Factors in Project Costing

Factors	Priority	Significance	
Construction	0.66	<div></div>	
Design	0.33	<div></div>	
<div></div> Not significant	<div></div> Significant		
Conclusion			
Risks	Possibility	Significance	Risk factors
Geo-technique risk	3	2	6
Change of customers' need (design change)	2	4	8

NPV can be calculated using the estimation calculated above. The discounted rate calculation methods are introduced in chapter 4. In Norway, for the public investment projects, the usually adopted risk return is 4% set by the Ministry of Finance. As for the strategic cost overestimation which is mostly seen in public projects, I would recommend people to refer to Quality-at-Entry system. But this part will not be discussed due to the focus of the dissertation is on private projects.

Risk assessment should involve people who have relevant project experience. Their suggestions are more valuable. The number of impact and possibility given by the experts should be based on the relevant result of successive calculations. In the example design has more significance; hence the higher score of risk impact on these risks. Similarly, the risk that would have impact on the construction may have higher score of risk possibility.

Alternative selection methods should be easy to do. The criteria should be as few as possible. The selected criteria must be highly relevant to the success or failure of the project.

In addition to the solutions given above, the changes from internal and external environment, significant or insignificant will perhaps change the project. In the Figure 7.4, it shows the changes from different perspectives can change the project; business case needs to be updated to response to these changes.

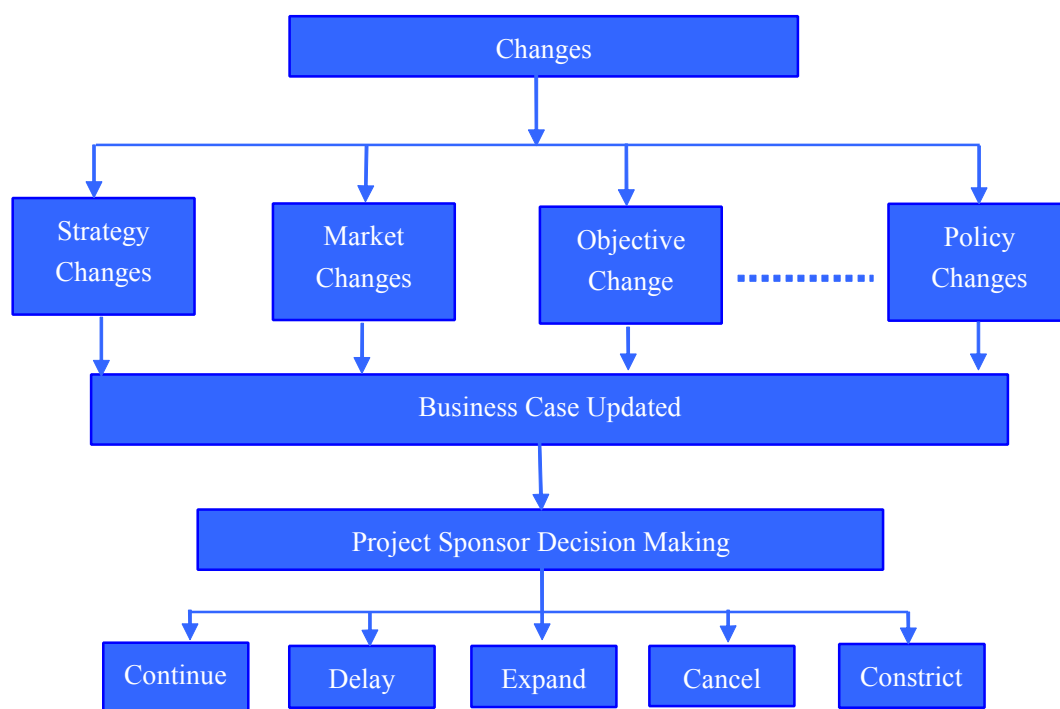


Figure 7.4 Changes and Decision Making of Project Sponsors

Considering the changes and uncertainties that impact the project, it is necessary to review business case regularly during each beginning of the project phases. Figure 7.5 in next page shows that the business case should be reviewed and updated in every beginning of the new phase of the BOT project. This process also is also true of any other project types. In doing the business case in every phase of the project, the project sponsors should be aware of the general situation for next project phase. Dividing the business case into several phases also allows the project sponsors to take a risk check against the project overall trend. In a large project with a long time

horizon in a turbulent market, any actions in the beginning are risky and might lead to the loss. The way of reducing risk is to review and update business case timely. In some cases, the project sponsors could choose to cancel the project, delay the project, expand the project or continue the project. The decision making process is based on different future conditions.

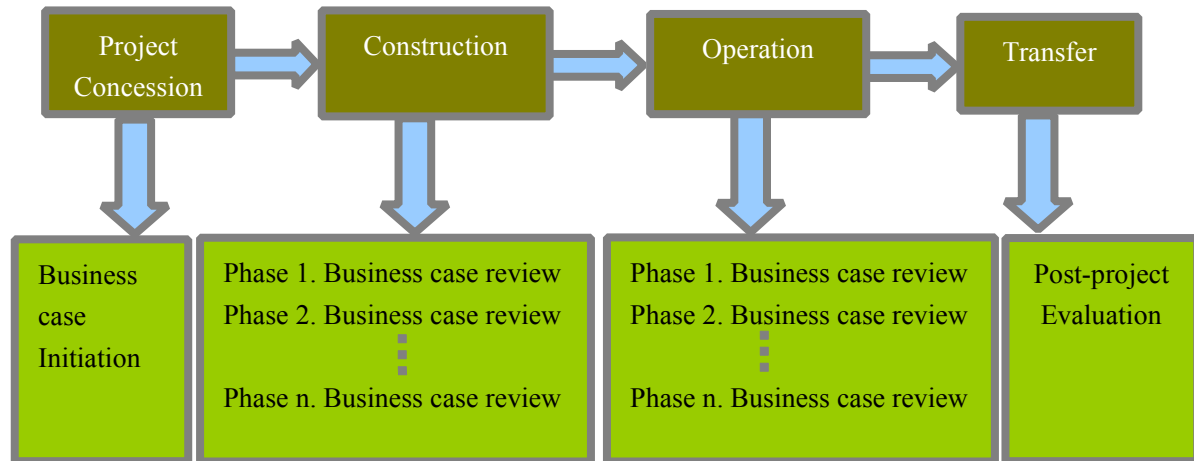


Figure 7.5 Business Case Checkouts in BOT Project

7.3 A Proposed Business Case Development Process

(1) Based on the theories in chapter 3 and my findings of the problems in section 6.2 and 6.3, I find that the original business case development process needs more elements to handle the uncertainty. In this section, I would like to develop the business case to incorporate the uncertain factors into the business case in a systematical approach. I divide business case into three phases. In each phase there are several steps. Compared to the general process, business case management is added as the third phase in order to deal with the potential risks and changes. Performance management strategy can guide the project managers to find out the deviation and measure the project performance against the what is described in business case, project management strategy can guide the project managers to deal with the deviation, risks management strategy can guide the project managers to avoid the deviation and change management strategy is to handle the changes so as to

reduce the impact of the changes to the lowest level. The holistic development of business case is now a dynamic process, which provides the strategy to handle the deviations.

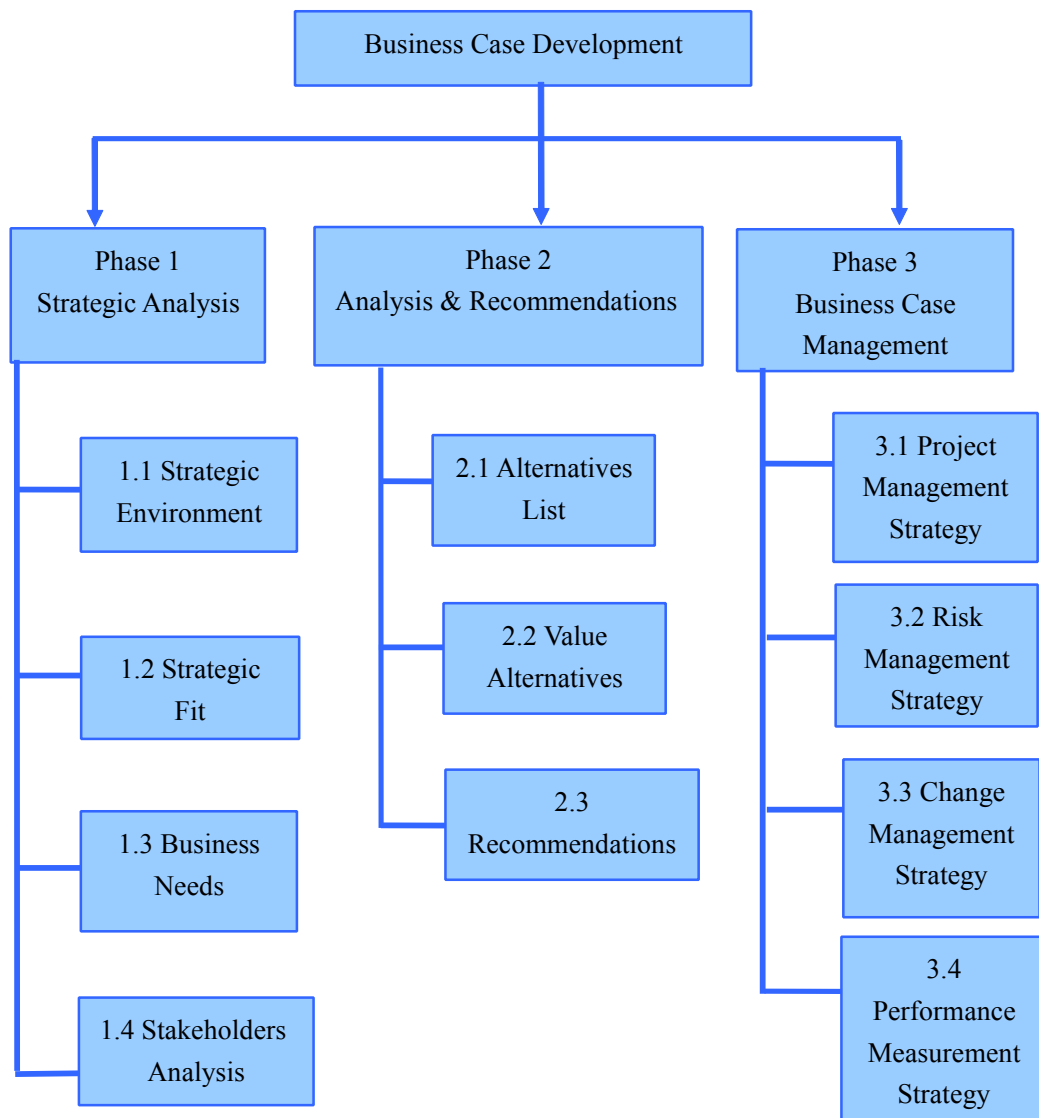


Figure 7.6 Business Case Development Phases

Phase 1. Strategic Analysis

1.1 Strategic Environment

Organizational review: Mission, vision, goals, service objectives and existing capacity—financial and human resources should be included in organizational review.

Business Outcomes: The potential outcome of the project should be stated here. Both direct outcome and indirect outcome should be listed.

1.2 Strategic Fit: It is a description of the alignment between project strategy and corporate strategy. First, the implementation of the strategy should be consistent with the regulations. Second, the project strategy should be consistent with the corporate strategy, but may be also unique to a specific project.

1.3 Business Need

Problem/Opportunity Statement: The problems statement should follow the original process, problem context, problem scope and the motivation of the problem should be stated.

Assumptions: Key assumptions should be provided such as investment return and cost. These assumptions are key criteria that will be used to evaluate the project. Assumptions should be realistic and accurate; otherwise the overall credibility of the business case can be negatively affected.

Constraints: The constraints are such as the deadline, budget, quality requirement, resource limitations and contract provisions. Constraints can be from internal and external environment.

1.4 Stakeholders Analysis

Stakeholder's analysis contributes to identifying a clear project goal as is stated before. When describing the stakeholders, the planners should consider both internal and external stakeholders; what their roles will be and what contributions they will bring to the realization of the investment. Primary stakeholders either directly benefit from a project's efficiency, revenues or competitive advantages or are those implementing the new project. Secondary stakeholders either have a dependent relationship with the primary stakeholders or are affected by their actions.

Phase 2. Analysis & Recommendations

2.1 List Possible Options

Options can come in many forms and it is important to explore all possible options. Keeping the current condition unchanged is also a solution to the questions sometimes. The status quo option will show where the organization would go if it do not pursue the investment proposal. In some cases, it might be the only acceptable alternative.

Screening of Options: This section could be the preliminary screening; all these options will be screened against some criteria such as achievability, key stakeholders benefits, affordability, strategic alignment and so on. The chosen options will be selected again later on under more rigorous criteria.

2.2 Value Options

A more rigorous analysis of the viable options is conducted in this section based on the analysis in previous sections. The advantages and disadvantages (with supporting evidence) of each option should be fully explored and evaluated.

Cost & Benefit Analysis: Project cost & benefit analysis should follow a successive calculation which is stated in section 6.2 in order to incorporate uncertainty. Using statistical analysis or expert three-point estimate (low value, mean value, high value) can make uncertainty incorporated in the project cost & benefits analysis. The planners should provide a complete description of the costs for each viable option. Projected costing estimation should be based on total cost of ownership; both direct and indirect cost should be accounted for. Non-monetary cost should be considered in the project cost estimation. Both financial benefit and non-financial benefit should be considered. The financial benefits are in terms of the cash flow in the project while the non-financial benefit can be for example, the reputation enhancement, employee satisfaction or productivity increase. When calculating financial benefits, the planners can also apply "successive calculation process", the uncertainty from the market like price and volume can be well covered by this method.

Calculate NPV: A profitability-dominated project should see NPV as the priority among the evaluation criteria. While to have the appropriate discount rate, the planners must have very good knowledge of the nature of the project, risk factors, market performance and financial skills. Precise NPV is impossible to get, however the planners should give the NPV as close to the true value as possible. Using successive calculation for each year's cash flow can include uncertainties. To handle the discount rate, one can apply the methods that are described in chapter 4.

Risk Assessment: Risk can be analyzed based on the theories described in chapter 4. But with the successive calculation, the risks factors would be more visible to the experts who will grade the probability and impact. Some results can be drawn from the successive calculation directly. For example, from Table 6.1, it is obvious that design is more uncertain than construction. Hence, risks that may impact design results may give a higher score than the risks that may impact the construction when grading risk impact. Similarly, when grading the probability, some of the risks that can influence construction may have higher score, since the higher the deviation is, the higher possibility that the risk could happen.

2.3 Recommendations

The planners should list all the options that are filtered from the first round screening and give each selection criteria the weigh and the number. The option with the highest score is considered to be the optimal option now. When selecting the optimal solution, the planners need to list the requirements for each option. Requirements and constraints can limit the project performance and even make a good option canceled. The planners should be aware whether the current optimal option is consistent with the organizational capacity and whether the organizational policy is supporting the current optimal option. The recommendation should be straightforward and easy to understand so that the project sponsors can clearly understand why the organization will benefit by focusing its investment on one particular option.

Phase 3. Business Case Management

3.1 Project Management Strategy

An overview of the methods and processes that is to gauge the project's progress and how that progress will be communicated to the project team and project sponsors should be included in business case. The decision process for continuing or canceling a project, commonly referred to as project gates, should be described in the business case. Project management includes operational, tactical and strategic management. Time, cost and quality need to be managed to compare the result to business case, project objective management is also one task of project management. In addition, the project managers must be wary of the changes of the situation that makes project strategy and corporate strategy changes as well. In other words, the project goal may change as well. Project management hence is a heavy task to handle the project from different perspectives and compare the results with the elements described in business case. If there is any deviation, the project managers are responsible to send the information back to planners and so as to adjust the business case.

3.2 Risk Management Strategy

Risk management strategy should demonstrate that the organization has a function in place to manage the risks of the project. Lists of identified risks will be constantly changing. New risks will be discovered, some may be successfully mitigated and some may need to be monitored. The risk management strategy will include the risk management plan, which describes how risks will be proactively managed throughout the project's life cycle. The plan should also include the methods for identifying risks, for determining how each risk will be described and managed, and for integrating risks within the project governance structure. Typically, the risk management plan and successful management of risks are the responsibility of the project manager and his or her team. Risk management strategy should present to the project managers that which risks are important and which risks are possible to happen. According to risk management strategy, the project managers can easily allocate the resource to manage those risks with high possibility to happen and high impacts to the organization.

3.3 Change Management Strategy

Most investments involve some degree of changes. These changes stem from internal changes and external environment. Changes lead project to derail from the business case. A change strategy is typically required to help transit the organization from the current state to the desired future state. The primary aim of the change management strategy is to handle the impact of the changes on the project. Changes bring new elements to the project as well as reduce elements from the project, which would lead to extra risks, costs and benefits changes. Changes strategies hence should be managed in line with other strategies.

3.4 Performance Measurement Strategy

Project implementation should be monitored and reported in terms of whether the project is on time, on budget, within scope, and delivering the expected product or capability. Performance measurement can directly demonstrate the deviations of the real performance from what is described in business case. Hence the deviations of project performance from business case are results of project changes and risks. Project performance can provide the evidence to the project managers whether the project is going wrong and where the project should be modified. Sometimes, project managers can find the problems based on the difference between project performance and the business case. Project performance should be managed along with other project strategies.

7.4 Project Financing-How to Borrow the Money?

Project financing is supposed to be a long term activity. It has lots of benefits that are contributive to project company as well as the third parties. However, project financing usually implies a long, complex and cumbersome structuring process, expensive structuring costs, comprehensive and expensive insurance coverage and in some cases, higher financial cost than conventional financing. In this section, I will first distinguish project financing with corporate financing and then discuss the

challenges in project financing.

Before I step into finding the challenges in project financing, let me first distinguish project financing from corporate financing. Project financing is non-resource financing, the project revenue is the only source to pay the money back, while corporate loans are resource financing, the whole company is responsible for the money borrowed. If the project fails, the company must pay the money back with its revenues. In project financing, the borrowing entity is the project company (a company established by the project sponsors' corporate, which is economically independent of the corporate), while in corporate financing, the borrowing entity is the corporate. In project financing, the lenders lend money based on the project profitability alone, the project sponsors' corporation credit record will not be considered, while in corporate financing, the credit record of the corporate will be seen as a reference by the lenders. In project finance, the collaterals can be everything relevant to project, but project alone. (project product, project site, project facilities, project future cash flow, project insurance contract and so on), while in corporate financing, there are usually no collaterals. In project financing, the control over the project cash flow is very strictly limited to the project sponsors until the money is paid back, while in corporate financing, the corporate can control the cash flow more freely. In project financing, the supervision and monitoring from the lenders is rigorous due to the non-resource character. While in corporate financing, the supervision is low. In project financing, bankruptcy is only within the project company whose all assets are the project. In corporate financing, bankruptcy will lead to the fall of the corporate. The understanding of the difference is contributive to understanding the characteristics of project financing and its challenges.

The first challenge could be the project feasibility. The project feasibility is important for the lenders since the money they lend is non-resource. The project sponsors must consider the project feasibility from the perspectives in Figure 7.7 (developed based on the theories in chapter 5)

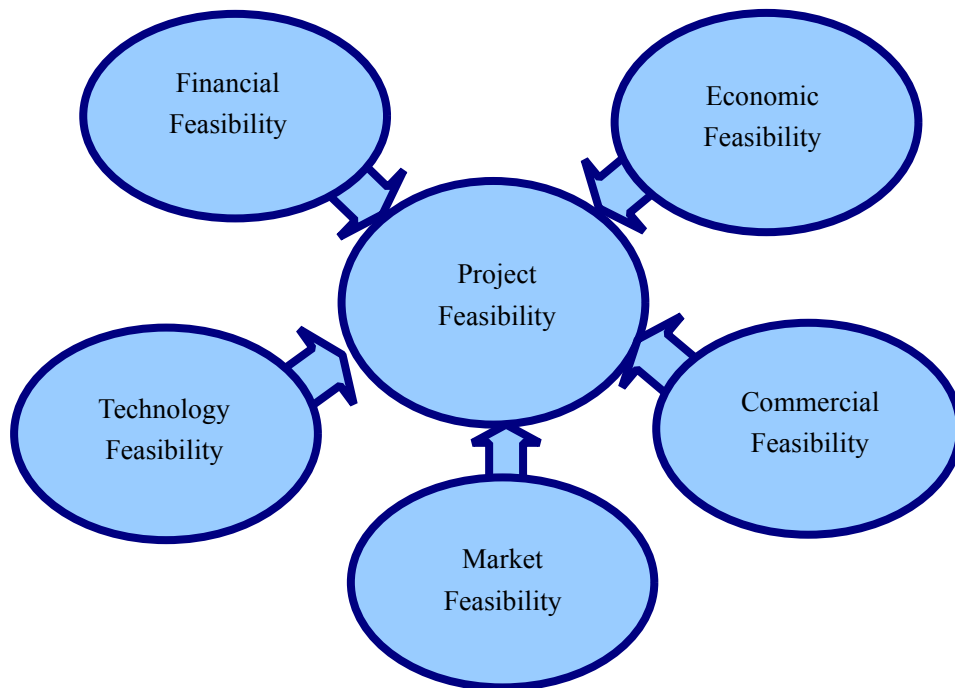


Figure 7.7 Project Feasibility Dimensions

Economic feasibility is that the project has to generate an acceptable rate of return to cover the cost of capital. The expected rate of return depends on the risk profile of the project. In other words net present value has to be positive. To make sure that in fact the project will not lose money, the lenders (investors) attach more importance to the project future cash flow of the project.

Commercial feasibility refers to availability of raw material, skilled labor, infrastructure and other factors of production. A number of projects have run into rough weather due to poor commercial viability. The commercial feasibility needs to be paid attention to by the project sponsors, as it might lead to the failure of the project.

Financial feasibility refer to the project sponsors' capability to pay back the principal if a significant portion of the debt financing for a project consists of floating rate debt. The company's capability to pay back increasing interest is evaluated in the financial feasibility studies.

Technology feasibility refers to a requisite number of technically capable people as well as technology required to set up and run the project in the project. The old technology might not be enough to deal with the problems in the project during the implementation of the project and new technology may also bring some problems to the project.

Market feasibility refers to project's outputs being able to be sold in the market. Very often demand analysis and projections are optimistic leading to problems in the future. The projection of both the product demand and product price are necessary for investors to learn the risks of the project. Market feasibility study is crucial for project investors to make the decision to finance the project.

Project feasibility is important in project as well as in project financing. In order to make the project feasible, the project sponsors must ensure the project is feasible economically, financially, technologically, commercially and feasibly on market. However, in project front-end phase, the authenticity of the project feasibility can't be confirmed due to existence of the uncertainties. The decisions based on the feasibility studies involve risks per se.

After the feasibility studies is over, and is approved by the lenders, the next challenge comes to the project company---how much should the project company from the lenders? Is that the more the better? Is there any risk involving? These questions are related with financial management. Too many cases have proved that high leverage can make a project company wither and die. The third challenge could be related to risk management. Faced with risks, how should the project company allocate the risks to different parties? How should project company deal with the risks in the front-end phase of the projects? How should the company organization be structured to lower these risks? These questions should be considered in detail before the project is implemented by the project company.

7.5 Case Discussion-Eurotunnel Project

The case study will be implemented from different perspectives, organizational structure, relationship management, contractual structure and capital structure will be intensively discussed.

7.5.1 Project Ownership Structure

The discussion and analysis are based on the information provided in chapter 6. Before the discussion, I would explain the basic information in an intuitive way. The ownership structure can be explained as the figure below:

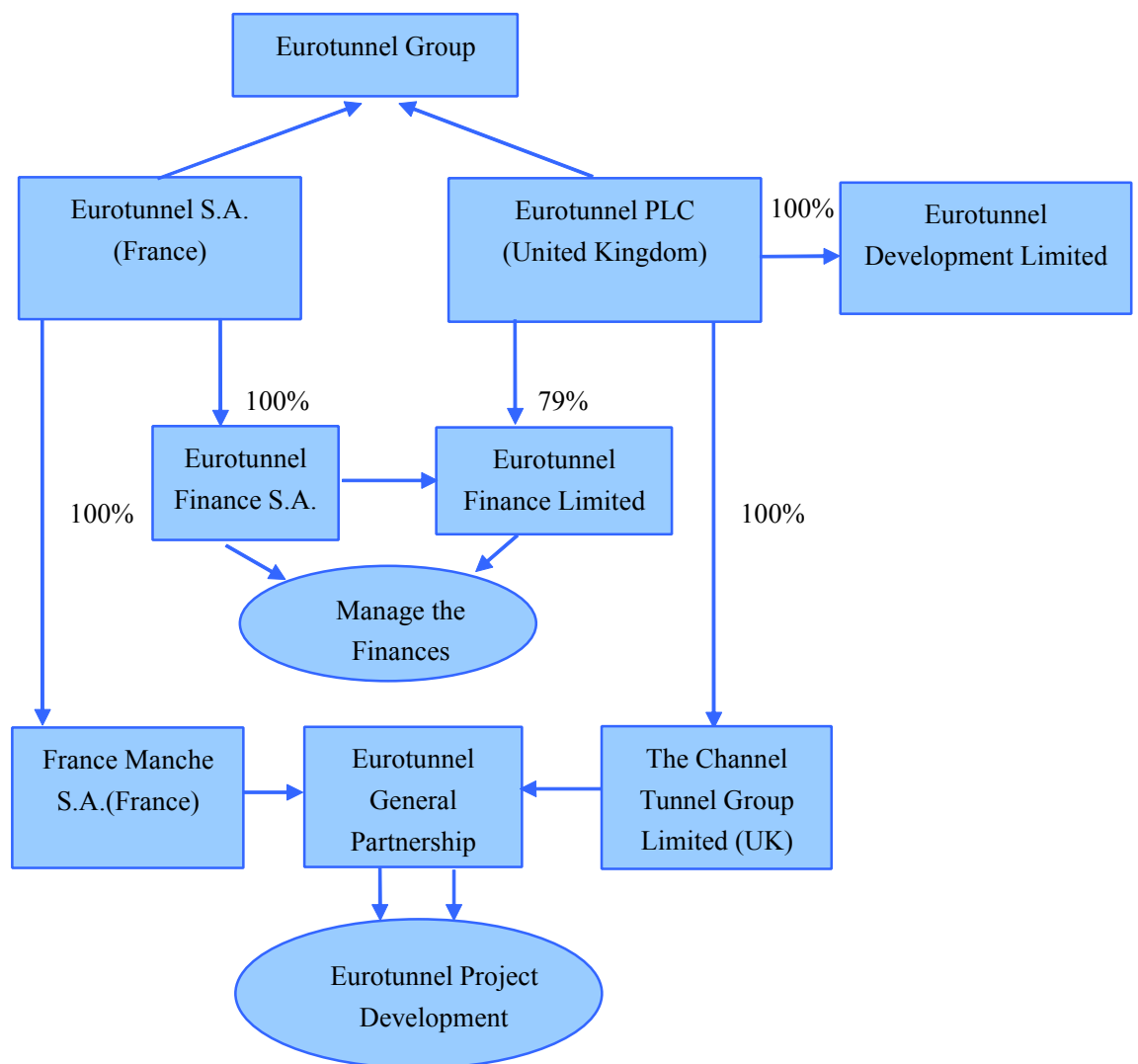


Figure 7.8 Ownership of Eurotunnel Project

Eurotunnel is a partnership between Chanel Tunnel Group (CTG) and France Mache (FM) established in August 1986 to construct and operate the tunnel under a 55 year concession from UK and French governments. This Partnership is a subsidiary of Eurotunnel SA in France and Eurotunnel PLC in the UK. Eurotunnel Finance SA and Eurotunnel Finance Ltd. are the subsidiaries with responsibility for financing the project. Eurotunnel Development Ltd. is wholly owned by Eurotunnel PLC which is a part of Eurotunnel Group.

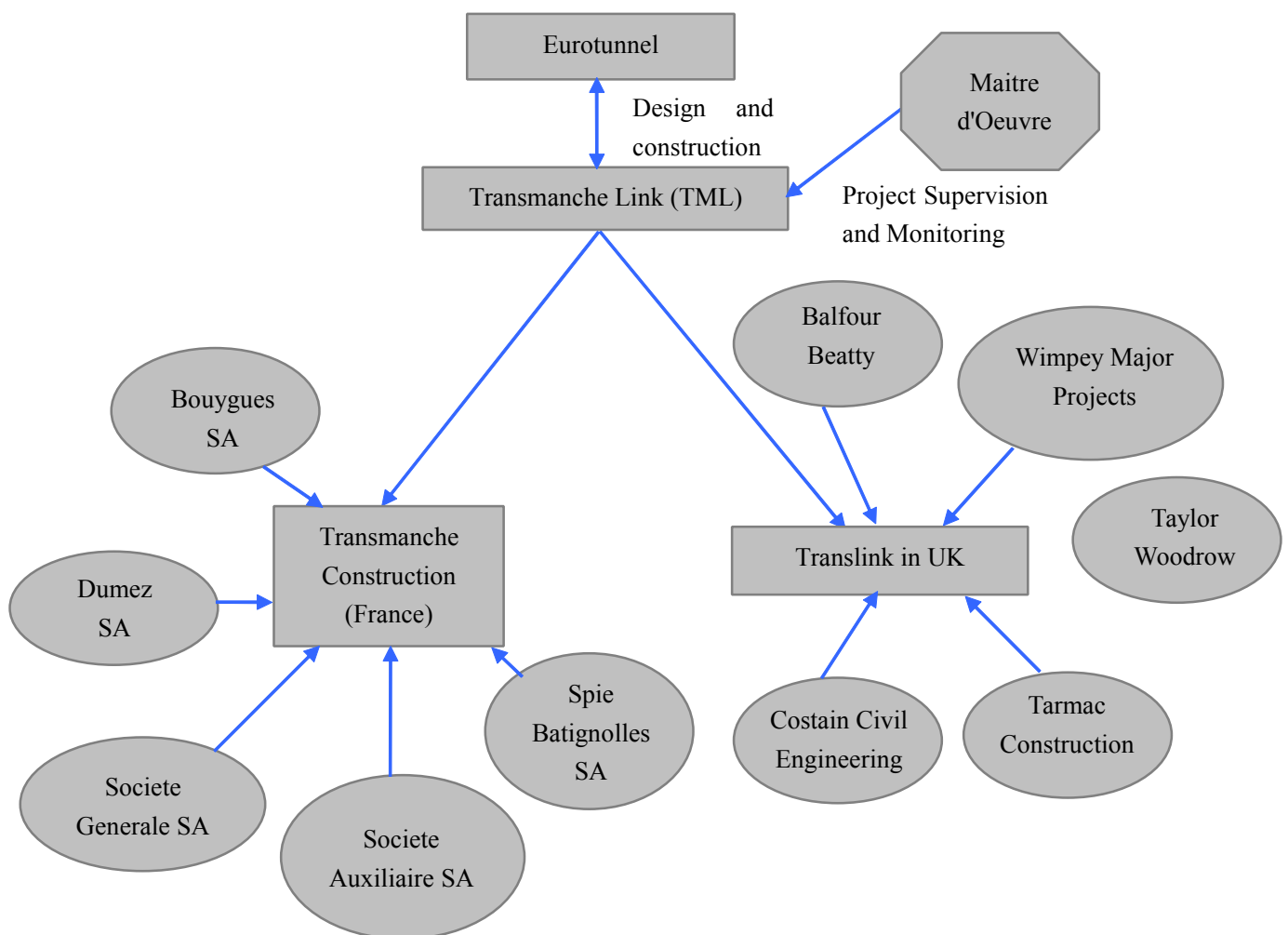


Figure 7.9 Ownership of Eurotunnel Main Contractor TML

The Figure 7.9 shows the structure of TML. TML (Transmanche Link) is an Anglo-French consortium which is responsible for the design and the construction of the project under a contract with Eurotunnel. TML is a joint venture between

Transmanche Construction in France and Translink in UK, each of which includes five domestic construction companies. TML, as the contractor, could prepare its own proposal to Eurotunnel for the design, construction, and commissioning of the system.

An independent organization, Maitre d'Oeuvre was appointed to monitor the design and construction of the project. This organization is a joint venture between Societe d'Etudes Techniques and W.S. Atkins Consultants Limited. The duties of this organization include verification that the works are carried out by TML according to budget, time schedule, safety standards, quality, and performance required by Eurotunnel. (Takesue, 1991).^[80]

7.5.2 Project Contractual Structure

1. Cost-plus contract with incentives

The tunnels and underground structures would comprise the target works which accounted for about 50 percent of the contract price. The TML would be paid for the target works on a cost-plus basis providing for a 12 percent profit margin. The construction contract contained an incentive structure: If the actual cost were less than the target cost, Transmanche Link would receive 50 percent of the savings; if it were more, Transmanche Link would pay 30 percent of the cost overrun, up to a ceiling equal to 6 percent of the target cost.

2. The lump-sum contract with incentives

The terminals, the fixed equipment, and the mechanical and electrical elements of the Eurotunnel System would comprise the lump-sum works. They would be paid on a lump-sum basis. Transmanche Link would realize all the savings if the lump-sum works were delivered under budget, but would have to pay the full cost of any cost overrun.

3. Subcontract for procurement items.

These items consisted of the locomotives and the shuttles. TML would subcontract for these items. Eurotunnel would pay the subcontracted bid price directly to the

subcontractors. TML would oversee the bidding and supervise the subcontractors. It would be reimbursed for its direct costs and paid a profit margin equal to about 12 percent of the value of the procurement items.

Transmanche Link would be held liable for damages of about £350,000 per day for delays up to 6 months, and £500,000 per day thereafter if the Eurotunnel Project was delayed beyond the final completion deadline. The obligations of Transmanche Link would be secured by a performance bond equal to 10 percent of the total value of the contract, which would be released upon completion of the Eurotunnel Project. In addition, 5 percent of the amount due to TML as progress payments would be withheld or covered by a performance bond during the construction period. The payments or the bond would be released in two installments, 12 months and 24 months following completion of the Eurotunnel Project.

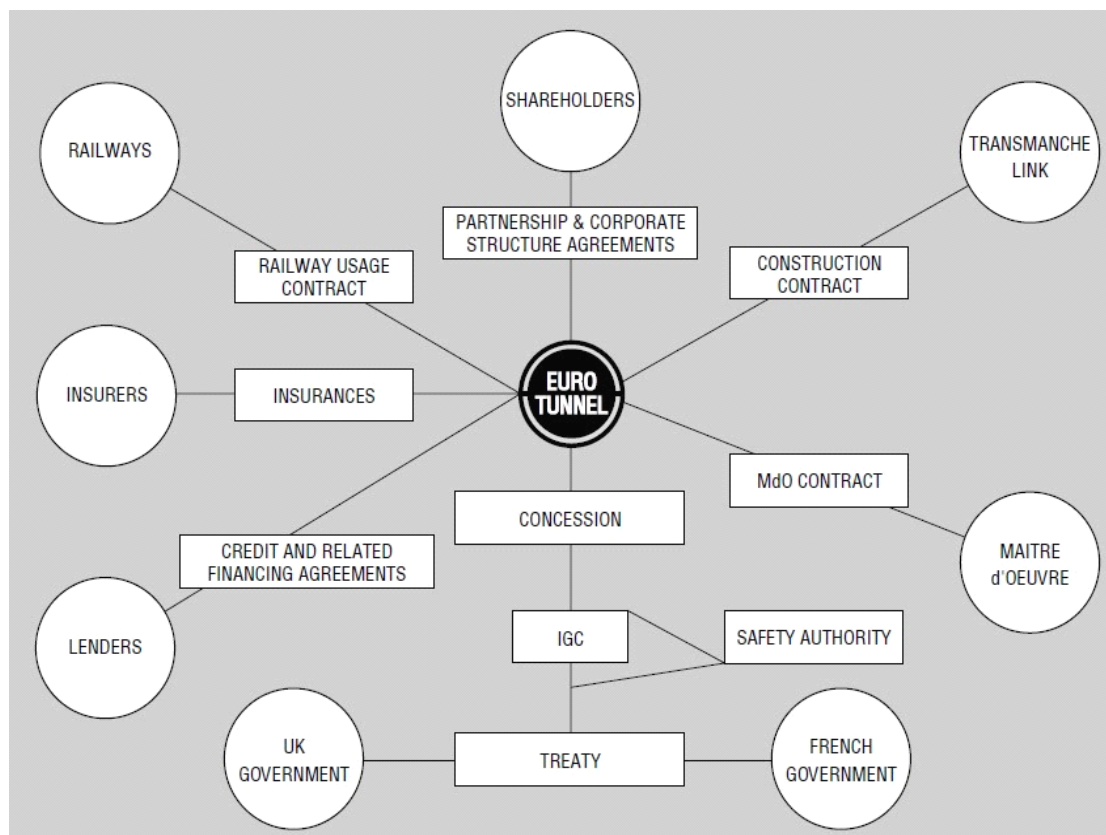


Figure 7.10 Eurotunnel Contractual Structure

(Source: Grant Michael, 1997)

Figure 7.10 shows Eurotunnel contractual structure. The treaty provided for the setting up of a bi-national intergovernmental Commission (ICG) and Safety Authority who monitor Eurotunnel's compliance with the concession. The railways usages contract provides Eurotunnel's only committed source of income. Under this contract, Eurotunnel is required to make half of the tunnel capacity available to the British, French and Belgian railways for their Eurostar and freight trains. In return, the railways pay a fixed charge and tolls based on the volume of traffic passing through the tunnel together with a contribution to Eurotunnel's operating cost. The Maitre d'Oeuvre (MdO) signed the contract with Eurotunnel to advise IGC, the banks and Eurotunnel on construction safety. Different parties signed the contract with Eurotunnel to provide the funds.

7.5.3 Financing Eurotunnel Project

The equities were issued five times. Equity issued before 1994 was to finance the project and the equity issued after the project was completed was to pay back the loan. The project was a high levered project with £5 billion in debt and £1 billion in equity. This structure is very dangerous. With £5 billion in debt, it was estimated that Eurotunnel should pay the interest £200 million per year after the project was over. The result shows that Eurotunnel was almost bankrupt even after debt restructure twice due to the high leverage and rolling-up interest.

7.7 Eurotunnel Project -What was Wrong?

Challenge 1. Relationship and Contract Management

(1) The management of huge number of stakeholders involved in this project was really a headache to Eurotunnel. The key stakeholders were TML and the financing banks. The relationship management between these parties must be managed well in order to make sure the project going smoothly. Three types of contract with TML would make the relationship management more complicated. During 1992, problems

appeared; TML launched a claim for additional construction costs of £1.5 billion which is under a lump sum contract. TML also asked £50 million in the interim. In 1995, Eurotunnel stopped to pay interest to the syndicate bank, and hereby Eurotunnel had to be restructured financially.

(2) The relationship between the railways companies and Eurotunnel is significant. With 50% revenues from the railways companies, Eurotunnel was quite aware of the significance of its relationship with them. There was possibility that after the completion of the project, the passengers' amount would not be enough to collect the fees to the cash flow predicted before. (in fact, in 1997 the possibility became the truth, the concession period was extended to 2086 due to revenue shortfall and these two railways companies promised to give 41% of their total revenue to Eurotunnel thereafter). Therefore, the relationship management with the offtakers was quite important for Eurotunnel's business.

(3) The relationship between contractors and banks was subtle. Any threat from the contractor (TML) and subcontractors (supplier of locomotives and shuttles) could have influence on the banks as the lenders indirectly. The risks between Eurotunnel and contractors (subcontractors) would increase the credit default risk of Eurotunnel. Management of the relationships would to some extent mitigate the tense between two parties. In the equity issuance, some private institutions (TML and investment institutions) had the shares of the Eurotunnel, which means, contractors had the control over the asset of Eurotunnel. They were not only those who provide service but also took part in the business in Eurotunnel. The relationship between Eurotunnel and the contractors and between contractors and banks become extremely difficult to manage. The result shows that after several disputes, TML was forced to give up its shares in Eurotunnel, thereafter its only role was the main contractor.

Challenge 2. Risk Management

Financial Risks.

(1) Currency risks: The total underwriting banks were 225 according to Roger (1990). The banks are from everywhere in the world. For one thing, when collecting the money, Eurotunnel must transfer the different currencies into French Franc or British Pounds. When repaying the loan, Eurotunnel must pay in the local currencies. Eurotunnel faced the big problem in currency exchange. (2) Interest risks: Due to unsettled interest rate depending on the risks of the project and inflation, Eurotunnel was faced with interest rate challenge. The floating interest rate increased the total cost of project financing. (3) Foreign exchange between British Pounds and French Franc. The expected traffic from UK to France is 2/3 of the total traffic. People from UK were willing to travel out to European Continent or import from the continent when British Pound appreciated against European currencies. When British Pound decreased, the people are not willing to travel out or import from the European countries. The traffic volume was to some extent dependent on the exchange rate between British Pounds and French Franc.

Market Risks

Eurotunnel bore with big uncertainty in the market. The market volume determined the revenue that can be generated. There are three parts that consisted of the total revenue of Eurotunnel. (1) shuttle fares (2) railway tolls (3) the ancillary duty-free sales. The competitors are air-freight and ferry. (in 1996, ferry companies reduced the fares in order to compete with Eurotunnel). Eurotunnel hereby bore risks from the uncertain market. It is necessary for Eurotunnel to know how many market shares that could be transferred from sea and air freight to Eurotunnel system.

Force Majeure Risks

Eurotunnel was faced with the risks that were unpredictable, such as flood, subsidence, fire and so on. In 1995, a strike happened before the busy travel period. In 1996 a fire happened in the shuttle leading a loss to Eurotunnel. Because of the fire the freight

traffic was suspended and the passengers were restricted.

Macroeconomic Risks

Both GDP performance of France and Britain would influence the total revenue of Eurotunnel. The marketing studies showed that in 1993 every 0.5 percentage drop in GDP would make the total revenue of Eurotunnel drop by 5.1 percentage, while in 2003 every 0.5 percentage drop in GDP would make the revenue of Eurotunnel drop by 7 percentage. The macroeconomic risks could be also concerned by the banks and other investors.^[42]

Political Risks

The political risks mainly come from the possibility of damage of the prestige of the government if any factors happened to stop the project or even abandon the project. However, other political factors could almost not impact the project (i.e. change of the interest of the political parties, death of the presidents and so on). The states even would not provided any fund into the project, they were in favor of the project and supportive of it considering its huge impact and strategic role. One example is that in 1987, the UK and French Government passed the legislation supporting Eurotunnel Project in order to make the equity issuing successful.

Completion Risks

Completion risks were extremely high. With different contractual structure with TML and the unforeseen risks ahead, Eurotunnel's risks of completing the project within time and budge could be a task impossible. The result showed that the construction phase (which actually started in February 1988) was characterized by delays and cost overruns. At the time of the 1987 IPO, the construction and equipment costs of the channel were estimated to £4.2 billion and the completion of the construction phase was planned in summer 1991. In 1990, the anticipated costs were inflated to £5.7 billion. Finally, the construction of the tunnel cost more than £7 billion and was one year late. Originally planned to open in May 1993, the tunnel opened in 1994.

Technological Risks

Design of Eurotunnel was not supposed to be a tough thing. With quite good condition of the channel, it was assumed to be relatively easy to build the channel. However, the potential design risks come to reality. In 1988, TML was faced with technical problems caused by poorer than expected ground conditions under the English coast. These first difficulties led to tunneling delays and cost overruns. In the following years, the main conflicts were about the cost of the rolling stock. The TML consortium argued that the Intergovernmental Commission (IGC) imposed major safety changes that led to considerably more sophisticated shuttles than expected.

Off-taker Risks

The two national-government-owned railway companies, British Rail (BR) and Soci'et'e Nationale des Chemins de Fer Francais (SNCF) would be the two largest direct customers of the Eurotunnel System. Their relationships with the Eurotunnel System would be defined by contract. Eurotunnel expected that half of the Eurotunnel System's revenues would come from these two railways; the other half would come from road vehicles (shuttle service) that are operated by Eurotunnel itself. Maintenance of a long-term contract and minimum conflicts between Eurotunnel and BR and SNCF is necessary for keeping the long-term revenue source.

Economic Risks

Economic risk is about risks of being able to pay back the loan and earn money. With market risks, financial risks, force majeure risks ahead, Eurotunnel bore huge economic risk. The meeting between Eurotunnel and the banks in 1997 showed that the economic risks were big and within the concession periods, Eurotunnel could not able to pay the money back.

Challenge 3. High Leverage Capital Structure.

Due to the high amount of interest and the poor performance of the revenue (loss of £925 million in 1995), in September 1995, Eurotunnel unilaterally suspended interest payments on more than £8 billion in bank loans. Therefore the banks required financial restructuring of Eurotunnel. The high leverage makes Eurotunnel's unlevered value very low, which is near to bankruptcy line. In 1997, Eurotunnel reduced its debt to £5 billion at the cost of the 49% of the equity holdings of Eurotunnel by syndicated banks, which left the original company shareholders' value decreased from £650 million to £250 million. The high leverage had imposed Eurotunnel to the risks of bankruptcy. With the debt restructure the original shareholders value decreased by 160%. At the same time, the lending banks also suffered from a big loss due to the restructure. According to above, debt financing risk for any projects could be carefully considered. Even the equity issuance is not that realizable in the beginning of the project, the project company must be aware of the cash flow and its ability to service the debt. Without the confidence in the potential revenue, project sponsors probably will lose the control over the project in the end because of high leverage. As an example, the project sponsors of Eurotunnel were changed 90% and 22% of the shares was held by Goldman Sachs by 2007.

7.8 Lessons and Suggestions

Eurotunnel Project is a BOT project financed with total private fund. In comparison with the final result of 140% cost overrun and 1 year delay, initially anticipated 25% cost overrun was obviously too optimistic. The continuous disputes between TML and Eurotunnel as well as between banks and Eurotunnel were considered as failures of relationship management. In 1997, the drawdown of the original shareholders value could be considered as repercussion of high leverage project financing.

The reasons of these problems could inspire me to ask the question that what the planners can do to deal with the problems. Based on the Eurotunnel Project, I have

concluded some key points that are noteworthy in project financing.

(1) Stakeholders management was extremely important in project financing. With regards to Eurotunnel Project, the project was involving 225 banks, 10 construction companies, 2 state government, 2 main offtakers, 1 safety monitoring committee, 1 quality monitoring committee, suppliers and thousands of shareholders. Stakeholders management becomes extremely important in project financing. Considering the key stakeholders such as contractors and lenders, to meet their needs is mostly about payment in time to these parties in terms of construction fees and interest and principal, which is embodied clearly in Eurotunnel Project. However, to achieve this goal seems to be very difficult with different factors that may happen in the future. Thus there are needs to control these stakeholders by using contracts and more communication and mutual understanding.

(2) Contract design in project financing is a difficult thing. With different types of work, contracts could be used in different forms. In Eurotunnel Project, the cost plus with incentive contract was reasonable; both parties would try to save the money for themselves. However, from my opinion, the lump sum contract used in Eurotunnel Project was not rational: with the technological uncertainty ahead of the project, any risks could happen and lead to project cost overrun. A lump sum contract hence could be seen as the source of the disputes between TML and Eurotunnel. It is especially noticeable that TML as the contractor was also the main equity holders of Eurotunnel Project, which means, when there were any disputes between Eurotunnel and TML, TML would never be the weak side of the disputes (shareholders have control over the company). This made any solutions to the disputes become more difficult to be drawn out. From Eurotunnel Project, it is remarkable that to transfer the risks to the contractors without risk compensation mechanism would be very risky itself: once any risks happen during the project, the project sponsors would have to suffer from long-term disputes and finally pay the cost.

In project financing the contract management is not only important in managing the relationship between the project companies and the contractors. In Eurotunnel Project, the contract between Eurotunnel and the syndicate banks were full of risk-averse terms. Even the syndicate banks had put so many terms in the contract to protect them from default risks (i.e. Debt cover ratio, cash flow projection, drawdown of the loans, interest rate change and so on), the syndicate banks were not able to stop the completion risks from happening. This is because of the irrevocable risks inside in the projects and the projects estimated even by the best experts would never be as same as the planners had expected. My understanding of the relationship between the project company and lending banks is that due to the nature of the project financing of being non-resource financing, the banks once lend the money to the project company, they would be suffering credit default risk from day one. Considering this reason, the project company's financing plan must sound reasonable and the projected cash flow, although would never be accurate, must be updated over time. In doing so, it does not only prevent lending banks from losing money, but also prevent the project company itself from losing the money. In addition the project company can benefit from doing so by building the long-term relationship with the banks for its next project.

The contracts between Eurotunnel and the offtakers were also important. In project financing, lending banks see the contracts between project company and the offtakers as the evidence of the project future cash flow. A good management of the contracts between project company and the offtakers is to guarantee that the project can have continuous capital support from the lending banks. In Eurotunnel Project, both offtakers are state-run. Keeping good relationship with them, Eurotunnel could keep the long-term contract with British and French government, thus the future revenue would be secured. My understating is that the offtakers in the projects are extremely important because they to some extent make project sponsors feel secured with the future cash flow. A majority of revenue for the project company is through the offtakers' buying behavior, thus avoidance of the disputes with offtakers is a sensible choice. Sometimes an adequate concession in the contract with offtaker would be

more beneficial in the long run than being entangled with some trivial terms in the contracts.

(3) In project financing, risks management could be prioritized. Risks can be found from different perspectives. For a mega-project like Eurotunnel Project, handling the risks is not an easy thing to do. As Eurotunnel Project is a privately financed project, the initial budge and time estimated could be considered as an appropriate estimation based on information and knowledge available of that day. But the result showed 140% cost overrun and 1 year day. The reasons are multi-dimensional where risks could account for most of the part. Technological risks (geological difficulties in UK side), inflation risk (high inflation rate in UK), microeconomic risks (GDP decrease in UK and France), currency risks (exchange rate among French Franc, US dollar and British Pounds), market risks (customer volume) and force majeure risks (fire in 1996 and strike in 1998) altogether contribute to the colossal difficulties in Eurotunnel Project. Some risks can be handled at the cost of buy hedging instruments (financial swap and options to hedge the interest rate risk, currency risks and so on), some risks can be dealt with by research or studies (market studies for market risks, study of technological risks), some risks can be dealt with by using contracts (turnkey key contract and performance bond for completion risks), some risks can be dealt by buying insurance contract (insurance for force majeure risks) and some risks can be dealt with by involving more stakeholders (public parties and National banks involvement for political risks). In Eurotunnel Project, risks were identified in a good way. However, Eurotunnel was still in big troubles. The technological issues and financial issues were parts of the reasons of cost overrun and project delay. In addition the risks allocation problems in terms of contractual types with different parties were also one of the reasons that led the project to cost overrun and delay. It was also reported that waste of time and project changes were other reasons for time delay (the waiting time of the procurement items being too long and changes of the safety system design). Considering the facts, risk management in project and project financing is a difficult thing to do. The project planners can't foresee all the risks, for

some risks, the planners could do nothing but wait until they happen.

My understanding of risk management in project financing and project is that risks identification and risk response are big problems to planners. Due to limited time horizons, budgets constraints and quality requirements, risk management becomes complicated. Any unexpected risks could add the cost of the project and extend the time. The aftermath of cost overrun and time delay could bring disaster to the project company, this is because time delay and cost overrun will change the project future cash flow, once the cash flow is changed, the chained effect will be imposed on the project financial performance (Eurotunnel financial restructure is a good example). Communications between different parties is a very useful way to know each other's interests in order to avoid misunderstandings. Some risks can never be eliminated whatever methods can be used, that is because a certain amount of events could be exposed only when a specific point in time is reached. As the old saying goes: no pain no gain. A project without risks would be without returns. Risk management could, to a great extent, offsets the side effects of the risks after they happen but could not stop a risk from happening. In large projects using project financing, cost overrun and time delay could be lethal problems, which sometime push the project company to the margin of bankruptcy. Hence risk management in project financing must concentrate more on risk impact directly and indirectly than calculating risk possibility (i.e. Signaling safety system design change in Eurotunnel led to cost increase and time delay directly, time delay caused Eurotunnel the loss of 3 months of future revenues indirectly). Risk management through contracts should be within the tolerance of both parties to avoid any disputes which would result in the suspension of the project.

(4) Capital structure in project could be another problem. Generally speaking, the selection of the financing models is not a difficult thing. However, to decide the capital structure is far more difficult. Debt financing is the priority of the equity holders since they would not reduce their control over the company and would retain their benefits. Some companies even have the debt ratio more than 90%. The higher

the debt ratio is the higher risk of bankruptcy the project company has. In 1998, Eurotunnel concluded the deal with the Steering Group (banks) for debt restructure. In 2007, Eurotunnel applied for bankruptcy safeguard in France. All the reasons is not that their revenue is little (£1.5 billion of net profits), but the revenue is not able to pay the interest (£2.6 billion). Being deeply immersed in debt suffocated Eurotunnel and its fate.

My understanding in capital structure in project financing is that, when the project company decides to finance their project using debt, they must bear in mind that debt would either save them or kill them. The rolling-up interest would make their decent revenue flow to banks continuously without surplus. A suggestion could be that if project is going to be operated in a very uncertain condition or the project product is going to be sold in a very turbulent market, the project company should not use debt to finance the project or use a small amount of debt to finance the project.

Eurotunnel Project was a success from strategic view; it increased the relationship between Britain and France, promoted the business between two countries and facilitated the European integration. From operational perspective, it could be considered as a success (not strictly speaking), although it had 1 year delay and 140% cost overrun, compared with other similar projects like Suez Canal tunnel (50 times cost overrun) and Seikan tunnel (14 years delay), Eurotunnel was quite a success. Considering it is a mega project, its operational performance is acceptable. However, the project owners may not think so. Eurotunnel was nearly bankrupt before 2007. A heavy debt burden and interest might have led Eurotunnel Project to an absolute failure as a private project from economical perspective. Eurotunnel had nice revenue; however the revenue paled in comparison with the huge interest to be paid.

All the problems found above makes me reflect on the nature of project financing. From my point of view, project financing is a double blade sword, using it in a good way would make the project company through the difficult times and earn money

when they don't have so much money in hand in the outset of the project, it could make all the efforts of project sponsor wasted when the project could not cover its interest with its cash flow. Hence several things should be addressed in project financing: (1) The feasibility study must be as precise as possible. The projected cash flow in business case must be able to become the basis on which the project company makes decisions. Any discrepancy from the prediction might be a disaster that may lead the project company to bankruptcy. (2) The capital structure must be reasonable. With uncertainty ahead, any irrational decisions on capital structure could result in fiasco of the project from owner's view. (3) Risk management should center on risk impact mitigation. There are too many risks that will happen during the project lifecycle. In project finance, risk management should be able to limit risks that may result in project cost overrun and time delay to the minimum, because cost overrun and time delay means the risks of bankruptcy in the frame of project debt financing. In addition, risks allocation must be effective, ineffective risk allocation through contracts may deteriorate the risks.

What is the relationship between project management and project financing then? From Eurotunnel Project, one can easily draw a conclusion that project management increases efficiency: lower cost and shorten time. Thus the possibility of cost overrun and time delay will drop dramatically. Cost overrun means the project company needs to borrow more money to cover the cost, while time delay means the cash flow will not be generated as it should have been on the planned date, which will lead to more interests to be paid. Cost overrun and time delay are the killers to projects using project financing. Project management must focus on these two areas to save the project sponsors from being trapped in a bad situation.

Chapter 8. Conclusion

In this chapter, I first review the research questions in the dissertation, second demonstrate what I did in the dissertation. In section 8.3, I elaborate the findings, results and solutions to the research problems. In section 8.4, I review the disadvantages as well as the limitations of the methods I use in writing the dissertation.

One can find the detailed information regarding methodology in chapter 2. In section 8.5, I give my suggestions to planners who are responsible to developing business case and to project sponsors who make decisions on financing the project. In section 8.6, I propose some potential topics that are worth doing research on for the further study in project front-end phase.

8.1 Research Questions Review

The research questions in the dissertation as are presented in the introduction chapter (section 1.3) are the following:

1. What is a good process of business case development?
2. What factors can make the business case development difficult and sometimes incorrect?
3. What are the challenges when a project is financed by means of project financing?
4. What are the suggestions or solutions to the challenges and difficulties when the companies are developing business case and using "project financing" to finance projects?

Based on my findings, I give my solutions and suggestions to these questions.

8.2 What I Have Done in the Dissertation

This dissertation focuses on business case development and project financing and the challenges and problems that are pertinent to business case development and project financing. The dissertation has explained a general business case development process

and investigated the shortfalls of this process. Based on the findings from the theories, a new business case development process is presented. In the new process, new elements are added and uncertainty factor is considered in cost & benefit analysis.

This dissertation put emphasis on project financing as well. The project financing models and the risks relevant to project financing are presented. The case study of Eurotunnel Project dives into the project with a time horizon from 1987 to 2082. Problems are analyzed from multiple dimensions. Solutions and suggestions to the problems are present in systematical manner. According to each problem, I have demonstrated my understandings and the suggested handling methods.

8.3 Results and Findings

The findings in the dissertation are extensive. Through the systematical study of project front-end phase, the findings fall into three parts. These three parts are presented below:

(1) Uncertainty is a very significant factor that must be taken into consideration in project front-end phase management. Project front-end phase, as the name suggests, is the foremost phase of a project. As uncertainty is highest in the beginning of a project and reduces over time, project front-end phase is influenced most by the uncertain factors from different perspectives. Thus, project front-end phase is difficult to manage; any actions in this phase could not equal 100% to what are desired in the end because of the existence of uncertainty. Cost overestimation and benefit underestimation are commonly seen in project front-end phase partly because of lack of information and knowledge. Communication is important in the project front-end phase because different priorities of different stakeholders can be known through communication for a common goal of the project. Business case (concept study) and financing project are the main activities in project front-end phase. They are the basics to get a project to start.

(2) Business case (concept study) is a process that justifies the project and based on it the project sponsors make decision on whether finance the project or not. Development of business case is not an easy thing to do. In a changing environment, any activities in the early phase of a project could be risky. Business case, due to the existence of uncertainties, is not possible to be accurate. Thus it leaves the planners in the dilemma that for one thing project sponsors need business case to make decisions on the project, for another thing, business case is not possible to be accurate. To solve this tricky problem, the planners could only take uncertainty into consideration. As several elements constituting business case are changing in a changing environment, there is a need to manage these elements to make sure business case could be reliable to be based on. By taking into uncertainty, the planners can to a great extent make sure that the business case could be accurate between specific intervals, hence business case can be based on to make decision. However, business case must be undated timely to be responsive to the changing environment and uncertainties.

The solutions are described in section 7.2; all the elements are considered with the impact of uncertainties. Figure 7.2 demonstrates the way I incorporate uncertainty into goals setting, objectives setting and strategic fit. Figure 7.3 demonstrate the way I incorporate uncertainty into cost & benefit analysis. The results from Figure 7.3 are the basis to risk assessment in business case. Figure 7.6 shows the model of a new business case development process. With several factors taken into account, the business case development process becomes dynamic and responsive.

Project financing is one of the methods of financing a project. Project financing has its benefits and disadvantages. One of the obvious characters of project financing is the establishment of "project company" which is sometimes a subsidiary of the project sponsors' company. In doing so, project sponsors isolate the project risks from the parent company. Thus, if the project fails, the parents company will not suffer from the loss except the asset value of the project. When using project financing, the

project sponsors must pay attention to project feasibility, project risks allocation, project financing risks management, stakeholders management, contractual management, and mostly important the project capital structure. These factors can deeply determine the project success. A general lesson is that high leverage could result in the bankrupt of the project company, hence in a highly uncertain environment; the project sponsors should prefer other means to finance the project rather than using debt. Risk management is extremely important in project financing; its role is to guarantee the project will have a positive cash flow to cover the loan and interest. Cost overrun and time delay are lethal in projects financed by means of project financing. Project management hence should put much emphasis on cost and time management. I give my suggestions to the challenges in project financing in detail. Every challenge that is described in the dissertation is given my understandings and opinions. The details about the suggestions can be found in section 7.4.

(3) A project can be seen as a success or failure from different perspectives. In the example, Eurotunnel Project can be seen as a success from the users' view, society's view and contractors' view. However it is seen as a failure from project sponsors' and lenders' view. Project's success or failure is not decided by a single party's view. Project post-evaluation hence should integrate opinions from different parties to assess a project on its success or failure.

8.4 Evaluation of the Research Methods

This dissertation is based on the research philosophy of interpretivism. The selected methods of writing the dissertation are literature review and case study (interpretivism). The selected philosophy lacks of subjectivity. The already available data used in the dissertation makes the research work lack of creation and originality. The lack of positivism philosophy makes the findings and suggestions unable to be tested and proved.

The only use of interpretivism philosophy in the dissertation leads to the singularity of

data selection method. No primary data is collected, which makes the dissertation alienated from the practical work more or less. I have made a lot of efforts to compensate these problems such as collecting the data which are practice oriented when I discuss business case and collecting data from different a large amount of sources for case study in order to be involved in the "real case" as much as possible.

Generally speaking, the findings and solutions are constructive; however the suggestions to the problems in project financing may not be applicable to other project financing cases. The solutions to problems in business case are then needed further test for its applicability and usability.

Due to the research limitations and my limited knowledge and skills, although I have tried to compensate the limitations by reading a large amount of books and articles, there may be some defects and flaws in the dissertation. I would look forward to getting any suggestions or critics of the dissertation in order for me to improve it further.

8.5 For Planners and Project Sponsors

The dissertation substantiates the importance of business case and project financing in projects and project management. The study has gone some way towards enhancing the understandings of design in project front-end phase. The two components that consist of project front-end phase are business case (concept study) and financing the project. In this dissertation, I have gone through both areas, general assumptions; conclusion and suggestions are given based on the literature review and case study. I would hope this dissertation can contribute a little to the private companies when they plan a business case and finance a project. The points below are important to bear in mind for planners and project sponsors:

(1) Business case without taking uncertainty into account is not reliable to make decisions on whether to finance a project or not.

- (2) Uncertainty influences the project and makes it deviate from business case. Project costs and benefits in business case should be in an interval to include the uncertainty rather than a single number.
- (3) Business case should be flexible to change. The timely undated business case should be easy to follow.
- (4) Change management strategy and performance management strategy can guide the project managers to find out the deviations, project management strategy can guide the project managers to deal with the deviations and risks management strategy can guide the project managers to avoid the bad deviations. These strategies should be included into business case.
- (5) Risk management is important in project financing; it is a determinative factor to project success or failure since the initial estimations never end up with the final result.
- (6) Stakeholders management is important; management of the relationship with lenders, contractors and offtakers is especially significant to project company.
- (7) Debt financing is a risky activity and better used in a stable environment.
- (8) Cost and time management should be prioritized in project management when the project is financed by the means of project financing. Because cost overrun and time delay may make the project company bankrupt.

8.6 Recommendations for Further work

The research that has been undertaken for this dissertation has highlighted several topics on which further research would be beneficial. Since research on business case and project financing demands knowledge from different disciplines, the future research could be made on different topics in combination with project management. In terms of business case, research can be concentrated on the alignment between strategic management and project management, project selection and portfolio management, risk management in project front-end phase. Considering the significance of cost & benefit analysis in business case, research can be towards to

Chapter 8. Conclusion

topics like "project planning under uncertainty" or "measurement of project economic performance" or "rationality of business case based project financing" and so on. In the area of project financing, even some topics tend to be analyzed by financial engineers; some topics are quite relevant to project management. For example, topics like "study of project organization structure with the involvement of lenders and investors", "project management from the owners' point of view", "project cost overrun and time delay- a reason of bankruptcy" are worth being taken researches on. These topics are interesting, but not so many people have studied yet. These topics are highly connected to project management. To better understand a project and manage a project, project front-end phase and its relationship with project lifecycle management have to be put more resource to study.

Reference

- [1] PMBOK, PMI, 2008
- [2] Kothari.C.R., Research methodology, methods and techniques, New Age International, 2004
- [3] Galliers.R.D., Choosing Appropriate Information Systems Research Approaches: A Revised Taxonomy, Nissen et al, 1991
- [4] Levin.D.M., The opening of vision: Nihilism and the postmodern situation. London Routledge, 1988
- [5] Hirschheim.R., Information Systems Epistemology: An Historical Perspective. In Research Methods in Information Systems, proceedings of the IFIP (International Federation for Information Processing) WG 8.2 Colloquium, Manchester Business School, 1-3rd September 1984 (E. Mumford, G. Fitzgerald, R. Hirschheim and A. T. Wood-Harper Ed.), 13-35, Amsterdam, 1985
- [6] Benbasat.I., Goldstein, D.K., & Mead, M., The case research strategy in studies of information systems. MIS Q 11(3):369–386 doi:10.2307/248684, 1987
- [7] Kaplan.B and Duchon.D., Combining qualitative and quantitative methods in information systems research: a case study, MIS Quarterly, (12:4), pp. 571–586, 1988
- [8] Benbasat.I., An Analysis of Research Methodologies, in F. Warren MCFarlan (Ed.), The Information Systems Research Challenge, HBS Press Boston, 1984
- [9] Pervan.G.P., A Case for More Case Study Research in Group Support Systems, TC8 AUS IFIP Conference, Bond University, Gold Coast, May 8-11, 485-496, 1994b
- [10] Alavi. M. and Carlson.P., A review of MIS research and disciplinary development. Journal of Management Information Systems, Spring, 8(4), 45–62, 1992
- [11] Odum.H., An Introduction to Social Research, p. 229, H. Holt and company, 1929
- [12] Burgess, Research Methods in Sociology, p.26 in Georges Gurvitch and W.E. Moore (Eds.) Twentieth Century Sociology.
- [13] Young. Pauline V., Scientific Social Surveys and Research, p.247, 1939
- [14] Dooley. K., Organizational Complexity, International Encyclopedia of Business

Reference

- and Management, M. Warner (ed.), London: Thompson Learning, p. 5013-5022, 2002
- [15] Watts.H., When teachers are researchers, teaching improves. *Journal of Staff Development*, 6 (2), 1985.
- [16] Davison. R.M., An Action Research Perspective of Group Support Systems: How to Improve Meetings in Hong Kong. Unpublished PhD Dissertation, City University of Hong Kong, 1998
- [17] Walonick.D.S., An overview of forecasting methodology Retrieved 03/08/2004, from <http://www.statpac.com/research-papers/forecasting.htm>, 2004
- [18] Gofton.L., Business Market Research. London, Kogan Page, 1997
- [19] Bangs.D., The Australian business planning guide. Warriewood, Woodslane Pty Ltd, 2000
- [20] Hoalan.H and Williamson.L., Feasibility Studies, Kentucky University of Kentucky, 2000
- [21] Truitt.W., Business Planning:A Comprehensive Freamwork and Proces. London, Quorum Books, 2002
- [22] Thompson. A., Overview of Business Plan. Perth, Best Entrepreneur.2003b
- [23] Thompson. A., Understanding the Proof of the Business Concept. Perth, Best Entrepreneur, 2003c
- [24] Thompson. A., Business feasibility study. Dimensions of business viability, Perth, Best Entrepreneur, 2003a
- [25] Wickham P., Strategic Entrepreneurship. Essex, Pearson Education, 2004
- [26] Project Management Template: <http://www.method123.com/>
- [27] <http://www.change-management.com/06-buscase.htm>
- [28] The Government of New South Wales, Australia, Business case guidelines, 2000
- [29]The Government of Alberta, Canada, A cost benefit assessment framework for information technology projects, 2007
- [30]The Government of Alberta, Canada, Business case usage guidelines, July 2002
- [31]Mochal Tom, Select and prioritize projects with a business case, December 2003
- [32]Schmidt,Marty J., The business case guide, 2002
- [33]Drucker.P.F., Our Entrepreneurial Economy, *Harvard Business Review*:58-6, 1984

Reference

- [34]<http://www.blurtit.com/q852188.html>
- [35]http://www.lpma.nsw.gov.au/__data/assets/pdf_file/0015/40704/1-Business_Case_Info.pdf
- [36]Kunt Samset, Project Evaluation: Making investment succeed, Tapir Academic Press, 2003
- [37]Morris PWG, Project organizations: structures for managing change. In: Kelley Albert J, editor. New dimensions of project management, Arthur D. Little Program. Lexington, MA: D.C. Heath and Co, 1982.
- [38] Turner. Rondey J., The Handbook of Project-Based Management: Improving the Process for Achieving Strategic Objectives, 1999
- [39]<http://www.brighthub.com/office/project-management/articles/54894.aspx>
- [40]Harrison E.F., The managerial decision-making process. Houghton Mifflin, 4th ed, USA, 1995
- [41]Business Case Guidelines, NSW Premier's Department Review and Reform Division, 2002
- [42]Finnerty. John D., Project Financing Asset-Based Financial Engineering, 2007
- [43]Department of Treasury and Finance, Victorian Government, Supplementary Guidance #2. Project Risk Management Guideline, Copyright State of Victoria, 2009
- [44] http://www.ehow.com/about_4710370_what-business-objective.html
- [45]Sukulpat K, Mohd N, Zairul M and Andrew David Ross, An application of analytic network process to assess risks in mega-construction project, 2007
- [46] Turbit Neville, Basics of Managing Risks, The Project Perfect White Paper Collection, 2005
- [47] Hooper. Paul K., Final report, FREP Handheld Business Case, BC Ministry of Forests and Range, 2007
- [48] Meredith.Jack R. and Mantel Samuel J., Project Management: A Managerial Approach, 8th Edition, Jr. 58-61 pages, John Wiley & Sons, 2012
- [49] http://en.wikipedia.org/wiki/Project_finance
- [50] Yescombe.E.R., Principles of Project financing, Academic Press, 2002
- [51] Buljevich.Esteban C. and Park.Yoon.S., Project financing and international

Reference

financial market chapter 9, Kluwer Publisher, 1999

[52] Andrew Fight, Introduction to Project Finance, Elsevier Inc, 2006

[53] Berk Jonathan and DEMarzo Peter, Corporate Finance, Pearson, 2010

[54] Gatti Stefano, Project Finance in Theory and Practice, Elsevier Inc, 2008

[55] Zhong Ying Qi and Xiao Wei Wang, Project finance, China Machine Press, 2009

[56] Qiu Larry D, Wang Susheng, BOT projects: Incentives and efficiency, Journal of Development Economics 94, pp127–138, 2011

[57] Tarun Sabarwal, Common Structures of Asset-Backed Securities and Their Risks, December 29, 2005

[58] Roger Stephaine, Eurotunnel: An innovative approach of project financing, 1990

[59] Pierre-Jean Pompée, Channel Tunnel Project Overview, 1995

[60] Schueler Andreas, Valuation companies in financial troubles-The Case of Eurotunnel, Universitaet der Bundeswehr Munich

[61] PMI global standard 2006a-3-13

[62] Grant Michael, Financing Eurotunnel, Japan Railways and Transport Review, 1997

[63] Nicolas Painvin, Fitch, Rating, Global Infrastructure & Project finance

[64] Lædre Ola, Olsson Nils, Torp Olav, Hansen Ole-Petter and Knut Samset, Managing the Front-end Phase of Projects, Department of Civil Engineering, NTNU, 2009

[65] Wright G. and Ayton. P., Judgmental Forecasting. John Wiley & Sons, UK.

[66] Terry Williams and Knut Samset, Issues in Front-End Decision Making on Projects, Project Management Journal, 2010

[67] Rolstadås Asbjørn and Johansen Agnar, From protective to offensive project management, paper presented at PMI Global Congress 2008-EMEA, 2008

[68] Baldry D., The Evaluation of Risk Management in Public Sector Capital Projects. International Journal of Project Management, pp35-41, 1998

[69] Galbraith. J.R., Designing Organizations: An Executive Guide to Strategy, Structure, and Process. Jossey-Bass, 2nd ed, San Fransisco, 2001

[70] Han Sangwon, A hybrid simulation model for understanding and managing

Reference

- non-value adding activities in large-scale design and construction projects, University of Illinois at Urbana-Champaign Doctoral Thesis / Dissertation, 2008
- [71]Austeng K. and Steenberg.G., Gjennomgang av risikoanalyser, Concept Research Programme,NTNU Norway, 2001
- [72]Cooke.R., Obtaining distributions from groups for decisions under uncertainty. In T. Williams, K. Samset, & K. Sunnev (Eds.), Making essential choices with scant information (pp. 257–278). Basingstoke, UK: Palgrave MacMillan, 2009
- [73]Linehan.C & Kavanagh.D., From project ontologies to communities of virtue. Presented International Workshop, Making Projects Critical, Bristol UK, 2004
- [74]Engwall. M., The futile dream of the perfect goal. In K. Sahil-Andersson & Soderholm (Eds.), Beyond project management: New perspectives on the temporary-permanent dilemma (pp. 261–277). Malmo, Sweden: Libe Ekonomi, Copenhagen Business School Press, 2002
- [75]Morris P., Implementing strategy through project management: The importance of managing the project front-end. In Terry Williams, Kunt Samset & K. Sunnev (Eds.), Making essential choices with scant information (pp. 39–67). Basingstoke, UK: Palgrave MacMillan, 2009
- [76]Kunt Samset, Projects, their quality at entry—And challenges in the front-end phase. In Terry Williams, Kunt Samset, & K. Sunnev (Eds.), Making essential choices with scant information (pp. 18–38). Basingstoke, UK: Palgrave MacMillan, 2009
- [77]Wright.G, Bolger.F & Rowe.G., Expert judgment of probability and risk. In Terry. Williams, Kunt Samset, & April 2010 K. Sunnev (Eds.), Making essential choices with scant information (pp. 213–229). Basingstoke, UK: Palgrave MacMillan, 2009
- [78]Bedford.T., Exploratory quantitative analysis of emergent problems with scant information. In Terry Williams, Kunt Samset & K. Sunnev(Eds.), Making essential choices with scant information (pp. 279–300), 2009
- [79]Drevland,Frode,Austeng Kjell and Torp Olav, Uncertainty analysis-Modeling, estimation and calculation Theoretical fundament, 2005
- [80]Takesue.Naoki, Financial Evaluation of Refinancing of the Eurotunnel Project, S.M thesis in Civil Engineering, MIT, 1991

Reference

- [81]Berg P., Styring av statlige investeringer, The Norwegian Ministry of Finance, Norway, 1999
- [82]Kharbanda O.P. and Pinto J.K., What Made Gertie Gallop? Lessons from Project Failures, Van Nostrand Reinhold, New York, 1996
- [83]Morris P.W.G. and Hough.G.H., The Anatomy of Major Projects, A Study of the Reality of Project Management, John Wiley & Sons, England, 1991
- [84]Torp Olav. Litteraturstudium innen tidligfasevurderinger av prosjekter, Concept Research Programme, NTNU Norway, 2001

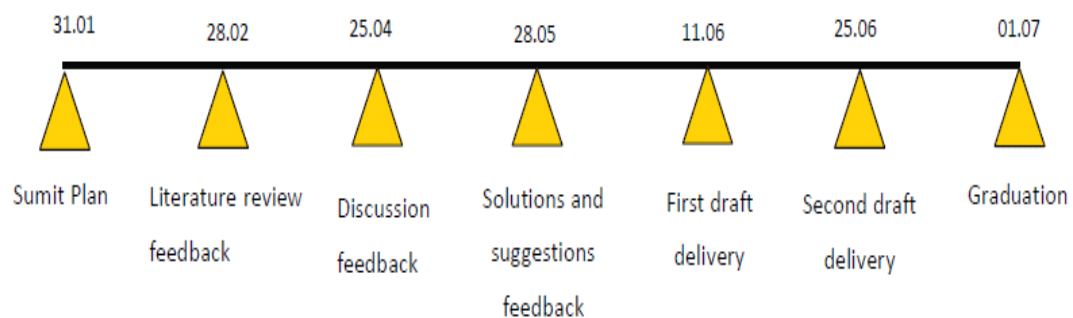
Appendix 1. Work Plan for Master Thesis

1. Main ideas and objectives

My Research will be in the field of project management frond end phase. Firstly project front-end phase will be studied by reviewing the theories. Some key concepts in this phase will be learned. Secondly, in combination with the knowledge of different disciplines, the dissertation will look into business case development and project financing. A large amount of information of these areas will be reviewed. Different elements in business case and project financing will be discussed. Some topics that are relevant to business case and project financing will be discussed such as strategic alignment, cost & benefit analysis, project financing models and project financing risk management etc. Thirdly, based on the theory, I will find the problems and challenges of business case development and financing project by means of "project financing". According to the problems, I will give the suggestions or solutions. The objective of the dissertation is to find a good way to develop business case and a good way of making good use project financing to finance the project. I hope the dissertation could be beneficial to private companies that are going to initiate projects.

2. Schedule and dates

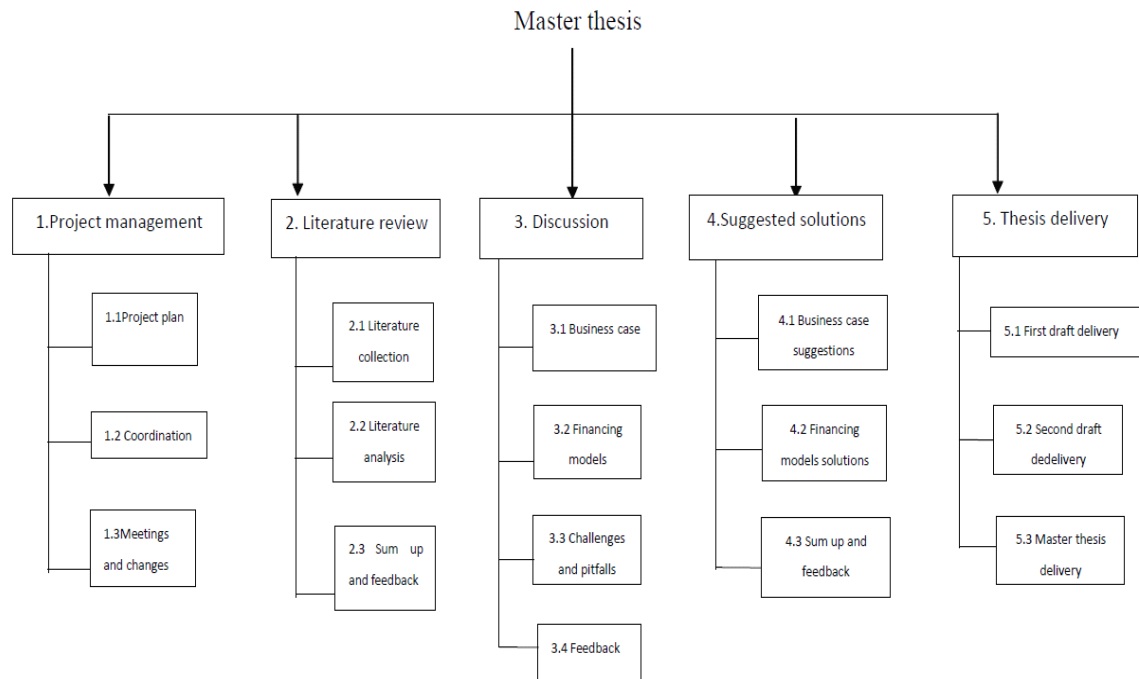
2.1 Milestones



2.2 Gantt chart



2.3 WBS



4. Deliverables

A constructive paper regarding suggestions and solutions to the problems relevant to developing business and financing project will be presented. In addition, extensive risk management methods in terms of project financial risks will also be included in the paper. The paper is to give some value to the companies so that they can benefit from the dissertation in initiating a project in an effective and efficient way.

5. Things to do

5.1 Literature review

An extensive collection of literatures will be done in the front-end phase; the content is relevant to the rational of business case development, underlying assumptions and expectations from business case. In addition, a swarm of literatures regarding to project financing will be looked through.

5.2 Discussion

First, a study is carried out on how business case can be developed and managed in project frond-end phase. Second, project financing models will be looked at carefully;

different financing models and different financial risks will be discussed. Third, the different challenges and pitfalls of developing business case and using project financing to finance a project will be presented.

5.3. Suggest solutions

Base on the theory above, I try to find an effective way to develop business case and using project financing. It is ideal that I can work with a real project case either to be implemented or being implemented within a Norwegian company to strengthen the skills and increase the ability to resolve the real problems by applying the theories into a real case.

5.4 Communication and coordination with supervisor

Along with the whole process of the dissertation, I will keep in touch closely to my supervisors. Any suggestions will be attached great importance to this dissertation. On top of that, I would like to learn knowledge in project management as much as possible from my seasoned supervisor Mr Agnar Johansen. This will be the priceless experience and unforgettable period in my last semester in NTNU.

Appendix 2. Meeting Minutes

There were several meetings from mid January to end of June; the structure of the dissertation was changed after the meeting on 15/05. After the meeting, some meetings about the contents of the thesis were held to improve the quality of the dissertation. The minutes of the meeting in 15/05 is listed below, which is a turning point of the dissertation.

Date: 15/05/2012

Time: 10.30-12.50

Location: SINTEF

Attendees:

Agnar Johansen

Simiao wang

Discussions:

The main objective is to change the thesis structure.

There are 6 parts to be changed:

1. Thesis structure. Each chapter must be relevant to the topic and the theory part and is able to be applied to the discussion part later)
2. Introduction:
 - a. Problem statement
 - b. Why the problems are interesting
 - c. Objectives
 - d. What are the research questions.
 - e. A description of the content of each chapter
3. Methodology
4. Theory and case study
5. Discussion and solution
6. Conclusion

Next meeting: 25/05/2012

Location: SINTEF

Discussion: an improved master thesis structure

Appendix 3. Examples of Costs

Examples of possible costs

Types of cost for the feasible options may include some or all of the following, depending on the nature of the project:

- **Direct project costs**
 - Project space, facilities, materials and tools
 - Project staff, consultants, contractors
 - Other internal resources required to advise on or support the project
- **Acquisition costs**
 - Land, real estate and office fitout
 - Equipment
 - Computer hardware, software licences
 - Tender costs
- **Implementation costs**
 - Implementation services and facilities
 - Staff replacement
 - Loss of productivity
 - Training, quality process
 - Documentation, manuals
 - Marketing, publicity
- **Whole of life ownership costs**
 - Service and operating costs
 - Lease, rental costs
 - Outsourcing costs
 - Annual maintenance/licences
 - Upgrade and replacement of facilities
 - Staffing costs
 - Ongoing training and support
 - Cost of finance
- **Social and environmental costs**
 - Degradation of environment
 - Loss of social amenity
 - Loss of or lowered standards of service
 - Loss of industry
 - Loss of employment, deskillling
 - Lowered community standards of health, safety, security
 - Costs passed on to public

Appendix 4. Example of Benefits

Examples of possible benefits	
Cost related benefits	Service related benefits
<p>Increased revenue</p> <p>Cost reductions</p> <ul style="list-style-type: none"> • Reduced maintenance <ul style="list-style-type: none"> Maintenance contracts Repair costs Reduction in downtime • Reduced staff costs <ul style="list-style-type: none"> Less staff Less overtime Less costly skills Reduced turnover Improved productivity • Environmental savings • Reduced operational costs (non-staff) <ul style="list-style-type: none"> Rent Power License fees Communications Stationery Stock <p>Cost avoidance</p> <ul style="list-style-type: none"> Increased service/same staff New service/same staff Increased capacity/same cost 	<p>Achievement of policy objectives</p> <ul style="list-style-type: none"> Better community health Safer workplaces Better educated population Better environment Sustainable development Industry development <p>Service enhancement</p> <ul style="list-style-type: none"> Faster service Wider range of services Tailored services Geographic access to services Longer hours open Greater equity of access Better systems support to the organisation's staff <p>Improved productivity</p> <ul style="list-style-type: none"> Increased revenue collection Increased client throughput More program places Increased assets/better utilisation More with the same resource Increased information accuracy Faster decision making

Appendix 5. Risk Check List

Risk checklist

Project type proposed under option

- Size of project.
- Importance of project to operations and service delivery
- Complexity of project
- Time frame: short, medium or long term

Note: generally, risk increases with the size, criticality, complexity and duration of the project.

Organisational impact

- Impact on business processes
- Impact on other projects
- Impact on organisational structure
- Interaction with other concurrent change programs
- Impact of staff absent from service delivery (for example, training)

Stakeholder impact

- Impact on other government organisations
- Impact on other services
- Impact on community

Scope

- How well defined the project scope is
- Extent of agreement amongst stakeholders about project scope

Technology

- Well-proven or new and emerging technology
- Project based on single technology or integration of multiple technologies
- Quality and complexity of existing data

Project organisation

- Organisation's experience in and capacity to deliver project
- Organisation's commitment to achievement of outcomes under this option
- Experience of project manager and others to be involved in this project option
- Are roles clearly defined?
- Will assigned staff be able to devote sufficient time?
- Are back-up resources available?
- To what extent is project option dependent on third parties?

Knowledge and support

- Are the necessary skills available to the organisation (internally or externally)
- Will the solution be supported internally or externally

Appendix 6. Quantitative Cost & Benefit Analysis

Quantitative Analysis – Option #1 (Non- Handheld)	Year 1 \$K	Year 2 \$K	Year 3 \$K	Year 4 \$K	Year 5 \$K	Year 6 \$K	Total \$K
Benefits:							
Cost Savings	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost Avoidance	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL BENEFITS	0	0	0	0	0	0	0
Costs:							
Non-Recurring	0	0	0		0	0	0
Recurring	\$119	\$130	\$127	\$137	\$148	\$151	\$813
TOTAL COSTS	\$119	\$130	\$127	\$137	\$148	\$151	\$813
Net Benefit or Cost of Viable Alternative 1	-119	-130	-127	-137	-148	-151	-\$813
Present Value of Benefits	0						
Present Value of Costs	-707						
NPV for Option #1	-707						
Discount Rate	4%						
Quantitative Analysis – Viable Option #2 (Handheld)	Year 1 \$K	Year 2 \$K	Year 3 \$K	Year 4 \$K	Year 5 \$K	Year 6 \$K	Total \$K
Benefits:							
Cost Savings	0	0	0	0	0	0	0
Cost Avoidance	0.00	0.00	0.00	\$13	\$13.2	\$13.6	\$25.96
Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL BENEFITS	0	0	0	13	13.2	13.6	\$39.52
Costs:							
Non-recurring	311.80	27.00	27.75	281.6	28.30	86.46	\$763
Recurring	92.00	92.67	95.42	98.25	101.1	104.1	\$583.69
TOTAL COSTS	403.80	119.67	123.1	379.8	129.4	190.6	1,346.6
Net Benefit or Cost of Viable Alternative 2	-92.00	-92.67	-95.42	-85.47	-88.0	-90.6	-\$544.1
Present Value of Benefits	32.47						
Present Value of Costs	1190.2						
NPV for Alternative 2	-1158						
Discount Rate	4%						

Appendix 7. Qualitative Cost & Benefit Analysis

Qualitative Summary	Description	Stakeholder(s) Impacted	Ranking
Benefits:			
Low Change to current process	Cost avoidance at all levels.	All	L
Costs:			
Organizational overhead at Branch Office	Paper checklist data will be re-entered in the Branch Office. There will be increased costs paper management costs at the branch level.	Field and branch staff.	L
Transition	Transition Management during first year to handle increase in escalated help desks and change management	All Staff impacted by Forecasting function across Government.	L
Viable Option #2			
Qualitative Summary	Description	Stakeholder(s) Impacted	Ranking
Benefits:			
Improved Morale	Improved morale for users in the field that would view a tangible handheld as an investment.	Field Staff	L
Leverage non-FREP Tasks	FREP handheld could be re-used for other mobile applications	Field Staff	M
Costs:			
Organizational overhead at Headquarters	IMG and WTS management effort	IMG and WTS staff.	L
Transition	Transition Management during first year to handle increase in escalated help desks and change management	All	L

Appendix 8. Eurotunnel's Conflicts

Contract	Date	Contractors	Origin and resolution of the conflict
Construction contract	TML	1988 to 1997	<p>Mid-1988: Eurotunnel deplores the delays and announces a 7% increase in costs.</p> <p>January 1989: A first settlement (Joint Accord) is signed (extension of the opening date by one month to June 1993, settlement concerning all outstanding payments)</p> <p>June 1989: Disagreements over the costs of the lump sum works (£384 million in dispute).</p> <p>February 1990: Second accord where TML accepts to assume a higher part of costs overruns.</p> <p>October 1991: Dispute on extra costs of the cooling system. TML threatened to stop work. The matter was taken to the Disputes Panel (March 1992) and to the Arbitration Panel (September 1992). TML received £200 million.</p> <p>January 1994: Dispute concerning the electromechanical part of the Tunnel and the rolling stock. In January 1994, TML claimed more than £1 billion to Eurotunnel. A settlement was signed on April 1994: Eurotunnel agrees to pay but in return TML guarantees £85 million in the May 1994 rights issue. Another claim was led by Bombardier for additional costs on Le Shuttle wagons. A settlement was found in 1994 where Bombardier received £195 million partly by cash and partly by shares (25 million units).</p> <p>December 1995: Eurotunnel submitted a claim to the Disputes Panel on the ground that TML mismanaged the procurement of rolling stock. The claim was rejected in April 1997.</p>
Railway contract	The Railways	1995	<p>March 1995: Eurotunnel initiated arbitration before the International Chamber of Commerce in order to renegotiate the Railway Usage Contract. Eurotunnel argued that the Railways breached the contract on several features (delay in introduction of Eurostar, delay in the construction of high speed rail link between London and the tunnel) and claimed £2 billion. This claim was rejected in November 1995</p>
Concession	French and English Governments	1993 and 1997	<p>December 1993 : The governments agreed to extend the Concession from 55 years to 65 years</p> <p>December 1997 : The governments agreed to extend the Concession from 65 years to 99 years</p>

Appendix 9. Eurotunnel Financial Data

Eurotunnel cost until opening

£ million	Nov. 1987	Nov. 1990	Oct. 1991	May 1994
Target works (e.g. tunnels)	1,367	2,009	2,009	2,110
Lump sum works (e.g. buildings)	1,169	1,305	1,305	1,753
Procurement items (e.g. shuttles)	252	583	692	705
Bonus TML		72	72	46
Direct works				36
Project contingency		239	239	
Total construction costs	2,788	4,208	4,317	4,650
Corporate costs	642	787	829	1,128
Provision for inflation	469	1,031	1,031	1,146
Net financing costs	975	1,386	1,534	4,757
Capital Expenditure				222
Transfer to interest reserve				72
Net Cash Out Flow at the Beginning of Operations		196	343	-1,859
Total	4,874	7,608	8,054	10,116

Eurotunnel Profits and Losses in 2004 and 2003

£'000	2004	2003
Total turnover	555,173	583,944
Total operating expenditure	383,883	414,160
<i>Operating profit</i>	171,290	169,784
Total financial income	32,964	43,005
Total financial charges*)	331,158	362,143
<i>Financial result</i>	(298,194)	(319,138)
Exceptional result**)	(442,806)	(1,184,847)
<i>Taxation</i>	23	24
Loss for the year	(569,733)	(1,334,225)

Eurotunnel cash flow statement in 2004 and 2003

£'000	2004	2003
Net cash inflow from operating activities	283,312	314,304
Returns on investments and servicing of finance	(281,241)	(277,878)
Capital expenditure	(18,934)	(24,717)
Other non-operating cash flows and taxation	(13,859)	20,367
Cash (outflow)/inflow before financing	(30,722)	32,076
Financing	724)	(68,100)
Decrease in cash in the period	(31,446)	(36,024)

