

# Project Investment and Financing, a Study on Business Case Development and Financing Models

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## Abstract

The importance of the front-end decision-making phase in projects is increasingly being recognized. Project front-end phase management is believed to be the genesis of any given project as it plays a crucial role in determining the success or otherwise of the entire project. In spite of this, only 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 systematic 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 project financing. Project financing is a special financing method which is seen as a well-established tool that helps project sponsors initiate a project and deliberate on ways to fund the project. I am going to dive into these two areas, identify the challenges and provide suggestions to solve them. I use literature review as the method to study the business case. Extensive suggestions are given based on previous studies and theoretical works in different disciplines where existing literature and case studies are used in discussing project financing. The solution to the problems in business case is to establish a dynamic business case development process to respond to the ever-changing environment. This process could therefore, reflect the changes and uncertainties in the project financing. A general conclusion is that project financing is more suitable to projects with low future uncertainty. When deciding to use project financing, the project sponsors must be very discrete about the nature of the project and its potential profitability.

**Keywords:** project front-end phase, business case development, project financing, viability,

## 1.0 INTRODUCTION

In project front-end phase, business case development and project financing are seen as the two important tasks to be fulfilled before the project implementation. Business case captures the reasoning for initiating a project and provides the rationale for the project's approval. A compelling business case adequately captures both the quantifiable and unquantifiable characteristics of a proposed project, convincing the project sponsors to invest. Thus, business case can be seen as the cornerstone of project financing specifically, business case is the basis on which a project implementation is established. A number of research reports conclude that unsatisfactory project results are often caused by insufficient or inadequate use of resources in the front-end phase, hence the need for studying project front-end phase. However, little has been done to develop know-how and methodology for front-end management (Berg 1999, Kharbanda and Pinto 1996, Morris and Hough 1991, Torp 2001).

*Knut Samset in his book Project Evaluation:* What is closely connected to business case is project financing. In situations where project sponsors lack the requisite funds for the project, they may adopt "project financing" as a means 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 the requisite funds at the outset of a given 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 on a project, thus indirectly impacting project final outcome. Considering the significance of both business case in project front-end phase and project financing, I would like to implement a deep study by focusing on the main activities: business case development and project financing.

## 1.1 Background of Study

A project can be used to resolve problems or discover opportunities for corporations. A promising project brings anticipation and benefits to organisations, however projects also have risks; a risky project could lead to losses or even bankruptcy. More and more companies are becoming aware of the importance of project front-end phase. Business case and project financing study provide decision-makers with information on project feasibilities and fundamentals. It is necessary to study project front-end phase as part of project whole life cycle management, as it gives preliminary evidence to project stakeholders about project feasibility for decision making. However, few project management literature covers this area, probably because project front-end phase is more concerned by the project sponsors rather than project managers. To better understand the rationale for project start-up, I am going to dig into project front-end phase as well as project financing in the dissertation.

## 1.2 Problem Statement

Projects mean differently to different project sponsors. For public projects the project sponsors are more concerned about project strategy, project impacts and project sustainability than economic value whilst for private projects, the sponsors are concerned with 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 projects. However, it has been proven that business case is not always the basis on which project sponsors make decisions. The estimation from business case is often inconsistent with the final result, project sponsors could suffer from potential losses if they make decisions based on inaccurate business case. Hence business case must be as accurate as possible to ensure that 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 capital needs. In a significant number of instances, projects have viable goals but find that traditional lenders are unable to understand their initiatives. Project financing has its special benefits as well as risks; some projects that are financed by means of "project financing" have proven successful in spite of their associated risks. Hence to finance a project by means of "project financing" has proven to be an optimal way highlighted by project sponsors.

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). 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 contributes a lot to 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 project failure. Thus, good management of the front-end phase is of importance before project viability is established. Business case development and financing project are two core tasks that should be executed carefully to serve as reliable reference for project sponsors to make decision on whether to undertake the project or otherwise and to determine appropriate financing model 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 accounts for project final result often deviating from its predictions and the problems relevant to project financing. I expect through the answers to these challenges to be managed to establish the basics for project sponsors to judge the viability of project initiation and to select appropriate project financing method for the approved project.

## 2.0 LITERATURE REVIEW

### 2.1 Project front-end Phase Management

Project Front-end management is management of projects in the front-end phase and includes front-end assessments. 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 is made. Unsatisfactory project results can be caused by insufficient or inadequate use of resources in the front-end phase. Some Norwegian scholars (Lædrein Ola et al. 2009) define project front-end phase (which is called business case in PMBOK) as the main task in project front-end phase that incorporates challenges and business needs statement, strategic alignment analysis and cost & benefits estimation of project management. Financing project happens immediately after the decision is made to implement the project. It is worthy of note that both business case development and project financing happen before the project is considered for implementation. Project alternatives need to be evaluated before the decisions are made. Too often, front-end assessments have concentrated on evaluating one single project, 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 analysed, 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 long 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 early phase, the uncertainty that is likely to affect the project performance need to be scrutinized.

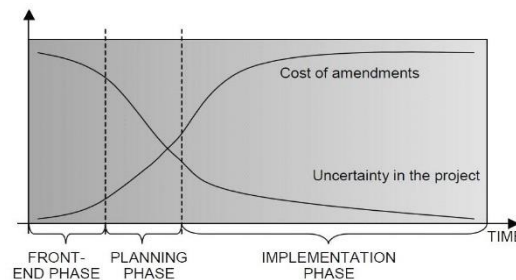


Figure 2.1 Correlations between Cost of Changes and Uncertainty (Source: Lædre Ola et al., 2009)

Figure 2.1 shows the uncertainty in project front-end phase is extremely high, as the project matures, the uncertainty becomes lower. Lack of information will result in decisions burdened with uncertainty (Wright and Ayton 1987). If key personnel 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 in the organization. Generally, the chance of making the right decisions increases as uncertainty decreases. Figure 2.2 below shows the relationship between information and uncertainty with time horizon.

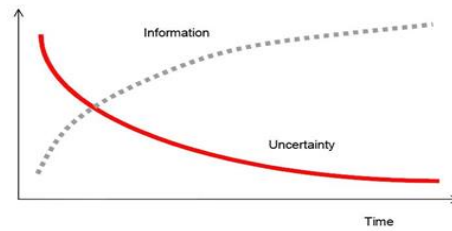


Figure 2.2 Uncertainty vs. Available Relevant Information in a Project  
 (Source: Terry Williams and Knut Samset, 2010)

Figure 2.3 below according to Agnar Johansen & Asbjørn Rolstadås (2008) in their article; From Protective to Offensive Project Management summarized three types of uncertainty and linked them to project life cycle, suggesting that total risks are high in project front-end phase. That 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 for final decision to be made. 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).

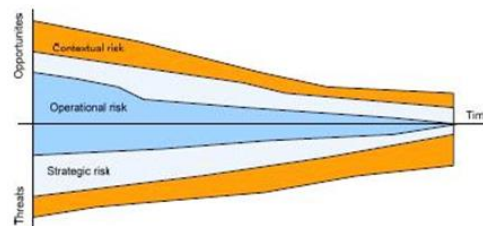


Figure 2.3 Risk Development through Project Lifecycle.  
 (Source: Rolstadås Asbjørn & Johansen.A, 2008)

Experience indicates that available resources in a project, including the known reserves, often will be spent (Galbraith 2001). 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 decreasing the original budgets are complex, and probably not fully understood.

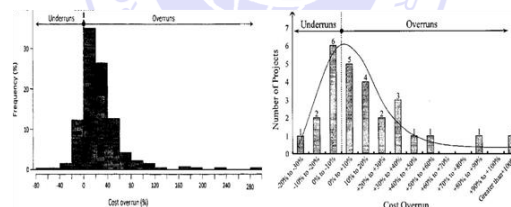


Figure 2.4 A-Cost Overruns (N=258). B-Cost Overruns of U.S. Projects  
 (Sources: Flyvbjerg et al. (2003) left. B - General Accounting Office (2005) right)

Figure 2.4 above shows that cost overrun happens much more than cost underrun. 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.

The information that forms the basis for decisions must be clearly communicated to decision makers (Harrison 1995). 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 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.

## 2.2 Why Use Business Case?

It is estimated that only one in fifty business ideas are actually commercially viable. Therefore a business case development is an effective way to safeguard against wastage of further investment or resources (Grifton 1997). Project planning starts only when the result of business case development proves the project to be feasible. The research and information uncovered in the business case development will support the business planning stage and reduce 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). The result of business case is the basis on which 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 market research and analysis in order to provide stakeholders with varying degrees of evidence that a business concept will in fact be viable (Hoaland & Williamson 2000; Thompon 2003c; Thompson 2003a; Wickham 2004).

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 measurable benefits to the organization, costs and return on investment and how the project will be strategically aligned with other projects and 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 start-up of a project. It includes a description of the business challenges or opportunity, costs and benefits of each alternative and recommendations 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 consideration. The business case is referred to frequently during the project to check whether the project is 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. 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 objectively review facts and assumptions. In addition, it is vital that 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 solutions and to identify where the business would be without the project. The development of the overall business case ensures that the development of financial justification will usually identify challenges with the solution. Moreover project sponsors now have a way to measure their success. This analysis is useful to prioritize a project against the many other initiatives in the business that may require capital investment.

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. 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.

## 2.3 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 refer to business case as project feasibility study, while others refer to it 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:

- Business case is a form of advice to executive decision-makers. It is a substantiated argument for a project, policy or program proposal requiring investment, often including a financial commitment.
- 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.
- 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, cost and benefit of each alternative and recommendations.
- A decision support and planning tool that projects the likely financial results and other business consequences of an action.
- Business case is a document that defines the proposal, layouts its objectives, deliverables, estimated cost and effort and scope.



- Business case is a decision support and planning tool that projects the likely financial results and other business consequences of an action”.

Generally Speaking, business case is a controlled process for identifying challenges 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; Thompson 2003c; Thompson 2003a)

## 2.4 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 business case should incorporate cost-benefits analysis. It is also remarkable that risk assessment is mentioned several times, similarly the alternatives should be analysed and recommendation should be given. In addition, according to the definition, 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. 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 the solution should be (should the problems be solved by initiating a project?), although this ultimately depends on what the problem is.

**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; 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.

**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 levels. 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.

#### 2.4.1 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.

**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. To identify a problem statement, the planners' need to describe the problem

and the motivation of the problem, the problem can be either internal or external; to specify the context of the problem; to define the scope of the problem and to define how many aspects are needed to address 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 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.

**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.

**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. 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 2.5 below shows that project can develop its strategies from different levels.



Figure 2.5 Project Strategy Development  
(Source: PMI global standard, 2006a-3-13)

Turner (1999) illustrates how organizations undertake programs and projects to achieve their objectives. According to the result of this research; he built a model to include corporation strategy and project portfolio strategy as shown in Figure 2.6.

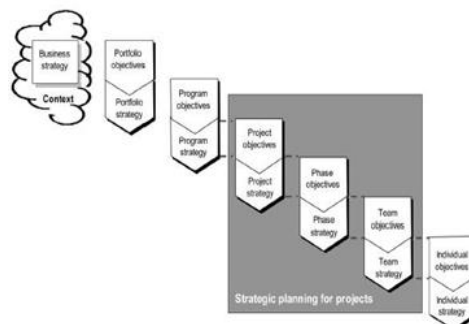


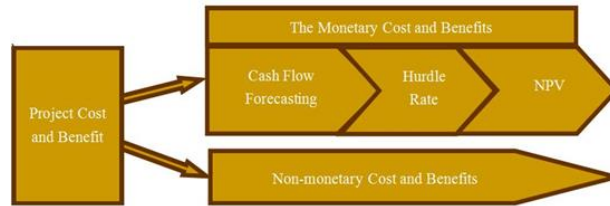
Figure 2.6 – Strategic planning for projects

Based on Figure 2.6 above, 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.

## 2.5 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.



**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.

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:

- 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.
- 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.
- 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.
- 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:

- Make a list of all monetary benefits that will be experienced upon implementation and thereafter. These benefits include direct profits from project outcome, increased contributions from investors, decreased production costs due to improved and standardized processes, and increased production capabilities, among others.
- 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.
- 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.
- 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 modelling 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, revenue can only be generated when the project is completed. 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 experts using subjective estimation. When calculating the costs, the planners need to break down the cost into different units, in each unit the planners can estimate fixed cost, viable cost, direct cost, indirect cost and sunk cost. When estimating benefits, planners can estimate items that constitute the source of cash flow (i.e. Project product revenue can be calculate by price multiplying the volume); to give value to the items estimated; to calculate the direct benefits like cost decrease and apply this new estimated cost into the next round of cost estimation. Table 1 below shows a simple cash flow forecasting example.

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	\$					

Table 1 - Cash Flow Forecasting Table (Source: Business Case Guidelines, 2002)

**Discounted Cash Flow Analysis:** In order to know the present value; 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  $\tau$  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 pre-tax rate of return; it must be multiplied by  $(1 - \tau)$  to convert it to an after-tax basis.

**Estimating the Cost of Debt:** The pre-tax cost of debt can be calculated by solving the following equation for  $R_d$ :

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

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 pre-tax cash debt service requirement payable in period  $i$  (i.e. interest plus principal). Typically, project debt must be repaid in instalments. When this is so,  $C_i$  includes the portion of principal that must be repaid in period  $i$ .

**Estimating the Cost of Equity: The Capital-Asset-Pricing Model:** Debt involves contractual payment obligations; equity does not. Thus, the procedure for estimating cost of equity differs from that of debt. The capital-asset-pricing model (CAPM) is useful for estimating the cost of equity for a project. Investor will purchase risky assets only if they expect to get a rate of return that makes it worthwhile to take on the risk. Hence the greater the risk, the higher the required rate of return. The 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.  $\beta^j$  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  $\beta^j$

**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.

- Obtain estimates of common stock betas for a sample of firms with the projects of the same type.
- Estimate the unlevered  $\beta$  for each of these firms by applying the equation:  $\beta_U = (1 - \theta) \beta_L / (1 - \tau\theta)$  where  $\theta$  is the firm's debt ratio,  $\beta_L$  is the leveraged beta, and  $\tau$  is the firm's income tax rate. The unlevered betas ( $\beta_U$ ) 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

$$\beta_L = \beta_U (1 - \tau\theta) / (1 - \theta)$$

Sample Firm	$\beta_L$	$\theta$	$\tau$	$\beta_U = (1 - \theta) \beta_L / (1 - \tau\theta)$
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 2: Industrial Beta to Evaluate the Project (Source: Finerty, John D., 2007)

Table 2, shows the way to calculate project beta to evaluate project cost of capital. For the example in Table 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:

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

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.

## 2.6 Project Risk Assessment

Project risk assessment is an important part in business case development process. Project risk assessment report provides project sponsors with information on 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. 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.

**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.

**Risk Quantification:** Risk quantification provides project sponsors with information on which risks need more attention in order to better handle them. For simplicity, rate can be on a scale of 1 to 4. The larger the number, the larger the impact or probability is. Thus by using matrix, priority can be established.

**Profitability Selection Method:** 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 projects 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.

- **Payback Period:** projects with shortest payback period can be appealing for selection.
- **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 often get selected.
- **NPV Method:** projects with highest net present value appeals better.
- **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 often gets selected.

**Table 3: Project Selection Factors (Source: Meredith Jack R. and Mantel Samuel J., 2012)**

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

Table 3 shows the common criteria used in evaluating projects for optimal solutions instead of focusing on financial performance alone. When using the criteria in Table 3, it is not necessary to use all of them to make a decision, and the criteria listed does not capture everything. The planners can use different criteria based on the nature of the project as well as the result of cost-benefit analysis. The favoured weighted factor scoring model, considers both 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  $i^{\text{th}}$  project,  $S_{ij}$  is the score of the  $i^{\text{th}}$  project on the  $j^{\text{th}}$  criterion, and  $W_j$  is the weight of the  $j^{\text{th}}$  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.

	WWe	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	Alternative 1	5	5
Personnel requirements	10%			
1. Training requirements	70	20	40	50
2. Labour skill requirements	30	20	20	20
TOTAL		62	65	64

Table 5: Weighted Scoring Model

Table 5 above explains the weighted scoring model which includes several factors to take into account in determining the final consideration. It suggests that projects with the highest NPV is not necessarily selected. Weighted scoring models are strongly favoured for three fundamental reasons. First, multiple objectives of the organization is reflected in the decision about which projects will be accepted or 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 towards short term that is inherent in profitability models such as discounted future cash flows. This is not a prejudice against discounting and most certainly does not argue against the inclusion of profitability as an important factor in project selection, but rather it is an argument against the exclusion of non-financial factors that may require a longer-run view of the costs and benefits of a project.

## 2.7 Project Financing Theory

Financing 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 in 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, various financing models will be discussed based on the existing theories; thirdly, project financing risk management will be introduced; and lastly, the link between project financing and business case will be discussed.

**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 lending institutions that provide debt facilities for the project. The facilities, usually loans are mostly 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.

In this model fund providers and those who sign contracts with the Project Company (the supplies, government, customers (off takers), contractors and operators) are listed. The contracts signed between the Project Company and the different parties will to some extent work as the warranties to comfort the funds providers. There are a lot of reasons that the project sponsors choose to use project financing:

- 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 creating liens.
- Project financing allows the company to avoid tax in a legal way, the higher the debt, the lesser the tax, hence the shareholders interest increases.
- By project financing, the credit rating of the sponsors is not negatively affected by the usually significant risks associated with project finance ventures. Sponsors may undertake several large and sometimes highly risky projects without jeopardizing their overall credit standing.
- Project Company usually does not intend to suffer any loss in case the project fails in the end. Using project financing, the sponsors could avoid bankruptcy even if the project fails, since the project company is independent of its parent company.

Project financing allows the company to spread its risks among different parties. Joint ventures could be a great way for project sponsors to share benefits and risks. In addition, project financing through issuing corporate bonds or other methods brings a large number of stakeholders. By this, political risks could be scaled down.

**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 and external. 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 and indirect financing. Direct financing is accessing funds through the stock market, corporate bonds and trust products. Indirect financing is a means of financing through banks and other financial institutions. Bank loans has become an important way of indirect financing.

**Project Financing Strategy:** According to the Pecking Order Theory, the first choice of financing is the internal funds of enterprises, namely retained after-tax profits. 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. The three reasons for this order are: internal financing has relatively low cost, minimized risk and flexibility and independence 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 can lead to reduction in investors' profits. New equity financing used in an unfamiliar field can dilute and reduce earnings per share so as to damage the interests of investors.

#### **Factors to Account for in Project Financing**

- (1) Impact of macro economy. When the economy goes down, the company should consider deferring or cancelling project if the project is very much influenced by it.
- (2) Asset and capital structure of the company. Under normal circumstances, Project Company adopts debt financing when they have high fixed asset ratio and equity financing when they have high liquid asset ratio.
- (3) Financial risk. Different financing methods have different risks. Debt financing has the highest risk due to the possibility that the project company may not be able to pay the debt when due. Equity financing has a lower risk because the project company does not need to pay any principle and interest to equity holders. Using debt financing has both positive and negative effects. The positive side is, the higher the debt ratio, the lower the company's tax obligation. In this way, the debt is theoretically better. However, when bankruptcy



risk is taken into account, debt is not any better. There is a need to find an optimal financing structure in order to make profits and lower risk.

- (4) Cost of capital. The project company should consider the cost of financing, the lower the cost, the higher the profit. Due to different cost of capital for project financing methods, the project company needs to take into consideration the cost & benefit for each project financing method before they initiate the project.
- (5) Profitability of the company. Generally speaking, the bigger the company's potential profit, the more risk the company can bear. When the potential profits are high, debt financing is a good choice and vice versa.
- (6) Tax 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.

Companies faced with the choice of project financing approach should consider the impact of different financing options, depending on their peculiar circumstances. The widely used financing methods of stock issuing and bank loans have their inherent shortfalls. When project sponsors decide to use these methods to raise money, they must be careful of the potential risks.

## 2.8 Debt Financing

**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 issuing new loan before the repayment period. In some cases, project lenders ask for higher interest rate than normal rate to compensate for the risk. During repayment period, project sponsors use sale revenue or cash flows generated by the project as repayment. The project sponsors also bear the risk that they could not pay back the money with the revenue, in this case the project company may go bankrupt.

**Corporate bonds:** The project company may issue corporate bonds to raise funds. Usually a project company issues bonds based on its credit ratings. 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 lower interest rate. The project company has a lower financing cost by issuing bond (interest is tax-free) and shareholders' control over the company is not diluted. The interest is the only payback during the project, thus leaving more revenue 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. Based on debt financing and equity financing models, many financing methods are 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 investors to recover their investment, operating and maintenance expenses from the project. Due to the long-term nature of the arrangement, the fund is usually raised during the concession period. The return rate is often tied to a combination of internal and external variables. 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 funds and signs the contracts with parties such as contractors and suppliers and pays them with the money gained from banks and investors. In the project operation phase, the project company uses funds received from operating the project product to pay banks and investors. When the concession is over, the project product will be transferred to the government.

**Asset Backed Securities (ABS):** 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. 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 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 funds from public investors. When the project is finished, the project company returns the funds to the investors through a trust institution.

## 2.9 Financing Models

Project finance is defined as a long term financing of infrastructure and industrial projects based upon projected cashflows rather than balance sheet of its sponsors. A financial model is constructed by the project sponsors as a tool to conduct negotiations with investors and prepare a project appraisal report. It is usually a spreadsheet designed to process a comprehensive list of inputs assumptions and to provide outputs that reflect the anticipated real life interactions between data and calculated values for a particular project. Properly designed, the financial model is capable of sensitivity analysis, thus calculating new outputs based on a range of data variations

There are endless types of project financing models. However, the mostly used types are the Three Statement; Discounted Cash Flow (DCF); Merger (M&A); Initial Public Offering (IPO); Leveraged Buyout (LBO); Sum of the Parts; Consolidated; Budget; Forecasting and Option Pricing Models (OPM).

## 2.10 Project Financing Risk Management

Project financing models have been introduced so far. 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 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.

**Political risks:** the political risks could be seriously influential to big investment projects. The cancel or delay of a project due to political changes could lead to 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.

**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.

**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.

**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. 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.

## 2.11 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. 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 earlier, 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 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 the only document that is presented to project sponsors to get projects approved but also to various stakeholders that are involved in the project. Stakeholders like government, suppliers, contractors, insurance companies and so on will refer to business case before making any decisions. Business case is of importance to lenders and investors, project profitability and relevant risks of projects are interesting parts to project sponsors. Based on business case, lenders and investors decide whether to finance a 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. Project financing problems could make business case difficult to be developed; likewise business case based recommendation can make investors doubt the authenticity of project profitability.



### 2.12 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 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.

**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 travel between UK and French Terminals on specially designed shuttles operated by Eurotunnel itself. The shuttle trains consist of a number of specially designed wagons. These wagons are well ventilated and incorporate modern design and safety features. Different types of shuttles carry passengers and freight vehicles. The ferry-trains that are shuttles depart every 12 minutes. Each train is composed of 12 or 24 wagons. The figure below is the terminals oversee in French and England.



**France**



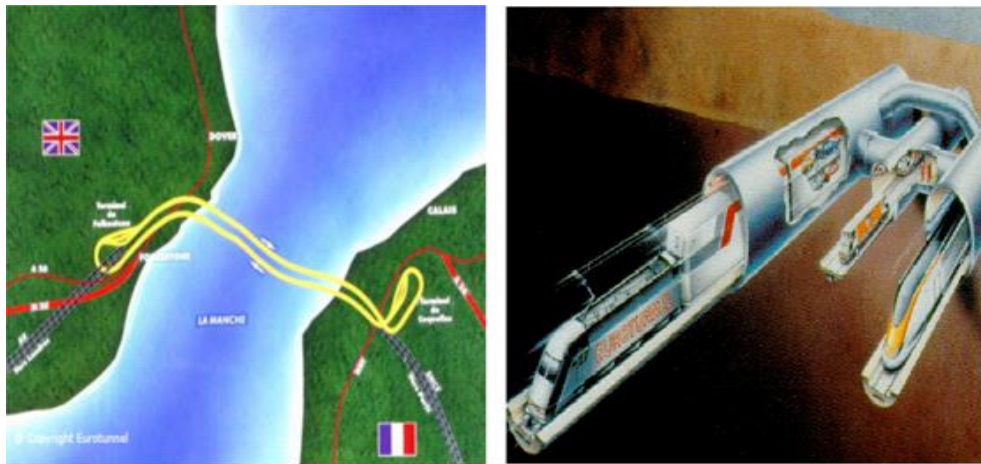
**England**

**Background:** The idea of a fixed link between Britain and the European mainland was first seriously considered in Napoleonic times. A tunnel was even started in 1880, but it was stopped two years later after British



fears of invasion. In 1975, another start was cancelled 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 governments were 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.

As a result, the Channel Tunnel Group and Franche Manche were formed. The banks reported to the two governments on feasibility and favoured a tunnel solution. However, it was not until 1985 that the governments called for proposals for a concession to both construct and 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. The consortium's bid was successful and in 1986, at a Ceremony in Lille, Prime Minister Margaret Thatcher and President Francois Mitterand, announced their backing for the present scheme. The formal concession agreement was subsequently signed in 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. In 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 1987. However, it received Royal Assent and later the Anglo-French treaty was ratified at the Elysee Palace by Prime Minister Margaret Thatcher and President Francois Mitterand in the same year. (Link Magazine, 1994). The Figure below shows the project location and the 3-D channel tunnel sketch.



**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 an amount of £6 billion, which is an additional 25% in order to cover the exposure to inflation and construction risks. The banks demanded at least £1 billion capital to commit the stockholders to the project. The stockholders required 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). 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 was broken down as follows: 2.6 billion British pounds, 21 billion FFR, and 450 million USD. Drawing was allowed in other currencies. The debt financing was arranged by five banks: UK Banks (Midland, Natwest) and French Banks (Credit Lyonnais, Banque Nationale de Paris, Banque Indosuez). Through these banks, Eurotunnel got the money from up to 225 banks. In order to get the loans from the syndicate banks, Eurotunnel had to fulfil the following conditions: (1) total equity must be £1 billion. (2) £700 million equity should be paid for the capital cost (3) progress should be satisfactory (4) that the future cost of the project is reasonable. 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.

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. Cash flow provisions have to be based on various factors such as expenses, traffic, revenues, taxes, inflation, interest rate and other economic factors. According to the agreement, Eurotunnel was not to draw on its credits if the debt coverage ratio was 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 over the project. Commission fees were high. Eurotunnel paid 1/8 percent of the total amount of funds raised to the five banks. To underwriting banks (around 200 banks in the beginning), Eurotunnel paid 7/8 of the underwritten amount. In addition, Eurotunnel had to pay pre-loan commitment, regular commitment 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 was the collaterals including the concession, the performance bond from the contactors, etc. Eurotunnel bore the risks of defaults if (1) the default cover ratio was 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 had 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.

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

### 3.0 RESEARCH 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.

#### 3.1 Research Methodology and Research Methods

Research methodology is used to systematically solve 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 the criteria by which they can decide that certain techniques and procedures will be applicable to certain problems. This makes it necessary for the researcher to design his/her own methodology.

**Research Philosophy:** This 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).

**Positivism:** Positivists believe that reality is stable and can be observed and described from an objective viewpoint (Levin 2016). 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. 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 2016). Alavi and Carlson (2017) 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.

**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 positivism.

**Rationale for Choice of Approach:** It has often been observed (Benbasat et al.2007) very accurately that no single research methodology is intrinsically better than any other, many authors calling for a combination of research methods in order to improve the quality of research (Kaplan and Duchon 1988). Equally, some institutions have tended to adopt a certain "house style" methodology (Galliers 1991); this seems to be almost in defiance with 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).

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

### 3.2 Exploratory Research Studies

Exploratory research studies are also termed as formulative research studies. The main purpose of this 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.

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, the task is to review the available material for deriving the relevant hypotheses from it.

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.

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.

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.

### 3.2 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.

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 pre-test the data collection instruments before they are finally used for the study purposes.

### 3.4 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.

### 3.5 Research Strategy

A large number of research methodologies have been identified, Galliers (2011) for example listing fourteen. While Alavi and Carlson (2012) reported in Pervan (2014b), use a hierarchical taxonomy with three levels and eighteen categories. Galliers (1991) identified methodologies, indicating they typically conform to the positivist or interpretivist paradigms. Laboratory experiments permit the researcher to identify precise relationships between a small amounts of variables that are studied intensively via a designed laboratory situation using quantitative analytical techniques with a view to making generalizable 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).

*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).

*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, "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." 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."

*Simulation* is slowly gaining popularity as a method of choice for organizational researchers (Dooley 2002). 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).

*Action research* is according to Watts, 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

### 3.6 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. 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.

**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 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 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.

### 3.7 Ethical Consideration

Ethical considerations in research are critical. Ethics are the norms or standards for conduct that distinguish between right and wrong. They help to determine the difference between acceptable and unacceptable behaviors. Why are ethical considerations so important in research? First, ethical standards prevent against the fabrication or falsifying of data and therefore, promote the pursuit of knowledge and truth which is the primary goal of research. Ethical behavior is also critical for collaborative work because it encourages an environment of trust, accountability, and mutual respect among researchers. This is especially important when considering issues related to data sharing, co-authorship, copyright guidelines, confidentiality, and many other issues. Researchers must also adhere to ethical standards in order for the public to support and believe in the research. The public wants to be assured that researchers

followed the appropriate guidelines for issues such as human rights, animal welfare, compliance with the law, conflicts of interest, safety, health standards and so on. The handling of these ethical issues greatly impact the integrity of the research project and can affect whether or not the project receives funding.

Because ethical considerations are so important in research, many professional associations and agencies have adopted codes and policies that outline ethical behavior and guide researchers. These codes address issues such as honesty, objectivity, respect for intellectual property, social responsibility, confidentiality, non-discrimination and many others. These codes and policies provide basic guidelines, but researchers will still be faced with additional issues that are not specifically addressed and this will require decision-making on the part of the researcher in order to avoid misconduct. The resources on this page address many of those issues and the case studies used in these resources provide excellent examples of these types of issues. One of the most important ethical considerations in research is the use of human subjects. To address these considerations, most institutions and organizations have developed an Institutional Review Board (IRB). An IRB is a panel of people who help to ensure the safety of human subjects in research and who assist in making sure that human rights are not violated. They review the research methodology in grant proposals to assure that ethical practices are being utilized. The use of an IRB also helps to protect the institution and the researchers against potential legal implications from any behavior that may be deemed unethical.

Examples of some of these issues include voluntary participation and informed consent. These principles are followed to guarantee that all human subjects are choosing to participate of their own free will and that they have been fully informed regarding the procedures of the research project and any potential risks. Ethical standards also protect the confidentiality and anonymity of the subjects. Review the following slideshow to begin understanding the key ethical considerations for researchers and the history of ethical issues in research. This slideshow is a comprehensive discussion of ethical issues that researchers may face and provides definitions of key terminology for new researchers. This slideshow includes the use of case studies to illustrate many of these considerations.

### 3.8 Research Methods

**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.

**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.

**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 or 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.

**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.

**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.

**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.

**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 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.

### 3.9 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.

#### 4.0 DATA ANALYSIS

In this chapter, I first analyse the research questions in the dissertation, second demonstrate what I did in the dissertation, elaborate the findings, results and solutions to the research problems; 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 3. In section 4.1.2, I give my conclusions for the questionnaire. In section 4.1.3 I analyse the interviews conducted in writing the dissertation and finally write my conclusions on the interviews conducted.

##### 4.1. Analysis and Conclusions From Questionnaires / Interviews

The research questions in the dissertation as presented in the introduction chapter 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. The findings in the dissertation are extensive. Through the systematic study of project front-end phase, the findings fall into three parts presented below:

**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.

**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 as that, all the elements are considered with the impact of uncertainties. There is demonstration that shows the way I incorporate uncertainty into goals setting, objectives setting and strategic fit. I incorporate uncertainty into cost & benefit analysis. 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. 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. 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 analysed from multiple dimensions. Solutions and suggestions to the problems are present in a systematic manner. According to each problem, I have demonstrated my understandings and the suggested handling methods.

## **5.0 EVALUATION OF THE RESEARCH**

### **5.1 Findings and Discoveries**

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 lacked subjectivity. The already available data used in the dissertation makes the research work lacked in creativity 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.

### **5.2 Limitations**

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.

### **5.3 Recommendations**

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.

In addition to the solutions given above, the changes from internal and external environment, significant or insignificant will perhaps change the project. Considering the changes and uncertainties that impact the project, it is necessary to review business case regularly during each beginning of the project phases. 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.

Based on the theories in chapter 2 and my findings of the problems in section. 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.

#### 5.4 Further Study and Research

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 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. 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) Stakeholder's 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.

## 5.5 Conclusions

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 4.2; all the elements are considered with the impact of uncertainties. There is demonstration that shows the way I incorporate uncertainty into goals setting, objectives setting and strategic fit. I incorporate uncertainty into cost & benefit analysis. 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.

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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.

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