4

INVESTMENT DECISION-MAKING IN COMPANIES

Introduction

An organization may be viewed simply as a collection of projects, some of which were started a long time ago, some only recently begun, many are major 'strategic' projects and others minor operating-unit-level schemes. It is in the nature of business for change to occur, and through change old activities, profit centers and methods die, to be replaced by the new. Without a continuous process of regeneration firms will cease to progress and be unable to compete in a dynamic environment. It is vital that the processes and systems that lead to the development of new production methods, new markets and products, and so on, are efficient. That is, both the project appraisal techniques and the entire process of proposal creation and selection lead to the achievement of the objective of the organization. Poor appraisal technique, set within the framework of an investment process that does not ask the right questions and which provides erroneous conclusions, will destroy the wealth of shareholders.

The employment of project appraisal techniques must be seen as merely one of the stages in the process of the allocation of resources within a firm. The appraisal stage can be reached only after ideas for the use of capital resources have been generated and those ideas have been filtered through a consideration of the strategic, budgetary and business resource capabilities of the firm. The appraisal stage is followed by the approval, implementation and post-completion auditing.

Any capital allocation system has to be viewed in the light of the complexity of organizational life. This aspect was ignored in Chapter 2, where mechanical analysis is applied. The balance is corrected in this chapter. It considers the process of project development, appraisal and post-investment monitoring.

No doubt the project to build the Airbus 380 (*see* Case study 4.1) has been through many of the stages of project development and implementation discussed in this chapter: from the generation of the idea, its screening for budgetary and strategic constraints, to a thorough analysis in quantitative terms. Now that the aircraft are being produced, there will be a capital expenditure control system designed to monitor progress against targets. And, over the next few years, there will be an audit of the entire project.

Case study 4.1

Will it fly?

Airbus's Superjumbo

Surely one of the biggest investment appraisal decisions ever made was when Airbus decided to go ahead and produce the A380 superjumbo. This is one of those 'bet the company' type investments. A massive $10,700m will be needed to create this monster aircraft.

It was touch and go all through 2000 as to whether Airbus would dare to invest so much money. Before they said 'yes let's do it' they had to have firm orders for at least 50 aircraft. Finally, just before Christmas the sixth major buyer signed up to take the order book to 50 definite and 42 on option (the airlines have the right to buy, but not the obligation).

The A380 will be significantly larger than Boeing's highly successful 747. It will carry 555 passengers (compared with 416). It will also cut direct operating costs for the airlines by 15–20% compared with Boeing's 747–400 and will be able to fly 10% further (8,150 nautical miles).

So, where is all the money on development and build going? This is a project at the cutting edge of technology. The remarkable innovations cost a tremendous amount in terms of up-front cost, but the benefit will be spread out over many decades. Here are some of the innovations:

- New, weight-saving materials
- Better aerodynamics
- Carbon-fiber reinforced plastic central wingbox. Forty percent of the structure and components will be made from new carbon components and metal alloys.
- Upper fuselage shell is not to be aluminum but glare: a laminate with alternative layers of aluminum and glass-fiber reinforced adhesive
- Innovative hydraulic systems and air conditioning.

Airbus reckoned they needed to sell at least 250 aircraft to break even in cash flow terms. (Presumably meaning that nominal cumulative cash inflows equal nominal cumulative cash outflows.) To achieve a positive net present value would require the sale of hundreds more aircraft. Each airplane has a list price of around $216m–$230m, but don't pay too much attention to that, as airlines receive substantial discounts. At full tilt something like 96,000 people will be working on this aircraft.

And yet it could so easily have been abandoned. Boeing decided not to develop a superjumbo because it estimated the maximum market at 500 as they think that airlines are generally content to continue using the 747. Airbus estimated the market for jumbos and superjumbos at 1,550. It expects to take two-thirds of that business, worth $400bn in today's prices.

Less than three years after going ahead with the project Airbus passed the halfway mark to break even with 129 firm orders or commitments, mostly thanks to a flow of deals with Asian airlines in late 2003.

The managerial art of investment selection

This book places strong emphasis on the formal methods of project appraisal, so a word of warning is necessary at this point. Mathematical technique is merely one element needed for successful project appraisal. The quantitative analysis is only the starting point for decision-making. In most real-world situations there are many qualitative factors that need to be taken into account. The techniques described in Chapter 2 cannot be used in a mechanical fashion. Management is largely an art form with a few useful quantitative techniques to improve the quality of the art. For instance, in generating and evaluating major investments the firm has to take into account the following.

Strategy

The relationship between the proposed project and the strategic direction of the firm is very important. A business unit investment isolated from the main thrust of the firm may be a distraction in terms of managerial attention and financial

resources. A project that looks good at divisional level may not be appropriate when examined from the whole-firm perspective. It may even be contradictory to the firm's goals. For example, luxury goods companies are sometimes enticed to produce lower priced items for the mass market or to stretch the brand into unrelated areas. The project, when judged on its own appears to have a very high NPV. But there is the danger of losing the premium brand strategic position (expensive and exclusive) in the existing product ranges by being associated with something that does not quite fit the image the firm has nurtured.

Social context

The effect on individuals is a crucial consideration. Projects require people to implement them. Their enthusiasm and commitment will be of central importance. Neglecting this factor may lead to resentment and even sabotage. Discussion and consensus on major project proposals may matter more than selecting the mathematically correct option. In many cases, quantitative techniques are avoided because they are precise. It is safer to sponsor a project in a non-quantifiable or judgmental way at an early stage in its development. If, as a result of discussion with colleagues and superiors, the idea becomes more generally accepted and fits into the pervading view on the firm's policy and strategy, the figures are presented in a report. Note here the order of actions. First, general acceptance. Second, quantification. A proposal is usually discussed at progressively higher levels of management before it is 'firmed up' into a project report. One reason for this is that continuing commitment and support from many people will be needed if the project is to succeed. To engender support and to improve the final report it is necessary to start the process in a rather vague way, making room for modifications in the light of suggestions. Some of these suggestions will be motivated by shareholder wealth considerations, others by goals closer to the hearts of key individuals. Allowing adaptability in project development also means that if circumstances change, say, in the competitive environment, the final formal appraisal takes account of this. The sponsor or promoter of a capital investment has to be aware of, and to adjust for, social sub-systems within the organization.

Expense

Sophisticated project evaluation can cost a considerable amount of money. The financial experts' input is costly enough, but the firm also has to consider the time and trouble managers throughout the organization might have to devote to provide good-quality data and make their contribution to the debate. In a firm of limited resources it may be more efficient to search for projects at an informal manner, thus generating a multitude of alternative avenues for growth, rather than analyzing a few in greater quantitative depth.

Forget how the crow flies

If you want to go in one direction, the best route may involve going in the other. Paradoxical as it sounds, goals are more likely to be achieved when pursued indirectly. So the most profitable companies are not the most profit-oriented, and the happiest people are not those who make happiness their main aim. The name of this idea? **Obliquity**

John Kay

I once said that Boeing's grip on the world civil aviation market made it the most powerful market leader in world business. Bill Allen was chief executive from 1945 to 1968, as the company created its dominant position. He said that his spirit and that of his colleagues was to eat, breathe, and sleep the world of aeronautics. 'The greatest pleasure life has to offer is the satisfaction that flows from participating in a difficult and constructive undertaking,' he explained.

Boeing's 737, with almost 4,000 planes in the air, is the most successful commercial airliner in history. But the company's largest and riskiest project was the development of the 747 jumbo jet. When a non-executive director asked about the expected return on investment, he was brushed off: there had been some studies, he was told, but the manager concerned couldn't remember the results.

It took only 10 years for Boeing to prove me wrong in asserting that its market position in civil aviation was impregnable. The decisive shift in corporate culture followed the acquisition of its principle US rival, McDonnell Douglas, in 1997. The transformation was exemplified by the CEO, Phil Condit. The company's previous preoccupation with meeting 'technological challenges of supreme magnitude' would, he told Business Week, now have to change. 'We are going into a value-based environment where unit cost, return on investment and shareholder return are the measures by which you'll be judged. That's a big shift.'

The company's senior executives agreed to move from Seattle, where the main production facilities were located, to Chicago. More importantly, the more focused business reviewed risky investments in new civil projects with much greater scepticism. The strategic decision was to redirect resources towards projects for the US military that involved low financial risk. Chicago had the advantage of being nearer to Washington, where government funds were dispensed.

So Boeing's civil orderbook today lags behind that of Airbus, the European consortium whose aims were not initially commercial but which has, almost by chance, become a profitable business. And the strategy of getting close to the Pentagon proved counter-productive: the company got too close to the Pentagon, and faced allegations of corruption. And what was the market's verdict on the company's performance in terms of unit cost, return on investment and shareholder return? Boeing stock, $48 when Condit took over, rose to $70 as he affirmed the commitment to shareholder value; by the time of his enforced resignation in December 2003 it had fallen to $38.

… at Boeing, the attempt to focus on simple, well defined objectives proved less successful than management with a broader, more comprehensive conception of objectives.

… Obliquity gives rise to the profit-seeking paradox: the most profitable companies are not the most profitable-oriented. ICI and Boeing illustrate how

a greater focus on shareholder returns was self-defeating in its own narrow terms. Comparisons of the same companies over time are mirrored in contrasts between different companies in the same industries. In their 2002 book, *Built to Last: Successful Habits of Visionary Companies*, Jim Collins and Jerry Porras compared outstanding companies with adequate but less remarkable companies with similar operations.

Merck and Pfizer was one such comparison. Collins and Porras compared the philosophy of George Merck ('We try never to forget that medicine is for the people. It is not for the profits. The profits follow, and if we have remembered that, they have never failed to appear. The better we have remembered it, the larger they have been') with that of John McKeen of Pfizer ('So far as humanly possible, we aim to get profit out of everything we do').

Collins and Porras also paired Hewlett Packard with Texas Instruments, Procter & Gamble with Colgate, Marriott with Howard Johnson, and found the same result in each case: the company that put more emphasis on profit in its declaration of objectives was the less profitable in its financial statements.

… Would Boeing really have benefited from careful analyses in the mid-1960s of the prospective return on investment from development of the 747? An analyst would have had to anticipate the oil shock, the globalisation of world markets and the development of the aviation industry through to the end of the century. Anyone who has built models of these kinds, or scrutinised them carefully, knows that the range of possible assumptions is always wide enough to allow the analyst to come up with whatever answer the person commissioning the assessment wants to hear.

EXHIBIT 4.1 Forget how the crow flies

Source: *Financial Times Magazine* 17 January 2004

Stifling the entrepreneurial spirit

Excessive emphasis on formal evaluatory systems may be demotivating to individuals who thrive on free-thinking, fast decision-making and action. The relative weights given to formal approaches and entrepreneurialism will depend on the context, such as the pace of change in the market-place.

In the 1990s arguably Boeing sacrificed its vision of being a company always on the cutting-edge of commercial plane design, breaking through technological and market-place barriers. This reduced the vibrancy of the pioneering spirit of the organization, as it refocussed on short-term financial performance measures. This is expressed well by John Kay – *see* Exhibit 4.1. Professor Kay makes a valid point that in going directly for 'shareholder value' firms may actually do less well for shareholders than those that focus on vision and excellence first and find themselves shareholder wealth maximizers in an oblique way. However, it is possible to argue that Boeing's managers, in the 1990s were not, in fact, shareholder wealth maximizers in the sense described in Chapter 1 because they forgot the crucial 'long-term' focus. Being daring and at the cutting-edge may be risky, but it often leads to the highest long-term shareholder wealth.

Concentrating on short-term financial goals and presenting these as shareholder wealth maximizing actions can lead to slow pace and market irrelevance. So, being too fastidious in requiring immediately visible and quantifiable returns in an uncertain world can result in the rejection of extremely valuable projects that require a leap into the unknown by a team of enthusiasts. Where would Microsoft be today if in the 1970s it had conducted rigorous NPV analysis on its operating systems when PC sales numbered a few thousand?

Intangible benefits

Frequently, many of the most important benefits that flow from an investment are difficult to measure in money terms. Improving customer satisfaction through better service, quality or image may lead to enhanced revenues, but it is often difficult to state precisely the quantity of the increased revenue flow. For example, new technology often provides a number of intangible benefits, such as reduced time needed to switch machine tools to the production of other products, thereby reducing risk in fluctuating markets, or a quicker response to customer choice. These non-quantifiable benefits can amount to a higher value than the more obvious tangible benefits. An example of how intangible benefits could be allowed for in project appraisal is shown through the example of Crowther Precision plc.

Non-quantifiable benefits can amount to a higher value than the more obvious tangible benefits.

Worked example 4.1
CROWTHER PRECISION PLC

Crowther Precision plc produces metal parts for the car industry, with machinery that is now more than 20 years old. With appropriate maintenance these machines could continue producing indefinitely. However, developments in the machine tool industry have led to the creation of computer-controlled multi-use machines. Crowther is considering the purchase of the Z200 which would provide both quantifiable and non-quantifiable benefits over the old machine. The Z200 costs £1.2m but would be expected to last indefinitely if maintenance expenditure were increased by £20,000 every year for ever.

The quantifiable benefits are:

(a) reduced raw material requirements, due to lower wastage, amounting to £35,000 every year for ever;
(b) labor cost savings of £80,000 every year for ever.

These quantifiable benefits are analyzed using the NPV method.

Incremental net present value analysis of Z200

		Present value, £
Purchase of machine		–1,200,000
Present value of all annual raw material savings	$\frac{35,000}{0.1}$	+350,000
Present value of all annual labor savings	$\frac{80,000}{0.1}$	+800,000
Less present value of all annual increased maintenance costs	$\frac{20,000}{0.1}$	–200,000
Net present value		–250,000

Note: Assume discount rate of 10%, all cash flows arise at the year ends, zero scrap value of old machine.

Examining the quantifiable elements in isolation will lead to a rejection of the project to buy the Z200. However, the non-quantifiable benefits are:

- reduced time required to switch the machine from producing one version of the car component to one of the other three versions Crowther presently produces;
- the ability to switch the machine over to completely new products in response to changed industry demands, or to take up, as yet unseen, market opportunities in the future;
- improved quality of output leading to greater customer satisfaction.

It is true that the Crowther Precision cash flow analysis has failed to take into account all the relevant factors, but this should not lead to its complete rejection. In cases where non-quantifiable elements are present, the problem needs to be separated into two stages.

1. Analyze those elements that are quantifiable using NPV.
2. If the NPV from Stage 1 is negative, then managerial judgment will be needed to subjectively assess the non-quantifiable benefits. If these are judged to be greater than the 'loss' signaled in Stage 1 then the project is viable. For Crowther, if the management team consider that the intangible benefits are worth more than £250,000 they should proceed with the purchase of the Z200.

This line of thought is continued in Chapter 19, where operational and strategic decisions with options (real options) are considered. As the article in Exhibit 4.1

shows, the decision to commit to an investment means the loss of options. While reading it you might like to relate the ideas presented to Airbus's commitment to the A380 (Case study 4.1). It is committed, while Boeing has greater freedom to act.

Tyranny of time

By their very nature capital investment decisions threaten to place a straitjacket on companies. There is no easy way out.

Peter Martin

When you make a capital investment decision, you freeze time. In fast-moving industries, this may be the most important aspect of the decision – more important than its actual content. But it is rarely assessed in this light.

There is any amount of theory about how to take capital investment decisions….

All such approaches assume that there are financial and easily quantifiable costs of taking the decision; and less measurable benefits to set against it. The techniques all revolve around ways of making imponderable future benefits more tangible. There is a reason for this: managers usually want to take investment decisions while their superiors usually do not. So the techniques are ever more elaborate ways of capturing the discounted value of blue sky.

But there are also intangible costs of taking the decision, and they are not given the attention they deserve. The cost of freezing time is one of the most important.

Here is how it works. When you make a big capital investment decision, it will usually take between 18 months and five years to bring the plant fully into operation. The cost of tying up capital for that time is reflected in the investment appraisal. But the broader implications of tying up the company are not.

When you have committed yourself to a big new plant, you have not just signed a cheque for the money. You have also sold your soul to this technology, on this scale, in this site. That is what freezing time means. Until the plant is complete, and it is clear whether it works and whether there is a market for its products, time stands still. For you, but not for your rivals.

They are free to react, to adjust technology, to play around with the pricing and volume. You are not. Unless you have built an implausibly flexible new plant, you are on a convergence course with a straitjacket.

Once your new plant is up and running, you can start to adjust the pattern of its output, and strive to reduce its costs. But until then, your options are more limited: press on, or give up.

The semiconductor industry illustrates this dilemma in a big way. In the mid-1990s, the UK looked like a good home for a bunch of new chip plants. Siemens, LG Group and Hyundai all targeted the British regions for big state-of-the-art factories. One of them – Siemens' factory on Tyneside – opened and promptly shut down again. The other two have never made it into production, and look more questionable by the moment: the Asian crisis undermined their parents and their markets simultaneously.

The decisions all three companies had to make were unenviable, because they were all or nothing. Technology had moved on while the plants were being prepared. Once the Siemens plant came into production, it was clear that it was the wrong plant, making the wrong sort of chip, in the wrong place.

So the company shut it down, at vast cost – only to invest another huge sum in a different plant to make different

chips in France. For LG and Hyundai the moment of decision comes even before they have had the satisfaction of seeing their plants up and running.

The problem is not so much the risk that a plant's technology may prove inappropriate, or that its markets may not meet expectations: these are the normal risks of doing business in a capital intensive industry. It is more that the process of building the factory shuts out other alternatives, freezing the company's options and its internal clock.

What can companies do to avoid this risk? First, look for investment decisions that can be made piece by piece, and implemented quickly, minimising the freezing effect. Engineers usually hate this approach, because it means they are never designing plants at the cutting edge of the technology, or at maximum efficient scale. That's tough.

Second, once an investment has been approved, managers must resist the temptation to make the decision sacrosanct. It needs revisiting, in the light of changing technology and markets, just as much as plants that are already operating. This is a difficult balance to strike, because every big investment decision usually had to be made in the teeth of the opposition of a faction that wanted something bigger, smaller, older, newer, or somewhere else. This group of dissidents will never be happy with the decision, and they may even be right.

Third, keep a close eye on the relationship between the product cycle time in your industry and the time it takes to get a new plant commissioned.

If the former is shrinking while the latter is lengthening – a common feature of any high-technology industry that has to cater to retail consumers – there will come a point at which the price of freezing time will outstrip the benefits of new plant.

If you cannot keep going by patching the old factory, it is time to think of some revolutionary new process that will replace one big capital investment decision with a lot of small ones. Or give up.

EXHIBIT 4.2 Sacrificing options

Source: *Financial Times* 1 June 1999, p. 18

More tricky issues in real world project appraisal

A fundamental principle in project appraisal is to include only incremental cash flows. These are defined as the cash flows that are dependent on the project's implementation. If a project is accepted only those cash flows which are induced by the investment at time 0 and in subsequent years are regarded at incremental. Some of these cash flows are easy to establish but others are much more difficult to pin down.

INCREMENTAL CASH FLOW	=	CASH FLOW FOR FIRM WITH THE PROJECT	–	CASH FLOW FOR FIRM WITHOUT THE PROJECT

Here are some guide-posts to finding relevant/incremental cash flows:

Include all opportunity costs

The direct inputs into a project are generally easy to understand and measure. However, quite often a project uses resources which already exist within the firm but which are in short supply and which cannot be replaced in the immediate future. That is, the project under consideration may be taking resources away from other projects. The loss of net cash flows from these other projects are termed opportunity costs. For example, a firm may be considering a project that makes use of a factory that at present is empty. Because it is empty we should not automatically assume that the opportunity cost is zero. Perhaps the firm could engage in the alternative project of renting out the factory to another firm. The forgone rental income is a cost of the project under consideration.

The project under consideration may be taking resources away from other projects.

Likewise, if a project uses the services of specialist personnel this may be regarded as having an opportunity cost. The loss of these people to other parts of the organization may reduce cash flows on other projects. If they cannot be replaced then the opportunity cost will be the lost net cash flows. If replacements are found then the extra cost imposed, by the additional salaries, etc., on other projects should be regarded as an opportunity cost of the new project under consideration.

For a third example of opportunity cost, imagine your firm bought a stock of platinum to use as a raw material when the price was low. The total cost was £1m. It would be illogical to sell the final manufactured product at a price based on the old platinum value if the same quantity would now cost £3m. An alternative course of action would be to sell the platinum in its existing state, rather than to produce the manufactured product. The current market value of the raw platinum (£3m) would then be the opportunity cost.

Include all incidental effects

It is possible for a new project to either increase or reduce sales of other products or services offered by the company. Take the case of an airline company trying to decide whether to go ahead with a project to fly between the USA and Japan. The direct cash flows, of selling tickets, etc. on these flights, may not give a positive NPV. However, it could be that the new service generates additional net revenue not only for US/Japan flights but also on existing routes as customers switch to this airline because it now offers a more complete world-wide service. If this additional net cash flow is included the project may be viable.

If a clothes retailer opens a second or a third outlet in the same town it is likely to find custom is reduced at the original store. The loss elsewhere in the organization becomes a relevant cash flow in the appraisal of the *new* project, that is, the new shop.

In the soft drinks business, the introduction of a new brand can reduce the sales of the older brands. This is not to say that a company should never risk any cannibalization, only that if a new product is to be launched it should not be viewed in isolation. All incremental effects have to be allowed for including those effects not directly associated with the new product or service.

The irrelevance of sunk costs

Do not include sunk costs. For example, the project to build the Concorde involved an enormous expenditure in design and manufacture. At the point where it has to be decided whether or not to put the airplane into service, the costs of development became irrelevant to the decision. Only increment costs and inflows should be considered. The development costs are in the past and are bygones; they should be ignored. The money spent on development is irrecoverable whatever the decision on whether to fly the plane. Similarly with Eurotunnel, the fact that the overspend runs into billions of pounds and the tunnel service is unlikely to make a profit does not mean that the incremental cost of using same electricity to power the trains and the cost of employing train drivers should not be incurred. The £9bn+ already spent is irrelevant to the decision on whether to transport passengers and freight between France and the UK. So long as incremental costs are less than incremental benefits (cash flows when discounted) then the service should operate.

A common mistake in this area is to regard pre-project survey work (market demand screening, scientific study, geological survey, etc.) as a relevant cost. After all, the cost would not have been incurred but for the possibility of going ahead with the project. However, at the point of decision on whether to proceed, the survey cost is sunk – it will be incurred whether or not implementation takes place, and is therefore not incremental.

A common mistake is to regard pre-project survey work as a relevant cost.

Sunk costs can be either costs for intangibles (such as research and development (R&D)), or costs for tangibles that have no other use (such as the costs of the Eurotunnel). When dealing with sunk costs it is sometimes necessary to be resolute in the face of comments such as 'good money is being thrown after bad'. Always remember the 'bad' money outflow happened in the past and is no longer an input factor into a rigorous decision-making process.

Be careful with overhead

Overhead consists of such items as managerial salaries, rent, light, heat, etc. These are costs that are not directly associated with any one part of the firm or one project. An accountant often allocates these overhead costs among the various projects a firm is involved in. When trying to assess the viability of a project we should only include the incremental or extra expenses that would be incurred by going ahead with a project. Many of the general overhead expenses may be incurred regardless of whether or not the project takes place.

There are two types of overhead. The first type is truly incremental costs resulting from a project. For example, extra electricity, rental and administrative staff costs may be incurred by going ahead rather than abstaining. The second type of overhead consists of such items as head office managerial salaries, legal expertise, accounting services, public relations, (R&D) and even the corporate jet. These costs are not directly associated with any one part of the firm or one project and will be incurred whether or not the project under consideration goes ahead. The accountant generally charges a proportion of this overhead to particular divisions and projects. When trying to assess the viability of a project only the incremental costs incurred by going ahead are relevant, those costs which are unaffected are irrelevant.

Dealing with interest

Interest on funds borrowed to invest does represent a cash outflow, but this element should not be included in the cash flow calculations. **To repeat, interest should not be deducted from the net cash flows**. If it were subtracted this would amount to double counting, because the opportunity cost of capital used to discount the cash flows already incorporates a cost of these funds. The net cash flows are reduced to a present value by allowing for the weighted average cost of finance to give a return to shareholders and lenders. If the undiscounted cash flows also had interest deducted there will be a serious understatement of NPV. For more details on the discount rate incorporating the cost of debt finance (interest) see Chapter 10.

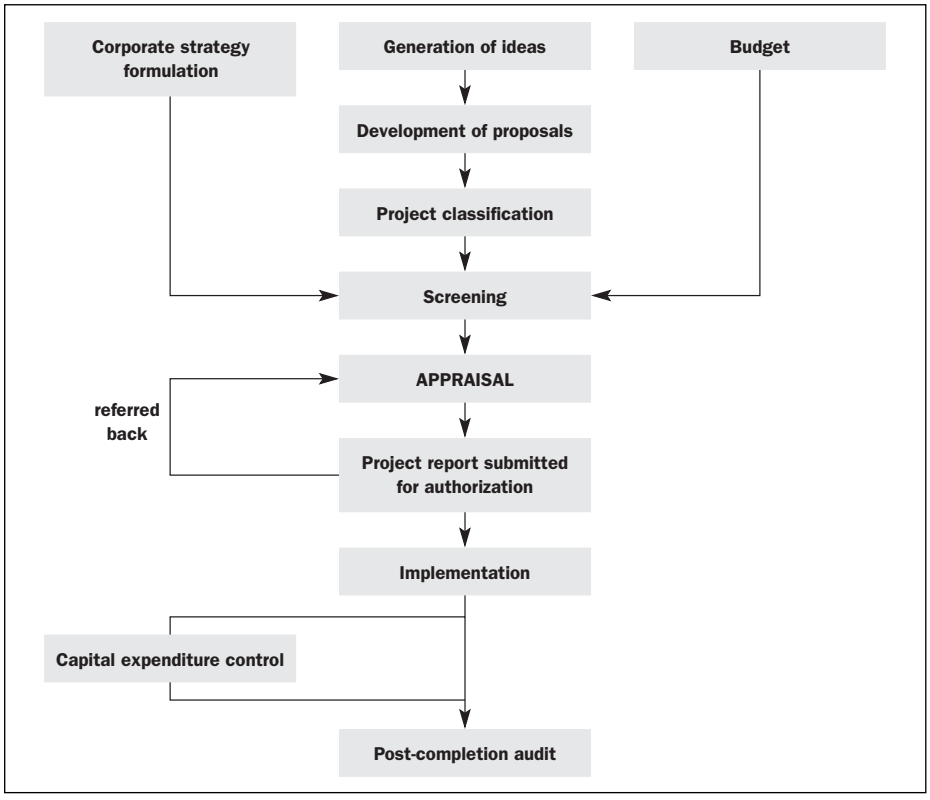
The stages of investment decision-making

There is a great deal more to a successful investment program than simply project appraisal. As Figure 4.1 demonstrates, project appraisal is one of a number of stages in the investment process. The emphasis in the academic world on ever more sophistication in appraisal could be seriously misplaced. Attention paid to the evolution of investment ideas, their development and sifting may produce more practical returns. Marrying the evaluation of projects once screened with strategic, resource and human considerations may lead to avoidance of erroneous decisions. Following through the implementation with a review of what went right, what went wrong, and why, may enable better decision-making in the future.

The emphasis in the academic world on ever more sophistication in appraisal could be seriously misplaced.

Investment by a firm is a process often involving large numbers of individuals up and down an organizational hierarchy. It is a complex and infinitely adaptable process that is likely to differ from one organization to another. However, we can identify some common threads.

FIGURE 4.1
The investment process



Generation of ideas

A firm is more likely to founder because of a shortage of good investment ideas than because of poor methods of appraisal. A good investment planning process requires a continuous flow of ideas to regenerate the organization through the exploitation of new opportunities. Thought needs to be given to the development of a system for the encouragement of idea generation and subsequent communication through the firm. Indeed, one of the central tasks of senior management is to nurture a culture of search for and sponsorship of ideas. In the absence of a well-functioning system, the danger remains that investment proposals only arise in a reactive manner. For example, a firm examines new product possibilities only when it realizes that the old product is becoming, or has become, obsolete. Or else the latest technology is installed in reaction to its adoption by a competitor. A system and culture is needed to help the firm 'get ahead of the game' and be proactive rather than reactive.

One of the main inputs into a more systematic search for ideas is likely to be an environment scanning process. It is also helpful if all potential idea-generators

are made aware of the general strategic direction of the firm and the constraints under which it operates. Idea generators often become sponsors of their proposals within the organization. These individuals, in a poorly operating system, can see themselves taking a high risk for very little reward. Their reputation and career prospects can be intimately associated with a project. If it goes badly then they may find themselves blamed for that failure. In a system with such poor incentives the natural response of most people would be to hold back from suggesting ideas and pushing them through, and concentrate on day-to-day management. This defensive attitude could be bad for the organization and it is therefore incumbent on senior management to develop reward systems that do not penalize project idea generators and sponsors.

Development and classification

As the sponsor or the division-level team gather more data and refine estimates, some degree of early filtering takes place. Ideas that may have looked good in theory do not necessarily look so good when examined more closely. In a well-functioning system, idea generation should be propagated in an unstructured, almost random manner, but the development phase starts to impose some degree of order and structure. Many firms like to have a bottom-up approach, with ideas coming from plant level and being reviewed by divisional management before being presented to senior management. At the development stage the sponsor elaborates and hones ideas in consultation with colleagues. The divisional managers may add ideas, ask for information and suggest alternative scenarios. There may also be division-level projects that need further consideration. As the discussions and data gathering progress, the proposal generally starts to gain commitment from a number of people who become drawn in and involved.

Ideas that may have looked good in theory do not necessarily look so good when examined more closely.

The classification stage involves matching projects to identified needs. Initially, there may be a long list of imaginative project ideas or solutions to a specific problem, but this may be narrowed down in these early stages to two or three. Detailed evaluation of all projects is expensive. Some types of project do not require the extensive search for data and complex evaluation that others do. The following classification may allow more attention to be directed at the type of project where the need is greatest:

- *Equipment replacement* Equipment obsolescence can occur because of technological developments which create more efficient alternatives, because the old equipment becomes expensive to maintain or because of a change in the cost of inputs, making an alternative method cheaper (for example, if the oil price quadruples, taxi firms may shift to smaller cars).
- *Expansion or improvement of existing products* These investments relate to increasing the volume of output and/or improving product quality and market position.

- *Cost reduction* A continuous process of search and analysis may be necessary to ensure that the firm is producing at lowest cost. Small modifications to methods of production or equipment, as well as the introduction of new machines, may bring valuable incremental benefits.
- *New products* Many firms depend on a regular flow of innovatory products to permit continued expansion. Examples are Intel, GlaxoSmithKline and 3M. These firms have to make huge commitments to R&D, market research and promotion. Vast investments are needed in new production facilities around the world.
- *Statutory and welfare* Investments may be required by law for such matters as safety, or pollution control. These do not, generally, give a financial return and so the focus is usually to satisfy the requirement at minimum cost. Welfare investments may lead to some intangible benefits which are difficult to quantify, such as a more contented work-force. The Arnold and Hatzopoulos (2000) survey showed that 78 percent of the firms undertook non-economic projects directed at health and safety issues; 74 percent accepted projects motivated by legislation; and 54 percent had paid for uneconomic projects for social and environmental reasons.

The management team need to weigh up the value of a more comprehensive analysis against the cost of evaluation. Regular equipment replacement, cost reduction and existing product expansion decisions are likely to require less documentation than a major strategic investment in a new product area. Also, the information needs are likely to rise in proportion to the size of the investment. A £100m investment in a new pharmaceutical plant is likely to be treated differently to a £10,000 investment in a new delivery vehicle.

Screening

At this stage, each proposal will be assessed to establish whether it is sufficiently attractive to receive further attention through the application of sophisticated analysis. The quality of information is generally rather poor and the payback method may feature predominantly at this point. Screening decisions should be made with an awareness of the strategic direction of the firm and the limitations imposed by the financial, human and other resources available. There should also be a check on the technical feasibility of the proposal and some preliminary assessment of risk.

- *Strategy* Capital allocation is a pivotal part of the overall strategic process. A good investment appraisal system must mesh with the firm's long-term plan. The managers at plant or division level may not be able to see opportunities at a strategic level, such as the benefits of combining two divisions, or the necessity for business unit divestment. The bottom-up flow of ideas for investment at plant level should complement the top-down strategic planning from the center. Each vantage point has a valuable contribution to make.

- *Budget* Most large firms prepare capital budgets stretching over many years. Often a detailed budget for capital expenditure in the forthcoming year is set within the framework of an outline plan for the next five years. Individual projects are required to conform to the corporate budget. However, the budget itself, at least in the long run, is heavily influenced by the availability of project proposals. The Arnold and Hatzopoulos (2000) survey shows the use of budgets by UK firms (*see* Table 4.1).

TABLE 4.1
Capital expenditure budgets for UK firms

	Small firms	Medium-sized firms	Large firms
	%	%	%
Outline capital expenditure budgets are prepared for:			
1 year ahead	18	8	–
2 years ahead	18	25	13
3 years ahead	35	50	18
4 years ahead	9	–	5
More than 4 years ahead	21	13	61
Blank	–	4	3
Detailed capital expenditure budgets are prepared for:			
1 year ahead	70	79	55
2 years ahead	21	13	21
3 years ahead	9	4	8
4 years ahead	–	–	5
More than 4 years ahead	–	4	11

Note: 96 firms completed the survey questionnaire.
Source: Arnold and Hatzopoulos (2000)

Appraisal

It is at the appraisal stage that detailed cash flow forecasts are required as inputs to the more sophisticated evaluation methods, such as net present value. Manuals provide detailed checklists that help the project sponsor to ensure that all relevant costs and other factors have been considered. These manuals may explain how to calculate NPV and IRR and may also supply the firm's opportunity cost of capital. (If risk adjustment is made through the discount rate there may be more than one cost of capital and the sponsor then has to classify the project into, say, high, medium or low risk categories – see Chapter 5.) The project promoter may seek the aid of specialists, such as engineers, accountants and economists, in the preparation of the formal analysis.

Report and authorization

Many firms require that project proposals are presented in a specific manner through the use of capital appropriation request forms. These detail the nature of the project and the amount of finance needed, together with the forecasted cash inflows and the NPV, IRR, ARR or payback. Some analysis of risk and a consideration of alternatives to the proposed course of action may also be required.

Expenditure below a threshold, say £100,000, will gain authorization at division level, while that above the threshold will need approval at corporate level. At head office a committee consisting of the most senior officers (chairman, chief executive, finance director, etc.) will meet on a regular basis to consider major capital projects. Very few investment proposals are turned down by this committee, mainly because these project ideas will have already been through a number of stages of review and informal discussion up and down the organization, and the obviously non-viable will have been eliminated. Also, even marginally profitable projects may get approval to give a vote of confidence to the sponsoring management team. The alternative of refusal may damage motivation and may cause loss of commitment to developing other projects. If the senior management had had doubts about a proposal they would have influenced the sponsoring division(s) long before the proposal reached the final report stage. In most cases there is a long period of consultation between head office and division managers, and informal pressures to modify or drop proposals can be both more efficient and politically astute ways of proceeding than refusal at the last hurdle.

Implementation

Capital expenditure controls

Firms must keep track of investment projects so as to be quickly aware of delays and cost differences compared with the plan. When a project is authorized there is usually a specified schedule of expenditure, and the accountants and senior management will keep a watchful eye on cash outflows. During the installation, purchasing and construction phases, comparisons with original estimates will be made on a periodic basis. Divisions may be permitted to overspend by, say, 10 percent before a formal request for more funds is required. A careful watch is also kept on any changes to the projected start and completion dates. Deviations from projected cash flows can be caused by one of two factors:

Senior management will keep a watchful eye on cash outflows.

- inaccuracy in the original estimate, that is, the proposal report did not reflect reality perfectly;
- poor control of costs.

It is often difficult to isolate each of these elements. However, deviations need to be identified and explained as the project progresses. This may permit corrective action to be taken to avoid further overspending and may, in extreme circumstances, lead to the cancellation of the project.

Post-completion audit

Post-completion auditing is the monitoring and evaluation of the progress of a capital investment project through a comparison of the actual cash flows and other costs and benefits with those forecasted at the time of authorization. Companies need a follow-up procedure which examines the performance of projects over a long time span, stretching over many years. It is necessary to isolate and explain deviations from estimated values.

Table 4.2 shows the extent of the use of post-competition audits by UK companies.

TABLE 4.2

Replies to the question: 'Does your company conduct post-audits of major capital expenditure?'

	Small %	Medium-sized %	Large %	Composite %
Always	41	17	24	28
Sometimes/ on major projects	41	67	71	59
Rarely	12	17	5	10
Never	6	–	–	2

Note: 96 companies responded to the survey.

Source: Arnold and Hatzopoulos (2000)

There are three main reasons for carrying out a post-completion audit:

- *Financial control mechanism* This process helps to identify problems and errors evident in a particular project. A comparison with the original projections establishes whether the benefits claimed prior to approval actually materialize. If a problem is encountered then modifications or abandonment may be possible before it is too late.
- *Insight gained may be useful for future capital investment decisions* One benefit of auditing existing projects is that it might lead to the identification of failings in the capital investment process generally. It may be discovered that data collection systems are inadequate or that appraisal methods are poor. Regular post-completion auditing helps to develop better decision-making. For instance, past appraisals may have paid scant regard to likely competitor reaction; once recognized, this omission will be corrected for in all future evaluations.
- *The psychological effect* If potential project sponsors are aware that implemented proposals are monitored and reviewed they may be encouraged to increase their forecasting accuracy. They may also be dissuaded from playing 'numbers games' with their project submission, designed to draw more resources to their divisions or pet schemes unjustifiably. In addition, they may take a keener interest in the implementation phase.

Senior management must conduct a careful balancing act because the post-completion audit may encourage another sort of non-optimal behavior. For instance, if managers are judged on the extent to which project outcomes exceed original estimates, there will be a tendency to deliberately understate the forecast. Also, if the audit is too inquisitorial, or if it too forcefully apportions blame for results that are only partially under the control of managers, then they may be inclined to suggest only relatively safe projects with predictable outcomes. This may result in a loss of opportunities. Ideally, regular post-completion reviews are needed, but many firms settle for an audit one year after the asset has been put in place. This may be inadequate for projects producing returns over many years. Some firms do manage an annual review of progress, and some even go as far as monthly monitoring during the first year followed by annual reviews thereafter. Many projects involve only minor commitment of resources and are routine in nature. The need for post-completion auditing is not as pressing for these as it would be for strategic projects requiring major organizational resource commitment. Given the costs involved in the auditing process, many firms feel justified in being highly selective and auditing only a small proportion. Another reason for not carrying out a post-completion audit in all cases is the difficulty of disentangling the costs and benefits of a specific project in a context of widespread interaction and interdependence.

Conclusion

The typical student of finance will spend a great deal of time trying to cope with problems presented in a mathematical form. This is necessary because these are often the most difficult aspects of the subject to absorb. However, readers should not be misled into thinking that complex computations are at the center of project investment in the practical world of business. Managers are often either ignorant of the principles behind discounted cash flow techniques or choose to stress more traditional rule-of-thumb techniques, such as payback and accounting rate of return, because of their communicatory or other perceived advantages. These managers recognize that good investment decision-making and implementation require attention to be paid to the social and psychological factors at work within an organization. They also know that formal technical appraisal takes place only after a long process of idea creation and development in a suitably nurturing environment. There is also a long period of discussion and commitment forming, and continuous re-examination and refinement. The real art of management is in the process of project creation and selection, not in the technical appraisal stage.

Managers are often ignorant of the principles behind discounted cash flow techniques.

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