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Managing Investments in Information Systems and Technology

The applications portfolio will include a range of different IS/IT investments that have been identified as new developments or significant enhancements to existing systems. Before resources are assigned and development begins, several other steps need to be taken, including establishing the expected benefits of the investments, justifying the costs of the systems, technology and business changes involved and allocating priorities to individual developments across the portfolio. These decisions can all be aided by reference to application portfolio analysis, which provides a straightforward way of understanding the nature of the contributions expected from investments in relation to current and future business strategies. As was discussed in Chapter 8, organizational IS competencies in relation to establishing effective investment appraisal processes, setting priorities and delivering the benefits expected are key ingredients of successful IS/IT strategic management. Using the competency framework to assess organizations' overall IS capability often reveals major weaknesses in these areas. In particular, planning for and managing the benefits and the business changes essential to realizing them is cited as a continuing failing in many organizations.[1] Having a strategy is only a means to an end— delivering the business results required from the strategy is the main objective.

This chapter tackles some of the main issues relating to decision making and management of IS/IT investments:

- justifying investments in information systems and the associated technology, using various ways of assessing benefits;
- determining priorities, taking into account the range of economic

and other types of business benefit, resource constraints and logical factors of precedence;

- processes for managing the realization of the expected benefits;
- assessing the risks of the investments based on the characteristics of the application and the approach to its management.

INVESTMENT AND PRIORITY SETTING POLICIES

Investments in systems and technology compete with alternative investments such as buildings, plant, equipment, research and development (R&D) and advertising, for the organization's funds. IS/IT investments have traditionally been evaluated like capital projects such as plant and equipment assuming a fixed cost offset against net revenue over the life of the application. However, many modern applications are more like 'new business ventures' or business initiatives where the financial aspects of the outcome can only be guessed and the technology is only one component of a major change program. There is no simple answer to the question: on what basis should IS/IT investments be assessed against other investments? However, it is important that some general rules are established, within which applications and supporting technology requirements are evaluated. Otherwise, any strategy will be distorted over time by inconsistent, even arbitrary, decision making.

If the organization was able to develop, at any one time, all the applications demanded, inconsistent evaluation would not really matter. The overall return on IS/IT investment might be very poor, but at least the worthwhile would get done as well as the worthless! However, in most cases not all demand can be satisfied and priorities must be set. If no consistent justification approach is followed, the more beneficial applications may well be deferred, allowing those that make a lesser contribution to proceed. Assuming that does not mean an opportunity completely forgone, which may occur with delay, the resources and funds invested will have provided a poorer return than could have been achieved—hardly good management practice!

An obvious conclusion from the above is that the same principles and practice should govern the 'go–no go' decisions for individual applications and deciding priorities across applications competing for resources. The only additional factor, assuming that systems are not sequentially dependent, is the amount of resource consumed. The limiting factor is normally people, in quantity or quality (particular skills or knowledge), but the same logic applies whatever is the limiting resource (e.g. finance)—priority setting should enable maximum return from the use of that resource.

EVALUATING IS/IT INVESTMENTS

Much has been written about how investments in IS/IT should be assessed and justified. There is little, if any, consensus on how it should be done, but considerable consensus that the methods used are rarely appropriate! Several surveys have shown that there is still virtually no consistency in the practices used. Cooke and Parrish[2] discovered that 70% of organizations had no formal justification and post-implementation review process for IS/IT investments. Farbey *et al.*[3] found that only 50% of IS/IT projects were subject to formal preinvestment appraisal; in less than half the cases was a recognized financial analysis technique used, and in barely 30% was the outcome of the investment evaluated. They, like many others, suggest that given the wide variety of types of IS/IT investment and the wide range of benefit types, which can be quantified to greater or lesser degrees, a multiplicity of methods for justifying investments is needed. But, they recognize that selecting the right approach in any situation can itself be fraught with organizational and political problems.

Other analyses by Ballantine *et al.*[4] and Willcocks and Lester[5] suggest that traditional financial analysis techniques are still commonly in use, but that organizations are finding it increasingly difficult to use them as the types of benefit become more difficult to quantify adequately. Hochstrasser,[6] Peters[7] and Symons[8] all suggest ways in which different techniques can be used to evaluate different types of project. Interestingly, Lincoln and Shorrock[9] found that many successful 'strategic' IS/IT projects had bypassed the normal justification process used in the organization. Overall, organizations are far from satisfied with the techniques and processes they have for IS/IT investment appraisal—only 36% felt they were adequate in a survey[10] of major UK corporations.

Grindley[11] summed up the mistrust of conventional justification methods in two insights from his survey:

- 83% of IT directors admit that the cost–benefit analyses supporting IT investment proposals are a fiction;
- quote from a CEO: 'It's like there is a spontaneous conspiracy to exaggerate the benefits.' Many others would agree, no doubt!

A number of good papers on this subject are included in a book edited by Willcocks, entitled *Information Management: The Evaluation of Information Systems Investments*.[12] The approach described here is taken from one of the chapters of that book, but the authors recognize there is considerable merit in many of the other methods proposed. Farbey *et al.*'s book *IT Investments: A Study of Methods and Practice*,[13]

for example, provides a detailed assessment of the issues involved and how different approaches to evaluation are needed to accommodate them.

A pure technology investment cannot strictly give a return on investment, unless it replaces an older technology and carries out the same functions more efficiently. Most technology investments are justified on the back of applications. Even if capacity and infrastructure components have to be purchased in advance of the need, the justification should be primarily based on their subsequent use in business applications and the resulting benefits. However, it is often difficult to associate all infrastructure investments with the subsequent benefits of using applications, even where sophisticated capital cost recovery accounting techniques are used. More comprehensive approaches to developing the case for investing in infrastructure are considered in Chapter 11.

Another point of evaluation logic, which is perhaps peculiar to IS/IT investments, is the way in which particular costs and benefits should be treated. Most accounting evaluation practices are conservative, expecting the worst and mistrusting the best. Raw IT costs have been reducing at 25% per annum for some 25 years, and this is difficult for accounting procedures to accept when evaluating systems with 5, 8 or 10-year lives. This changing reality of running costs of systems over time must be allowed for where shared resources are used. It is important to take a realistic (even marginal) view of the costs rather than a theoretical one. Equally frequently, the full costs of 'development' are not included. Normally, the IS function and procurement costs for hardware, software licences and purchased services are estimated in some detail, but costs incurred by business departments in specifying, testing and implementing the system are rarely included adequately.

On the other side of the coin, identifying and quantifying the benefits of any system can be a difficult, even impossible, task, as suggested above. In their book, Parker *et al.*[14] assess in detail the ways in which information and systems benefits accrue and how they can be quantified to help in justifying investments. They consider three main types of application:

1. *substitutive*—technology replacing people with economics being the main driving force, to improve efficiency.
2. *complementary*—improving organizational productivity and employee effectiveness by enabling work to be performed in new ways;
3. *innovative*—achieving a competitive edge by changing trading practice, creating new markets, etc.

They suggest ways in which each of the different types of application should be justified and define five basic techniques for evaluating benefits:

1. *Traditional cost–benefit analysis*, which allows for efficiency improvements in organizational processes resulting from automation (e.g. automating invoices and sending them electronically to customers via e-commerce, saving labour and data entry costs for all parties).
2. *Value linking*, which estimates the improvement in business performance, not just savings made, from improving the linkages between processes or activities (e.g. automatic reconciliation of orders, invoices and payments to enable accounts staff to spend more time resolving customer queries and issues, leading to fewer bad debts and less dissatisfied customers); or interactive component design with suppliers via a shared Computer-Aided Design (CAD) system, to reduce the number of iterations needed.
3. *Value acceleration*, which considers time dependence of benefits and costs in other departments of system improvements (e.g. giving sales data to buyers on a daily basis, improving their ability to respond to changes in demand and negotiate more effectively with suppliers). This implies that benefits can occur in other parts of the business, not just where the system is actually implemented.
4. *Value restructuring*, which considers the productivity resulting from process and organizational change and change of job roles (e.g. information-intensive tasks such as forecasting and planning can often only be improved by a combination of better systems and a change in organizational responsibilities).
5. *Innovation evaluation* attempts to estimate the value to the business of new business or new business practices levered from IS/IT (e.g. the launch of an online banking service may change the company image and attract new types of customers).

The above categories of benefit evaluation are suggested to be related to their application types and the portfolio classification, as shown in Figure 9.1. There are also obvious similarities with the benefits derived from different levels of IT-induced transformation described in Chapter 1.[15] By analysing costs and benefits using these techniques, the overall 'economics' of an application can be assessed. The ideas are certainly more creative in interpreting information's long-term value than traditional accounting views of systems investments.

Although it is important to quantify and express in financial terms as many of the costs and benefits as possible, it is simply not feasible to express all the benefits of 'systems' in financial terms, and it serves no useful purpose to develop spurious calculations to quantify the unquantifiable! If a new system will reduce staff frustration and stress by organizing policy and procedure information in an electronic library, accessible

	Substitutive (efficiency)	Complementary (effectiveness)	Innovative (competitive)
1. Cost/Benefit	✔	✔	✔
2. Value linking	✔	✔	✔
3. Value acceleration	✔	✔	✔
4. Value restructuring		✔	✔
5. Innovation evaluation			✔

<———— Support ————>   <——— High potential ———>

<———————— Key operational ————————>

                    <———— Strategic ————>

Figure 9.1   *Relationship between benefit types and the application portfolio*

from every desktop via an Intranet, it is difficult to calculate all the benefits financially even after the event, let alone before it has happened. However, as will be seen on page 442, it is important to determine in advance how any intended benefit will be measured. In this case, a staff survey could be an appropriate measuring instrument, along with measures of absenteeism or turnover to determine the overall effect.

   What is more important is to base the assessment of application investments on the overall nature of the contribution they are expected to deliver to the business. The portfolio approach can offer help in making such judgements. The rationale for developing applications or investing funds and resources in each segment of the matrix is different, therefore the evaluation process should be different. The arguments used to justify a prototype system to model customer online buying behaviour are not the same as those used to justify a replacement of the general accounting system. Equally, response to a competitor's online service, which is causing customer attrition, and a decision to bring together data from disparate applications in a data warehouse require different approaches to evaluation. The risks and consequences of failure in the various segments are also different. This can be allowed for by requiring

a higher predicted rate of return where the risk is higher, although this may in turn merely lead to creative accounting for the benefits! It is perhaps better to analyse the inherent nature of the risks and take appropriate action to deal with them, as far as possible, as will be outlined later.

The portfolio approach suggests that:

- Quantified, financial justification of applications is easier in the key operational and support quadrants, where most aspects of the application will be better known or can be determined, risks are lower and the rate of change is slower.
- A singular approach to investment justification will tend to produce one type of application to the exclusion of others. This argument is particularly strong where a scarce resource approach has been adopted and pure financial return on investment decides investment priorities—support applications will always be easier to justify financially.
- The way in which applications are planned and managed by the organization will also affect the way in which they are justified— whether they are customer-related applications integral to achieving business objectives or systems intended to save major costs in one part of the organization.

Figure 9.2 highlights some of the key points to be considered in the evaluation of applications in each segment.

Support Applications

The main argument for such systems is improving efficiency, which should be possible to quantify and convert into a financial argument for investment. Additional arguments may revolve around system and technology obsolescence and general staff productivity/time saving, and these may be difficult to identify accurately and therefore to quantify. In this segment, it is reasonable to expect potential benefits to be estimated before resources and costs are incurred to identify the most economic solution within the benefits achievable.

Again, if the application is competing with others for the limited resource, then a support application must show a good economic return for the allocation of a scarce resource. If, however, the project can be carried out within the user department's control, then it is reasonable that, since the budget or funding is under local control, the 'go–no go' decision is made by local user management. The IS/IT investment is an alternative use of funds to other investments locally and is not

STRATEGIC	HIGH POTENTIAL
Enable the achievement of *business objectives* via explicit critical success factors £	R&D project to explore potential value and cost - fund from R&D budget *Risk money* £
Disadvantage/Risk if it is not done *(critical failure factors)* and/or quantified performance improvement £	Net cost reduction through *quantified savings* £
KEY OPERATIONAL	**SUPPORT**

£ extent to which benefits can be justified financially

Figure 9.2   *Investment justification*

competing with alternative use of scarce IS/IT resources. It is to be hoped that user management will expect the case to be argued in predominantly financial terms, but if not that is their responsibility.

In summary, assuming a scarce resource strategy is being adopted centrally for most support applications, then any allocation of that resource should be argued on economic, return-on-investment grounds primarily. At the same time, some discretion can, without great risk, be left to local management via a free-market strategy.

Key Operational Applications

While, as far as possible, all costs and benefits of a new development, redevelopment or major enhancement to a key operational system should be converted to a financial evaluation, this may not allow for all the arguments involved.

For support systems, it was suggested that benefits should be estimated before any resource is allocated or costs determined. This is inappropriate for key operational applications, where financial benefits are not the only

driving force. The most economic solution in the short term may not be the most effective over the long term given the role such applications play in the core business processes. This is the area for strict 'feasibility study' to find the best solution from a range of alternatives, each with differing costs, benefits and risks.

The business may suffer a serious disadvantage if a system fails or becomes less adequate in meeting the business needs as they evolve. It might be worth spending more to achieve a more adaptable or integrated solution that meets a range of needs more effectively and upon which new strategic applications can be built. Normally, this will increase the cost and make the overall benefits difficult to express financially. Some of those additional benefits will be able to be related to critical success factors (CSFs), which provide a clear link of the investment to the achievement of business objectives. An argument often used is 'what will happen to the business if we do not invest in improving this key-operational system?' and therefore 'can we afford the risk of not doing it?' Perhaps the term 'critical failure factor' is more appropriate when considering the possible disadvantages of not investing.

The implementation strategy that works best for key operational systems is monopoly, which implies a central control and vetting of all applications and enhancements. This enables a standard checklist of questions to be considered in the evaluation of any new project. Factors that are important (other than economic return) from either a business or IS/IT perspective can be allowed for and, if necessary, changed over time. The monopoly approach should also avoid implementing solutions based solely on economic expediency rather than business benefits, although it may mean that a particular application may cost more in the short term.

In conclusion, it should be stressed that, for key operational systems, the business unit management should be the final arbiter. It is their business that will suffer by lack of investment and they should (provided they can afford to pay) be allocated the necessary resource to meet such systems needs. It is clearly untenable to allow competitive disadvantages to develop due to lack of investment in IS/IT.

Strategic Applications

The fact that an application is deemed strategic implies that it is integral to achieving aspects of the future business strategy. Obviously, it is important to cost the investment and, where possible, put figures to the potential benefits, even if the latter are only ranges or orders of magnitude, not estimates suitable for a discounted cash-flow calculation. However, the main reasons for proceeding are likely to remain mainly

non-financial—expressed as the business opportunity that is being created or the CSFs that the application specifically addresses.

The strategy most appropriate for this part of the matrix is central planning, whereby IS/IT opportunities and threats are being considered along with the business issues and strategies. Hence, an application will get the 'go–no go' decision based on how directly it relates to the business objectives and particular strategies. The benefits will derive from achieving those objectives by enabling the required business changes, not from the system alone. Whether this will actually happen is partly a question of luck (that the target does not move), partly of judgement (the quality of business acumen of senior managers) and partly good management of the application development and associated business changes.

A key issue is whether the management team, steering group or whoever makes such decisions is unified in endorsing the project and that the 'organization' deems the investment worthwhile. The critical factor is then resourcing the task sufficiently to achieve the objectives in the optimum timescale. This may need repeated senior management intervention to ensure that both user and IT resources are made available. The budget for such investments and financial control of actual expenditure should perhaps reside with the steering group to ensure that progress and resourcing are centrally monitored as well as planned.

High Potential Applications

The very essence of high potential projects is that the benefits are unknown and the objective is to identify the benefits potentially available and how they could be achieved. It should be justified on the same basis as any other type of R&D, and preferably from a general R&D budget rather than IS/IT funds. In practice, where the money comes from— R&D budget or IS/IT or user budgets—is important, but not critical. What does matter is not pouring money down the seemingly bottomless pit that R&D can become, if not properly monitored. It must be remembered that many high potential ideas tend to arise informally, based on individuals' creative thinking, rather than from formal planning, and it is important not to stifle creativity through excessive bureaucracy. However, many of the ideas simply will not work! and some control is essential to avoid significant waste of resources. It can be argued that many e-commerce/e-business investments in 2000–2001 could have benefited from better evaluation of their potential, before large sums were spent on IT implementations that were based on incorrect assumptions and little, if any, objective assessment of their potential value.

The idea of 'product champions' to be responsible for such projects, given a budget against agreed general terms of reference to deliver results or otherwise, is the most effective way of initiating and managing the high potential stage in application life cycles. No investment should stay in this segment for too long or have too much money spent on it. When initial allocations are used up, further sums have to be justified based on the evidence of the possible benefits, not just allocated in the vague hope of eventual success.

This approach fits the leading-edge and free-market strategies for the experimentation and assessment that high potential applications need. However, it should be obvious that those responsible for ensuring that central planning works for strategic applications must be aware of what is being evaluated in the high potential segment and by whom and over what timescale.

The above approaches to application justification in the various segments may lack the precision ideally required. But, this is no more than is true of other investments in research and development, advertising, reorganization, building new plant or facilities, or launching new products and services. IS/IT investments should be considered just as objectively and just as subjectively as other business investments. The portfolio approach allows the balance to vary according to the expected contribution required.

SETTING PRIORITIES FOR APPLICATIONS

As mentioned earlier, the mechanisms used to decide whether or not applications go ahead should also be used to set priorities across applications when they cannot all be done in parallel. Some priorities are logical—Project B, for analysing customer data, cannot proceed before Project A has built the data warehouse, for example—but many are largely independent of one another.

It is important to introduce a consistent, practical approach to priority setting if any strategy is to be implemented successfully. Short-term business pressures will change, projects will not proceed as planned, resources will not be available as expected, new opportunities and requirements will emerge. Each of these can cause changes to priorities and, unless a consistent rationale is employed, 'crisis management' will repeatedly override the strategy. Priorities need to be set in the short term to enable the best use of resources within the acquisition lead time for further resources, assuming these are actually obtainable. Priority setting is at the core of effective strategic management—selecting the best investments to pursue and, perhaps even more importantly, those to defer or

abandon. Inadequate mechanisms for agreeing priorities are a significant cause of organizational failure to deploy IS/IT successfully.

Based on the earlier discussion of application evaluation, it should be seen that setting priorities across applications of a similar type (i.e. support, key operational, etc.) is not too difficult. After ranking them on similarly expressed benefits, the remaining parameter to optimize is the resource use. It is also prudent to modify the final ranking by consideration of the ability to succeed, to ensure that not just high-risk projects are tackled, resulting eventually in no achievement! Risk can either be allowed for as contingencies in cost and resources, or by reducing the expected benefits, or, in some cases, both. How risk can be assessed is considered later in this chapter.

Hence, three factors need to be included in the assessment of priorities:

- *What is most important to do*, based on the benefits identified.
- *What is capable of being done*, based on the resources available.
- *What is likely to succeed*, based on the risks of failure of each investment.

Hochstrasser[16] suggests a way of calculating a 'project priority value' that includes an assessment of 'potential barriers' to achievement of the benefits. He also classifies project types according to their strategic nature and whether the benefits can be aligned closely to the system itself or due to complementary improvements.

Within the *support* segment, setting priorities should not be too difficult. Those with the greatest economic benefit that use the least resources should get the highest priority. This will encourage users to express benefits financially and look for resource-efficient solutions, like software packages, to obtain a priority. Most organizations are experienced in delivering support applications and, consequently, they tend to be relatively low risk. The main consequence of failure is money wasted rather than major business problems, hence any more detailed priority assessment should be based on the relative financial risks of the investments.

Within the strategic segment, the basic rationale is to give priority to those applications that will contribute most to achieving business objectives, and use the least resources in the process. To assess this, some form of simple decision matrix, like that shown in Figure 9.3, can be useful in assessing the relative strategic contribution or weighting of the competing projects. Each application should be explained in terms of the degree to which (high, medium or low) it is relevant to achieving each of the critical success factors. It produces a 'score' or value for each potential investment based on the level of expected contribution to the current objectives.

	APPLICATION CONTRIBUTION		
	HIGH (3)	**MEDIUM (2)**	**LOW (1)**
OBJECTIVE A: CSF 1 CSF 2 CSF 3, etc.			
OBJECTIVE B: CSF 1 CSF 2, etc.			
OBJECTIVE C: CSF 1 CSF 2, etc.			
OBJECTIVE D: etc.			
TOTALS			

OVERALL TOTAL [ ]

Figure 9.3 *Strategic weighting via critical success factors*

It should be noted that, while CSFs cannot be weighted (by definition), the various business objectives can be ranked to indicate relative strategic priorities.

Like all decision-support tools, it should not be used mechanistically: a score of 25 is not necessarily better than 24, it means they are about equally important. Again, by dividing the 'score' by the quantity of limited resources required, the overall contribution from the options available can be maximized, especially in the short term.

Often, the benefits from strategic IS/IT investments are uncertain and depend on future events, making priority setting even more difficult. To address this issue, a number of researchers have proposed *real options analysis* as an alternative approach more appropriate to the nature of

some IT investments, especially major infrastructure investments.[17] Essentially, an option is the right, but not the obligation, to act at some future date. The choice whether or not to act is dependent on specific situations occurring in the future, but it is usually uncertain as to which of the potential situations will actually happen. By taking an option (i.e. making an IT investment today), the possibility is provided to take some action(s) in the future when less uncertainty exists. While real options can be used to make investment decisions, the approach is more helpful in making choices among investment options available. In relation to the portfolio, the approach is best used for strategic and high potential applications where future uncertainty can be expressed in terms of different scenarios that can be subjected to 'what-if'-type assessments.

Working with a mid-sized Austrian auto parts manufacturer, Taudes *et al.*[18] applied real options to the problem of deciding whether to migrate from SAP ERP system R/2 to R/3. Even though the initial set of applications to be run under R/3 were the same as currently running under R/2, the real options analysis demonstrated that the future opportunities to introduce applications based on EDI, workflow management, document management and e-commerce justified the introduction of R/3. The higher implementation costs could be related to higher future benefits and the additional value provided by R/3 could be explained.

Setting priorities among key operational systems is more complex than support, but involves less uncertainty than strategic applications. The arguments for (i.e. benefits of) key operational investments will essentially comprise:

- financial;
- critical success factors (either directly or by enabling strategic developments);
- risk to current business (critical failure factors);
- infrastructure improvement.

Each of these benefit areas must be given some form of relative weighting based on the current business situation, to decide the preferred mix of benefits before looking at resource constraints. Then, the costs and/or resources used by the project should be compared against its relative importance in each of the four categories to establish overall priorities. Economic benefits are straightforward, and business objectives can be assessed via CSFs. The view of 'infrastructure' implies providing adequate technologies or improving the organizational capability to utilize its IS/IT, or enhancing specific competencies to improve the future business contribution from IS/IT. Risk to current business could be assessed by describing 'what risks are run if the project does not go

ahead', which should be expressed in terms of the impact on the business, its probability of occurrence and an assessment of when the risk might arise. Applications scoring highly in all four categories are obviously higher in priority than those scoring highly in one, two or three categories, and those at each level in the ranking using fewer resources get priority. It is a subjective method, but it does allow for the strategic, financial, business and IS/IT perspectives to be included.

Buss[19] makes an important observation concerning, as he says, the 'misconception' that 'a steering committee can decide the priorities.' In general, he suggests, politics will interfere, representation in discussion will be unbalanced and the only common ground will end up as economics! He says the best way to set priorities is to make them the product of a formal planning process at corporate or business unit level. The mechanisms to be employed can be agreed by a steering group, but it should not be implemented as a meeting-based process.

Hochstrasser[20] argues that these mechanisms must be applied consistently across all projects, or the priority setting process will remain arbitrary and chaotic.

High potential applications are difficult to prioritize and will tend to be driven somewhat in the reverse of strategic applications: what resource is available to do it and then which application might best employ that resource? As discussed in Chapter 7, high potential applications are often 'individually' driven, a champion usually exists; it is the secondary resources that are the problem. While it sounds wrong to suggest that 'he who shouts the loudest' or 'has the most influence' will obtain priority, in this segment it may be the best way to allow priorities to be set because:

- the results will depend not just on the value of the idea, but also on the force with which it is pursued;
- setting objective priorities on scant evidence is not very reliable anyway.

If the idea potentially impacts many CSFs, it clearly stands out from others and should be elevated above the general scramble for R&D-type resources. In the discussion below, high potential applications are not considered as being in competition for IS/IT funds, but are funded from R&D general budgets. But, of course, they may well compete for key skills or resources.

The remaining task is to set priorities across the segments of the portfolio to decide how much resource to devote to the different types of application. This is not simple since the rationale for investment in each is different, as shown above. However, the approach recommended for key operational applications can be extended to cover the whole portfolio. Strategic applications will score heavily on CSFs, whereas

Table 9.1   *Examples of effect on weighting of various factors (High, Medium, Low)*

FACTOR	Objectives/ CSFs	Business risks	Infrastructure	Economics
1. All types of investment have to be cost-justified to meet strict ROI hurdles	L	L	L	H
2. Business is in weak position or in decline—short-term profitability	L	M	L	H
3. Business is in a high-growth market and satisfying the market demand is paramount	H	H	M	L
4. Environment is very competitive and business performance must be improved	H	H	L	M
5. Need for redevelopment of old systems. Systems and/or technology are out of date compared with competitors or peer organizations	L	H	H	M
6. New systems are required to support major business/organization change or rationalization	M	H	M	L
7. Technology cost performance enables lower costs for existing systems if redeveloped	L	L	H	H

support applications should deliver a good financial return. Management must decide the weighting they wish to attribute to each type of benefit and then rank the systems.

The relative weighting given to each will depend on a number of factors, a few of which are listed in Table 9.1. In general, the greater the confidence senior management have in their business strategy and collective judgement, without the need to be reassured by figures, and the trust they have in the competencies of business users and IT professionals in developing effective systems, the greater the weighting that will be given to CSFs, etc., relative to financial aspects. In a way, this is a sign of maturity of the organization regarding how it plans and manages IS/IT as described in Chapter 3. It also tends to reflect the relative strength of the enterprise within its industry: the stronger the position, the fewer IS/IT investments are expected (like other investments) to prove an economic case in advance.

If the overall plan is developed and maintained in a priority sequence, that reflects the ratio of benefits to be achieved (adjusted for risk) to the limiting resource consumed, then it helps both in short and long-term planning decisions because:

- resources can be reallocated where necessary from lower to higher-priority applications on a rational basis, with the agreement of line managers;

- appropriate resourcing levels for the future can be set, and action taken to obtain the right type of resources to meet the demands, based on a full understanding of the benefits achievable.

It is quite possible then to produce a 'planning system', that should keep the plans and resource utilization up to date. It is important to disseminate the current plan to all involved to aid understanding of the reasons for the relative ranking of any particular project. Mystery or uncertainty are far more destructive of strategies than the discussion and reconciliation of real problems.

Again, the above arguments may lack the precision ideally required for setting priorities. Much subjective judgement is inevitably involved, but 'rules' for inclusion of the relevant factors can be established, to avoid each priority decision being made on a different set of criteria.

BENEFITS MANAGEMENT

One of the factors that differentiates successful from less successful companies in their deployment of IS/IT, according to a number of surveys,[21] is the management resolve to evaluate IS/IT investments before *and after* they occurred. A survey of approaches to managing IS/IT benefits in 60 major organizations[22] revealed that only 26% of the companies always reviewed projects after completion to determine whether benefits were delivered—a finding in line with earlier surveys. However, as with previous surveys, most respondents believed that their organization's investment appraisal processes were not appropriate for the types of investment being undertaken, and 45% admitted overstating the benefits to gain approval, in the full and certain knowledge that no evaluation would be made after implementation! In the same survey, 76% of organizations believed there was significant scope for improvement in managing the benefits of IS/IT projects, but only 10% had any defined process as a basis for management action to deliver the benefits on which investments are justified.

There is limited value in any sophisticated system of investment evaluation and priority setting unless the 'system' is examined in terms of whether or not it delivers the business improvements required. Some form of post-implementation review must be carried out on a high percentage of projects to identify whether (i) they were carried out as well as possible and (ii) whether the benefits claimed (or possibly different benefits) were achieved or not. While preinvestment appraisal and post-implementation review are obviously important, they are essentially one-off 'snapshots' of the situation and, hence, insufficient in terms of
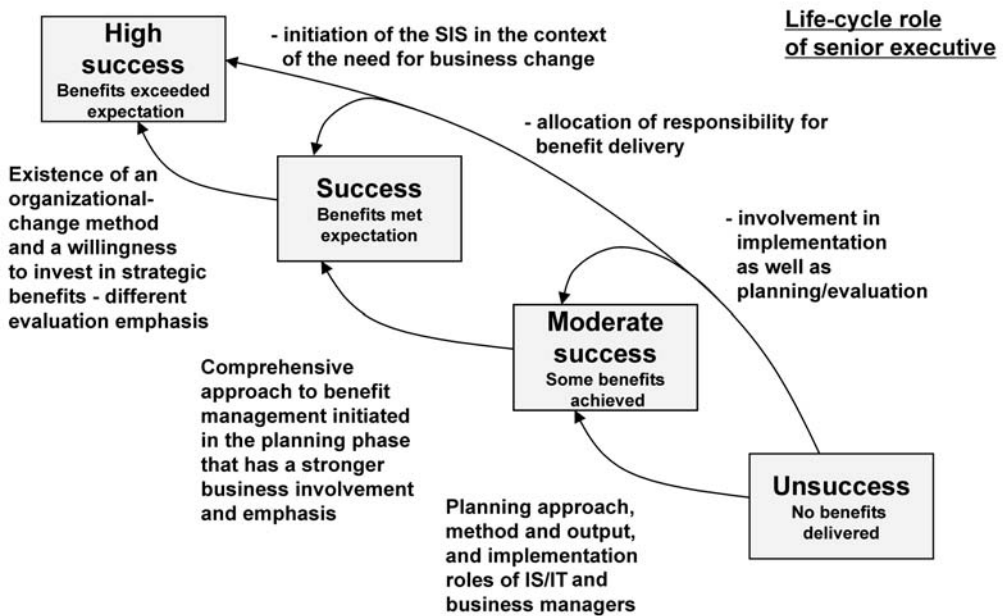
Figure 9.4 *Factors increasing the degrees of success in strategic information systems*

the actions needed to ensure that the maximum benefits available are delivered.

In a detailed study of 11 strategic IS/IT investments (varying in cost from £5m to £100m) across a range of industries,[23] a number of factors that differentiated success from failure were identified. While some were already well known (e.g. involvement of senior management throughout the project life cycle), the successful investments were characterized by a deliberate, comprehensive approach to managing the benefits and allocation of responsibilities to line managers for benefit delivery (see Figure 9.4). In addition, in highly-successful projects, management treated the IT investment as a component of organizational change and were able to use existing change management processes to ensure the business maximized the value of the IT investment through associated changes to business practices.

What is also clear from surveys and the study above is that it is becoming increasingly difficult, given the types of systems being implemented, to predict all the benefits that can be delivered. That increases

the importance of having a process that actively addresses the management of benefits throughout the investment's life. In particular, any post-implementation review should focus not only on what has happened in terms of delivered benefits but should also consider what further benefits could now be gained. These issues prompted an extended research program at the IS Research Centre, Cranfield School of Management, in collaboration with major UK-based organizations, to develop new approaches to improving IS/IT benefit realization. Key aspects of the approach resulting from that work, and now in use in over 100 organizations, are described below. A Wentworth Research report[24] described the approach as one of the few that comprehensively addressed the range of management issues associated with maximizing actual benefits delivered.

The Context of Benefits Management

A major IS/IT development will consist of a large number of activities in business areas and the IS function. Any particular development will also rely upon an ongoing set of organizational competencies that enable new systems to be devised, implemented and operated successfully. These are not just technology competencies but also business competencies in defining its information and processing needs, managing the changes that are required to gain benefits from the technology and using the systems successfully. In essence, therefore, any major IS/IT development will consist of the mix of activities for which best practices and relevant methodologies have been developed over the last 30 years.

Systems development methodologies such as SSADM (Structured Systems Analysis and Design Methodology), DSDM (Dynamic Systems Development Methodology) and SSM (Soft Systems Methodology) are processes and methods designed to ensure that the right system is developed in the most appropriate way to agreed quality and performance requirements.

Project management methodologies like PRINCE (Project Management in a Controlled Environment) are essential for managing the activities and resources associated with a project to deliver the system and complete the other tasks to agreed times and costs. Most organizations now recognize that this is a shared responsibility between business and IT management. Ultimately, it is the business that suffers the real consequences of poor project management and business project managers are often appointed for major IS/IT investments, although their roles and responsibilities are not always clear.

As stated above, few organizations have a complementary process focusing on identifying and managing the business benefits required.

Often, this is seen merely as part of the investment appraisal approach to enable a valid business case to be developed. The results of the R&D program described above suggest that investment appraisal should be considered as one event (albeit an important one!) within an overall process that can be defined as:

> *Benefits Management: the process of organizing and managing such that potential benefits arising from the use of IT are actually realized.*

It would seem most appropriate that the business project manager should be responsible for this particular set of activities. The ability to achieve benefits from a particular investment will depend largely on the organization's experience and knowledge of what types of benefit IS/IT investments can or cannot deliver and how they can be obtained.

Based on the different objectives and rationale for the applications in each segment of the application portfolio, it can be seen that the mix of activities and their criticality to success will vary. Strategic applications imply that significant business changes will need to be made in association with the new system to create the desired advantage. Equally, understanding and defining the benefits required will need considerably more innovative thinking than, say, buying a new accounting package. Figure 9.5 summarizes the generic sources of benefit for the different segments in the matrix. These align closely with the 'information economics' concepts discussed earlier in this chapter.

While the Benefits Management process is applicable across the whole portfolio, its value increases as the issues associated with delivery of benefits become more complex. The inputs to the process provide a first understanding of the range of tasks involved. They essentially ask three questions:

- Why is the investment being made—what is causing the organization to change and how critical to its future is the successful management of the changes? (*the benefit drivers*)
- what *types of benefit* is the organization expecting from the investment overall—to reduce costs, improve operational performance, gain new customers, create a new capability, etc.? These need to be understood in general terms before detailed analysis of potential benefits in relation to the extent of change required is undertaken.
- How will other activities, strategic initiatives, business developments or organizational issues affect the particular investment either to facilitate or inhibit its progress and outcome? (*the organizational context*)

STRATEGIC	HIGH POTENTIAL
Business innovation and change **Business process restructuring**	**(R&D projects)**
Business effectiveness **Business rationalization and integration**	**Business efficiency** **Process elimination and cost reduction**
KEY OPERATIONAL	SUPPORT

Figure 9.5   *Generic sources of benefit for different applications*

An assessment of these inputs provides the background to setting objectives for the project and to identify the key stakeholders and their potential role in and influence on the project. The Benefits Management process then enables the relationship between the enabling technology and changes to processes, structures and working practices to be assessed, in combination, to identify the best way of realizing the maximum set of benefits from the investment.

Since the purpose of any IS/IT investment is to deliver improvements to business and/or organizational performance, it would seem logical that the main 'process' around which others should fit is benefits management, rather than the project management, investment appraisal or systems development approaches. These should be adapted to match the types of change involved in the investment and the range of benefits expected to be achieved. Figure 9.6 summarizes the context of the Benefits Management process described below.

THE BENEFITS MANAGEMENT PROCESS

In considering the activities required to manage the delivery of benefits, it has been assumed that the IT-based system is delivered to specification
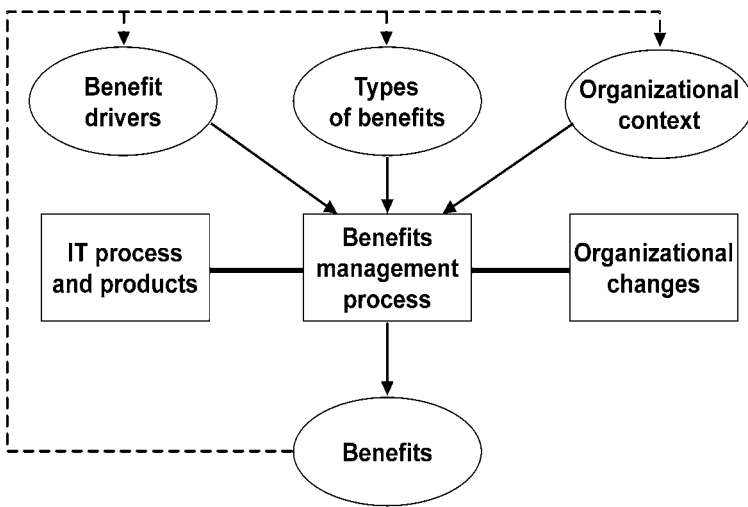
Figure 9.6   *Benefits management context*

(i.e. the technical part of the development is successful). However, as the benefits management process proceeds, it may cause revision to the specification, and it is assumed that effective change control processes can deal with this. The other related set of activities are organizational changes of many types that have to be made to deliver the benefits. The benefits management process should be the driving mechanism for these change activities. How to bring them about in detail is addressed in the wealth of change management and organizational development literature.

   The model proposed here for a benefits management process draws heavily on total quality management philosophies and incorporates a number of tools and techniques from different sources to address particular aspects. The five steps in the iterative process are described in outline in the following subsections (see Figure 9.7). Each stage is considered in overview from the viewpoint of the business management roles and responsibilities, and key tools and techniques are briefly described. This description is a summary of the *Best Practice Guidelines*[25] developed for organizations to utilize the process.

Stage 1: Identification and Structuring of Benefits

Based on the outcome of the strategy processes, the overall business rationale for a new or improved system will have been identified: the nature of the types of target benefit and extent of change involved to
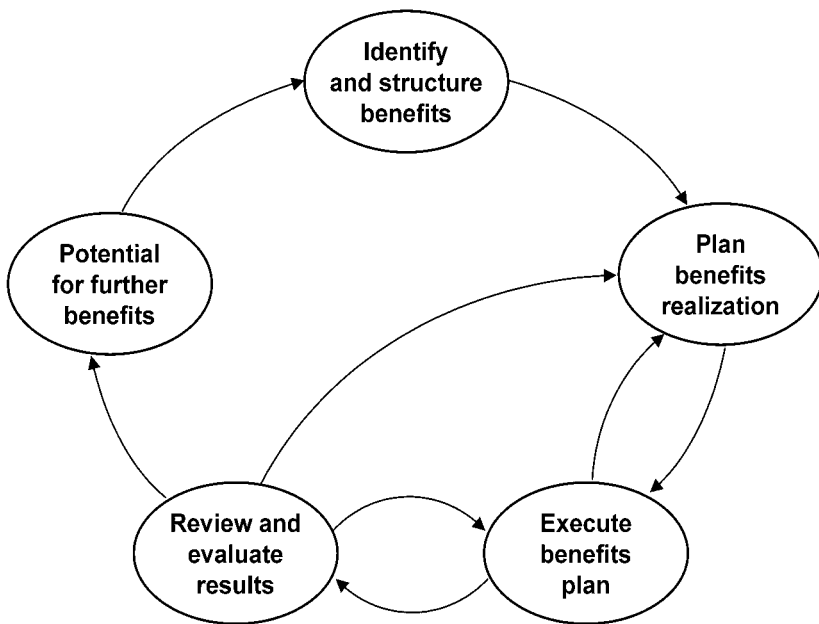
Figure 9.7   *A process model of benefits management*

obtain them will depend on their impact and criticality for the business strategy which in turn determines whether the system is strategic, key operational or support, as described in Chapter 7. If the nature of the benefits and/or how to obtain them is unclear, then the system should be put through the R&D stage implied by the high potential segment until they are better known. Hence, the whole benefit management process does not really apply to the high potential segment, but some of the techniques can be used to enable the benefits to be identified or assessed in terms of how best to achieve them.

Identifying the target benefits implies an iterative process of establishing the investment objectives and the possible business performance improvements that the system and associated changes should or could deliver. The achievement of each objective could well deliver a variety of different benefits across the organization and also to trading partners and customers: customer service improvements in one area could produce new marketing or selling opportunities; productivity gains in administration may release resources for 'front-office' activities. The process is inevitably iterative since objectives may be modified and new benefits identified as ideas and options are considered in the 'creative' stage of

discussion, or perhaps rejected after more careful scrutiny. The benefits should also be tested against the 'benefit drivers' in the organization (i.e. the business strategy), to ensure they are relevant and that investment to achieve them will be endorsed by senior management.

All business performance improvements are measurable, and hence so are all the benefits delivered by information systems. Some can be measured directly in relation to the system (e.g. staff headcount reductions due to automation, decrease in product rejects due to quality control data, reduction in stock levels through a warehouse control system). Many of these can also be easily converted into financial values; where this can be done, it should be, to enable an economic appraisal to be made. In other cases, the measurement may be less direct. Better timing and control of deliveries should lead to more satisfied customers, which in turn may lead to increased sales or at least avoiding lost sales due to delivery problems. The level of customer satisfaction will need to be measured and some estimate made of the business benefits of improved delivery. These quantified benefits may not, however, be suitable to undergo rigorous discounted cash-flow calculations. In essence, every target benefit should be expressed in terms that can, in due course, be measured, even if the measure will be subjective (e.g. customer or staff opinion). These measurable improvements will be reviewed in Stage 4 of the process.

As an example, Frito-Lay,[26] the snack-food manufacturer, decided to equip its sales/delivery force with hand-held computers. The prototype system showed that this saved about three to four hours of administrative effort each week. The sales managers were asked to decide what that time saving could deliver as a benefit. It was agreed that each sales/delivery person should be able to increase their sales by between 3% and 10% per week, given the increased selling time available and their different customer mixes. This became one of the target benefits to be delivered by the system, and after implementation this was measured. An average of 6%, over and above general market growth, was achieved.

The final part of this stage is the determination of where in the business (or even in trading partners) each benefit should occur and, hence, who in the organization should be responsible for its delivery. This is a logic often overlooked in bringing in new systems, but 'ownership' of each of the benefits and clear allocation of responsibility for delivery is essential to success. This is easy to identify if the system is mainly within one function or area of the business, but it is more difficult when the system crosses functions, and especially when reorganization and rationalization of tasks across functions are integral to the delivery of benefits. Responsibility may have to be shared, but then this must be made explicit. Given that a manager is made accountable for the delivery of each of the

intended benefits, any benefits lacking such ownership are removed from the list!

In most organizations, given that the investment could now be costed, etc., an investment proposal would be put forward at this point, but that should not happen until after Stage 2.

Stage 2: Planning Benefits Realization

Having identified and allocated responsibility for benefits to individuals (or perhaps teams), the next step is to determine the changes required for delivery of each benefit and how the IS/IT development will enable the changes and benefits to occur.

The output from this activity is described as a *benefit dependency network*, which relates the IS/IT functionality via the business and organizational changes to the benefits identified. Developing such a 'cause–effect' network is again an iterative process best conducted in a workshop mode, since, as changes required are identified, a network of interrelating changes and dependences will evolve, and the feasibility of achieving some of the benefits will be questioned. Equally, further benefits may well be identified. The overall structure of such a network is depicted in Figure 9.8, showing its two main components: the benefits and objectives that argue the case for investment and the change management plan required to achieve them. The changes are of two types—business changes and enabling changes—which can be defined as:

- *Business changes* are those changes to working practices, processes and/or relationships that will cause the benefits to be delivered (or begin to be delivered). They cannot normally be made until the new system is available for use and the necessary enabling changes have been made; for example, allocating more sales time to potentially high-value leads, identified by the new system, requires the system and perhaps other enablers to be in place.
- *Enabling changes* are those changes that are prerequisites for making the business changes and/or are essential to bring the new system into effective operation. These often involve defining and agreeing new working practices, redesigning processes, changes to job roles and responsibilities, new incentive or performance management schemes, training in new business skills, etc. (as well as the more obvious training and education in the new system). They can often be made, or have to be made, before the new system is introduced (e.g. agreeing a new sales account management and incentive scheme to ensure rewards reflect the attention to high-value customer needs).
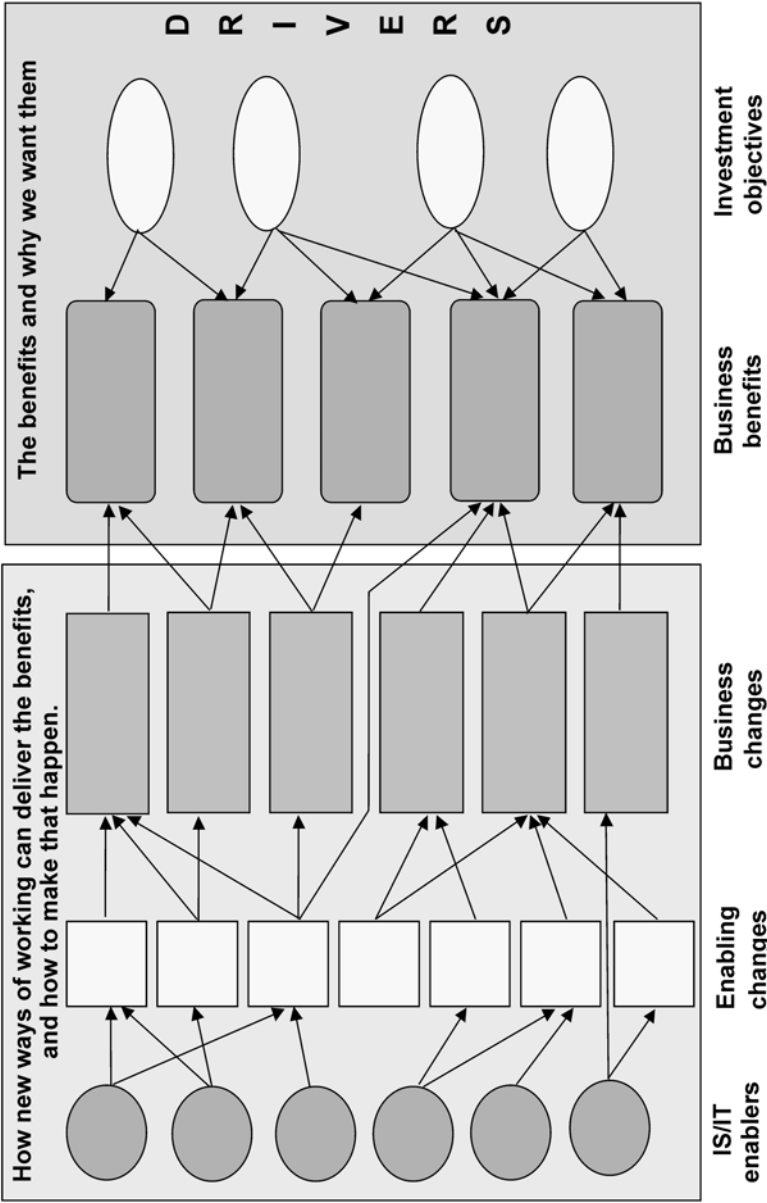
Figure 9.8   *Benefits dependency network*

As with the benefits, the ownership and responsibility for each change has to be identified and agreement reached on how successful achievement of the change will be determined.

Before the network and resulting benefits plan can be finalized and a sound business case proposed, a thorough *stakeholder analysis* is required to check the feasibility of achieving all the changes (and hence benefits) on the network. The purpose of stakeholder analysis is to understand those organizational (and possibly customer or supplier) factors that will affect the organization's ability to achieve the required improvements. The first task is to establish who all the stakeholders are with respect to the investment—this is often seen simplistically as whoever is paying for it and the IT specialists! In reality, anyone affected by the system or the process of development is a stakeholder, and the view they take of the investment may influence the outcome. It may have been possible to identify all the relevant stakeholders at the start of the project and involve them in creating the network, but this is not always feasible and an analysis of stakeholder issues is needed.

The main objective is to address the 'what's in it for me?' problem of IS/IT investments. Often, projects fail because of the lack of cooperation of parties who were not considered material to the system's success, but whose ability or willingness to accept change or otherwise is essential, requiring their active cooperation in delivering the real business improvements required. At the same time, potential 'disbenefits' of the system should be considered (i.e. what adverse impacts on the business, organization or particular stakeholder groups may result). Some of these may be deemed unacceptable, and the objectives or scope of the system should be revised or actions put in hand to ensure that these disbenefits are avoided. No one wants nasty surprises at the end of the implementation. So, as far as it is possible, these should be anticipated and avoided by action during the development process. The analysis should also enable stakeholder views, which might cause potential negative effects and hence risks, to be identified and dealt with through other actions. The additional actions identified become further 'enabling changes' that should be added to the network.

There are a number of techniques for carrying out a stakeholder analysis, but the one that fits most closely with the benefits management approach is an adaptation of an assessment technique devised by Benjamin and Levinson.[27] Figure 9.9 shows an example of the use of the technique.

Each stakeholder group is considered in terms of the extent to which they perceive the project produces benefits for them, relative to the amount of change they will have to undergo or endure before they see the benefits. Some form of resistance can be expected if they perceive the

Stakeholder group	Perceived benefits (disbenefits)	Changes needed	Perceived resistance	Commitment (Current and Required)				
				Anti	None	Allow it to happen	Help it happen	Make it happen
Customers	Configuration tailored exactly to needs - no testing / reject	None	None			C — Action required? → R		
Sales and marketing managers	Improved customer service and product quality image	New incentives to get sales reps to use system with customers	Reluctance to change reps reward systems		C — Action required? → R			
Sales representatives	(Extra work in preparing requirements and quotes)	To use system and improve quality/accuracy of quotes	No time available to use/learn system. Loss of autonomy	C — Action required? → R				
Manufacturing/ Logistics	Removes need for configuration checking. Less returns/queries	Stop current checks to put onus on reps to get it right	Do not trust sales reps' accuracy in requirements/ quote	C — Action required? → R				
IT developers	New advanced system - remove old difficult to maintain system	Skills in expert system development	None					

Based on a project to implement an expert system for Product Configuration

Figure 9.9 Stakeholder analysis (source: *after Benjamin and Levinson*)

changes outweigh the benefits and if they have to endure significant change for no benefit. That resistance could cause major project risks. Based on the current positioning of each stakeholder and the required level of resources or support they are needed to provide, an action plan to move their perceptions or deal with their concerns can usually be devised. However, in some cases, the gap may be too great and the ambitions for the project reduced to enable at least some of the benefits to be realized. Whether substantial additional action is justified, or it is better to reduce the investment scope, depends on the number and value of the particular benefits that the stakeholder resistance may affect.

The other reason for the analysis of stakeholder interests is to consider aspects of business change outside the particular project and the possible implications on achieving the benefits. For instance, other business initiatives, reorganization and possible changes in key stakeholders may have a significant impact. The purpose of assessment is to obtain ownership and buy-in of relevant individuals and groups, and to identify organizational factors that will enable or disable the achievement of the benefits, or otherwise significantly affect the outcome. Figure 9.10 shows an example of part of an actual benefit dependency network for a successful CRM project.

The essence of the first two stages of the process can be summed up as a series of questions that have to be answered in order to develop a robust business case for the investment and a viable change management plan to deliver the benefits. These questions and their relationships are shown in Figure 9.11. Only when this assessment has been completed and the feasibility of achieving the target benefits thoroughly tested should a business case requesting funding for the IS/IT investment be developed.

Presenting the Business Case

How the case for investment has to be described to senior management will depend on the processes and procedures in the organization. However, based on the research, a format for presenting business cases was developed that has proved to be more appropriate than many others—based on its adoption in many organizations. Figure 9.12 outlines the basic format and logic of the argument for investment. The case should start with the context within which the need for investment in change has arisen—the drivers. The objectives for the investment—the situation that should exist on a successful completion—linked to the specific business drivers causing investment should follow. The benefits should be expressed in tabular rather than list form showing (a) how they arise (the columns) and (b) how explicitly they can be stated in advance (the rows).
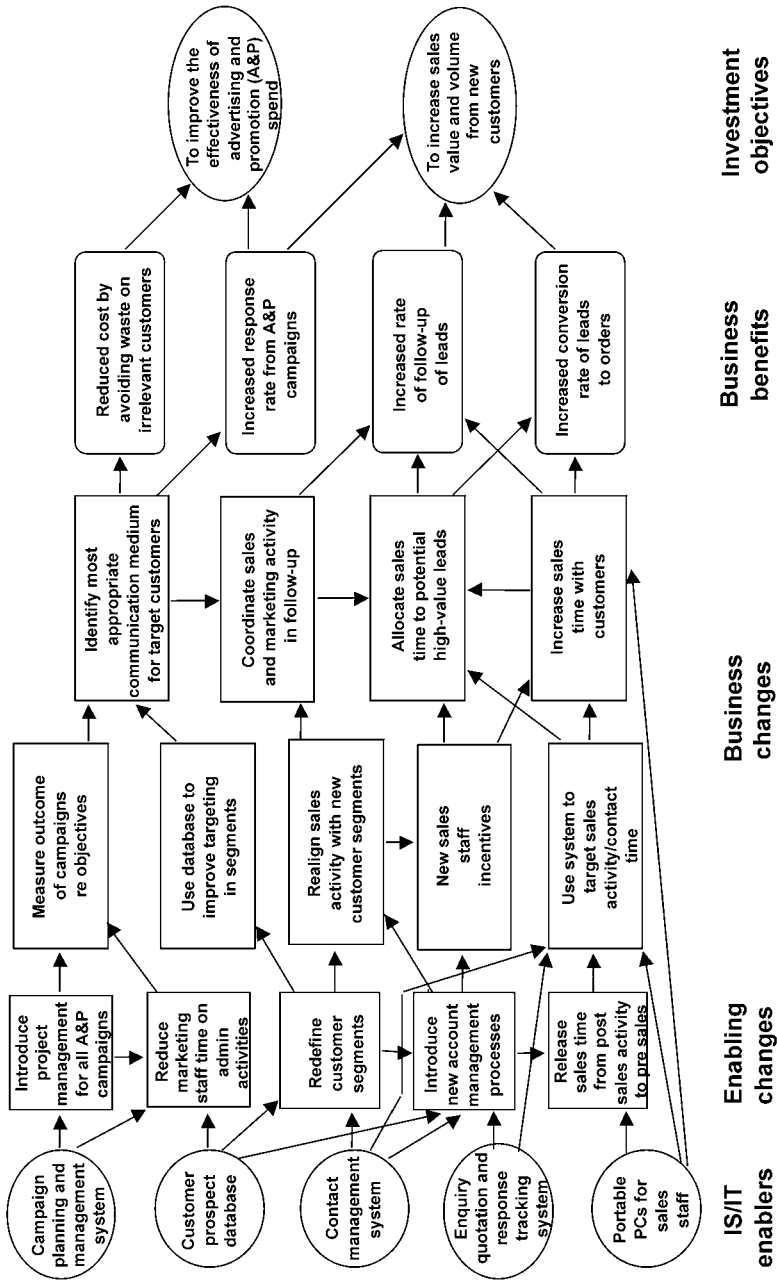
Figure 9.10 Example of (part of) benefits dependency network—sales and marketing system

| IS/IT enablers | Enabling changes | Business changes | Business benefits | Investment objectives |

To improve the effectiveness of advertising and promotion (A&P) spend

To increase sales value and volume from new customers

Reduced cost by avoiding waste on irrelevant customers

Increased response rate from A&P campaigns

Increased rate of follow-up of leads

Increased conversion rate of leads to orders

Identify most appropriate communication medium for target customers

Coordinate sales and marketing activity in follow-up

Allocate sales time to potential high-value leads

Increase sales time with customers

Measure outcome of campaigns re objectives

Use database to improve targeting in segments

Realign sales activity with new customer segments

New sales staff incentives

Use system to target sales activity/contact time

Introduce project management for all A&P campaigns

Reduce marketing staff time on admin activities

Redefine customer segments

Introduce new account management processes

Release sales time from post sales activity to pre sales

Campaign planning and management system

Customer prospect database

Contact management system

Enquiry quotation and response tracking system
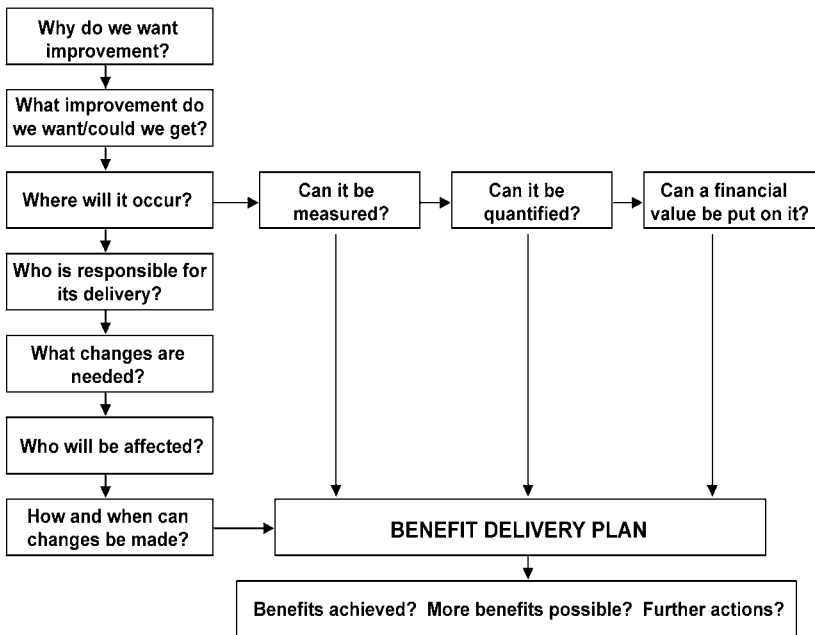
Portable PCs for sales staff

Figure 9.11   *The dimensions of benefit management*

The structuring of the benefits into columns based on whether they result from innovation (doing new things), performance improvements (doing things better) or reducing or eliminating unnecessary activities (stop doing things) may appear simplistic, but it increases the understanding of the nature of the changes that create the benefits.

The structure of the rows needs some further explanation. In constructing the network and benefits plan, every benefit needs to be attributed with a measure or measures to define how its delivery will be assessed. These may be specific, objective measures (i.e. it is *measurable*) or informed, subjective assessments (i.e. it is *observable*). Both imply sufficient is known about the current situation that it will be feasible to assess how much the situation has improved following the changes. This is, however, insufficient to justify spending large sums of money!

Quantifiable benefits are those for which sufficient evidence or data exists to forecast how much improvement should result from the changes. For example, eliminating a cause of delivery failure to customers will reduce customer complaints (due to that cause) to zero. To quantify
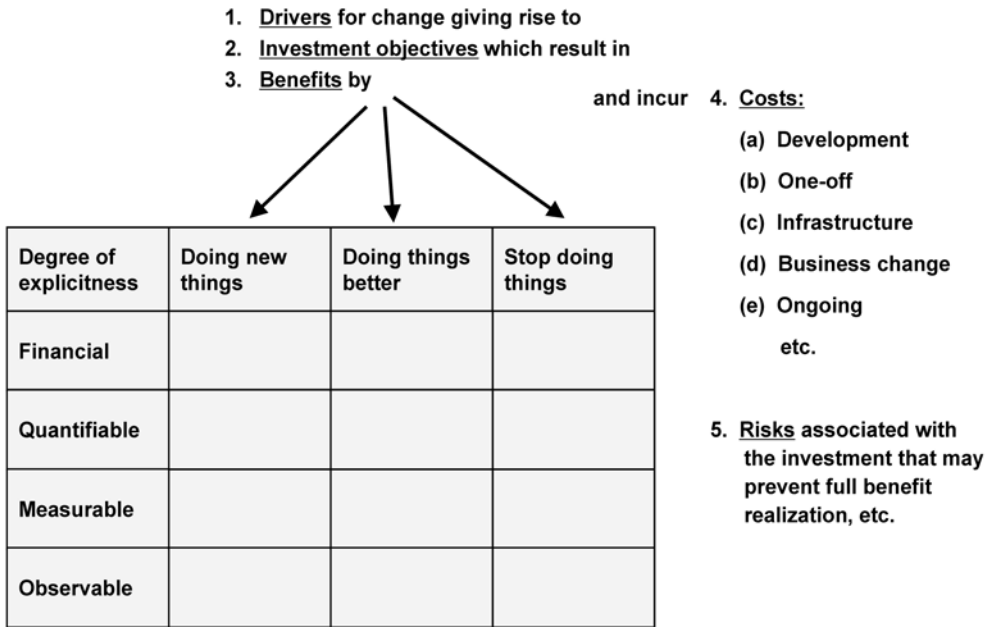
1. <u>Drivers</u> for change giving rise to
2. <u>Investment objectives</u> which result in
3. <u>Benefits</u> by

and incur   4. <u>Costs:</u>

(a) Development

(b) One-off

(c) Infrastructure

(d) Business change

(e) Ongoing

etc.

Degree of explicitness	Doing new things	Doing things better	Stop doing things
Financial			
Quantifiable			
Measurable			
Observable			

5. <u>Risks</u> associated with the investment that may prevent full benefit realization, etc.

Figure 9.12 *The investment proposal—making the case*

many of the benefits may require further work; for example, detailed study of particular activities, introducing new measures of current performance, transfer of experience from similar projects, external benchmarking or modelling of achievable performance improvements or even running pilots or prototypes to test estimates or assumptions about the effects of new ways of working. This is worth the effort if the potential benefit is significant, both to produce a rigorous, arguable business case and to reinforce the importance of the business change activities in the benefits plan. Once the levels of improvement can be calculated or estimated, some of those benefits should be able to be expressed *financially* by multiplying by a unit cost or value. Using the above example: delivery failures may have led to customer attrition and the value of lost business can be calculated, plus the additional cost saving associated with dealing with returns and redelivery.

This reflects normal approaches to evaluating benefits, but gives a more explicit structure for their expression and forces more rigour across the range of benefits. If there are no quantifiable or financial benefits that can be explicitly described, then either the investment is

not viable or the project is still high potential at this stage and further R&D work is needed.

Support applications would be expected to produce financial benefits in the 'do better' and 'stop' columns, since they address well-known tasks and activities. At the opposite end, strategic investments should produce new ways of doing business, the benefits of which are more difficult to quantify and express financially in advance as discussed earlier, as well as a range of 'do better' benefits, which may often be expressed financially. Key operational applications should produce a range of benefits in the 'do better' column, some in the 'stop' and even a few in the 'new' column.

The rest of the business case is more traditional: detailed costings for the investment and a high-level risk assessment identifying reasons why the benefits might not be realized, as well as actions to reduce or mitigate the risks, or contingencies included to accommodate them. Risk assessment and management is discussed in more detail later in the chapter.

Stage 3: Executing the Benefits Plan

As with any plan, the next stage is to carry it out and adjust it as necessary, as issues arise affecting its achievement. Monitoring progress against the activities and deliverables of the benefits plan is just as important as for the IS/IT development plan, and the two plans are components of the overall project plan. It may be necessary to establish interim targets and measures to evaluate progress toward key milestones or the final implementation. It is the business project manager's responsibility to decide what action to take in terms of reviewing the scope and specification of the system or its business justification. During this stage, further benefits may also be identified, and again the business project manager should decide on appropriate action to plan for the benefit or defer it until Stage 5. Equally, it may become apparent that intended benefits are no longer feasible or relevant and the benefits plan should be modified accordingly, along with any consequent reduction in the IS/IT functionality. Factors outside the benefits plan itself such as changes in the organization or problems in meeting the requirements at the intended cost will, of course, initiate reviews of the project deliverables and plan and, in turn, cause a reassessment of the benefits plan and even the business case.

Stage 4: Reviewing and Evaluating Results

Once the new system, business changes and the benefits plan have been implemented, there must be a formal review of what was and was not achieved. This evaluation has two purposes:

- to maximize the benefits of the particular investment;
- to learn how to improve benefits delivery from future investments.

All comprehensive project management, systems development and change management methodologies include a review process following implementation, and they should be carried out prior to the benefit review. The results of those assessments may provide explanations for the non-delivery of intended benefits, as well as knowledge to improve the management of future projects or systems design. Such post-implementation reviews are often in place in organizations, but tend to be held behind the closed doors of the IS function and are reviews of the implementation process rather than the investment outcome. This review is a business review aimed at maximizing the benefits gained from the particular system and increasing the benefits from future IS/IT investments.

The evaluation should involve all the key stakeholders and focus on what has been achieved, what has not (or not yet) been achieved and why, and identify further action needed to deliver outstanding benefits, if possible. The reasons for lack of benefit delivery may be due to problems in any of the earlier stages, hence they may have to be revisited to correct the situation. Another aspect of this review is to identify any unexpected benefits that have arisen and understand how they came about. This again may prove valuable input to the first stage of the process in future projects.

It is worth stating that any post-implementation review should not become a 'witch-hunt'; it must be an objective process with future improvements in mind, not a way of allocating blame for past failures. If it is seen as a negative process, honest appraisal and a constructive critique of what has happened become impossible and the whole process falls into disrepute or is not carried out.

Stage 5: Potential for Further Benefits

Much of the research referred to earlier has shown that it is often impossible to identify all the benefits of a system in advance.[28] Further benefits often become apparent only when the system has been running for some time and the associated business changes have been made. If, as has been suggested, more benefits are actually identifiable after the event than before it, where there is no review process these will probably never be identified.

Therefore, having reviewed what has happened, it is equally important to consider what further improvement could now be possible as a result of implementing the system and associated changes. This should be a creative process similar to Stage 1, involving the original stakeholders

and any others who may be able to contribute, based on the knowledge now available for new opportunities to be identified and fed into the first stage of a new iteration of the process. If this is not done, many available benefits may be overlooked. If maximum value is to be gained from the overall investment in IT, benefit identification should be a continuing process, from which IS/IT projects are defined. Often, in the past, the project was defined first then benefits were 'created' in order to justify the cost. IS/IT planning should be driven by the delivery of a benefit stream that improves business performance at the optimum manageable rate.

Benefits Management: Summary

In the 1970s, it became clear that the activities involved in the IT aspects of IS development could be brought together into a coherent approach or methodology to improve the reliability and quality and reduce the costs of the process. Most surveys show that two-thirds of IS/IT investments fail to deliver the expected benefits, and one of the reasons for this is that little attention is paid to actually delivering the benefits! Most organizations now recognize that, to get 'value for money from IT', they must actively manage the value component as well as the costs. Understanding the full range of issues involved in achieving the benefits through IT-enabled change is still incomplete. No framework is yet available that will fit the needs of all types of application, the wide variety of benefits they can deliver or the different circumstances within which they must be achieved.

The process described here, including further tools and techniques involved in each stage, was developed by studying what actually happened on a number of major projects in large companies. Some of these were trying actively to manage the benefits, others were not. Using the benefits management approach, it was possible to understand why some projects were more successful than others in delivering benefits. By applying the approach to new projects, it was possible to both avoid the 'loss' of benefits that were clearly achievable and, in most cases, to identify and realize more extensive benefits than had been identified in previous, similar projects.

A secondary outcome of applying the approach is that IT costs can actually be reduced for some investments. In the extreme case, the project is cancelled because no benefits can be delivered! But, more commonly, the essential IT functionality required can be identified more explicitly in relation to the benefits the functionality actually produces, thus eliminating costs that deliver nothing of benefit. It is also possible to reduce the amount of IT functionality deployed by making more changes in business

practices to utilize package software 'off the shelf' or to reduce procedural complexity rather than automate it!

Many organizations have realized that this approach to managing benefits is not peculiar to IS/IT projects and can be used to improve the success of other change programs, business developments and strategic initiatives. Of course, in more and more of these, IT is one of the enablers of change, and many organizations have taken the stance that, apart from infrastructure projects, there are now really no IS/IT projects *per se*—there are only change projects that have significant IS/IT components. As one IT director explained, 'introduction of benefits management improved the business–IT relationship more than any previous initiative, resulting in IT being seen as integral to the business and a major contributor to business performance.'

ASSESSING AND MANAGING INVESTMENT RISKS

As part of the appraisal of investment viability, it is essential to assess the potential risks: both the risks of failing to deliver anything at all and, more commonly, of failing to deliver some or all the benefits. Extensive research into the reasons for information systems investment failure by Lyytinen and Hirschheim[29] suggested that failure can occur in four domains:

1. *Technical failure*—this is clearly the domain of IT, who are responsible for the technical quality of the system and the technology it uses. Technical failure is increasingly less common and is often the cheapest to overcome.
2. *Data failure*—this is a shared responsibility between IS/IT professionals and the users who input the data. Obviously, good design, processing integrity and sound data management practice are the responsibility of IS, but not everything can be legislated for and the effectiveness of business processes and procedures and data quality control fall clearly in the user domain.
3. *User failure*—while some blame for the users misunderstanding the system may accrue to the IS/IT professionals, the primary responsibility for ensuring users are trained to use the system appropriately and to its maximum capability must rest with the business management. A major weakness in many implementations is inadequate training, and many systems become less effectively used over time as staff change and ongoing training investment is insufficient, even non-existent.

The risks that cause failure in these three domains are largely *process* or *content* risks (i.e. risks due to poor understanding or definition of requirements or how they can be satisfied, or inadequacies in the process of development and implementation). Most good software engineering, systems development and project management methodologies have risk assessment and management techniques that, if applied rigorously, can deal with the majority of these causes of project failure.[30]

4. *Organizational failure*—systems may be satisfactory in meeting particular functional needs, but may fail because they do not satisfy the organization overall, due to inadequate understanding of how the system relates to other processes and activities. For example, a budgetary control system specified for and by accountants at the centre may fail to meet the needs of line managers to plan and control different types of business expenditure. Responsibility here clearly lies outside the IS/IT domain and must be shared by line and senior management for not aligning systems with organizational needs.

The Lyytinen and Hirschheim analysis considered only these four domains, but a fifth and increasingly more serious area of failure exists:

5. *Failure in the business environment*—the systems are or become inappropriate to external or internal business requirements due to changing business practices instigated by others, or by not supporting the business strategy adequately, or simply by not coping with the volume and speed of business process needs effectively or economically. The responsibility for this is essentially senior management's, although, without active user and IT input, they cannot be expected to identify or understand the problems, or be able to take action to correct them.

   In a study of 'abandoned projects', Ewusi-Mensah and Przasnyski[31] conclude that economic and technical factors were not major factors in contributing to management decisions to abandon projects before completion. Most were abandoned due to organizational factors such as loss of management commitment and political and interpersonal conflicts (i.e. these are serious areas of potential risk in a project). Interestingly, for the majority of projects they studied, of which 40% were considered 'strategic' and 60% were 'urgent', 85% were not seen as high risk at the start and 64% were expected to deliver considerable benefits. As with abandonment, major investment failure in Categories 4 and 5 above is due to lack of understanding of the *contextual* factors that produce project risks,

or the inability to identify or address emergent issues that introduce risks of not achieving the required outcome. It is these types of factor, inherent in the nature of the objectives of investment or in the organization's ability to manage change, that conventional risk analysis techniques do not adequately address.

The riskiness of IS/IT was brought into sharp focus in the 1990s, with the much-publicized and well-analysed failure of a number of large projects[32] such as those in the London Stock Exchange (TAURUS), the London Ambulance Service, the Performing Rights Society, Prudential Europe's Unite project (which aimed to allow near real-time processing of orders for new policies and pensions via the Internet), and a joint Benefits Agency and Post Office project.[33] Despite all that can be done to bring structure and certainty to the process of information systems developments, they are often still inherently risky adventures at times, as all the evidence of poor success rates confirms. The more strategic IS/IT investments become, the greater the consequence of failure and the more difficult it is to foresee and deal with the range of risks involved. The approach described here is the flip side of the benefits management coin—factors affecting the organization's ability to deliver benefits from a system that technically, at least, works! The purpose in assessing risks is to understand them, such that the investment scope can be amended to avoid them or effective action can be taken before or during the process to deal with them.

The risks of each development need to be assessed in order to improve the chances of success, but management need to understand the relative risks of all the developments in the portfolio in order to set sensible priorities, as mentioned on page 431. This means comparing the risks of strategic, key operational and support applications in a consistent way. (High potential systems are inherently very risky and the R&D approach is used to minimize the consequences of the risk in business and financial terms.)

As described in Figure 9.5, the 'generic' causes of benefit in each of the other segments of the portfolio relate to the degree of business change required in addition to the increasing uniqueness of the system from support to strategic. The assessment approach described here is intended to address the risk factors that are due to the nature and degree of change involved, as well as the organization's ability to achieve those changes. It is additional and complementary to the risk analysis and management techniques, embodied in existing formal methodologies, that should also be used to address more traditional content and process risk factors.

Clearly, from the above, the outcome of change in strategic projects is less certain than in key operational or support, and the organization's

experience in managing the types of change involved in a strategic project is likely to be less than for the other two. It is therefore almost certain that strategic investments will 'score' more highly in any risk assessment relative to, in turn, key operational or support. This 'riskiness' should, of course, be offset by the scale of the benefits that will result if the investment succeeds. How to interpret the risks of projects in different portfolio segments is described later.

The approach builds directly on the creation of a benefits dependency network, which is in essence a cause–effect network of relationships, linking IS/IT functionality via enabling changes to business changes, which, when implemented with that, will deliver measurable benefits in line with investment objectives.

Following the development of the benefit management research, two further research programs were undertaken at Cranfield, to study a number of major IT-enabled change projects. A new framework was developed that identified success factors in each stage of the overall process,[34] and a further program of action research followed to test the effectiveness of the framework on large, complex, live projects.[35] One aspect of this study was to incorporate risk assessment of the change aspects in the framework and evaluate its effectiveness in identifying and addressing those risk factors. Potential factors were identified from both IT and business change literature[36] and classified within four major headings, posed as questions:

A. What kind of change will be involved?
B. How ready is the organization to accommodate the change?
C. How will the organization react to the change?
D. How dynamic is the context within which the change is to be effected?

Under each heading, a number of factors (total 25) provide the basis for assessing probable overall success and identifying particular areas for management attention and action. Box 9.1 describes the factors and the five-point scale used to assess the potential impact of each factor, as well as the degree of overall risk in relation to each of the questions A to D above.

The analysis should be undertaken by the project management team, probably in a workshop mode to gain a consensus view. Having agreed a score on each factor, a summary average score for each category can be calculated. Any individual factor scoring 4 or 5 should cause relevant aspects of the project to be reviewed in order to:

- identify the possibility of changing its scope or the development approach to reduce the risk; or

Box 9.1   IT-enabled change—risk-factor analysis

Factor	*Range*

A.1	Business impact	Marginal — 1 2 3 4 5 → Core

A.2	Degree (scale, scope, size) of change	Low — 1 2 3 4 5 → High

A.3	Pace of change	Gradual — 1 2 3 4 5 → Rapid

A.4	Technology innovation	Familiar — 1 2 3 4 5 → Novel

A.5	Novelty of business solution	Familiar — 1 2 3 4 5 → Novel

A.6	Clarity of vision of intended outcome	Sharp — 1 2 3 4 5 → Vague

Category A: Kind of change	Incremental change — 1 2 3 4 5 → Radical change

B.1	Level of dissatisfaction with the status quo	High — 1 2 3 4 5 → Low

B.2	Strength of drivers and constraints—balance	Positive — 1 2 3 4 5 → Negative

B.3	Business sense of ownership	Strong — 1 2 3 4 5 → Weak

B.4	Agreement on project objectives by key stakeholders	Agreed — 1 2 3 4 5 → Controversial

B.5 Senior management stance

Supportive ← 1 2 3 4 5 → Disinterested

B.6 History of success or failure—track record

High success ← 1 2 3 4 5 → Low success

B.7 Change management capability

Competent ← 1 2 3 4 5 → Weak

B.8 Technology competency and experience

Expert ← 1 2 3 4 5 → Novice

B.9 Project management competency and experience

Competent ← 1 2 3 4 5 → Weak

Category B: State of readiness

High motivation ← 1 2 3 4 5 → Low motivation

C.1 Stakeholder commitment to benefits

Strong ← 1 2 3 4 5 → Weak

C.2 Stakeholder willingness to change

Ready ← 1 2 3 4 5 → Against

C.3 Stakeholder willingness to contribute resources

Willing ← 1 2 3 4 5 → Antagonistic

C.4 Process and systems interfaces

Few ← 1 2 3 4 5 → Many

Category C: Likely reaction

Supportive ← 1 2 3 4 5 → Reactive

D.1 Dependence of objectives on current commercial environment

Low ← 1 2 3 4 5 → High

D.2	Susceptibility to regulatory and legislative changes during project	Low 1 2 3 4 5 High
D.3	Dependence on current management structure	Low 1 2 3 4 5 High
D.4	Dependence on other projects	Low 1 2 3 4 5 High
D.5	Dependence on key personnel	Low 1 2 3 4 5 High
D.6	Appropriateness of internal control mechanisms	Supportive 1 2 3 4 5 Obstructive
Category D: Contextual change		Passive 1 2 3 4 5 Active

- agree actions that can address the underlying cause(s) of the weakness; or
- establish appropriate contingencies to accommodate problems; or
- perhaps all three, in the case of a 5!

If the average for any category is 4 *or* 5 or 50% or more of the category factors are 4 or 5, there is cause for considering whether the investment as intended will succeed. However, the interpretation and alternative courses of action vary according to the portfolio positioning.

Strategic investments are likely to score highly in Categories A and D. Provided this is offset by low scores in Categories B and C and action can be identified per high-risk factor, as above, the project should still be viable. However, if this is not the case, actions should focus on reducing risk factors in B and C by reviewing the change components of the benefit dependence network to reduce the scale, severity or speed of change to make it more manageable. Alternatively, some benefits may have to be forgone or postponed by accepting that not all the changes are

achievable at present. If the project scores highly in Category C, but low in Category B, careful attention should be paid to particular stake-holders' issues to reduce the potential resistance, by focusing on the specific Category C risks identified.

Key operational investments are similar to the strategic projects, except that a high score in A is more serious. Given the potential impact on existing operations, unless all other categories are low, the nature and scope of the proposed solution should be considered carefully, with the objective of finding a lower-risk, alternative way of delivering the set of benefits. Again, it may be possible to address particular risk factors by specified action to reduce the overall 'score'.

Support investments—a high score in Category A, C or D suggests that the project is not support! and its expected contribution should be recon-sidered. The main risk category is C and, if this scores highly, it implies that essential changes will be resisted. While the application can still be implemented, few, if any, of the benefits will actually be realized and attention to the detailed stakeholder concerns and the reasons for them is needed.

This brief overview of this approach to risk assessment and its inter-pretation is intended to demonstrate how it can be used to improve the understanding of why projects can and do fail, but, more importantly, how it directs management attention to aspects it must consciously and explicitly address. The purpose is to increase the chances of success!

This approach is relevant to most IS/IT projects, although some, because of their uniqueness or sheer size, incur additional risks. Griffiths and Willcocks[37] have reviewed such projects and compared relative success and failure in terms of the risks involved.

SUMMARY

The purpose of all investments in IS/IT is to deliver improvements in aspects of organizations' activities. Some may be in response to legislative or regulatory requirements and must be done to avoid breaching laws or regulations. Most, however, are discretionary—the money could always be spent on other things—and IS/IT investments compete for the funds available and, perhaps more significantly, the time and priorities of people in the organization. If the benefits are to be delivered, the commit-ment of resources and skills over an extended period is required.

Most of the literature in the field focuses on 'appraisal', not 'manage-ment'. IS/IT investments are inherently risky, many fail to deliver the intended benefits—some because the benefits were never achievable, others because the risks were not identified or understood and many

because the development was inadequately managed. This chapter has attempted to describe an overall, balanced approach that can increase the chances of success in both identifying and delivering the available benefits.

IS/IT investments are becoming increasingly complex in terms of the way in which they impact an organization's performance. Gaining the benefits from IS/IT is increasingly dependent on changes in business practices, and even in organizational roles and structures. This chapter has dealt with application investments, rather than infrastructure investments, which are considered in Chapter 11. Applications are the primary channel through which infrastructure investments deliver business benefits, other than lower IT costs. Applications, therefore, must explicitly or implicitly justify most of the costs of infrastructure through the benefits they deliver.

Since the applications make different contributions to a business, as described by the applications portfolio, they need to be appraised in different ways. This is well understood, but, as yet, methods of investment appraisal do not adequately reflect this complexity and the subtleties involved. The approach described here offers some practical guidance to the most appropriate ways of assessing the different types of investment.

Priority setting, while allowing for logical precedence of development and key resource availability, should be based on the same principles as investment appraisal to maximize the benefit stream from the plan. Obviously, the delivery of the ideal benefit stream will be affected by the risks of the individual projects. Therefore, the risk assessment process should be driven by the effect of the risks on delivering benefits, based on the nature of the benefits. Most of this is well known, if not always practised successfully. However, what is far from common practice is the proactive management of the benefit delivery itself. A process and related techniques, which have helped address this weakness in many organizations, have been described.

The importance of post-implementation reviews is also emphasized as the means by which organizations can learn from experience, both good and bad, and become more successful with their IS/IT investments. The value of strategic planning is mainly in selecting the right things to do, but poor implementation, which fails to deliver the benefits of these 'right things', can easily negate the value of planning.

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