Module 2 Topic 2: Establishing Objectives & Performance Measures

The previous chapter discussed the way in which projects and corporate strategy are linked. This chapter will address how the project is aligned with the overall corporate strategy, and the measures used in order to ensure it achieves its part in meeting the organisation's goals.

The chapter covers the following topics:

1. Setting Project Objectives
2. The Effects of Change on a Project
3. Measures of corporate change
4. Key Performance Indicators
5. Critical Success Factors

Setting Project Objectives

The management of a project is concerned with ensuring the project achieves the objectives set for it. Generally these evolve out of some form of strategy development process, i.e. strategic programming (see Chapter 1 of this module). For this to happen effectively, realistic project objectives must be set. Developing realistic goals should be done in a proactive manner, not left to emerge somehow in a reactive or ad hoc manner as part of the project development process. Setting clear objectives is essential in reducing the amount of unnecessary risk in the project. Information on the project's progress towards achieving the objectives is a key input to the decision making process for controlling the project. Therefore the objectives must be measurable.

Traditionally the project objectives have been defined in terms of the 'project triumvirate' of time to complete, cost to complete, and adherence to technical specifications (i.e. quality)[1].

> 'In simple terms, the client's objectives are always a combination of the objectives for performance of the completed scheme, for achieving this performance within a named cost or budgetary limit and for getting the project into use by a target date' (Barnes, 1988)

This does not mean that other objectives should not be considered. Objectives for the 'Beatrice' platform, a project to build an oil platform in the North Sea, for example, were listed by Gaisford (1986) as follows:

> '*Primary*
> - Safe
> - Operable
> - Shortest convenient time
> - Minimum achievable cost
> - Economic viability
>
> *Secondary*
> - Reliable
> - Ease of construction
> - Ease of installation
> - Maintainable
> - Minimum operating cost
>
> *Tertiary*
> (depending on circumstances)'

Gaisford continues:

[1] See Module 1, Chapter 1

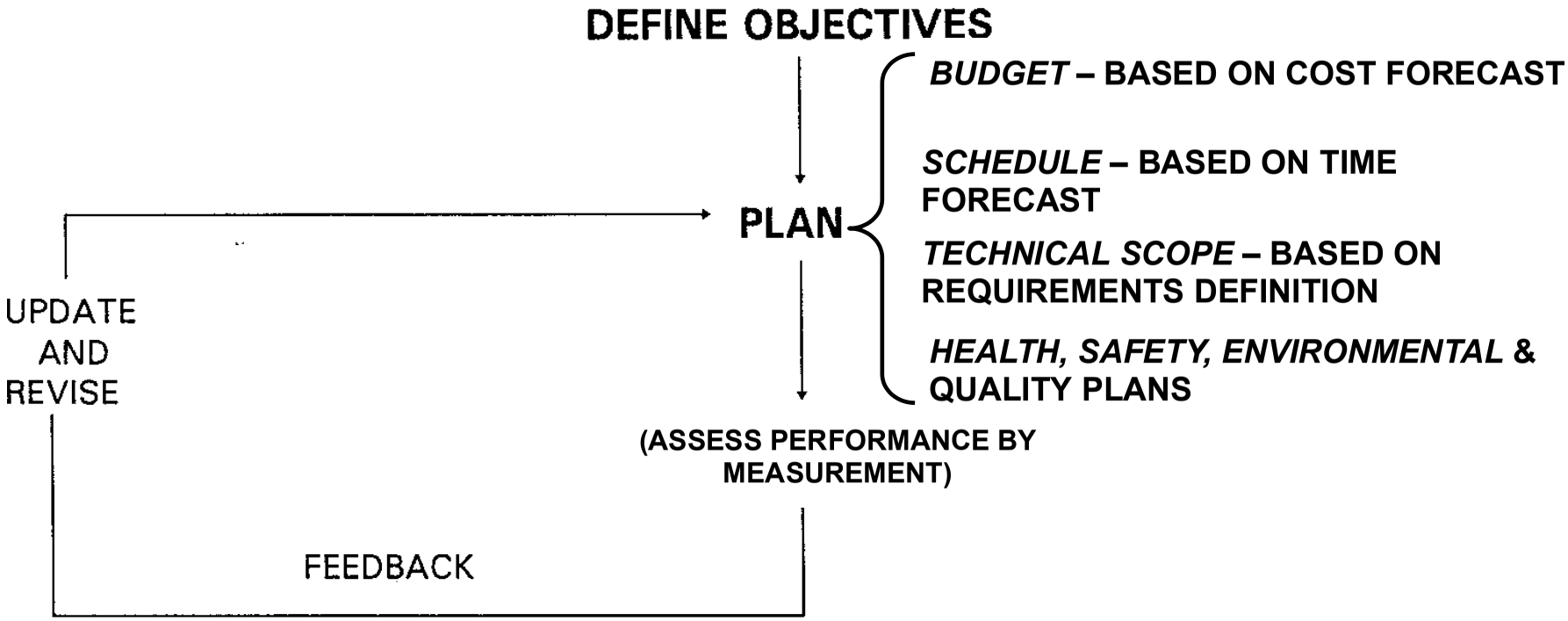

Fig. 2.1 The Control Cycle

NOTE: It is important to realise that quality applies to more than just technical performance, and so is not a synonym for technical performance.

> 'The primary concern at this stage [feasibility] is to produce a safe and operable facility which can be built in the shortest, convenient time to a minimum cost. Other considerations, such as operating costs and reliability, are secondary although, together with a whole host of other considerations, they need to be properly analysed and considered before the final choice is made.'

These other considerations include detailed economic analysis and it is often, in commercial and privately funded projects, these financial analyses that determine how the objectives are set. However, project objectives are also frequently influenced by other considerations than simply 'rational' economic analysis. The issues involved in shaping a space or military project are usually related strongly to factors that will dominate any consideration of cost; research and development projects are likely to be much more open ended in nature than other projects, with several options towards a final solution being pursued simultaneously. Whilst rational economic objectives may appear to predominate in projects, in reality it is the strategic issues that led to the project in the first place that form the objectives.

The list above also points towards the fact that there are internal and external drivers of project objectives. At the top of the list, in this case of a complicated engineering structure, is safety (this will not always be the case, e.g. in a war). Whilst this may be driven from an *internal* desire to ensure that the organisation's people and others likely to be exposed to the processes or outputs of the project (in this example of building and operating the engineering facility) are not subject to risk to their safety, there is also a major external driver for safety to be a primary objective. That external driver is legislation. Other external drivers of project objectives for a major physical facility, in a modern context, will include environmental legislation and environmental pressure groups[2]. These external drivers should have been considered in the corporate strategy formulation work that led to the project, but must be revisited at a more detailed level when formulating the project strategy (see Chapter 3 of this module).

Morris and Hough (1987) demonstrated the great significance that external factors can have on projects. They investigated a number of large projects and identified that unclear project objectives resulted from not adequately addressing external factors. Examples of the factors not addressed are as follows:

The Channel Tunnel, 1960 – 1975
- Nature of the future competition with the ferries
- The lack of the projects control over the rail link from the tunnel to London
- The political environment in which the project existed (in terms of timing of the project in relation to government elections)

Concorde
- The possible difficulty in obtaining airworthiness certification by the aviation safety authorities for such a technically advanced aircraft
- Environmental concerns over the 'sonic boom' generated by the aircraft at supersonic flight speeds
- The likelihood of having difficulty in getting landing rights at major international airports

Advanced Passenger Train
- The degree of media coverage of prototype testing

Thames Barrier
- Institutional factors including client support for organised labour disputes (the client included the Greater London Council of Ken Livingstone), and limited delegated power from the client to their project manager
- Different payment regimes for different sets of unionised labour groups

[2] Legislation and pressure groups bring quite separate influences to bear, to wit the difficulties Shell experienced in disposing of its Brent Spar platform recently, despite complying with environmental legislation.

The Effects of Change on a Project

It is important to reduce uncertainty to the minimum for a project, and setting clear and prioritised objectives is a fundamental part of this process. However, sometimes changes to the objectives become inevitable. That this may happen is not necessarily in itself a bad thing, or a failure of either corporate or project management. Occasionally the environment changes unexpectedly – e.g. new legislation may be introduced; economic conditions may change; business conditions may alter. Such changes may impact on the firm, and its projects, to such an extent that corporate strategy has to be changed and projects either cancelled or their objectives changed to meet the needs of the new strategy. In this situation it may be decided that the best course of action is to complete the project (because some of its objectives are still valid and/or the cost of cancellation would outweigh the benefits of continuing) and accept a revised effectiveness of project (and hence corporate) performance because of the changed objectives. It may also be decided that the objectives for the project should be changed, and the project redefined in order to meet the new objectives. It must be recognised that this course of action will lead to disruption of the project. It is possible that there will be a delay in completion of the project and overspend on the budget, as well as other effects. If this is the case the new objectives must be carefully considered and the outcome on cost and time to the project should be carefully estimated. It is also possible that the project scope may be reduced, or it may become simpler to implement the project. Importantly, the effect of the changes to the project objectives must be assessed in the light of the likely alteration in the operations of the project deliverable, whether it be a physical facility, an organisational change programme, a set of procedures etc. The project must then be reassessed in the light of the new risk factors to ensure that the benefit to the business is worth the disruption to the project.

Figure 2.2 shows how the cost of changes on the project increases dramatically once the project has entered the implementation stages, compared with the much lower cost of change during the concept, feasibility, and design stages. During the early stages fewer people are involved and the decisions made are more strategic in nature. A simple example is a change fed back from the corporate executive, at the concept stage of an organisational change project, to have separate sales and marketing departments instead of a combined one. This will require reworking the project objectives and reassessing the risk associated with the change on the overall project. It can be carried out by a small number of people relatively quickly. This same change, brought into the project during the implementation stages, will require significant amounts of time and resource to adjust the project plan to meet the new requirement. It may also cause demotivation in the project team as work already implemented has to be 'undone' and the new structure put in place.

It is also possible that significant changes in the firm's environment are anticipated, but the exact nature of the change is unknown. Despite this situation the organisation may decide that strategy implementation must continue by starting projects anyway. In this situation the strategy for executing the project must plan for the possibility of change. This may be done by implementing the corporate strategy in smaller projects, with shorter time duration's, or phasing larger projects to achieve much the same degree of flexibility. A programme of projects may also be used to reduce the impact on any one project should change be required. Where physical products are the output of the project PrePlanned Product Improvement techniques may be used which means that planning to incorporate new components/ upgrades in later releases is carried out.. *If change is likely to happen, plan for it*.

Measures of corporate change

As a consequence of viewing the project more holistically (see chapter 1 of this module) it can be seen that project performance measures based primarily around time, cost and quality are not good enough to measure performance when the project is an instrument of corporate change. This concern with the wider aspects of project performance is mirrored by changes in the way firm's measure their corporate performance. Increasingly, corporate performance is being measured *primarily* by the value of the firm (known as value based management – VBM). This is especially important for organisations that have shareholders to satisfy, and are seeking to measure corporate success by the creation of shareholder value. In contrast to the traditional types of historical, factual information collected and analysed by the accounting function within an organisation, VBM includes the measurement of such non-financial variables as market share, customer satisfaction, product defects, research & development and brand perception (Mills et al, 1999). The value that a project contributes to the value of the corporation, i.e. to its shareholders, is likely to dominate the formulation of its objectives.

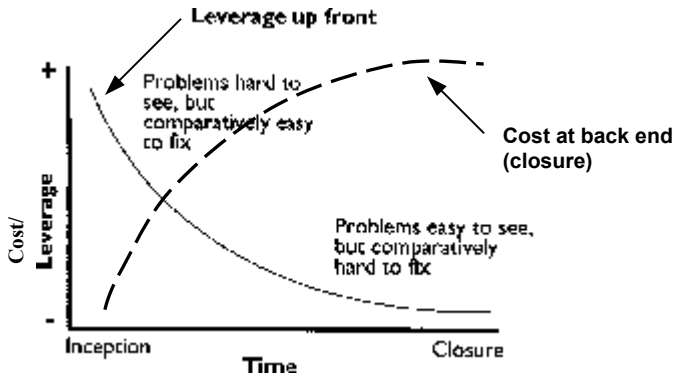

Figure 2.2 Cost and Leverage of Decisions During the Project Lifecycle
(After Allinson, 1997)

Lumby (1991) makes it explicit that the reason for capital investment projects (in the commercial environment) is because they are '…the *main way* in which firms can enhance the wealth of their shareholders' (italics added for emphasis). Mills et al (1999), when discussing the fundamental asset structure[3] of firms, notes:

> '[the firm's] future requirements will typically be assessed in relation to prospective returns in relation to the perceived level of risk associated with the investment. This typically means looking at investments using project appraisal techniques and working capital in relation to its costs and benefits.'
>
> '…the value of a share and shareholder value is dependent upon perceptions of the future, which can be assessed by assessing prospective cash flows to be generated…'

Merrett and Sykes (1973) establish a clear linkage between project financial analysis and corporate performance, particularly the value of shares in that firm.

> 'It is probably true to say that most equity investors [i.e. those holding shares in a company] expect that firms will maintain the rate of return on equity capital during periods of general inflation at a level which adequately compensates in real terms for the opportunities – of consumption or alternative investments – foregone….The majority of firms would probably accept that it should be an object of policy in investment [in projects] to try to maintain/obtain a worthwhile real rate of return on equity capital invested.'

Furthermore, they discuss in detail the analysis of the investment required in a project in relation to long and short term shareholders:

> 'An example is where is where a company embarks on a profitable large capital project with, say, a two- to three-year investment outlay period before income begins to flow. In these circumstances it is possible that the stock market will undervalue the future income prospects until the income actually begins to flow. Short-term shareholders selling out before that time will lose. Thus, although the project may suit the longer term shareholders who will be still be holding their shares when stock market values reflect the worth of the profitable investment, the short term shareholders will not so gain. Given that a management's duty is to all of its existing shareholders, is it right to accept the new project or should it be rejected in favour of short-term projects which benefit reported profits much sooner, and so favour the short-term shareholder? Or should the company follow a mixed strategy of projects equitably chosen to reflect the proportion of the two types of shareholder?'

[3] Assets are not only those measurable in monetary terms, although only these will be reported on the balance sheet. 'Assets show how a firm has deployed the funding available. Assets represent what is owned by an organisation or what is owed to it' (Wall, 2000). Asset structure refers to the way in which the firm balances its long and short term assets.

The implication for the management of projects is that measuring financial and other data, based on the *value the project is creating*, is fundamental in assessing the contribution of the project to the firm's strategic goals. Hence the project is controlled on the basis of the data collected from these measurements. Since these measures should be established in the corporate strategic plan, they must also be reflected in each project's strategic plan[4] as well. In this way the project's progress towards achieving its own objectives can be directly related to the organisation's progress towards achieving its strategic goals.

There are many ways of measuring the project's advancement towards its objectives. These measures should be directly derived from the strategic goals that the project is individually (or in concert with other projects) working towards. For projects that exist in the corporate environment (as opposed to projects in not-for-profit organisations) some of the measures of project performance are likely to be financially based, as well as others that are measuring more intangible, but nevertheless important, factors. Some examples of the measure that may be used are now discussed in more detail.

Return on Investment (ROI)

Simplistically, this refers to the amount of benefit expected to be gained for a given investment, and can be used in a qualitative way to measure benefits from investments such as project management education for a work force! (Qualitative because measuring the financial return on the monetary investment in situations such as this very difficult). Ibbs (2000) has attempted to measure the return on investment of a firm using project management techniques to achieve corporate change, but this relies on making a number of assumptions about the figures used that are subjective in nature.

Return on Investment understood in quantitative financial terms is the average rate of return (ARR), which gives the average annual profit on an investment as a percentage of the sum invested (Wall et al, 2000):

$$\text{ARR} = \frac{\text{total profit over project life}}{\text{Capital outlay on project}} \times 100$$

This measure enables comparison between competing firms to select the most profitable project in which to invest capital. It is not a very sophisticated measure for what may be very complex cash flows, but nevertheless it does provide a readily understood ratio, that is commonly used in financial management of firms. The ongoing measurement of the ROI (or ARR) throughout the life of the project indicates the profit performance of the project, and hence how it is contributing to the corporate financial situation (which is very likely to be important in terms of a profit making organisation's strategy).

The Project Manager is able to influence ROI at different stages of the project lifecycle. During the project front-end, when requirements of the project are being determined and the project definition is being undertaken, there is great capacity to influence the 'cost' (not necessarily financial) of delivering the requirements. This may be done by negotiating reduced or better focused requirements from the project owner. Alternative design solutions for achieving the requirements of the project can be analysed carefully with regard to technical risk and ease of implementation, thereby making the cost of the project more predictable. As the implementation stages of the project begin, the project manager should be able to ensure contractual arrangements with external (and internal) suppliers to the project are designed to minimise risk to the project schedule and cost plan.

Shareholder value

This is a measurement of the net present value[5] of cash to shareholders. Shareholder value analysis measures a company's ability to earn more than its total cost of capital. This measurement is used at two levels within a company – the operating business unit and the corporation as a whole. Shareholder

[4] The project quality plan should also include these measures of progress towards the objectives, since the quality plan will detail the procedures which ensure that the project will achieve those objectives.

[5] Net Present Value (NPV) 'is the value today of the estimated cash flows resulting from an investment. It is found by discounting the future cash flows to make allowance for the opportunity cost of tying up capital in the investment. Each years discounted cash flow is added together and taken [subtracted] from today's cash outlay on the project' (Wall, et al, 2000).

value is the value that has been created from the business unit or corporation from its cash flows over time. Using shareholder value analysis allows tradeoffs to be made between the options of: reinvesting in existing businesses, products etc; investing in new businesses, products, etc; or returning cash to shareholders (Mills et al, 1999). Either of the first two options may be undertaken as a project, and therefore the sponsor of the project will have a great interest in whether the value being created by the project, for the shareholder, is in fact in line with expectations.

Measurement of shareholder value is closely associated with the financial analysis undertaken to establish the economic viability of the project before it is approved for implementation. This analysis will include a prediction of the present and/or net present value of the project, and the associated cash flows (or discounted cash flows), payback period[6], etc. Hence measures of actual cash flow, and present value that can be deduced from that measure, are important ways of ensuring that a project is proceeding satisfactorily towards achieving the objectives of the project (and hence the strategic goals of the organisation).

Competitive Position

There are two fundamental concerns of positioning – competitive advantage and competitive scope[7].

Competitive Advantage – The two basic types of competitive advantage are *lower cost* and *differentiation.* Porter's definition of these two concepts are:

> 'Lower cost is the ability of a firm to design, produce, and market a comparable product more efficiently than its competitors. At prices at or near competitors, lower cost translates into superior returns.'
>
> 'Differentiation is the ability to provide unique and superior value to the buyer in terms of product quality, special features, or after sales service' (Porter, 1998).

Although these two types of competitive advantage are not mutually exclusive, achieving both is difficult (to provide the superior value to customers required for differentiation usually costs more than the 'normal' value, which makes it hard to achieve low cost simultaneously[8]). What can be seen is that the factors relating to competitive advantage are factors of prime importance in the projects that are implemented within the context of the product's, or the firm's, strategic positioning decision, e.g. low production cost or high product quality.

Competitive Scope

> 'The other important variable in positioning is competitive scope, or the breadth of the firm's target within its industry. A firm must choose the range of product varieties it will produce, …..the types of buyers it will serve, the geographic areas in which it will sell, and the array of related industries in which it will also compete.'
>
> (Porter,1998)

Different firms in the same industry can select different competitive scopes (as can competing firms from different nations). The organisations strategy for positioning will include such factors as the range of services or products it will sell, the types of clients or buyers it will market to, the geographic areas in which it will sell, and what other related industries is the firm in competition with (because of the danger of substitute products not initially recognised as being a competitive threat replacing the firms product or service).

---

[6] See Module 4, Chapter 3 for further explanation of investment appraisal

[7] Porter (1998) combines these into generic strategies of cost leadership, differentiation, cost focus, focused differentiation. See Chapter 1 of this module for further discussion of Porter's strategic model.

[8] It may be possible to succeed for relatively short times in being both low cost and differentiated if technological advances are taken up early. Especially where IT is concerned, new software programs for design tools or enhancements to hardware enabling better communication systems to be built could provide 'fleeting advantages'. However, it is unlikely the new technologies will not be taken up in time by competitors and so reduce the differentiation and cost advantage gap.

In the same way as for the competitive advantage decisions discussed in the previous paragraph, these factors have a direct impact on the objectives of the project, and hence on what must be measured to monitor progress towards achieving those objectives.

Another important competitive issue is the time it takes to get a product to the market. Early entry to a market may be essential for the product to be profitable. This is clearly demonstrated in the market for computer hardware and software, when being second into a market may mean no profit at all is generated by the product. The consideration of time-to-market is not only applicable to new product development projects. The building of industrial infrastructure may also be driven by time-to-market considerations of the product that the plant is to produce. This is common in the pharmaceuticals industry.

Productivity

This is a measure of the efficiency with which inputs to a project are transformed into outputs. Productivity can be measured at any level of the work breakdown structure (see Module 1, Chapter 5). This is an important measure because it indicates the likely rate of progress with a given resource employed. Hence the project schedule can be more accurately predicted in the first instance if resource productivity is known accurately. This will be the case for resources such as production machinery, but can also be reasonably accurately predicted for labour resources. Productivity also has a financial implication as well as time, because knowing the productivity of resource enables the unit cost of output to be established and hence the total project cost can be more accurately predicted. It is clear that it is essential to measure productivity on an ongoing basis throughout the life of the project, in order to be able to continually assess the time and cost to complete the project.

Market Share

Market share is a measure of the firm's sales against total sales in a given market. Market share will always be important, even if the firm does not aim to dominate the market. The measure provides direct feedback from the market of the performance of the service or product.

> 'Analysing trends in market share is important for a firm because it shows its position in relation to the market as a whole. It may not be good enough, for example, to have a 5% sales increase if the market is rising at 10%, as market share is being lost. The 5% sales increase may boost profits this year, but if the market becomes highly price competitive as it reaches maturity, the firm's products may not be strong enough to survive' (Wall et al, 2000).

Even if the project may only create a second order market share effect, say it is an organisational change project to the sales team structure, rather than a product improvement project which is a first order effect, the effectiveness of the project can be analysed using market share information. Hence the project leadership are able to make control decisions using this type of information.

Brand Image

Brand image is usually associated with consumer goods and is important in that part of industry because marketing decisions can be based on the amount of brand loyalty, and whether or not the product is a brand leader or not. New Product Development projects are likely to be highly influenced by measures that relate to the brand, since the new products must gain the maximum advantage from their brand image. But brand image can also be interpreted in a wider sense as well. Rolls Royce for instance has a strong brand image in the public perception, yet many of their products are not sold to the general public, but into industry. Hence the industrial buyer may be influenced towards purchasing a service or product which will be recognised by *their* customers and therefore reflect well (or possibly with a product with a poor brand image badly) on their own product brand image. For instance an aircraft manufacturer may use Rolls Royce engines on its aeroplanes because Rolls Royce have a brand associated with high quality products, and this association may assist in the sales of the aircraft. This effect of brand image influences the price elasticity[9] of the product. Therefore understanding and

[9] Price elasticity is a measure of the way the demand for a product/service responds to a change in price. It is of considerable importance, since it affects pricing decisions. A high price elasticity means the market will not readily absorb higher prices to cover increased production costs. A product which is price inelastic will be meet little resistance in the market place to increased cost and will maintain market share (It is in fact possible to increase market share by increasing prices – perfumes are an example where higher price = greater exclusivity).

measuring the effects of brand image is important for many projects that are instruments of corporate change.

Key Performance Indicators

Key Performance Indicators (KPIs) are used to measure project performance. They may be used to measure project performance that is directly related to the measures of corporate change (discussed above). However, KPIs are also used to measure project specific performance i.e. the performance of the project processes.

The Association for Project Management (APM) (2000) describes KPIs as:

'… those project management indicators that:

- are determined at the beginning of the project
- reflect directly on the key objectives [goals] of the project
- provide the basis for project management trade-off decisions during the course of the project.'

And at the completion of the project these KPIs (APM, 2000):

- 'will be the most relevant measures to confirm the acceptability of the project and its product by the project's stakeholders as being "successful";
- can be measured in some way, at some time, on some scale'

However, KPIs will measure more than just the primary business objectives (derived from corporate strategy) of the project. They are used to measure *performance* of the project. This means they not only apply to project outturn achievement (measurement of progress towards the project objectives, enabling corrective action to ensure objectives met) but also to the performance of the 'machinery' of the project, i.e. the project processes.

Some of the measures of corporate change previously described will be measured in the project by relevant KPIs. Some examples of other KPIs could be related to:

- General company objectives (e.g. adherence to the corporate mission statement, performance of health, safety and environmental policies, compliance with human resource strategies)
- Project and project management processes (e.g. effectiveness of project control mechanisms, degree of project cost reduction by using designated procurement practices, amount of change occurring in project)

The 'Movement for Innovation' in the UK construction sector has identified several industry-wide KPIs that firms can use to benchmark themselves against others in the industry. These KPIs are directly translatable into KPIs to be measured in discrete projects, from where the information can be passed up to the corporate level for assimilation into an organisation-wide measure of performance. These KPIs are used to measure progress towards delivering projects (DETR, 2000):

- 'on time
- on budget
- free from defects
- efficiently
- right first time
- safely'

The KPIs used are as shown in table 2.1. Notice how there is a combination of indicators measuring progress towards strategic goals (e.g. 'Business Performance') and project process performance (e.g. 'Cost', 'Change Orders').

[10] As reported by Pinto and Kharbhanda, (1995)

Group	Indicators	Level
Time	1. Time for Construction	Headline
	2. Time Predictability – Design	Headline
	3. Time Predictability – Construction	Headline
	4. Time Predictability – Design & Construction	Operational
	5. Time Predictability – Construction (Client Change Orders)	Diagnostic
	6. Time Predictability – Construction (Project Leader Change Orders)	Diagnostic
	7. Time to Rectify Defects	Operational
Cost	1. Cost for Construction	Headline
	2. Cost Predictability – Design	Headline
	3. Cost Predictability – Construction	Headline
	4. Cost Predictability – Design and Construction	Operational
	5. Cost Predictability – Construction (Client Change Orders)	Diagnostic
	6. Cost Predictability – Construction (Project Leader Change Orders)	Diagnostic
	7. Cost of Rectifying Defects	Operational
	8. Cost In Use	Operational
Quality	1. Defects	Headline
	2. Quality Issues at Available for Use	Operational
	3. Quality Issues at End of Defect Rectification Period	Operational
Client Satisfaction	1. Client Satisfaction Product – Standard Criteria	Headline
	2. Client Satisfaction Service – Standard Criteria	Headline
	3. Client Satisfaction – Client-Specified Criteria	Operational
Change Orders	1. Change Orders – Client	Diagnostic
	2. Change Orders – Project Manager	Diagnostic
Business Performance	1. Profitability (company)	Headline
	2. Productivity (company)	Headline
	3. Return on Capital employed (company)	Operational
	4. Return on Value Added (company)	Operational
	5. Interest Cover (company)	Operational
	6. Return on Investment (client)	Operational
	7. Profit Predictability (project)	Operational
	8. Ratio of Value Added (company)	Diagnostic
	9. Repeat Business (company)	Diagnostic
	10. Outstanding Money (project)	Diagnostic
	11. Time taken to reach Final Account (project)	Diagnostic
Health and Safety	1. Reportable Accidents (inc fatalities)	Headline
	2. Reportable Accidents (non-fatal)	Operational
	3. Lost Time Accidents	Operational
	4. Fatalities	Operational

Table 2.1 KPIs Currently in Use in the Construction Industry
(DETR, 2000)

KPIs should be defined at the beginning of the project, and must be measurable (otherwise how will one know if they have been achieved?). Whilst this sounds obvious, it must be remembered that KPIs can only be useful if the information needed to determine the KPI during, and at the end of the project, is actually available. This implies that the project management information system (whether it be a sophisticated IT based system, or a simple paper based one) must collect relevant data and generate the appropriate information outputs to provide the KPIs to the project's management team.

The KPIs should be used to assess the success of the project at completion. Determining the KPIs to be used in a project by consultation between the corporate executive responsible for corporate strategy and project managers means that project success can be defined as meeting the KPI requirements set at the beginning of the project. KPIs should be included in the Project Strategy document (see Chapter 3).

Critical Success Factors

Critical Success Factors (CSFs) are sometimes used synonymously with KPIs. Literally, however, CSFs are the factors that are critical to success. They are '…an important tool of management and information systems design for the identification of where an enterprise needs to concentrate in order to compete successfully' (Morris, 1994). Success is an elusive measure but is basically an outturn measure. CSFs are therefore the factors that are critical to achieving success, *not* a measure of performance which is what KPIs are.

Three major studies of CSFs have been undertaken in the project management field; Morris and Hough (1987), Baker, Murphy, and Fisher (1974), and Pinto and Slevin (1988). Independently, the first two studies identified factors of project success that were strikingly similar (Pinto and Kharbanda, 1995). The success factors found by Morris and Hough (1987) in their authoritative study of major projects are as follows:

Project definition
Define comprehensively
Communicate clearly
Phase as appropriate
Identify, assess and develop sub-objectives clearly
Relate objectives to participants
Do not force clarity until appropriate
Beware of progressive change
Avoid too early a commitment

Planning, design and technology management
Attend to broader systems aspects of projects
Relate to phasing, logistics, geophysical uncertainties, and the design and production relation
Have back-up strategies for high risk areas
Develop the accuracy of estimates to an extent consistent with the uncertainties present, e.g. technology, methods
Avoid concurrency
Test design adequately before final project commitment is made
Recognise the extent to which R&D is completed will affect accuracy of estimate
Use flexible design philosophies
Recognise that good design management is essential, especially where there is technical uncertainty or complexity
Recognise that interface management is important where there are significant interdependencies
'Freeze' design once agreed
Beware of switching design authority during different phases of design
Pay attention to detail since mistakes can be costly
Encourage replication where appropriate

Politics/Social factors
Ensure effective sponsorship
Recognise fiscal, safety, employment, etc., constraints
Ensure support for such management actions as may be necessary
Constrain nationalistic aspirations on international projects
Manage community factors effectively

Schedule duration
Recognise the major impact that output, price, regulation, technical developments, government or corporate changes can have on definition of success
Phase projects where/as possible to avoid unnecessary over-commitment

Schedule urgency
Avoid rushing
Note possible disruptive effect on work sequencing
Beware of impact on full discussion by all parties
Beware of when urgency and technical uncertainty go together (concurrency)

Finance
Undertake full financial analysis of all project risks: budget validity, political support, owner's commitment, etc., including inflation, and possible currency variations
Be cautious over availability of funds
Be prepared to stop funding where necessary
Seek sponsors interested in success of project *per se*, not just a good return
Beware of exchange rate movements
Check definition of project success if business case of project changes

Legal agreements
Ensure break clauses are adequate
(Beware of 50-50 partnerships)
(Beware of mixed public-private funding)
Seek commitment to making contract work

Contracting
Consider whether more innovative contractual arrangements may not be required
Consider incentive contracts valuable where it is difficult to get competition, though beware of too high a level of technical uncertainty
Ensure contractors are sufficiently experienced to perform the work
Consider extent to which competitive bidding is appropriate
Beware of same organisation acting as contractor and owner
Provide adequate bid preparation time
Beware of cheapest bid
(Beware of having to manage a large number of contracts)
Define contractor's responsibilities clearly
Make contractors financially responsible for their performance as far as possible
Beware of contract forms which unfairly penalise contractor, particularly for factors outside his control
(Beware of mixing firm price and reimbursable forms)
Question the threat of liquidated damages
Appraise carefully whether interference by the owner in the execution of the contract is justified

Project implementation
Seek appropriate client, parent company and senior management attitudes and support
Control all those aspects of project which can affect the chances of success
Recognise the magnitude of task and organise appropriately
Obtain clear client guidance
Foster good client-contractor relations
Integrate the project teams' perspectives with the project aims during start-up
Assess risks adequately
Develop good planning, clear schedules, adequate back-up strategies
Exercise firm, effective management from the outset
Recognise the importance of effective, schedule conscious decision making
Provide clear and comprehensible project organisation appropriate to size, urgency, and complexity of the project
There should be one person, or group, in overall charge having strong overall authority
Ensure effective leadership
Strive for a well motivated, experienced team
Develop appropriate controls, highly visible, simple and 'friendly'
Check definition of success, where changes are allowed
Ensure resources are adequate, properly planned and flexibly employed
(Consider use of site labour agreements)
Ensure labour practices are consistent amongst and between contractors
Give full authority to quality assurance and auditing
Recognise that good communications are vital

Human factors
Ensure top management support
Recognise and demonstrate the importance of effective leadership
Seek competent personnel
Ensure communications are effective
Consider which power style is appropriate
Recognise that people are human and less than perfect

Baker, Murphy and Fisher (1974) found that 77% of the causes of *perceived* implementation success were due to the single factor of 'co-ordination and team client relations' (which was in fact composed of a variety of items such as capability of the project team, sense of mission, team spirit, goal commitment, and supportive informal relations of team members). The similarity between the two studies is clear.

Pinto and Slevin then built on these factors and validated a 10-factor model of CSFs. These factors are:

1. 'Project mission. Initial clearly defined goals and general directions
2. Top management support. Willingness of top management to provide the necessary resources and authority/power for implementation success
3. Schedule plans. A detailed specification of the individual action steps for system implementation
4. Client consultation. Communication, consultation, and active listening to all parties impacted by the proposed project.
5. Personnel. Recruitment, selection, and training of the necessary personnel for the implementation project team.
6. Technical tasks. Availability of the required technology and expertise to accomplish the specific technical action steps to bring the project on-line.
7. Client acceptance. The act of "selling" final product to its ultimate intended users
8. Monitoring and feedback. Timely provision of comprehensive control of information at each stage in the implementation process.
9. Communication. The provision of an appropriate network and necessary data to all key actors in the project implementation process.
10. Troubleshooting. Ability to handle unexpected crises and deviations from plan.'

It should be noted however that this list can be criticised. For instance the client is frequently a different entity from the users, e.g. infrastructure and public transport projects where the client is rarely the group of people that will actually use the project deliverable (i.e. the public); speculative building projects where the end user is not even identified when the project begins (hence 'speculative'); software design for IT/IS projects for organisations, etc. Also points 4 and 7 are not greatly differentiated from each other, and neither are 8 and 9.

Clarke (1995) has identified a much smaller group of key success factors of organisational change projects:

1. 'Communication throughout the project
2. Clear objectives and scope
3. Breaking the project into "bite sized chunks"
4. Using project plans as working documents'

This list again demonstrates similarities with the studies cited earlier, but can also be criticised as being almost so general as to be merely a statement of common sense[11].

Despite the number of studies there is very little *empirically* based knowledge of what the key factors of project success actually are. There are however similarities by what is reported to have been found, but most of the work relates to what factors are *perceived* to lead to success; there is little research on

[11] The difficulty of making statements that are generally applicable to a discipline or area of knowledge should not however be underestimated. Too general and the statement becomes devoid of meaning yet too detailed and the statement becomes only applicable to small areas of application. See Checkland (1984) for further discussion on this issue.

what *actually* leads to success. A summary of the findings of much of the CSF research work that has been done is presented in table 2.2. The author (Crawford, 2000) surveyed the research literature regarding CSFs in project management and presented the information according to type of project (E & C = Engineering and Construction, IS/IT = Information Systems/Information Technology), and whether the studies were conducted pre or post 1995.

All studies (N=13)	E & C (N=7)	IS/IT (N=6)	Pre 1995 (N=6)	Post 1995 (N=7)
Planning (integrative)	Planning (integrative) Stakeholder management (other) Team development	Strategic direction Team selection	Planning (integrative) Technical performance	Communication Monitoring and controlling (integrative) Organizational support Planning (integrative) Strategic direction Team selection
Monitoring and controlling (integrative) Team selection Technical performance	Communication Leadership Monitoring and controlling (integrative) Monitoring and controlling (risk) Technical performance	Monitoring and controlling (integrative) Planning (integrative)	Leadership Monitoring and controlling (integrative) Stakeholder management (other) Team development	Leadership Monitoring and controlling (risk) Stakeholder management (client) Team development Technical performance
Communication Leadership Strategic direction Team development	Organization structure Organization support	Communication Leadership Organizational support Technical performance	Communication Monitoring and controlling (risk) Organizational structure Strategic direction Team selection	Decision making and problem solving Organizational structure Project definition Task orientation
Monitoring and controlling (risk) Organizational support Stakeholder management (other)	Administration Decision making and problem solving Planning (specialist – time) Project definition Stakeholder management (client) Strategic direction Task orientation Team selection	Monitoring and controlling (risk) Organizational structure Project definition Stakeholder management (client) Team development	Administration Organizational support Planning (specialist – time) Project definition	Administration Planning (specialist – cost) Planning (specialist – time) Stakeholder management (other)
Organizational structure	Closing cost Closing (integrative) Monitoring and controlling (cost) Monitoring and controlling (scope) Monitoring and controlling (time) Planning (specialist – cost)	Administration Planning (specialist – cost) Planning (specialist – time) Stakeholder management (other) Task orientation	Stakeholder management (client) Task orientation	Closing cost Closing (integrative) Monitoring and controlling (cost) Monitoring and controlling (scope) Monitoring and controlling (time)
Project definition Stakeholder management (client)		Closing (cost) Closing (integrative) Decision making Monitoring and controlling (cost) Monitoring and controlling (scope) Monitoring and controlling (time)	Closing (cost) Closing (integrative) Decision making and problem solving Monitoring and controlling (cost) Monitoring and controlling (scope) Monitoring and controlling (time) Planning (specialist – cost)	

Table 2.2 Common Project Critical Success Factors Identified in the Literature

Quoting directly from the paper:

> 'In conducting the analysis, the importance of Planning and Monitoring and Controlling at the integrative level, rather than the detailed levels of specialist scope, time, cost, risk, and quality

planning was a strong and interesting result, with Monitoring and Controlling of risk being the only specialist area to be mentioned within the top three ranking categories. Stakeholder Management (other) encompasses stakeholder issues external to the parent and client organizations, including environmental and political issues, and it seems intuitively correct that this would rank highly for the success of engineering and construction projects. The increase in mention of Communication, Strategic Direction and Team Selection and decrease in importance of Technical Performance, post-1995, are of interest and appear attributable, at least in part, to the application of project management beyond its strong Engineering and Construction origins.'

Many of the CSFs are common to all stages of the project, e.g. team motivation. However, other CSFs are stage specific e.g. effective requirements definition during the project front end work. This emphasises the need to take a dynamic view of project development, using the project lifecycle as a framework for assessment of the needs of the project as it progresses.

CSFs should be established at the time that the project is being defined. They should be used to understand what areas of management of the project must be concentrated upon in order to improve the chances of completing the project successfully. Whilst the listings above give an indication of the commonly found factors of success, there will also be project specific factors (especially related to stage specific activity, as previously noted). The identification of these project specific CSFs must be given high priority: They represent issues of strategic importance to the project's chance of achieving success. They will guide the project management team as to where to direct their energies; what issues must be attended to with great concentration. CSFs should also be included in the Project Execution Strategy document, along with the project KPIs.

References

1. Association for Project Management (2000) *The APM Body of Knowledge*. APM, UK.
2. Baker, B. N, Murphy, P. C., and Fisher, D. (1983) 'Factors Affecting Project Success', in Cleland, D. I. and King, W. R. (Eds.)(19) *Project Management Handbook* (2nd Edition). Van Nostrand Reinhold, New York.
3. Barnes, M. 'Construction Project Management', in *International Journal of Project Management*, Vol. 6, No. 2, May 1988. Pp69-79
4. Clarke, A. (1999) A Practical use of Key Success Factors to Improve the Effectiveness of Project Management, in *International Journal of Project Management*, Vol. 17, No. 3, pp139-145.
5. Department of the Environment, Transport and the Regions (2000) *KPI Report for The Minister for Construction.* DETR. http://www.m4i.org.uk/fr-publications.html
6. Gaisford, R. W. 'Project Management in the North Sea, in *Project Management*, Vol. 4, No. 1, February 1986. Pp 5-12.
7. Ibbs, C. W. 'Calculating Project Management's Return on Investment', in *Project Management Journal*, June 2000.
8. Lumby, S. (1991) *Investment Appraisal and Financing Decisions* (4th Edition). Chapman and Hall, London.
9. Merrett, A. J. and Sykes, A. (1973) *The Finance and Analysis of Capital Projects* (2nd Edition) Longman Group, London.
10. Mills, R. W., Print, C. F., and Rowbotham, S. A. (1999) *Managerial Finance, Shareholder Value and Value Based Management*. Mars Business Associates Ltd, Lechlade, UK.
11. Morris, P. W. G. and Hough, G. H. (1987) *The Anatomy of Major Projects*. John Wiley and Sons, Chichester, UK.
12. Pinto and Kharbhanda (1995) *Successful Project Managers: Leading Your Team to Success*. Van Nostrand Reinhold, New York.
13. Pinto, J. K. and Slevin, D. P. (1987) 'Critical Factors in Successful Project Implementation', in *IEEE Transactions on Engineering Management*, EM-34, pp 22-27.
14. Porter, M. E. (1998) *The Competitive Advantage of Nations* (2nd Edition). London: Macmillan Press.
15. Wall, N., Marcousé, I., Lines, D., and Martin, B. (2000) *The Complete A – Z: Economics and Business Studies*. Hodder & Stoughton, London.