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**PROJECTS
and
PROJECT MANAGEMENT**

a review of the literature

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Abstract:

Project management concerns the activities of defining, planning, implementing and successfully concluding the implementation of projects. In this review the definition of the term *project*, and hence of *project management*, are considered, and significant issues in the application of project management in an organisational environment are addressed. Among these issues are project and matrix organisation, the definition and evaluation of project goals and objectives, project control, and the skills required for successful project management. The literature consulted is eclectic, including both rigorous academic research and the experience-based advice of practitioners and consultants in the area.

Definitions

Most writers on the subject of project management find it necessary to provide a definition or listing of characteristics of a project, or project manager, or project management in order to set their remarks in context. The representative body for the project management profession in the UK, the Association For Project Management [APM], has "no official definition of the term" *project* (Heath, 1995), although a form of definition is contained within the APM's *Body of Knowledge* (1995), the reference document for those aspiring to professional certification by the Association.

To provide an authoritative definition, a total of 49 definitions were collected from a wide variety of texts, company guidance documents, journal articles and training material. A content analysis was then performed on the definitions. The results showed that the following characteristics of a project received mention by a significant proportion of sources, using the same or closely equivalent wording:

Complexity of component tasks	29	Connected activities; sequenced activities; clear, manageable steps; integrated; complex; sub-tasks; inter-related; co-ordinated.
Diversity of contributors	20	Team of people; ad hoc team; co-operative enterprise; cross-functional; cross-divisional; variety of skills/resources.
Finity of resources	20	Limited/specified resources; funding limits; budgets; specified costs.
Centrality of control	17	Central direction; one person's responsibility; organised; co-ordinated; planned; special skills/techniques; client/customer.
Product specification	13	Specified quality; specification; end product; time, cost and quality.

<u>Characteristic</u>	<u>Times mentioned</u>	<u>Examples of terms used</u>
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Definition of objectives	35	definite objectives; finite; goal-directed; specific task; limited scope.
Definition of completion time <i>Often linked to</i>	34	Defined end-date; defined time-frame; specified completion time; defined start and end points; a beginning and end.
Definition of starting point	22	
Uniqueness	33	Non-repetitive; unique; one-time; one-shot; non-routine; separately-identifiable; no practice/rehearsal; risk; uncertainty.

This enables the following definition to be constructed:

A project is a unique, finite undertaking with clearly-defined objectives, involving many inter-related tasks or activities and the contribution of a number of people working co-operatively under centralised control to produce a specified outcome or product within clearly-defined parameters of time, cost and quality.

However, although this definition may adequately define project work, it only partially addresses the difficulty in identifying a project manager. To define this term simply as "the person with overall responsibility for the execution of a project" would be unsatisfactory because of the difficulty in generalising the project definition. This problem can best be understood through the concept of

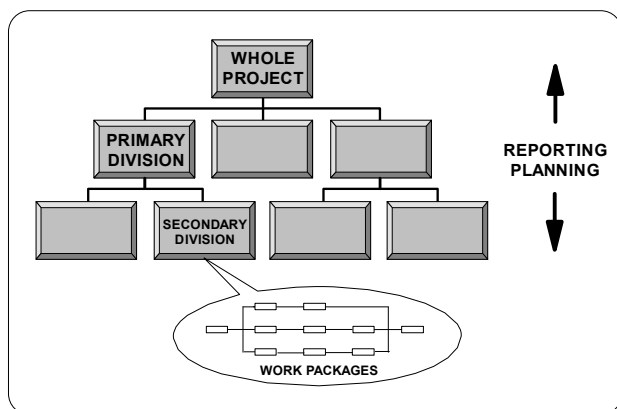
the Work Breakdown Structure [WBS], a device commonly used throughout project work for planning and for subsequent reporting. (See, for example, Harrison, 1992; Lock; 1992 or Reiss, 1992).

The WBS is a hierarchical breakdown of all the work required to complete the project. Starting with a description of the whole project, subdivisions are made into meaningful sections, for example, specific kinds of work, or perhaps geographical sectors. Lockyer and Gordon (1996) suggest that:

"Common ways are by division of the product into major components which are then split into sub-assemblies and so on down to components, by a functional breakdown or by cost centre code. The way chosen is usually related to the type of project and the industrial or public sector in which it is taking place."

Further logical subdivisions may be made "explod[ing the WBS] into increasingly finite, measurable tasks and sub-tasks" (Kliem and Ludin, 1992) until, at the "bottom" of the structure, work packages can be defined which specify tasks to be undertaken, together with relationships with other tasks and a variety of detailed information about timescales, deliverables, costs and resource needs. Harrison (1992) describes the WBS as "a method of project organization, planning and control, based on 'deliverables' rather than simply on tasks or activities". Morris (1994) asserts that "it is fundamental to project control" because "without a WBS it is difficult to communicate a clear view of the total scope of the project and to organize the various project data in a consistent way".

A WBS is often represented graphically, as shown below.



Work Breakdown Structure [WBS]

During the life of the project, the WBS can be used as a model for reporting progress, since each of its elements represents a summary of all the work below it in the hierarchy. Costs incurred and

objectives realised may be aggregated and reported against the higher level, enabling management of the overall project without excessive detail.

In a complex project there may be several levels in the structure before work packages are defined, and it may be appropriate for the work packages themselves to be sub-divided to provide a level of detail which would be inappropriate when considered from the whole project viewpoint. A further complication may be introduced if the project forms part of a "programme", defined by Ferns (1991) as: "A group of projects that are managed in a coordinated way to gain benefits that would not be possible were the projects to be managed independently".

The various levels in this structure, including the work packages, display a high degree of self-similarity, that is, "differences between them are purely matters of scale and scale is wholly relative" (Gray, 1997). Work packages are very likely to be managed as though they were projects, sub-divided into lower-level tasks or activities with a number of individuals taking responsibility for the implementation of the component elements. A person responsible for any one of the elements of the WBS, at any level, may regard the scope of his/her responsibilities as a project, and the manager of a project which is part of a programme may be constrained in the latitude he/she has to manage idiosyncratically. The potential complexity of major projects is "horizontal" as well as "vertical". Harrison (1992) alludes to the need for coordinated management:

"More and more undertakings are involving multiple disciplines and/or multiple companies for their completion. If these undertakings are to be completed successfully, the individual disciplines and companies can no longer take a blinkered, parochial approach and be managed as separate entities. They are inevitably interdependent and interact, and therefore require integration into one project organization.

Project management provides the means for this integration, the forms of organization which span multi-discipline and multi-company activities, and the management systems designed to cope with this situation and the problems involved."

The involvement of contributions from people with differing reporting or management lines, gives considerable scope for overlap or duplication of roles:

"The project ... could be of such importance and complexity that each of the ... organizations [involved] would need to appoint its own project manager. The roles of these project managers will not be identical, owing to the division of work and responsibilities, and

to the particular roles and functions of the different organizations." (Young, 1994).

Harrison (1992) observes that "there are often two levels of project manager": the overall manager of a multi-company or multi-discipline project, and managers of individual companies or disciplines within the project. Corrie (1991) complains that "The term 'project manager' has become overworked - each participating party may have one or several persons so titled, who may only be responsible for certain elements."

Thus it can be seen that to define the term *project manager* only against a benchmark of responsibility for a project is unduly restrictive, since it limits the role to current assignment and not to the nature of the work performed. In addressing this difficulty in another context Gray (1997) has used the term "project-type work activity [*pwa*]" to embrace a documented responsibility which complies in general terms with the criteria for a project but may in a specific case be situated at any level in the WBS.

The project managers on which this research is focused are therefore managers who are, or have been and may be again, personally accountable for a project-type work activity [*pwa*].

Project management

"Project management was established as a popular discipline in the late 1960s and 1970s, through the creation and activity of the US and European project management societies and, crucially, through the widespread adoption in business, government and the military of the matrix form of organization. Suddenly, thousands of professionals were pitched into task-focused, project-type situations." (Morris, 1994).

Cleland (1994) describes project management as "an idea whose time has come .. a distinct discipline to be applied to the management of ad hoc activities in organizations". Some indication of the increasing popularity of project management can be observed in the rising membership of the UK Association for Project Management. When the writer was elected to membership in October 1987 he was member number 1,964; the membership in early 1997 exceeded 9,000. Popularity, however, does not necessarily bring with it understanding or status. Morris (1994) observes that project management "lacks the academic and professional support that many other, arguably less important, disciplines receive. It is widely misperceived as a collection of planning and control techniques rather than as a rich and complex management process."

Cleland (1994) takes a similar view of current general levels of understanding:

"The majority of the body of knowledge on general management today treats project management as if it were a nearly separate entity in the management of contemporary organizations. Little is found in this literature that puts project management in its larger, more important role as a philosophy and process for the management of change in organizations".

Meredith and Mantel (1995), [using data up to twenty years old] suggest that where organizations have applied project management approaches the balance of outcomes is clearly favourable:

"Actual experience with project management indicates that the majority of organizations using it experience better control and better customer relations. A significant proportion of users also report shorter development times, lower costs, higher quality and reliability, and higher profit margins. Other reported advantages include a sharper orientation toward results, better interdepartmental coordination, and higher worker morale.

On the negative side, most organizations report that project management results in greater organizational complexity. Many also report that project organization increases the likelihood that organizational policy will be violated - not a surprising outcome, considering the degree of autonomy required for the project manager. A few firms reported higher costs, more management difficulties, and low personnel utilization."

Cleland (1994), however, claims an influence for project management over the development of management thinking and organisational change: "Project management has led the way in formalization of the erosion and crossing of organizational boundaries". Cooke-Davies (1990) also believes that, as well as the direct benefits of using project management, project experience has a beneficial influence on general management performance:

"Flexible project teams allow resources to be focused more appropriately on the immediate needs of the business. Project-based budgeting allows business spending to be precisely aligned to business strategy. Further, experience of managing projects helps a management team to develop exactly those qualities of initiative and effectiveness which chief executives believe to be in short supply"

Morris (1994) complained [see above] that project management was "widely misperceived as a collection of planning and control techniques", and Kerzner (1989) reinforces this with his assertion that "project management is more behavioural than quantitative". Baguley (1995) agrees that "Projects are people-centred - they need and demand, whatever their duration or outcomes, the skills and abilities of people in order to create, plan and manage the processes and activities involved."

Kliem and Ludin (1992) draw attention to the complexities of the interactions between the various components of project work and organisation, and suggest that "perhaps the best way to see what is meant by the people side of project management is to regard a project as a system". Morris (1994), enumerates some of these components: "Before one goes very far, discussion of attitudes and commitment, of criticism or communications, leads to project organizational issues such as project leadership, team management, industrial relations, and owner-supplier contractual and organizational relationships."

Morris, who has a long-term research interest in project failures and their causes, hints that people need the right environment if they are to deliver good results:

"the high failure rate associated with projects - particularly major ones - suggests that the challenges which major projects present may often be too great for the people we put in to manage them.

Or is it the organizational or institutional context that proves too intractable? Time and again we see projects getting into difficulties because of organizational constraints and cultures that individuals are not able to overcome."

Project organisation

Lock (1996) stresses the importance of appropriate organisational support for the management of projects, asserting that project managers:

"cannot expect to operate effectively alone, without adequate support and cooperation. This obviously includes the willing cooperation of all staff engaged on the project, whether they report to the project manager in the line organization or not. But it also includes support from higher management in the organization, who must at least ensure the provision of essential finance, accommodation, facilities, equipment, manpower and other resources when they are needed and the availability of suitable clerical or other supporting staff. Just as those working on the project need to be properly motivated, so does the project manager, and supportive higher management who show constructive and helpful interest in the project can go a long way to achieve this."

Baguley (1995) identifies three main forms of project organisation:

- "Client focused organisation, which integrates the project into the existing organisational structure;
- Matrix organisation, in which the project manager draws the people resources required from each of the client organisation's functional departments; and
- Project focused organisation, in which the project team exists as a self-contained unit with its own

resources, staff, premises and so on".

The matrix form of organisation is central to most concepts of project management, unless the project is very small-scale, and will be explored in greater detail below.

The way that the project contributors or participants are organised is seen as important. Adams and Barndt (1988) collected data from "a variety of research efforts using different samples collected at different times over a two-year period". They found, inter alia, that

- "Individual project organizations tend to be relatively small in the early and late phases of their life cycle, and much larger in the middle phases.
- As the project progresses in its life cycle, the overall intensity of conflict decreases.
- The smaller the project, the more closely it resembles the characteristics classically recognized as representing project teams - participative, dynamic, and collegial team efforts. Larger efforts clearly display the characteristics of more bureaucratic organizations."

Baguley (1995) believes that the use of project teams leads to increased involvement and commitment by the participants, and better integration with the wider organisation:

"The project team is a powerful weapon in the process of managing change and creating the successful project. This can only take place with the support and cooperation of others, and those who attempt to impose change on others put not only the project, but also their future relationship with others, at risk."

Adams and Barndt's (1988) research leads them to offer advice about team construction:

- "The project team size should be kept as small as possible, consistent with being able to accomplish the tasks;
- Increased formalization of the project's structure [eg, specialized groups, formal reports, chain of command, specified procedures] should be avoided wherever possible;
- Team members should be encouraged to work jointly to resolve conflicts in a manner that is best for the project as a whole, rather than for any one team member."

Morris (1994) expresses similar views: "Project personnel should be treated as members of a team, with great emphasis on active communication and productive conflict". Briner, Geddes and Hastings (1990) advocate creating an atmosphere where constructive conflict thrives:

"It's very important that interest in the quality of results is shared across technical boundaries. Team members should be able to challenge and support colleagues in the interest of getting a better result. There should be

plenty of frank discussion, full of constructive criticism, with everybody concentrating on the issues and not on the shortcomings of particular individuals. It should be the aim of the project leader to create an atmosphere in which self criticism rather than criticism of others is the rule, and in which people are free to say what they feel and be listened to."

This level of constructive conflict may not always be easy to achieve, however. An essential prerequisite is trust, or "safety", and confidence in interpersonal relationships, but "The temporary nature of the project organization means also that members of the project work together for a limited period of time and there is no time for interpersonal relationships to develop into a static state, as in usual operations management." (Harrison, 1992).

Munns (1995) has examined the effects of trust on work and productivity. He defines two kinds of trust; Global and Specific. "Global trust relates to the universal perception of other people or groups. ... The 'specific' element of trust relates to the way in which an individual responds to a particular situation". Recent research has concentrated on specific trust, but has tended to study "permanent organisations in which trust has been allowed to develop over a period of time". Munns points out that projects are temporary organisations, with people employed on temporary basis, doing something unique. They therefore do not allow enough time for trust to build. Members of the team "cannot experience situational trust when the situation is abstract, which is the case in a temporary environment. The specific component of trust, which relies on the situation, can only be developed as the project team begins to work together and the behaviour of the team members can be assessed". (Munns, 1995).

Matrix organisation

"Matrix management is a 'mixed' organisational form in which normal hierarchy is 'overlaid' by some form of lateral authority, influence, or communication." (Larson and Gobeli, 1987).

This is in contrast to what Cleland (1994) calls the "*Functional organization*" approach to project work, in which "the project is divided up and assigned to relevant functional areas with coordination being carried out by functional and upper levels of management."

Kliem and Ludin (1992) assert that:

"Today, the matrix organizational structure is commonplace. Using a matrix ... an organization can have people from different functional groups ... support the project manager. These people may also support

another project. Consequently, they work on more than one project and usually for more than one project manager. This clearly violates the unity of command principle."

Harrison (1992) has also drawn attention to the differences between traditional organisation theory and the matrix approach:

"The matrix form of project organization conflicts with traditional organization theory in many ways. Inherent in it are dual subordination, division of authority and responsibility without corresponding authority and a disregard for the so-called hierarchical principles."

Wysocki, Beck and Crane (1995) suggest that the matrix approach is "probably the most common form found in today's organizations, although there is strong evidence that that is changing and businesses are moving toward a hybrid form of project structure". This movement is observed even within individual projects by Morris (1994):

"One pattern that has emerged for virtually all projects is that once 'downstream implementation' begins - after project definition is basically completed and contracts for implementation are let - the amount of work and management control and co-ordination will increase substantially. There is often a swing at this point from a more functional, or vertical, orientation to a predominantly project, or horizontal one: the so-called 'matrix swing'"

Several writers identify differing levels of matrix organisation. Larson and Gobeli (1987), Harrison (1992) and Cleland (1994) all define Functional, Balanced, and Project forms of matrix organisation:

Functional Matrix

"occurs when the project manager's role is limited to coordinating the efforts of the functional groups involved". (Larson and Gobeli, 1987)

"project manager has limited authority; coordinates contributions of functional departments; functional managers retain responsibility for their parts of the project." (Harrison, 1992)

"a person is designated to oversee the project across different functional areas." (Cleland, 1994).

Balanced matrix

"is one in which the project manager is responsible for defining what needs to be accomplished while the functional managers are concerned with how it will be accomplished." (Larson and Gobeli, 1987).

"project manager and functional managers share authority." (Harrison, 1992).

"A person is assigned to oversee the project and interacts on an equal basis with functional managers." (Cleland, 1994).

Project matrix

"refers to a situation in which the project manager has direct authority to make decisions about personnel and work flow activities. (Larson and Gobeli, 1987).

"project manager has authority for all project-related work. Functional managers contribute personnel and expertise." (Harrison, 1992).

"a manager is assigned to oversee the project and is responsible for completion of the project." (Cleland, 1994).

The latter form is close to a dedicated project team, or what Cleland (1994) calls a "pure project approach", in which "the project is truly like a minicompany. The project team is independent of major support from any major functional units or departments." In this situation "a manager is put in charge of a core group of personnel from several functional areas who are assigned to the project on a full-time basis." (Cleland, 1994).

According to Harrison (1992):

"The principle difference between these three forms of matrix organisation is the relative authority and power of the project manager vis-a-vis the functional manager. In the functional or weak matrix the project manager has very little formal authority, and the functional manager is all powerful. In the project matrix, these positions are reversed and the project manager has the greater authority. In the balanced matrix there is a position somewhere between these two extremes."

Robins (1993) points out that the allocation of resources to work in matrix situations may be achieved either by subcontracting work from the project to functional departments, or by subcontracting labour from the functional departments to the project. Robins does not explore the implications of this for the project manager's authority but it would seem likely that the team factors would be weaker in the former case than in the latter.

Assessments of the comparative advantages and disadvantages of using a matrix approach are compiled by Larson and Gobeli (1987) and by Lientz and Rea (1995). The advantages are listed as follows:

"Efficient use of resources - Individual specialists as well as equipment can be shared across projects"

"Project integration - There is a clear and workable mechanism for coordinating work across functional lines"

"Improved information flow - Communication is enhanced both laterally and vertically"

"Flexibility - Frequent contact between members from different departments expedites decision making and adaptive responses"

"Discipline retention - Functional experts and specialists are kept together even though projects come and go".

"Improved motivation and commitment - Involvement of members in decision making enhances commitment and motivation".

Larson and Gobeli (1987)

"Very good for project-oriented companies"

"Ensures that people on projects are utilized [as otherwise they are returned to the pool]"

"Project manager tends to be powerful in getting resources"

"Accountability and tracking of projects improved"

"Possibility that people who move between projects can build skills"

"Provides formal structure for projects of medium to large size"

"Ability to track what people are working on in projects"

Lientz and Rea (1995).

The following disadvantages are identified:

"Power struggles - Conflict occurs since boundaries of authority and responsibility deliberately overlap".

"Heightened conflict - Competition over scarce resources occurs especially when personnel is being shared across projects".

"Slow reaction time - Heavy emphasis on consultation and shared decision making retards timely decision making"

"Difficulty in monitoring and controlling - Multidiscipline involvement heightens information demands and makes it difficult to evaluate responsibility".

"Excessive overhead - Double management by creating project managers".

Larson and Gobeli (1987)

"Good people will be in heavy demand for projects; others, who are not so good, will sit in the unassigned pool"

"Difficult to assign control between project and line management"

"Line managers tend to be weak"

"Projects with long lives tend to be confused with line organizations"

"Difficult to share resources between projects"

"More difficult to have lessons and skills cross projects - less chance for organization history"

"Project prospers and traditional organization suffers

More difficult to anticipate resource needs and staff for requirements".

Lientz and Rea (1995).

Lock (1996) reinforces the positive aspects of the matrix approach:

"The matrix option ... allows the establishment of specialist functional groups which have 'eternal life', independent of the duration of individual projects. This continuity of work promotes the gradual build-up of expertise and experience. Specialist skills are concentrated. Pooling of skills provides for flexibility in deploying resources. Each member of every specialist group enjoys a reasonably stable basis for employment [provided the order book is full]."

Harrison (1992) is more cautious, at least in respect of the dedicated project team which, he says "is the most effective at achieving results" but which "tends not to use resources efficiently, except in the larger projects". Harrison also warns that "although the matrix organization can achieve results and facilitate teamwork, it also creates many human relations problems". Prominent amongst these human relations problems is that of "dual or multiple command structure, with functional personnel being subjected to the authority of both their functional and project managers. It may lead to role ambiguity and conflict of interests" (Young, 1994).

Lockyer and Gordon (1996) define the situation:

"Staff who are seconded to a project have in effect two supervisors:

- 1 the head of the function who is their normal supervisor and is the one to whom they look for salary, promotion and career prospects; and
- 2 the project manager to whom they are responsible for their work in the project and who will report on that work, and their general conduct, to their functional head.

This inevitably leads to divided loyalties and problems as a result, particularly when staff are seconded full-time to the project and may be physically absent from the function office at the time of annual reviews and similar occasions and so feel that they do not receive the recognition that their work on the project deserves. Oddly enough, this problem appears to be at its worst when the physical separation is so slight that communications appear to be easy and no formal structure is set up. A distant location forces the setting up of formal communications channels. Equally, when a problem, not necessarily technical, arises concerning some aspect of the project to whom do staff turn? They are in an invidious dual reporting situation, and to whomever reference is made, the other 'supervisor' will feel aggrieved."

Ford and McLaughlin (1993) believe that this has potentially serious implications for individuals and organisations:

"The dual responsibility problem is particularly acute for matrix-type structures where two separate areas of the organization are continually sharing human and physical resources. The question of who is ultimately in charge becomes a point of serious contention.

Any time an organization puts together people from two or more functional units on a temporary assignment, this dual responsibility issue becomes a source of conflict. Some analysts argue that this conflict is constructive. However, most recent investigations conclude that the conflict has the potential to harm both the success of the project and the individuals who participate in the project."

Harrison (1992) describes "dual subordination in the matrix organization" as a "complex psychological situation" which "puts stress on all three people involved, just as in a love triangle".

Perhaps these observations do no more than restate a piece of ancient wisdom: "No man can serve two masters; for either he will hate the one, and love the other; or else he will hold to the one and despise the other." (St Matthew's gospel, ch. 6 v. 24).

Wysocki, Beck and Crane (1995) believe that problems can often be avoided if lines of authority are clearly defined at the outset:

"Perhaps the major issue in cross-functional teams is line of authority. It should not happen by default. The stakeholders, especially the contracted team members and resource managers, must have formal statements from the project champion or customer as to who has the authority and responsibility for the project. A formal kickoff presentation, led by the project champion or customer, will include an announcement [verbal and in writing] as to the lines of authority for the project. Having done this at the beginning of the project, there is little chance of confusion or problems downstream in the project."

A limited amount of research evidence is available to support the advice and observations of project management practitioners. Larson and Gobeli (1987) surveyed 510 members of the [US] Project Management Institute. 30% were project managers or project directors, 16% were top management, 26% were functional managers. Overall, 80% had experience of managing projects. "Over three-quarters of respondents reported that their company had used matrix. Of those who responded yes, 89 per cent felt that matrix would probably or definitely continue to be used. Only 1 per cent reported that matrix would definitely not be used again."

All three forms of matrix were widely used. The project matrix form had been used by over 78% of respondents, functional matrix by 74%, and balanced matrix by 64%. There was a slight bias towards project matrix for smaller firms. 123 respondents had experience of all three forms of matrix. This group rated project matrix highest - between 'effective' and 'highly effective'. Functional matrix was rated 'ineffective', whilst balanced

matrix was rated between 'ineffective' and 'effective'. Curiously, "one of the reasons mentioned for dropping matrix was that the organization was too small to sustain a matrix structure. However, when the effectiveness ratings were examined according to size of firm, size had little impact on the ratings". (Larson and Gobeli, 1987).

Cleland (1994) refers to "one study of the significance of project management structure on the success of 546 development projects" in which "it was found that projects relying on the functional organization or a functional matrix were less successful than those which used a balanced matrix, project matrix, or project team. The project matrix outperformed the balanced matrix in meeting schedule and outperformed the project team in controlling cost."

Frequent reference is made in the literature on matrix organisation to a study by Lawrence and Lorsch (1967) who studied six organisations in an industry "characterized by relatively rapid technological change and product modification and innovation". They assessed the degree to which units [subsystems] within each organisation were differentiated from each other "in terms of subsystem formal structures, the members' goal orientation, members' time orientations and members' interpersonal orientations", and how well integrated the subsystems were into the overall organisation, that is, how well they could cooperate and work together synergistically. The performance of the organisations was assessed using "conventional financial data used by management as measures of performance". Lawrence and Lorsch concluded that "other things being equal, differentiation and integration are essentially antagonistic, and that one can be obtained only at the expense of the other".

The implications of this for project management are somewhat ambiguous. It appears that Lawrence and Lorsch were not considering specifically project-type situations, but rather the ability of specialist functional units to cooperate. It may be that project-oriented matrix forms are an answer to their observations, rather than an example of them.

Ford and McLaughlin (1993), summarising research on matrix organisation, comment that "the research findings have not yielded many helpful insights for practising managers", which tends to support Larson and Gobeli's (1987) observation that "for the most part the literature consists of anecdotal success or failure stories".

Ford and McLaughlin (1993) suggest a balance where the project manager defines project work and has authority for direction and control of the project, whilst functional managers provide personnel to the project and carry out work [packages] defined by the project manager.

There is clear potential for conflict between the project and line management functions: "The functional manager is responsible for staff development and deployment. The project manager is responsible for getting projects done on time, within budget, and according to specification. The two sets of responsibilities are often at odds with one another." (Wysocki, Beck and Crane, 1995). Despite this, Kerzner and Cleland (1985) envisage the growth of a cultural form which facilitates matrix working, although this may take time:

"Within the matrix organization there is a potential for duplication in staffing. The functional manager who previously was free to manage the organization relatively unilaterally is forced to act in an environment that places a premium on the integration of resources through a project team consensus. To accomplish project results, he must learn to work with a vocal and demanding horizontal organization.

A cultural characteristic of the matrix design thus causes two key attitudes to emerge: the manager realizes that authority has its limits, and the professional realizes that authority has its place."

Morris (1994) believes this to be achievable, but warns that it "inevitably requires attention to be paid to the 'softer', people issues, so that the project suffers as little as possible. Changing structure involves changing roles and responsibilities. Teams will reform, new personalities will emerge, egos will be affected."

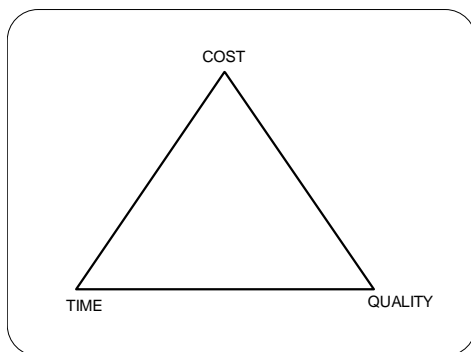
Young (1994) believes that a combination of training, clarity, and appropriate organisational status are required for successful application of matrix approaches:

"to use the matrix, personnel must be properly trained in understanding the concept, principles involved and the techniques of operation. Lines of authority and responsibility must be clearly defined, and any subdivision of responsibilities clearly allocated.

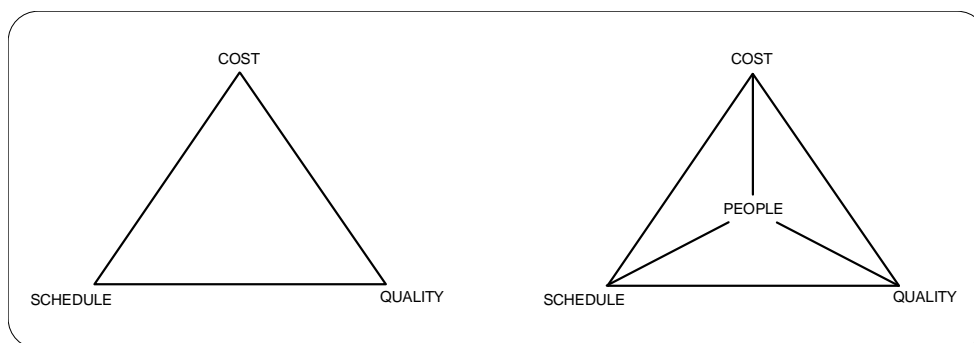
... the matrix organization is usually applicable at middle management level and is normally imposed on an existing functional organization structure. It is seldom applicable at the top managerial level. It is also rarely used at lower management levels without difficulties and much training."

Project goals and objectives

Several references have been made above to project objectives, goals or outcomes. The fact that a project is, by definition, unique means that its goals and objectives must be determined and defined specifically and cannot be generalised. However, a language or framework has developed to enable discussion of project objectives in generalised terms. Traditionally, the objectives of any project have been represented in the form of a triangle, showing time, cost, and quality [or schedule, budget, and technical specification] objectives (see, for example, Morris, 1994; Kerzner, 1989; or Wysocki Beck and Crane, 1995):



Time-Cost-Quality triangle



Kliem and Ludin's (1992) extra dimension

Obeng (1994) identifies the people involved in a project as stakeholders, who fall into three groups: some focus on project tasks and deliverables, for example, financial contribution, "timeliness in providing competitive advantage", and whether the project delivers the "specific technical and business objectives it was set up for. ... Others are primarily concerned with the way in which they are managed, influenced and involved **during** the project". Obeng maintains that this group is likely to measure success in terms of their own feelings. "The third group are primarily concerned with *both* the outcomes of the project and how well they think that they have been managed during the project". The attitudes of members of these groups

The illustrative and didactic power of this device is that it clearly shows how a change to any one of the factors must impact the other two. Some writers, however, have argued that the triangle is too simple a figure to represent the interacting objectives of most projects. Briner, Geddes and Hastings (1990) set the Time-Cost-Quality triangle inside a circle of three segments: Organisational politics, Personal objectives, and External or Commercial pressures. Kliem and Ludin (1992) show a tetrahedron about the dimensions of Schedule, Cost, Quality and People, arguing, like Briner et al, that the personal objectives and feelings of the people involved are intrinsic to the definition of the total project.

will be heavily influenced by the nature of their involvement: "It makes a difference whether the stakeholders are paying for the project or not. People create change - people constrain change. People constrain change when someone else imposes it on them. *It makes a real difference who is to change as a result of the project*". (Obeng, 1994).

Meredith and Mantel (1995) believe that the explicit objectives exposed in the Time-Cost-Quality triangle are only a sub-set of the objectives actually operating, and that the unacknowledged, 'ancillary' goals are likely to have a powerful effect on performance:

"There are tough problems associated with finding the ancillary goals of a project. First, and probably the most important, is the obvious fact that one cannot measure performance against an unknown goal. Therefore, if a goal is not openly acknowledged, project team members need not fear that their performance can be weighed and found wanting. The result is that goals appearing in the project proposal must be recognized, but 'unwritten' goals can often be ignored. Again, ancillary goals are rarely disclaimed; they are merely not mentioned.

Whether or not such anxiety is deserved is not relevant. Particularly in this era of corporate 'restructuring', anxiety is present. It is heightened by the fear that an evaluation may not be conducted 'fairly', with proper emphasis on what is being accomplished rather than stressing shortcomings. If the self-image of the project team is very strong, this barrier to finding ancillary goals may be weak, but it is never absent." (Meredith and Mantel, 1995).

Gabriel (1991) insists that "the project manager must not only identify the objectives of the project, but demonstrate his/her own commitment to them". It is essential to "convince others of their validity and credibility" because "objectives that are not credible soon damage the work and motivation of the team".

Similarly, a distinction may be drawn between the explicit objectives, or 'deliverables', of the project as defined in its documentation, and the long-term benefits an organisation hopes to derive as a result of receiving those project deliverables. This issue will be discussed further in the context of project success and failure.

It should not be assumed that the goals or objectives will remain stable throughout a project's duration. Priorities external to the project may change, impacting on support or resourcing, and the personal objectives of participants may also change, both for external and project-intrinsic reasons.

"Most companies believe that if they have enough resources to staff all of the projects that come along, then the company is 'overstaffed'. As a result of this philosophy, priorities may change continuously, perhaps even daily. Management's goals for a project may be drastically different from the project's goals, especially if executive involvement is lacking during the definition of a project's requirements in the planning phase." (Kerzner, 1989).

"As the project nears completion, obstacles tend to be clustered around two issues: first, last-minute schedule and technical changes, and second, a series of problems that have as their source the uncertainty surrounding what happens to members of the project team when the project is completed." (Meredith and Mantel, 1995).

Project control

The establishment of clear objectives, or deliverables, is usually regarded as the first phase, or at least an early phase, in a project's life-cycle. Most writers are agreed that projects progress through a series of phases, although the number of phases identified and the nomenclature used vary widely: "The project management literature has a variety of definitions of the project life cycle and the number of stages it contains ... However, there is agreement that a project life cycle exists and that the individual stages can be distinguished from each other." (Ford and McLaughlin, 1993).

These stages or phases can frequently be reduced to four broad groups. Adams and Barndt (1988) refer to these as Conceptual; Planning; Execution; and Termination, whilst Briner, Geddes and Hastings (1990) argue that "every project goes through the same phases: definition, planning and resourcing, implementation, and hand-over." Project goals and objectives are defined during the conceptual or definition phase. During the planning phase the detailed steps, or work packages, are defined that must be undertaken in order to achieve the desired or specified results.

Project control, at least in the immediate context, consists in the visibility of actual progress and outcomes compared with the planned progress and outcomes, and the possession and exercise of power to change what is happening.

"One characteristic of any project is its uniqueness, and this characteristic means that the PM will have to face and overcome a series of crises. From the beginning of the project to its termination, crises appear without warning. The better the planning, the fewer the crises, but no amount of planning can take account of changes that can and do occur in the project's environment." (Meredith and Mantel, 1995).

"Control is a fact-finding and remedial action process to facilitate meeting the project objectives and goals; its primary purpose is not to determine what has happened [although this is important information], but rather to predict what may happen in the future if present conditions continue and if there are no changes in the management of the project. This enables the project manager to manage the project in compliance with the plan". (Cleland, 1994).

The exercise of control in the absence of direct authority is one of the continuing issues of project and matrix management. No simple answer is proposed in the literature, although negotiation, delegation, persuasion and other 'soft' skills recur as themes in the advice to practitioners (see for example, Kliem and Ludin, 1992; Morris, 1994; or Kerzner, 1989). Robins (1993) is pessimistic:

"The principle is that effective management, that is control, can only be achieved if authority is vested along with responsibility in the delegation process. If this rule is broken, the management of projects will never be effective on a permanent basis. This is more important than anything else in project- or programmes- management theory."

Corrie (1991) argues for clear and recognised project management procedures, which at least provide a commonly-understood framework within which efforts can be coordinated. Lock (1996) emphasises the role of communication, specifically to clarify the project's authority chains and cascaded objectives, but also in a wider and more general context:

"An effective organization will ensure that clear lines of authority exist, and that every member of the project knows what he or she must do to make the project a success. This is part of the management communication framework, essential for motivating all the staff employed. A well-motivated group can be a joy to work with. A badly informed group, with vague responsibilities and ambiguous levels of status and authority, is likely to be poorly motivated, slow to achieve results, costly to run and extremely frustrating to work with.

The complement of good management communications is the provision of adequate feedback paths through and across the organization." (Lock, 1996).

In summary, project control requires initial clarity, in the form of defined objectives and a plan for achieving them; a flow of information; and the power to make changes where necessary. In the project management context it is frequently the case that this power is not bestowed by organisational position and this implies that alternative means must be found of bringing about changes in the actions of those whose cooperation is needed.

Factors in project success and failure

"Projects ... are concerned with change and, therefore, carry with them considerable uncertainty, and with uncertainty comes risk" (Lockyer and Gordon, 1996)

The effects of these uncertainties on project outcomes have entered the public consciousness through some well-publicised, perhaps infamous, public-sector projects. Caulkin (1996) observes that, of twenty-three programmes examined by the National Audit Office - "almost all were late [the average slippage was 31 months]" and total overspend came to £700 million. Caulkin cites some examples of well-known projects that overran budget and/or schedule, including: Eurofighter - 3 years late and £1.25 billion overspent [UK liability only]; the British library -

"nearly three times dearer than it should have been, still unfinished and without a definite completion date"; the Stock Exchange Taurus project - "embarrassingly aborted"; the London Ambulance computer system, which collapsed disastrously when implemented; and the Channel tunnel, notoriously over-budget. Morris (1994) reports a similar pattern: "in the early 1980s ... I had data on 1449 projects - all that I could find in the public record; of these, incredibly, only 12 had out-turn costs below or on budget. [Later I repeated the exercise with over 3000 projects, with similar results.]"

To balance this otherwise depressing picture, it should be observed that 'success' is not necessarily an objective or measurable term. Concorde, by budget or schedule factors, would be considered a project which clearly failed, but as a technical achievement, and as an enduring icon of national pride, it has been highly successful; so much so that British Airways were overwhelmed with applications when they offered a strictly limited number of flights from London to New York for £10, in the spring of 1997. "When measuring project success, one must consider the objectives of all the stakeholders throughout the project life cycle and at all levels in the management hierarchy. Therefore, to believe that, with such a multitude of objectives, one can objectively measure the success of a project is somewhat an illusion." (de Wit, 1988).

Just as the traditional 'Time-Cost-Quality' triangle has proved inadequate in defining project objectives, so these factors have been found unsatisfactory in assessing the success or failure of projects, a concept which "has remained ambiguously defined both in the project management literature and, indeed, often within the psyches of project managers" (Pinto and Slevin, 1986).

"Projects are often rated as successful because they have come in on or near budget and schedule and achieved an acceptable level of performance. These characteristics may be used because they are the easiest to measure [quantify] and they remain within the realm of the project organization. ... Other project organizations have begun to include the client satisfaction variable in their assessment of project success." (Pinto and Slevin, 1986).

The view that project success must be judged on the outcomes of the project within the recipient organisation, and not solely on the adequate discharge of the 'contractual' criteria of budget, performance measurement, and delivery on schedule, is widely supported across the recent literature.

"The research conducted by the authors on over 650 projects supports the following definition of success: If the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key people in the parent organization, key people in the client organization, key people in the project team, and key users or clientele of the project effort, the project is considered an overall success" (Baker, Murphy and Fisher, 1988).

Baker et al found that "Technical performance is integrally associated with perceived success of a project, whereas cost and schedule performance are somewhat less intimately associated with perceived success". Satisfaction of people associated with the project was also found to be more important than cost or schedule performance.

Pinto and Slevin (1988) suggest three criteria for project implementation success: Technical validity - the project "works" or "does what it is purported to do"; Organizational validity - "the project [is] compatible with the needs of the user. ... if the final project is not used by the clients, that implementation effort is viewed as a failure"; and Organizational effectiveness - "once the new project has been given to the clients and is being used, it is contributing to an improved level of organizational effectiveness in the client's organization". Their view is that:

"A project is generally considered to be successfully implemented if it

- Comes in on-schedule [time criterion]
- Comes in on-budget [monetary criterion]
- Achieves basically all the goals originally set for it [effectiveness criterion]
- Is accepted and used by the clients for whom the project is intended [client satisfaction criterion]"

Cleland (1994) takes a broadly similar view:

"Project success means that the project has met its cost, schedule, and technical performance objectives and has been integrated into the customer's organization to contribute to the customer's mission. A successful project means that the organization has been successful in positioning itself for the future; a specific strategy has been designed and implemented".

The Association for Project Management (1995) states that

"Three basic sets of criteria [on which the relative success or failure of the project may be judged] can be identified:

1. those of the sponsoring organisation ie the owner or user
2. the traditional or classic project management one of 'on time, in budget to specification';

3. the project participants' profitability"

Kerzner (1989) modified his earlier definition of project success as "the completion of a project within the constraints of time, cost, and performance" to

"include completion:

- Within the allocated time period
- Within the budgeted cost
- At the proper performance or specification level
- With minimum or mutually agreed upon scope changes
- Without disturbing the main work flow of the organization
- Without changing the corporate culture."

Some writers draw attention to the changes which may occur during and after the lifetime of a project, which may have a bearing on how it is perceived and judged. Avots (1984) argues that "During the early phase of the project, schedule is of primary importance, while cost takes second place and quality third. Later in the project, cost becomes the controlling interest, with schedule taking a secondary role. After the project has been completed, schedule and cost problems are easily forgotten and quality becomes the key."

Lientz and Rea (1995) point out that to judge by "project on schedule and within budget ...[is] not as simple as it seems because the budget and schedule may have been changed many times". They ask whether the end product is in use, and go on to consider "project manager and team performance ... did the project team deal with issues early or as soon as they surfaced? Or, did they fester and get worse? Was management kept informed about the project? What signs were there of misunderstandings?"

Lientz and Rea believe that any evaluation should take a wider view of the impact a project has had, before assessing its success:

"A project can achieve its objectives and yet fail due to side effects. Take a large dam in Africa. It holds water to control flooding. It can generate power. But it may silt up. The cost of the power infrastructure may be more than that of imported oil. The lack of flooding may mean that the country has to import vast quantities of fertilizer. The side effects may outweigh the engineering success." (Lientz and Rea, 1995).

Obeng (1994) argues that "project success is and can only be defined by the stakeholders". These stakeholders may have differing requirements:

"there can be ambiguity in determining whether a project is a success or a failure. ... it is still not clear how to measure project success because the parties

who are involved in a project perceive project success or failure differently. A project which is considered to be a success by the client might be considered a failure by top management, if the project outcome does not meet top management specifications, even though it might satisfy the client". (Belassi and Tukel (1996).

"The project objectives are conditioned by the Client's strategic aims. Even where these appear to be obvious - for example the profits and long term health of a company, or the implementation of Government policy - they should be reviewed to ensure that the project objectives are consistent with them." (Corrie, 1991).

"Of course, major projects have a mixture of motives, objectives and disciplines involved. However, it is essential to decide which is the dominant factor." (de Wit, 1988).

Briner, Geddes and Hastings (1990) maintain that the project manager has the responsibility for understanding and clarifying the requirements of the various stakeholders:

"The soft and less easily measured criteria of the project are often more important than the hard and easily measured criteria. ... It is part of the job of a project leader to 'tease out' such soft criteria in discussion with the client and end-users at the start of the project.

Hard success criteria tend to relate to what is done. Soft success criteria relate more to how it is done."

Lientz and Rea (1995) do not expect clear-cut judgements for most projects

"In general, most projects are viewed as a mixture of failure and success. Some things worked; some did not. The end product is often not quite right. It works but unforeseen behavior and impacts occurred."

de Wit (1988) is more forthright: "referring to a project as being a success or a failure without qualification is a nonsense".

Several writers have compiled lists of factors conducive to project success or failure. Adams and Barndt (1988) collected data from a group of fifty managers with "some project involvement" over two years. The subjects were asked to think of successful projects, put themselves in the project manager's position, and suggest things they might do to help the project succeed. Ten factors were identified:

- | | |
|---------------------------|--|
| 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 project success |
| 3. Project Schedule/Plan | A detailed specification of individual actions steps for project implementation |

- | | |
|----------------------------|--|
| 4. Client Consultation | Communication, consultation and active listening to all impacted parties |
| 5. Personnel | Recruitment, selection and training of the necessary personnel for the project team |
| 6. Technical Tasks | Availability of the required technology and expertise to accomplish the specific technical action steps |
| 7. Client Acceptance | The act of 'selling' the final project to its ultimate intended users |
| 8. Monitoring and Feedback | Timely provision of comprehensive control 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 |
| 10. Troubleshooting | Ability to handle unexpected crises and deviations from plan |

The study by Baker, Murphy and Fisher (1988) of "over 650 projects" found that participation by the project team in setting schedules and budgets was significantly associated with project success, whilst a lack of such participation was associated with project failure. Other factors significantly associated with failure were: lack of team spirit; lack of sense of mission; job insecurity; and lack of influence on the project manager

Baker et al found a linear correlation between project success and the degree of goal commitment in the project team, and with the degree to which task commitment, backed-up with social commitment, was used as means of conflict resolution.

Corrie (1991) lists the causes of project failure as:

- The project was badly conceived - factors which might affect it not properly considered
- Project scope not adequately defined and agreed
- User kept at arm's length from project development
- Conflicting objectives of participants not recognised
- Project badly organised
- Poor communications
- Amount of planning inappropriate to the scale of the project
- Optimistic planning led to underestimate or resource requirements
- Contract strategy not considered until too late - options restricted
- Poor change control

- Harrison (1992) cites some 1988 research by Duffy and Thomas on project audits to produce another list of factors in project failure:
- Not full-time project manager, client, etc.
- Inappropriate project organization, roles and responsibilities not clearly defined
- Lack of direction control
- Contract strategy not decided [until too late]
- Scope of work not defined and understood
- Level of planning inappropriate to scope of work
- Poor change control
- Poor risk identification and management

Harrison uses this and other research to argue that

"There is a large amount of consensus both in the UK and the USA as to the reasons for the success or failure of projects and of project management. The principal factors leading to project failure have been identified as the following:

- Inadequate and inappropriate organisation structures, which lead to problems of authority, responsibility, communication and coordination.
- Inadequate planning and control methodologies and systems.
- The intergroup and interpersonal human problems and conflicts that arise in the flexible and complex organization of projects.
- A lack of integration of the organization, the work, the people and the management systems."
- "there is much consensus in these studies as to the reasons for the success or failure of projects and of project management. The following principal factors can be identified:
- Organization
- Planning and control
- Human factors"

Lientz and Rea (1995) provide a list of "20 ways to fail as a project manager

1. Take a hands-off approach to project administration
2. Do not get involved in individual tasks
3. Let issues drift and remain unresolved
4. Be unwilling to listen to suggestions for change
5. Be overfocused on specific project management tools
6. Become obsessed with percentage complete for tasks
7. Measure milestones by presence and not quality
8. Devote too much attention to relations with management and not enough to the project team
9. Be overconcerned with project administration and neglect project management
10. Attempt to micromanage the project and not delegate
11. Be formal in relations with the project team

12. Do not stay in communication with line managers
13. Make too many changes to the schedule
14. Be willing to rapidly adopt new tools without assessing the consequences
15. Be status-oriented and not issue-oriented at project meetings
16. Develop an overly general project plan without detailed tasks
17. Be tool-focused as opposed to method-oriented with the tools supporting the methods
18. Fail to regularly communicate in person with all key members of the project team
19. Leave issues unresolved and allow them to fester and grow
20. Address issues without analysis

Pinto and Kharbanda (1996) provide only twelve ways "to ensure a project's failure:

1. Ignore the project environment [including stakeholders]
2. Push a new technology to market too early
3. Don't bother building in fallback options
4. When problems occur, shoot the [person] most visible
5. Let new ideas starve to death from inertia
6. Don't bother conducting feasibility studies
7. Never admit a project is a failure
8. Overmanage project managers and their teams
9. Never, never conduct post-failure reviews
10. Never bother to understand project trade-offs
11. Allow political expediency and infighting to dictate crucial project decisions
12. Make sure the project is run by a weak leader.

Meredith and Mantel (1995) collected data "over a period of three years from a sample of over 400 project leaders in predominantly technical undertakings. ... [project leadership criteria] included: two years of experience in managing multidisciplinary projects, leading a minimum of three other project professionals, and being formally accountable for final results." They found that problems of project control, leading to perceived failure, were differently attributed by stakeholder groups. "Project leaders" blamed poor project control on:

- "Customer and management changes
- Technical complexities
- Unrealistic project plans
- Staffing problems
- Inability to detect problems early"
- "Senior management ranks these reasons somewhat differently:
- Insufficient front-end planning

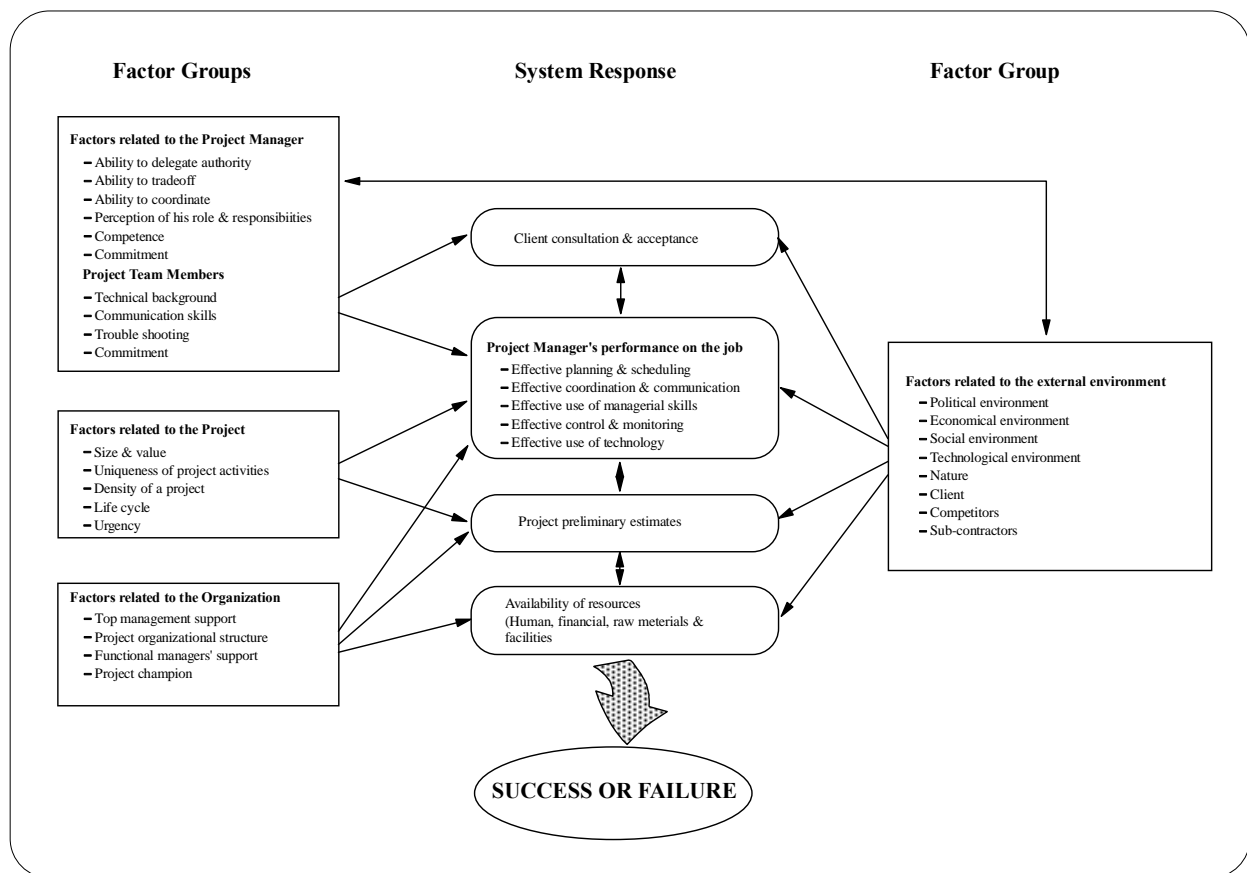
- Unrealistic project plans
- Underestimated project scope
- Customer and management changes"

"Managers at all levels have long lists of 'real' reasons why ... problems ... occur. ... The most frequently mentioned reasons for poor project performance can be classified in five categories:

- Problems with organizing project team
- Weak project leadership
- Communications problems
- Conflict and confusion
- Insufficient upper management involvement

Most of the problems ... relate to the manager's inability to foster a work environment conducive to multidisciplinary teamwork, rich in professionally stimulating and interesting activities, involvement, and mutual trust."

It can be seen that there is a wealth of advice for the practising project manager, although some of it is couched in rather negative terms. Belassi and Tukul (1996) have provided a useful summary of project success factors, collated from the literature, which brings some order to the mass of opinion, research and experience represented above and elsewhere. This is illustrated diagrammatically in the figure below:



Factors in project success

Belassi and Tukul (1996)

Belassi and Tukul identify, from the literature and from their own research, "top management support" as probably the most critical factor in project success. This is because "Top management usually controls a project manager's access to resources which are supervised by functional managers. The level of support provided by the functional manager is usually determined by the level of support from top management" (Belassi and Tukul, 1996). Morris (1994) agrees that "*it is particularly important to project success that there be commitment and support at the top, without it the project is probably doomed*". This requirement

can be seen as a component of matrix working, which has already been explored above, and is related to the degree of authority accorded to the project manager (see, for example, Thamhain and Wilemon, 1974; Baker, Murphy and Fisher, 1988; or Cleland, 1994). Organisation structure: "having the wrong people in key positions with their roles and responsibilities being neither well defined nor understood" (Corrie, 1991) has also been identified as a key factor in project failure. Lockyer and Gordon (1996) link this factor directly to top management support, contending that "a project may suffer because of the degree of importance

assigned to it by the parent company. Should it be deemed to be of little value there may be attempts to 'pass off' difficult employees to the project".

Baker, Murphy and Fisher (1988) found that "excessive structure" was significantly related to failure, and that "bureaucracy and spatial distance of the project manager to the project" was linearly related to failure.

The importance of the feelings and attitudes of people working on a project is a recurring theme in the literature. Morris (1994) is adamant:

"Projects demand significant effort, under difficult and even hostile conditions, often without the benefit of high personal financial reward. [In fact ... people often work feverishly to put themselves out of a job!]. Unless there is a major commitment to making the project a success, unless the motivation of everyone working on the project is high, and unless attitudes are supportive and positive, the chances of success are substantially diminished."

Fortunately, according to Cleland (1994) "Most people associated with a project are disposed to make it succeed", although even this has a down side, leading project participants to continue their commitment "even beyond a point of unwise cost increases or schedule delays. All too often project managers will ask for more time and more resources to make the project succeed, even beyond prudent justification." (Cleland, 1994).

The factor in generating positive attitudes which emerges from many of the studies and practitioner advice is the fostering of an effective project team.

"Much is rightly said and written about the importance of motivating people who work on projects. An important aspect of motivation is the generation of a team spirit, in which all members of the team strive to meet common goals. It is obviously easier to establish team spirit when a project team actually exists, as opposed to the case where the people are dispersed over a matrix organization which has to deal with many projects." (Lock, 1996).

Tampoe and Thurloway (1993) conducted a survey of 98 project managers, extracted from responses from 491 "knowledge workers". Their findings led them to "take the view that the fostering and developing of a project environment which encourages mutuality, belonging, rewards, bounded power and creative autonomy is likely to result in improved project performance." Cleland (1994) refers to work by Thamhain and colleagues "into work group dynamics" which "clearly show significant correlations and interdependencies among work environment factors and team performance". Four primary factors leading to high

team performance are identified in these studies: "managerial leadership, job content, personal goals and objectives, and work environment and organizational support". Altogether sixty "influence factors to the project team characteristics and performance" were identified, but only twelve were found to be statistically significant to high team performance. The six drivers "that have the strongest positive association to project team performance are:

- Professionally interesting and stimulating work
- Recognition of accomplishment
- Experienced engineering management personnel
- Proper technical direction and leadership
- Qualified project team personnel
- Professional growth potential

while the strongest barriers to project team performance are:

- Unclear project objectives and directions
- Insufficient resources
- Power struggle and conflict
- Uninvolved, disintegrated upper management
- Poor job security
- Shifting goals and priorities"

(Cleland, 1994)

This echo of Herzberg's two factor approach is adopted, more explicitly, by Meredith and Mantel (1995) who refer to Herzberg to support their contention that "recognition, achievement, the work itself, responsibility, advancement and the chance to learn new skills are motivators" in project work. (See Herzberg, 1959).

Tampoe and Thurloway's (1993) research identified as "Key motivators":

Mutuality: "mutual support and encouragement between line management and project managers" plus "loyalty of project managers to their organizations and their profession"

recognition for personal achievement

belonging: "supportive, cohesive and friendly team relations ... clear communications ... clear information and project goals"

bounded power: "authority and control over project resources and people ... abilities to influence decisions"

creative autonomy: opportunities to use creativity and potential ... good working conditions"

This leads them to consider that the climate within which the project team operates may be more important to project success than the specific detail of the project itself:

"The key motivators that were identified by our sample to be of most importance tended to focus on the

intangible variables that create the project environment, as well as on more pragmatic factors, such as resources and support from senior management. ... Considering this in relation to the valence-expectancy model of motivation, we proffer the view that many of the respondents' drives to succeed are being adversely affected by approaches which focus on deliverables rather than the empowerment of teams to deliver".

The work of Munns (1995) and others on the place of trust in effective project team working has been referred to above. This factor must be a major determinant of the climate within which the project is implemented.

The more technical project management factors contributing to success or failure seem to be of much less significance than the human factors. The need to set, and express in writing, clear goals or desired outcomes is mentioned by most authors (for example, Cooke-Davies, 1990; Corrie, 1991, Morris, 1994; or Lockyer and Gordon, 1996), followed by sound planning of the tasks or activities necessary to realise those goals (eg, APM, 1995; Wysocki, Beck and Crane, 1995; Lockyer and Gordon, 1996).

Corrie (1991) asserts that "The causes of project failures occurring during implementation or after completion can often be traced back to deficiencies in the planning stages." Robins (1993), having examined the interactions which occur in matrix situations, takes a different view:

"The conclusion to be drawn from this analysis may seem a little surprising. It is that the power to make project management effective in the matrix environment lies with the financial director. ... The project manager of all major projects is given a budget to spend. He/she always has the authority to control external subcontract expenditure when work is subcontracted out."

Robins suggests that in most companies that are managed on a matrix basis the project manager does not have full control and therefore cannot manage effectively. Robins argues that the financial director could remedy this quite simply by empowering the project manager to control the project finance.

Meredith and Mantel (1995) argue that "the principles and practices of good, general management also apply to the management of projects". Wysocki, Beck and Crane (1995) think that this principal applies in reverse and that the skills needed to manage projects successfully will have an increasingly important place in general business management:

"The familiar command and control structures imposed at the turn of the century are rapidly disappearing. In

their place we have task forces and self-directed work teams. Empowerment of the worker lies at the heart of these new structures. With that empowerment comes the need for solid project management skills".

Belassi and Tukel (1996) doubt if project outcomes are determined by single factors: "Usually a combination of many factors, at different stages of project life cycle, result in project success or failure", whilst Caulkin (1996) regards the issue as being very simple indeed: "Most project disasters can be traced back to two shortcomings so basic they appear to defy belief: failure to define the goal; and inability to define categorically where the responsibility is".

The job of the project manager

"In the project environment, everything seems to revolve around the project manager. Although the project organization is a specialized, task-oriented entity, it cannot exist apart from the traditional structure of the organization. The project manager, therefore, must walk the fence between the two organizations." (Kerzner, 1989).

The dual nature of the project management job is a thread which runs through the literature. Meredith and Mantel (1995) describe the tensions facing the "typical new project manager" who, they argue, "finds adjustment to this anomalous new role painful, confusing, and even demoralizing. Lacking real line authority, he or she must constantly lead, persuade, or coerce former peers through a trying period of change."

Lientz and Rea (1995) describe "three clearly defined management responsibilities" of the project manager:

- 1 "Resource manager. Manage and direct project resources to achieve the project objective.
- 2 Planning and control manager. Develop the project plan and ensure that the work is completed on time, within budget, and with acceptable quality.
- 3 Coordinator. Interface with upper management regarding project review, approval, and address project issues. The manager must also relate successfully to line managers and staff."

Meredith and Mantel (1995) suggest that "project managers face some unusual problems in trying to direct and harmonize the diverse forces at work in the project situation". They identify, from their own observations, three sources of difficulty: "organizational uncertainties, unusual decision pressures, and vulnerability to top management mistakes". Harrison (1992) attributes the main tensions of the job to the need to "manage their peers, juniors and superiors in other departments and companies who contribute to the project",

without the benefit of the "usual superior-subordinate relationships".

"In project management human relations problems are accentuated and accelerated. Project managers do not work in the usual superior-subordinate hierarchy and their responsibility typically exceeds their authority. Yet they must manage people who are not directly responsible to them and often outside their own company. They must also quickly build teams, or at least a cooperative working relationship, and must manage conflict which is generally held to be endemic in project work" (Harrison, 1992).

In order to manage a project, in any meaningful sense, the project manager must have the means of knowing how the project is progressing, by comparison with a predefined plan, and must be able to change what is happening. The first requirement depends very much upon establishing and maintaining communication channels (Williams, 1996; Belassi and Tukel, 1996) and upon direct observation:

"Project performance must be sensed - and that is where performance observation comes into play. Performance observation is the receipt of sufficient information about the project to make an intelligent comparison of planned and actual performance. Information on project performance can come from many sources, both formal and informal" (Cleland, 1994).

The ability to change what is happening is a function of the power which a project manager is able to exercise. It has already been established that direct line authority is not the norm in the project situation:

"Ford and McLaughlin in their research remind us that classical management theory holds that parity of authority and responsibility should exist. In project management there may not be such parity across the various stages of the life cycle. They note that few empirical data have been collected to test the hypothesis that parity does not exist and that this lack of parity is the cause of many management problems. In their research report collected from 462 information system managers, the data indicated that in the majority of cases parity did not exist". (Cleland, 1994. See Ford and McLaughlin, 1993).

Lacking direct authority, the project manager must use other forms of power to exercise control over events. Huczynski and Buchanan (1991) define five possible "power bases": *reward power*, where the leader can control rewards; *coercive power*, which depends on the ability to administer penalties; *referent power*, "followers believe that the leader has characteristics that are desirable and that they should copy"; *legitimate power*, "followers believe that the leader has a right to give them orders

which they in turn have an obligation to accept" and *expert power*:

"A leader has expert power if followers believe that the leader has superior knowledge and expertise which is relevant to the particular tasks or activities in hand. Expert power can confer leadership on anyone with the requisite knowledge and skills regardless of their job title or organizational position"

The latter form of power may constitute a threat to the project manager's authority, since he or she is unlikely to be an expert on all, perhaps on any, of the specialisms which will be required to contribute to the project.

"A project manager has to watch someone else provide the technical input in which the project manager may have experience and expertise. The project manager must be patient when someone accomplishes a task less proficiently than the project manager might be able to. The project manager must shift from the role of specialist to generalist - a leader in the management functions of planning, organizing, motivating, and control. This takes the project manager away from the technical aspect of the project, allowing the project team members to be the experts in the technical work they represent". (Cleland, 1994).

Lock (1996) believes that persuasion is the project manager's greatest source of power, although he does not rule out the use of coercive power altogether:

"The main show of authority which the project manager can wield stems from his or her own personality and ability to persuade or motivate others. In these enlightened times discipline no longer implies the imposition of rigid authoritarian regimes or management by fear through the constant threat of dismissal or other punitive action. Mutual cooperation and established job satisfaction are the more likely elements of an effective approach, especially in the long term. There will, however, be occasions when firm discipline has to be exercised; when, in the last resort, the full backing and support of higher management must be available as a reserve force on which the project manager can call in any hour of need."

Wysocki, Beck and Crane (1995) agree that he project manager must "communicate, sell ideas, negotiate, problem solve and resolve conflicts across functional and sometimes geographic boundaries". Kerzner and Cleland (1985) maintain that:

"Research has indicated that motivation in the matrix organization depends more on the de facto aspects of authority than on the legal aspects. Negotiating; persuading, and building alliances, trust, loyalty, commitment, communication, and such factors are important in motivating the team members. Much of the motivation comes from the influence of the peer group and the other clientele with whom the project manager must work."

The temporary or short-term nature of projects introduces additional tensions. Sommerville and Langford (1994) argue that this puts project staff repeatedly in the "position of new entrants", which is stressful. Harrison (1992) also draws attention to the effects of new and varied management styles on project personnel:

"The temporary, complex and often loose nature of the relationships and authority patterns involved in project work, combined with the number of different departments and companies, whose objectives, management styles and cultures may differ, leads to human behaviour problems and a tendency for conflict between individuals and groups. Thus traditional management theory has to be modified in the management of project."

There is also the question, affecting both the project manager and more junior members of the project team, of what will happen when the project is completed.

"Another possible difficulty is that, in organisations which are not completely project centred, when a project is completed there may not be another for the project team to pick up. As a result they may be dispersed either back to their original function - which may prove difficult if their place has been filled - or to some other part of the organisation, possibly to assist on another project. This can result in some confusion of loyalties, and beliefs that career prospects are jeopardised, unless clear policies are set down and understood by the staff concerned." (Lockyer and Gordon, 1996)

"Another critical point comes at the conclusion of the project, when its results are turned over to the regular organization and the project manager and team must return to their permanent assignments. By virtue of the interfunctional experience gained under pressure, the project manager often matures in the course of the project, becoming a more valuable manager, but may have trouble slowing down to a normal organizational pace. The routine job is likely to seem less attractive in terms of scope, authority, and opportunity to contribute to the business. Even the best project manager, moreover, can hardly accomplish given project objectives without antagonizing some members of management, quite possibly the very executives who will decide his or her future." (Meredith and Mantel, 1995)

Kerzner (1989) describes conflict as "the single most important characteristic of the project environment" and as "a way of life in a project structure". Conflicts, according to Kerzner, "can occur at any level in an organization, usually as a result of conflicting objectives". Thamhain and Wilemon (1974) measured conflict arising from several variables in a sample of 100 project managers. They found the principal sources of conflict to be, in order:

- 1 schedules
- 2 project priorities
- 3 manpower resources
- 4 technical conflicts
- 5 administrative procedures
- 6 cost objectives
- 7 personality conflicts

The most intense conflicts were with functional departments supporting the project, then with personnel assigned to the project from functional departments. Least severe conflicts were between project manager and their immediate subordinates.

Kezsbom (1992) updates this data from a survey of 285 "managers, scientists and technical specialists." The top three sources of conflict were found to be:

- 1 Goals/priority definitions
- 2 Personality and interpersonal relations
- 3 Communications (ie, disagreements arising from poor information flow.

The rank order of other identified sources of conflict is not clear from Kezsbom's paper, but scheduling is seventh, much lower down than in earlier research. Kezsbom found, however, that project managers themselves did rate scheduling high as source of conflict. Other sources of conflict identified were: managerial/administrative procedures [rank not known]; Resource allocation [rank not known]; reward structure/performance appraisal systems [rank not known]; technical opinions [rank not known]; leadership [rank not known]; ambiguous roles/structure [rank not known]; unresolved prior conflict [rank not known]; and costs [ranked tenth].

Lockyer and Gordon (1996) believe that resource demands are a primary source of conflict between project managers and functional managers: "functional heads ... see that projects require resources - previously totally under their own control - to be shared. In turn this will be seen as a loss of status and security, and defensive mechanisms will be set up."

Conflict is not necessarily destructive. In a study by Barker, Tjosvold and Andrews (1988) "The conflict approaches used by project managers in a matrix organization were described by 135 project team engineers." Conflict was found to be productive where "co-operative and confirming approaches" were used [*cooperative* means "emphasising mutual goals"; *confirming* means "conveys that the other person is effective, avoids insults and blaming"]. Alternatives to these approaches are *competitive* [where conflict is seen

as a "win-lose struggle"] and *avoiding* ["smoothing over differences"]. Meredith and Mantel (1995) confirm this finding: "Conflict can be handled in several ways, but one thing seems sure: Conflict avoiders do not make successful project managers. On occasion, compromise appears to be helpful, but most often, gently confronting the conflict is the method of choice."

Tampoe and Thurloway (1993) assert that "the key deliverable of the project manager's activity is team commitment and motivation, leading to effective project outcomes. ... meeting the project goals is the outcome of effective team activity" and Linkow (1996) argues that "effective managers see their projects as both a set of tasks and a series of agreements or decisions. Underlying both are human interactions. Whether tasks are executed well and agreements hold depends on how well inter-actions are managed".

However, advice to practitioners may seem most credible when given by a revered practising project manager. Eric Gabriel, a senior figure in the UK project management profession and familiar speaker at a wide variety of project management conferences world-wide, gives the following advice:

- "Concentrate on the objectives, not the people"
- "Seek to do nothing, or very little" - if the project manager does work which should be done by a team member, the team member will be demotivated. the project manager's job is to see that work is assigned and being done.
- "Do not organize the people, organize the job ... managing the interfaces between functions and job segments is important"
- "Expose problems - do not conceal them" - seek input from the team in solving problems - do not fail to respond to problems identified by the team
- "Phase the job ... By the breaking down of the project into phases, the work and interest curves can be kept ascending"

Gabriel (1991)

Project management skills

"At its most basic, project management is a deceptively simple discipline. It is the process of integrating *everything that needs to be done [typically utilizing a number of special project management tools and techniques] as the project evolves through its life cycle [from concept definition through implementation to handover] in order to ensure that its objectives are achieved*" (Morris, 1994).

There have been numerous attempts to define the skills required to carry out this daunting

responsibility. Thamhaim and Wilemon (1974) defined six groups of skills:

- | | |
|-----------------------|---|
| Leadership | <ul style="list-style-type: none"> • Clear direction and leadership. • Participating in technical problem solving and decision making. • Clearly delineating goals and objectives. • Unifying team toward project goals. • Delegating. • Sound decision making |
| Technical Expertise | <ul style="list-style-type: none"> • Understanding the technologies involved in the design, development, production, and fielding of a project. • Understanding of applications, markets, and customer requirements. • Managing technology. • Assessing risks and trade-offs. • Predicting technological trends. • Assisting in problem solving. |
| Human Skills | <ul style="list-style-type: none"> • Communicating effectively with the team. • Building multi-disciplinary teams. • Involving and stimulating personnel. • Managing conflict. • Communicating both orally and in writing with all levels of personnel. • Fostering a work environment conducive to teamwork. • Involving senior management. |
| Administrative skills | <ul style="list-style-type: none"> • Project planning. • Resource negotiations. • Securing commitments. • Assuming measurable milestones. • Establishing operating procedures. • Establishing and maintaining reporting and review systems. • Establishing and managing project controls. • Effective use of program management tools and techniques. |
| Organizational Skills | <ul style="list-style-type: none"> • Effective manpower planning • Understanding how the organization works and how to work with the organization effectively • Building multi-functional work teams. |

- Working effectively with senior management.
 - Understanding organizational interfaces.
 - Setting up an effective project organization.
- Entrepreneurial Skills
- General management perspective
 - Managing project as a business.
 - Meeting profit objectives.
 - Developing new and follow-on business

Owens (1982) collated research on the behavioural skills required for project management. He lists:

Leadership behaviour - contingency based

Motivation - the project manager needs to detect unfulfilled needs in the group and its members, and act to address them

Conflict-handling - a problem-solving or confrontational approach is recommended

Decision-making - participative decision-making helps with team-building and improves the effectiveness of decisions

Cooke-Davies (1990) argues that "project working requires team working skills, rather than rigid functional organisations. Project management values discipline and goal-orientation. It rules out seat-of-the-pants decision-making and self-seeking or *prima donna* behaviour".

Harrison (1992) maintains that "the critical areas of human behaviour in which a project manager must have expertise are ... :

1. Leadership
2. Achieving power in a fluid situation
3. The motivation of individuals and groups
4. Developing teams and teamwork
5. Managing conflict

Pettersen (in Fabi and Pettersen, 1992)

"compiled and analysed nearly 30 publications on this subject in a paper that examined the attributes of effective project managers. The basic ... requirements to emerge from this extensive literature are: management abilities [eg, planning, organization, supervision and control], decision-making, communication and human relations abilities, leadership and team management, the intellectual capacities needed to understand and analyse organizational phenomena, and finally a solid technical expertise in the project field."

Anderson (1992) sent a questionnaire to 2000 companies connected with the construction industry and received 1900 replies from 400 companies. Analysis of these replies showed that

"leadership skills and administration experience are the two attributes that have the highest frequency of significance". However, "leadership skills in themselves are not sufficient to ensure effective use. The project manager must have complementary human relations skills. Statistical evidence indicates a close correlation between leadership and human relations skills, although leadership skills appear to have stronger influence."

Cleland (1994) draws attention to "the importance of interpersonal skills and communication abilities to the project manager, citing a 1988 study by Simonds and Winch (1991) who carried out "more than 100 interviews with clients of design firms".

"the responses were emphatic that technical competence is not sufficient in managing a complex project. Project managers who have political savvy and the ability to communicate are important. It was found during these interviews that when something went wrong on a project, seven times out of ten the cause was a breakdown in communication, not a breakdown in technology ...

In additional experiences in conducting employee attitude surveys by this consulting firm, it was found that the most salient link to overall job satisfaction and low turnover is communication within the firm. In this firm's experience with clients, interview data, and attitude survey data the firm managers identified five types of communication skills essential to successful project management: interpersonal communication, presentation and public speaking, conflict management, negotiation, and writing". (Cleland, 1994).

Lientz and Rea (1995) define the attributes of a good project manager as

- Communicator,
- Generalist - able to see the big picture;
- Problem and conflict solver;
- People management;
- Experience;
- Ambition;
- Energy;
- Knowledge;
- Perspective;
- Sense of humour;
- Initiative and risk taking;
- Being organised;
- Able to take direction and suggestions;
- Familiarity with the organisation;
- Knowledge of technology;
- Toughness

They adopt a now familiar format by providing a list of "25 ways to succeed as a project manager:

1. Know what is going on in the project in detail

2. Understand and be sympathetic to project team members
3. Be able to make decisions
4. Understand issues and their importance and meaning to the project
5. Communicate effectively with management
6. Develop alternative actions
7. Translate actions into specific changes in the project
8. Know how to use project management tools and methods effectively
9. Be able to learn from past projects
10. Be able to criticize yourself and your performance
11. Be able to take criticism
12. Understand trade-offs involving the schedule and budget
13. Listen to project team members
14. Understand and act on suggestions for improvement
15. Be open to new methods
16. Understand the trade-offs between the project needs and the needs of the organization
17. Communicate effectively with line managers
18. Manage your time well
19. Set up and manage the project file
20. Be able to generate and use reports from project management software system
21. Have patience
22. Be able to take a longer term perspective
23. Have a sense of humour
24. Relate current events to project management and the project
25. Be able to run a meeting".

An ability to make decisions "without panicking" is proposed by Meredith and Mantel (1995) as a key project manager's skill, together with "an ability to put many pieces of a task together to form a coherent whole". Meredith and Mantel argue that "the functional manager uses the *analytic approach* and the project manager uses the *systems approach*". The difference in skills is that "the project manager must be more skilled at synthesis, whereas the functional manager must be more skilled at analysis". For this reason "a project manager ... is usually a generalist with a wide background of experience and knowledge. A project manager must oversee many functional areas, each with its own specialists".

The APM (1995) lists eight "principle characteristics of a Certificated Project Manager's personality", subsequently expanded to form a list of forty key competences:

- "Attitude - an open positive 'can do' attitude which encourages communication and motivation, and fosters co-operation.
- Common sense ...
- Open mindedness ...
- Adaptability ...
- Inventiveness ...
- Prudent risk taker ...
- Fairness ...
- Commitment"

Lock (1996) puts the ability to motivate people high on his list of required skills. This will depend,

in part, on displaying competence, making clear decisions, giving precise, achievable instructions, delegating well, listening to and accepting sound advice, being enthusiastic and confident, and thus generally commanding respect by example and qualities of leadership.

"Other essential characteristics of the project manager can be grouped under the heading of perceptiveness. Project managers must be able to select the salient facts for a set of data or a particular arrangement of circumstances. They must then be able to use these facts to best effect by taking action or reporting important exceptions to executive management, whilst filtering out the unimportant and irrelevant material." (Lock, 1996)

Belassi and Tukul (1996) found from a survey of 58 project managers [28% response rate] that

"Although top management support is still one of the most critical success factors, many project manager-related factors are also found to be critical, such as coordination and competence. Furthermore, factors related to project team members, such as technical background and commitment, became the most critical factors for construction and MIS projects. ... for each industry a project manager's performance on the job and the team members' technical background and commitment are most critical for project success".

Anderson (1992) has provided a model of the key attributes required by a project manager, under four headings: human relations skills, leadership skills, technical experience, and administration experience:

Human relation skills	Leadership skills	Technical experience	Administrative experience
<ul style="list-style-type: none"> ● Capacity to motivate people (understand elements of human behavior and their relationship to motivation) ● Team building ● Integrating team members ● Communications ● Conflict resolution 	<ul style="list-style-type: none"> ● Clear leader and director with authority ● Capability to plan and elicit commitment ● Problem identification and solving (director and facilitator) ● Balance technical, economics and human factors ● Decisive decision making (individual/group) ● Communications ● Conflict resolution 	<ul style="list-style-type: none"> ● Understand technology ● Knowledge of tools & techniques used in the engineering/ construction process ● Applications and methods ● Technology trends and evolution 	<ul style="list-style-type: none"> ● Planning ● Organizational skills ● Knowledge and understanding of estimating systems, cost control, scheduling control, quality and safety ● Procedure development and implementation

Project manager attributes Anderson (1992)

Anderson, however argues that

"the relationship between a project manager's managerial attributes and project success is indirect. That is, the attributes of the project manager in themselves do not directly determine whether a project performs well. Project performance is affected by the effective application of project management principles and recommendations selected by the project manager. Furthermore, the paper argues that high-quality managerial attributes are an equally important contributor to project success and commensurate with high-quality technical skills."

Summary

Project work, and the role of the project manager, can be defined in terms which acknowledge the contributions of participants other than the individuals with overall responsibility for an entire project. This is important because the use of the term *project* conveys no clear indication of the scope, value or complexity of the work involved.

The successful implementation of a project is not easily defined or recognised. Factors are involved which are difficult to quantify and may be perceived differently by the various participants, or stakeholders. It is clear, however, from research and practitioner experience, that the more clearly the project's goals or objectives can be defined, the more likely it is that the project will be generally regarded as a success. Sound and diligent planning is also a contributor to successful implementation. The aspect of project management which dominates discussion of project success or failure is, however, not technical

but rather relates to the interpersonal relationships between participants and people in the wider environment within which the project takes place. Project work is almost synonymous with team work, and good intra-team relationships are vital to successful project outcomes.

Similarly, projects exist in a wider commercial environment, and depend on supportive relationships with senior management and, usually, functional management. In many cases these relationships may cross boundaries between departments and between companies or organisations. Structural mechanisms for the governance of relationships under these conditions are grouped under the generic heading of *matrix* organisational forms. These structures have several variants, but a common facet is the tendency for individuals to have dual reporting lines. This represents a source of tension and has considerable potential for conflict.

Other tensions and conflicts may arise from relationships within the project team; between peers, who may be from different organisations or functional departments, and between superiors and subordinates. They may also arise between members of the project team and members of the permanent or functional organisation, senior management, and the prospective recipients of the project's deliverables. Conflicts arising during the currency of the project may have, or may give rise to concern that they will have, repercussions after the project is completed and the project staff return to the functional organisations.

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