

## 2.3 PROJECT MANAGEMENT

### 2.3.1 Introduction

Section 2.2 presented a content and a process perspective of both strategy formulation and implementation. This section focuses on the content-related issues of strategy formulation and implementation. The process-related issues will be examined in section 2.4.

With reference to the research, this section thus describes what is understood by formalized project management (i.e. the formulation of the strategy) and what the tools for the implementation of formalized project management are (i.e. the implementation of the strategy).

Nicholas (1990: 3) points out that humankind have been involved in project activities over an extended period of time. To illustrate this point, he recalls the building of the pyramids around 2500 years B.C. until today, the current planning which is under way for the NASA space station - Freedom.

Projects by themselves do not thus appear to be anything new. What is important, however, is that the nature of projects and the environment in which they are undertaken have changed dramatically over that time span. Nicholas (1990:9) identifies three prominent characteristics which distinguish modern society from earlier periods of history. These characteristics of complexity, interdependency and rapid, radical change demonstrate such differences in modern project environments.

Cleland and King (1983: 5-6) describe the challenges and problems of modern society as involving risk and uncertainty arising from many interacting forces and variables, rapidly changing technology, rising costs, increased competition, frequent resource shortages, and numerous interest

groups with their opposing views about the best course of action.

Although each project differs in its characteristics, all projects need to be managed in some way or other.

An approach to the management of projects which, while having evolved over time, has to a large extent only crystallized and been formalized over almost the last forty years (Tuman, 1993: 40), is project management. Based primarily on the systems approach to management, today project management is widely recognized by academicians and practitioners (Bennett, 1992: 9) as a distinct management approach for projects.

In this second section of the literature review, the discussion of formalized project management begins in subsection 2.3.2 with the definition of a project. The related concept of a project life cycle is illustrated in subsection 2.3.3. The need for management of projects is substantiated in subsection 2.3.4 and project management as an identifiable management approach for projects is defined in subsection 2.3.5. Subsection 2.3.6 focuses on the objectives of project management while subsection 2.3.7 identifies the main elements of project management. These main elements, which include the project manager (subsection 2.3.8), the project team (subsection 2.3.9) and the project management system itself (subsection 2.3.10) are then described in further detail. The functions of project management are identified in subsection 2.3.11 and the project environment is described in subsection 2.3.12. Having established a foundation for an understanding of project management, successful project management is then defined in subsection 2.3.13. The applications and different forms of project management are presented in subsection 2.3.14 and finally, subsection 2.3.15 summarizes section 2.3 of the literature review.

### 2.3.2 Definition of a project

The focus of project management is on the management of projects. It is therefore suitable to first define what is understood by the concept of a "project".

To do so, the characteristics that warrant classifying an activity or range of activities as a project may be listed. Nicholas (1990: 3-4) in a summary of several authors' viewpoints proposes that the characteristics by which activities are classified as projects centre on their purpose, complexity, uniqueness, unfamiliarity, temporary nature and life cycle of the activity.

Kerzner (1992: 2) considers a project to be any series of activities and tasks that have a specific objective to be completed within certain specifications, have defined start and end dates, have funding limits and further consume resources.

The Project Management Institute (PMI) (1987: 4-3) defines a project as:

"Any undertaking with a defined starting point and defined objectives by which completion is identified. In practice, most projects depend on finite or limited resources by which the objectives are to be accomplished."

Other characteristics of projects identified by Wideman (1991: 1-1,2) include rarity, subject to the constraints of time, money and resources, multi-disciplinary, and the requirement of a dynamic response to external complexities and internal developments.

Project endeavours differ in the kind of efforts required. Using a diagram, Nicholas (1990: 5-6) listed examples of actual projects according to their

degree of complexity and uncertainty. Complexity was measured by the magnitude of effort, the number of groups and organizations that had to be coordinated, and the diversity in skills or expertise needed to accomplish the work. Uncertainty was measured by the difficulty in predicting the final outcome in terms of the dimensions of time, cost and technical performance. From this classification it was concluded that:

- Time and resource commitments tended to increase with the degree of complexity of the projects.
- Most projects had some uncertainty in one or two of the dimensions but the most complex projects displayed uncertainty in all three dimensions.
- Projects that were very similar to other previous endeavours had lower uncertainty by reason of the learning curve concept.
- When the uncertainty of a project approached near zero and it was further repeated a large number of times, the effort was no longer considered to be a project.

For the purposes of this research, the following summary of the concept "project" will suffice:

- Projects are considered to be any series of temporary, non-routine, non-repetitive and unique activities which are undertaken to accomplish specific, definable objectives stated in terms of time, cost and performance requirements.
- Projects differ in their characteristics as reflected in their complexity (expressed by the unfamiliarity, magnitude and diversity of effort) and

uncertainty (expressed by the difficulty in predicting the measure of success of the final outcome).

- Projects consume limited or finite resources.
- Projects may require the contributing efforts of more than one organization and utilize multidisciplinary skills, talents and expertise which have to be coordinated across organizational boundaries.
- Projects require a dynamic response towards both internal developments and external complexities.
- Projects differ from continuous/repetitive and job/job-lot operational systems.
- Projects need to be both effectively and efficiently managed.

**Proposition 1:**

A success factor in the implementation of formalized project management is the participation in project-type work as an integral part of normal activities.

**Proposition 2:**

A success factor in the implementation of formalized project management is the involvement with projects which exhibit a high degree of complexity and uncertainty.

### 2.3.3 Project life cycle

An integral part of a project is its life cycle. The PMI (1987: 4-3) defines a project life cycle as:

"The four sequential phases in time through which any project passes, namely: concept; development; execution (implementation or operation); and finishing (termination or close-out)."

Nicholas (1990: 91) suggests that all projects can be divided into some logical phases or stages to indicate the types of tasks or activities that are conducted within a period of time. His model divides a project into four phases identified as the conception, definition, acquisition, and operation phases. Each phase has specific content and management approaches. He further notes that the number of phases and details for each are a matter of judgment and differ for each project, though the sequence is similar for virtually all projects.

Kerzner (1992: 82) also remarks that there seems to be little agreement among industries or even organizations within the same industry about the exact breakdown of the life cycle phase of projects. This, he suggests, is due to the complex nature and diversity of projects. Kerzner (1992: 82-91) follows the theoretical definitions of the life cycle phase of a system as proposed by Cleland *et al* (1983) identified as conceptual, definition, production, operational and divestment.

Wideman (1991: III-1) notes that the selection of appropriate stages is typically specific to the industry concerned. He proposes an anatomy of the project life cycle (illustrated in figure 2.3.1) whereby from a macroview, the plan itself and the next level (a phase) are generic to all projects but, moving further down to a microview, the third level (stages) is industry

specific while the fourth level (activities/tasks) is project specific.

**Figure 2.3.1: The anatomy of the project life cycle**

<b>MACROVIEW</b>	<b>PLAN</b>	<b>NUMBER OF COMPONENTS</b>	<b>APPLICATION</b>
	PHASES	CONCEIVE DEVELOP EXECUTE FINISH	GENERIC
	STAGES	5 TO 10	INDUSTRY SPECIFIC
<b>MICROVIEW</b>	ACTIVITIES OR TASKS	MANY	PROJECT SPECIFIC

Source: Wideman, R.M. 1991. *A framework for project and program management integration*. The PMBOK handbook series - No. 1. Figure III.1. p. III-1.

With due recognition of the viewpoints of both Nicholas (1990) and Kerzner (1992), it would be sufficient for the purposes of this research to conclude that, in general, a project progresses through four successive life cycle phases in time as proposed in the definition of PMI. These phases as well as some of the typical project phase activities are shown in figure 2.3.2 (Wideman, 1991: III-2).

Finally, it should be noted that the appropriate and consistent application of management to all levels of the project life cycle is greatly enhanced by the division of a project into distinct phases. A standard approach may then be applied to the more manageable work packages.

**Figure 2.3.2: Typical project life cycle and activities**

TOTAL PROJECT LIFE CYCLE			
PLAN		ACCOMPLISH	
PHASE 1	PHASE 2	PHASE 3	PHASE 4
CONCEPT Conceive	DEVELOPMENT Develop	IMPLEMENTATION Execute	TERMINATION Finish
Gather data	Appoint key team members	Set up: - organization - communications	Finalize product(s)
Identify need	Conduct studies	Motivate team	Review and accept
Establish: - goals, objectives - basic economics, feasibility - stakeholders - risk level - strategy - potential team	Develop scope baseline: - end product(s) - quality standards - resources - activities	Detail technical requirements	Settle final accounts
Guesstimate resources	Establish: - master plan - budget, cash flow - WBS - policies/procedures	Establish: - work packages - detail schedule - information and control systems	Transfer product responsibility
Identify alternatives	Assess risks	Procure goods and services	Evaluate project
Present proposal	Confirm justification	Execute work packages	Document results
Obtain approval for next phase	Present project brief	Direct/monitor/forecast/control: - scope - quality - time - cost	Release/redirect resources
	Obtain approval to proceed	Resolve problems	Reassign project team

Source: Wideman, R.M. 1991. *A framework for project and program management integration*. The PMBOK Handbook series - No. 1. Figure III.2a. p. III-2.

**Proposition 3:**

A success factor in the implementation of formalized project management is the division of a project into appropriate phases of development to promote the management of each successive life cycle phase.

### **2.3.4 The need for the management of projects**

As stated in subsection 2.3.2, the focus of project management is on the management of projects. This subsection examines why projects need managing.

Nicholas (1990: 7) concludes that:

"Although mankind has been involved in projects since the beginning of recorded history, obviously the nature and the environment have changed. ... To cope with new, more complex kinds of activities and greater uncertainty, new forms of project organization and new practices of management have evolved."

According to Wideman (1991: 1-1):

"Projects have always needed managing, yet many just limp along at a fraction of their potential simply because people don't know how to make them run any better."

As noted previously, projects by themselves are nothing new. So, too, the need for managing them also appears to be self evident. What is important, however, is the recognition that the projects which are undertaken in modern society necessitate a departure from the traditional management

approaches (Nicholas, 1990: 9).

Kerzner (1992: 3) lists some obstacles which the modern management of projects must overcome. These involve the project complexity, project risks, special requirements of customers, organizational restructuring, changes in technology and forward planning and pricing.

Cleland et al (1983: 4) argue that the solutions to problems imposed by the demands of rapid change and technological complexity must themselves be somewhat complex and adaptive to change. Nicholas (1990: 9) suggests that, in response to these different demands, new management approaches under the guise of the "systems approach" have become mandatory.

A modern method of management, which arose in response to the need for an approach which could deal with the problems and take advantage of the opportunities of modern society and is today being applied in a wide variety of industries and organizations, but which, according to Nicholas (1990: 8-9) unfortunately still lags far behind its potential, is project management.

Project management is a departure from the management of simpler ongoing, repetitive operations where the market and technology are more predictable, greater certainty exists about anticipated outcomes, and fewer parties or organizations are involved (Nicholas, 1990: 9). Wideman (1991: II-2,3) argues that the mere application of standard management principles to project-type work is invalid by reason of the precise definition of a project which highlights a dramatically different management environment. In support of his argument he contrasts some of the characteristics of a well-managed production or service organization with those of a project environment.

Wideman (1991: II-2,3) lists the characteristics of a well-managed production or service organization as follows:

- Roles and relationships are well understood, having been developed and adjusted over lengthy periods of time.
- Tasks are generally continuous, repetitive or exhibit substantial similarity.
- Relatively large quantities of goods or services are produced in a given time period.
- There is relative stability in the work environment. Change is minimal and protracted, and can be thoroughly programmed and progressively integrated.
- Management concern themselves with projects only on an exception basis.

This type of work environment is thus characterized by situations which are more predictable, less risky and stable, and can be efficiently handled by "mechanistic" organizational forms and management procedures (Nicholas, 1990: 9). The work places of such enterprises are bounded by traditional hierarchies, vertical lines of authority, centralized control and repetitive, assembly line-type jobs (Wideman, 1991: II-3).

A project environment by contrast, however, features the following (Wideman, 1991: II-3): temporary teamwork, informal relationships, complex management environment, specific time constraints, limited and/or shared resources, measurable progress against plans, and rapid change.

This type of work environment thus calls for adaptability and rapid response to change due to the volatile market environments and requires more "organic" forms of organizations and management procedures. These forms of organizations accommodate the need for high-level technical and managerial competence and considerably expand on the latitude and degree of decentralization in decision making (Nicholas, 1990: 9).

The sharp contrast in the nature of the activities between the different work environments for project and non-project work has been indicated. However, it must further be recognized that the achievement of specific objectives of a project entails a process. Wideman (1991: II-3) suggests that when project-type work is conducted through the traditional management approaches, these processes tend to break down. Consequently a new management philosophy, strategy and relationships are required. The new process entails project management and refers to the process of managing people within a project-oriented environment.

**Proposition 4:**

A success factor in the implementation of formalized project management is an adaptable organizational form with flexible management procedures which are capable of rapid response to change and also expand on the latitude and degree of decentralized decision making.

**Proposition 5:**

A success barrier factor for the implementation of formalized project management is the application of traditional management approaches (which call for vertical hierarchies, formal lines of authority, centralized control and are found in simpler ongoing, repetitive-type production and service organizations) to project-type work.

### 2.3.5 Definition of project management

A project as an identifiable undertaking of human organizations requires management. Nicholas (1990: 21) argues that, without some form of management, the objectives of projects could never be attained. Although the specific responsibilities of managers vary greatly, they all have the management role of integrating resources and tasks in order to achieve organizational goals (Nicholas, 1990: 21).

Kerzner (1992: 4) provides an overview definition of project management and states that:

"Project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Furthermore, project management utilizes the systems approach to management by having functional personnel (the vertical hierarchy) assigned to a specific project (the horizontal hierarchy)."

Kerzner (1992: 5-6) further states that:

"... project management is designed to manage or control company resources on a given activity, within time, within cost, and within performance. Time, cost and performance are the constraints on the project. If the project is to be accomplished for an outside customer, then the project has a fourth constraint: good customer relations."

The PMI (1987: 4-1) defines project management as:

" ... the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, quality, time and cost, and participant satisfaction."

Two aspects in the definitions of project management presented above warrant further discussion, namely (1) the emergence of project management as a systems approach to management and (2) the general management functions of planning, organizing, directing/leading and control.

With regard to the first aspect, Koontz et al (1988: 37-50) list twelve identifiable approaches which historically record the study of management science and theory. Of these, the following approaches may be considered pillars which underpin the project management approach: the interpersonal behaviour, group behaviour, decision theory, contingency or situational, managerial roles and, finally, the systems approach.

Kerzner (1992: 238-239) suggests that there are generally five management school philosophies. He notes that functional managers tend to practise the first three schools of management whereas project managers utilize the last two. The management school philosophies identified are the classical/-traditional, empirical, behavioural, decision theory and the management systems school.

In a similar but condensed review of the evolving series of management propositions and methodologies, Nicholas (1990: 22-23) identifies four basic viewpoints: the classical, behavioural, systems and contingency viewpoints.

Although project management could be shown to include some aspects of the comprehensive list of management approaches identified by Koontz *et al* (1988), the generalized management school philosophies of Kerzner (1992) and the condensed management viewpoints identified by Nicholas (1990), it is primarily considered a systems approach to management (Kerzner, 1992: 4). The systems approach recognizes that organizations exist in a universe of forces, are comprised of interrelated units of which the goals and outputs are coordinated and integrated for the benefit of the organization as a whole (Nicholas, 1990: 9).

**Proposition 6:**

A success factor in the implementation of formalized project management is the application of the systems approach to management (which implies that a department is an open system which interacts with and is influenced by its external environment, it comprises separate units, each with individual goals which must be coordinated and integrated for the benefit of the department as a whole) to project-type work.

Referring back to the definitions of project management presented, the second aspect to be addressed is the general management functions of planning, organizing, directing/leading and control.

Koontz *et al* (1988: 2) identify the basic functions of management as planning, organizing, staffing, leading and controlling. Coordination is seen as the essence and purpose of management rather than a separate management function.

Kerzner (1992: 239) recognizes the trend of modern practitioners to still identify the responsibilities and skills of management in terms of the

principles and functions as listed by Koontz *et al* (1988). However, he argues that these management functions are generally applied to traditional management and should be redefined for temporary management positions. Their fundamental meanings remain the same but the applications differ.

Nicholas (1990: 21-22) classifies the activities of a manager into five functions - planning, organizing, leadership, control and change. The functions are redefined for temporary management positions as:

- Planning. It involves setting project goals and establishing means for achieving them consistent with available resources and the forces in the environment.
- Organizing. It involves deciding how the work will be accomplished. It includes (1) hiring, training and assembling people into a system of authority, responsibility and accountability relationships, (2) acquiring and allocating facilities, materials, capital, and other resources, and (3) creating an organizational structure that includes policies, procedures, reporting patterns and communication channels.
- Leadership. It involves directing and motivating people to attain objectives. It focuses on workers, groups and their relationships to influence work performance and behaviour.
- Control. It involves the evaluation of performance with respect to standards of efficiency and effectiveness and, where necessary, corrective action.
- Change. The other functions are performed to accomplish project goals. This function is implied by reason of the need for continual

assessment and change. Organizations are open systems whose goals and activities have to be adapted to accommodate the changing forces in the internal and external environments.

It should be noted that the different functions of management as proposed by Koontz et al (1988) - primarily from a general management viewpoint - and both Kerzner (1992) and Nicholas (1990) - from a project management viewpoint - seem to exhibit a great deal of similarity. The following differences are worth noting:

- Both Kerzner and Nicholas exclude the staffing function. Kerzner (1992:4) explains that staffing is a line responsibility and that the project manager may merely request specific resources. Some of the activities which form part of this function are, however, included in either their organizing or directing function, respectively.
- Kerzner uses the term "directing" while Koontz et al prefer the term "leading" and Nicholas "leadership". Leading or leadership, however, includes the process and activities of directing. Kerzner (1992: 240-241) lists the elements of directing as staffing, training, supervising, delegating, motivating, counselling and coordinating.
- Nicholas defines a further management function of change. This is in recognition of the fact that an organization is an open system. The other authors do not specifically regard change as a separate management function but elsewhere accept the dynamic interaction with both the internal and external environmental variables.

**Proposition 7:**

A success factor in the implementation of formalized project management is the managerial proficiency of project manager with regard to the general management functions of planning, organizing, leading/directing and control.

Nicholas (1990: 25-27) summarizes the characteristics which are embodied in project management as proposed by Cleland et al (1983) as follows:

- A single person, designated as the project manager, heads the project organization and operates independently of the normal chain-of-command. This organization reflects the cross-functional, goal-oriented, temporary nature of the project.
- The project manager is the single focal point for bringing all efforts together to achieve the single set of project objectives.
- Since each project requires a variety of skills and resources, the actual work might be performed by many functional areas or even other organizations.
- The project manager and project team are responsible for integrating people from different functional disciplines who are working on the project.
- The project manager negotiates directly with functional managers for support. Functional managers are responsible for individual work tasks and personnel within the project while the project manager is responsible for integrating and overseeing the start and completion of activities.

- A project might have two chains-of-command: one vertical (and functional) and one horizontal (and project). Personnel might report to both the project manager and a functional manager.
- The project focuses on delivering a particular product or service at a certain time and cost, and to the satisfaction of technical requirements. In contrast, functional units must maintain an ongoing pool of resources to support organizational goals.
- Decision making, accountability, outcomes, and rewards are shared among members of the project team and supporting functional units.
- Though the project organization is temporary, the functional units from which it is formed are permanent. When a project ends, the project organization is disbanded and people return to their functional units or are reassigned to new projects.

Project management is today widely recognized and acknowledged as a distinct management approach for projects. The creation of an "own" or distinct body of knowledge for project management is illustrated in figure 2.3.3 (Wideman, 1987: 1-5).

For the purposes of this research, the following summary of the concept "project management" will suffice:

- For project objectives to be attained, projects need to be effectively and efficiently managed.

**Figure 2.3.3: Project Management Body of Knowledge**

PROJECT MANAGEMENT BODY OF KNOWLEDGE		
KNOW-HOW CONTINUUM		
GENERAL MANAGEMENT (ongoing)	PROJECT MANAGEMENT (projectized)	TECHNICAL MANAGEMENT (field specific)
Business policy and objectives		Management of specialists
Strategy and planning	SCOPE performance QUALITY	Quality control
Financial management		Schedule management
Economics and statistics		Costing
Personnel administration	viability project management process and control competitiveness	Human resources
Information systems		Communications
Organizational behaviour		Interface management
Marketing	COST effort TIME	Configuration management
Other		Other
<b>PROJECT MANAGEMENT OVERLAP AREAS</b>		

Source: Wideman, R.M. 1987. The framework: part 1: the rationale. *Project management body of knowledge (PMBOK)*. Project Management Institute. Figure 3. p. 1-5.

- Project management is primarily based on the systems approach to management.
- Project management involves the management functions of planning, organizing, leading/directing and control.
- The essence of management purpose is seen as coordination.

- The characteristics of project management, in addition to the single definitions thereof, provide an insight into the detailed workings of this management approach for projects.
- Project management is viewed as a distinct management approach for projects with an identifiable own, distinct and unique body of knowledge.
- A general overview definition of formal project management, incorporating most aspects of different authors, could be:

Project management as systems approach refers to the planning, organizing, leading, and controlling of human and material resources for the duration of a project which has been established in order to achieve and complete specific predetermined objectives of cost, time, performance and participant satisfaction.

### **2.3.6 Objectives of project management**

Koontz *et al* (1988: 659) define an objective as the ends toward which an activity is aimed or the end points of planning. No distinction is made between either the term "objective" or "goal". An objective is verifiable if, at some target date in the future, it can be determined with certainty that the objective has been accomplished. These objectives may be expressed both quantitatively and/or qualitatively.

Kerzner (1992: 410) lists some general characteristics of project objectives. The project objectives must be specific (not general); not overly complex; measurable, tangible and verifiable; realistic and attainable, and established within resource boundaries; consistent with the available or anticipated resources; and consistent with the organizational plans, policies and

procedures.

Nicholas (1990: 9) identifies the goals of project management as having three dimensions. They are to accomplish the work in accordance with:

- **Budget.** The cost parameter, which is the specified or allowable cost for the project or target cost for the work to be done.
- **Schedule.** The time parameter, which includes the time period over which the work will be done and the target date when it will be completed.
- **Performance.** The technical or specification parameter, which specifies what is to be done to reach the end-item and includes the required features of the final product or service, technological specifications, quality and quantity measures.

Kerzner (1992: 5) refers to these goals as constraints. He also includes a fourth constraint, namely good customer relations, when projects are undertaken for an outside customer.

PMI (1987: 4-1) refers to the predetermined objectives of scope, cost, time, quality and participant satisfaction. The scope objective encompasses in general, the goals and objectives of the whole project. The meaning is similar to the concept of management-by-objectives or MBO. Koontz *et al*, 1988: 659 define MBO as a comprehensive managerial system that integrates many key activities in a systematic manner which is consciously directed toward the effective and efficient achievement of organizational and individual objectives.

Kerzner (1992: 411) suggests that many projects are directed and

controlled using such an MBO approach. He views the underlying philosophy of MBO as proactive rather than reactive; results-oriented emphasizing accomplishment; and focused on change to improve individual and organizational effectiveness.

Closely related to the objectives of project management is the notion of project success and successful project management. These are further described in section 2.3.13.

**Proposition 8:**

A success factor in the implementation of formalized project management is the statement of specific, verifiable and attainable project objectives in terms of budget (cost), schedule (time), performance (quality) and stakeholders' acceptance including the utilization of an MBO approach to achieve the scope objective of the project.

### 2.3.7 Main elements of project management

Nicholas (1990: 11-12) identifies three main elements or key features which distinguish project management from earlier, traditional forms of management. The main elements are:

- **The project manager** - whose single, overriding responsibility is to integrate the work efforts of all participating functional support areas to achieve the project goals. The project manager is accountable for the entire project and should be totally dedicated to achieving its goals.
- **The project team** - who are the individuals and groups brought

together to form a single, cohesive team working towards a common goal. Project work is teamwork because it is accomplished by a group of people, often from different functional areas and organizations, who participate whenever and wherever they are needed.

- **The project management system** - which comprises the organizational structure, information processing system, and the practices and procedures that permit the integration of vertical and horizontal elements of the project organization.

Kerzner (1979: 6-8) in similar fashion identifies two guiding factors which form the basis for the underlying principles behind project management, namely:

- The establishment of the project manager as the focal point for the integrative responsibility.
- The establishment of an integrated planning and control system for effective integration of the horizontal and vertical units of the organization.

The main elements of project management which will be described in the following three subsections, are based on the key features of project management as proposed by Nicholas (1990) and embodied in Kerzner's (1979) guiding factors. The main elements of project management thus defined are the project manager (2.3.8), the project team (2.3.9), and the project management system (2.3.10).

**Proposition 9:**

A success factor in the implementation of formalized project management is the embodiment of the three main elements of project management, namely (1) a project manager (2) a project team and (3) a project management system.

### 2.3.8 The project manager

#### 2.3.8.1 The role of the project manager

Nicholas (1990: 172-173) argues that the role of the project manager is so central that, without it, there could not be project management. He identifies seven different roles (or dimensions to the role) which the project manager must fulfil:

- **Integrator.** The project manager's prime role is to integrate the diverse activities of scattered elements to achieve time, cost and performance objectives.
- **Communicator.** The project manager serves as the focal point for all reports, requests, memoranda and complaints. Between the sources and receivers of information, the project manager refines, summarizes and translates the information to make sure that all project contributors are well informed about the policies, objectives, budgets, schedules and changes.
- **Decision maker.** The project manager is in the central position to make critical decisions, such as the reallocation of resources, change of project scope or direction, and balancing schedule, cost and performance criteria.

- **Motivator.** The project manager instils a sense of direction and commitment to action. Motivating aspects associated with project-type work are spontaneity, achievement and excitement while infrequent contact, part-time personnel, diverse specialities and spatial distance between workers may reduce motivation.
- **"Evangelist".** The project manager conveys the faith in the project, its value and workability.
- **Entrepreneur.** The project manager is driven to procure funds, facilities and people for the start and, ultimately, the completion of the project.
- **Change agent.** The project manager initiates passage to new and promising areas, strives to overcome resistance to change, and is ready to adopt new and innovative ideas.

In a contributing letter to PMI in Wideman (1991: V-2), Zuberi also elaborates on the different roles of the project manager. He identifies three main roles:

- **Interpersonal.** The project manager is the figurehead and performs the ceremonial duties on the project. Managing human interrelationships in the project organization is seen as part of the leadership role and the influence may extend beyond the project bounds to the organization's chain of command and also to outside parties.
- **Informational.** Through the information/communications function, the project manager must receive quality information from subordinates as well as from outside sources, thereby developing a powerful database of relevant information. The project manager also acts as

spokesperson in conveying information outside the project group, informing and influencing the decisions of top-level management who have organizational control over the project.

- **Decisional.** Information, experience and courage to decide with incomplete data provide the input to decision making. As the project team's decision maker, the project manager may be acting as the interpreter and communicator; resource allocator; the monitor; and the entrepreneur seeking ways to improve group performance in a changing environment.

**Proposition 10:**

A success factor in the implementation of formalized project management is the performance of a variety of roles by the project manager, such as that of integrator, communicator, decision maker, motivator and change agent.

### 2.3.8.2 The responsibilities of the project manager

Nicholas (1990: 173-175) suggests that the principal responsibility of the project manager is to deliver the project end-item within the budget and time limitations, in accordance with technical specifications and, when specified, in fulfilment of profit objectives. The other responsibilities vary, depending on the project manager's capabilities, the current stage of the project, the size and nature of the project, and the specific duties delegated by top-level management. These other responsibilities may include:

- The planning of project activities, tasks, and end results including the breakdown of work, scheduling and budgeting.

- Organizing, selecting and placing the project team as well as coordinating tasks and allocation of resources.
- Interfacing and negotiating with functional managers, contractors, consultants and top-level management.
- Monitoring the project status.
- Identifying technical and functional problems, solving these problems directly or finding solutions to the problems elsewhere.
- Dealing with crises and resolving conflicts.
- Managing termination or redirecting efforts when objectives cannot be achieved.

Kerzner (1992: 174,597) also lists the responsibilities of a project manager, and includes:

- To produce the end-item with the available resources and within the constraints of time, cost and performance/technology.
- To meet contractual profit objectives.
- To make all required decisions whether they be for alternatives or termination.
- To act as the customer (external) and top-level and functional management (internal) communications focal point.
- To define the goals, objectives, requirements, major milestones,

ground rules and assumptions, the time, cost and performance constraints, operating procedures, administrative policy and reporting requirements.

**Proposition 11:**

A success factor in the implementation of formalized project management is the project manager's principal responsibility to deliver the project end-item within the budget and time limitations, in accordance with technical specifications and, when applicable, in fulfilment of profit objectives.

**2.3.8.3 The interface role of the project manager**

For project managers to fulfil their responsibilities successfully, they are constantly required to demonstrate their skills in interface, resource (Wall, 1984: 30-31), and planning and control management (Kerzner, 1992: 175).

With reference to interface management, Kerzner (1992: 11) points out that, although everything seems to revolve around the project manager in a project environment, the project organization cannot exist apart from the traditional structure of the organization. The project manager must therefore interface with both top-level and functional management. This interface role generally entails:

- Managing human interrelationships in the project organization.
- Maintaining the balance between technical and managerial project functions.

The interface role between the project manager and functional manage-

ment can further be defined by the following relationships (Kerzner, 1992: 278,647):

- The project manager must determine: what is to be done; when the task will be done; why the task is done; how much funds are available; and how well the total project has been done.
- The functional manager must determine: who will do the task; where the task will be done; how the task will be done; and how well the functional input has been integrated into the project.

**Proposition 12:**

A success factor in the implementation of formalized project management is the interface role of the project manager with both top-level and functional management.

#### 2.3.8.4 The authority of the project manager

Kerzner (1992: 106) defines authority, responsibility and accountability as follows:

- **Authority** is the power granted to individuals to make final decisions for others to follow.
- **Responsibility** is the obligation incurred by individuals in their different roles in the formal organization to effectively perform assignments.
- **Accountability** is the state of being totally answerable for the satisfactory completion of an assignment.

Nicholas (1990: 175) defines authority in general terms as the power of a manager to command others to act or not to act. He distinguishes between legal authority (which is conferred by the organization and is part of a job description) and charismatic authority (which stems from the power gained by personal characteristics, such as charm, personality and appearance).

Kerzner (1992: 245-246) views authority as the key to the project management process. Project authority is broken down into three constituent parts, namely *de jure* (legal) authority, *de facto* (reality) authority, and project charter authority. *De jure* and *de facto* authority are the same as the legal and charismatic authority identified by Nicholas (1990: 175). The project charter authority is exclusively applicable in project management and includes aspects, such as the approved project plan, the accepted cost estimate, and schedule commitments.

Unlike managers in traditional organizations, where the influence and authority flow vertically, project managers exist outside the traditional hierarchy. The position of the project manager is temporary, superimposed on the existing structure and therefore not privy to the same amount of leverage afforded by the legal authority through hierarchical position. A project manager works across functional and organizational lines and the influence and authority flow is both horizontal and diagonal.

Nicholas (1990: 177) notes that, despite the considerable amount of responsibility project managers must assume, they have very little formal authority to carry it out. This disparity is referred to as the authority gap. While project managers lack the necessary legal authority, other means (Youker, 1991: 40) for influencing people may be used. Nicholas (1990: 177) therefore concludes that successful project managers, no matter how much formal (legal) authority they possess, tend to rely on knowledge, experience and personal relationships for influence.

Finally, Kerzner (1992: 254-255) also notes that, because of the authority gap, project managers must rely on other means of influence. These include the use of coercive, connection, expert, information, legitimate, referent and reward power bases (Pitts, 1990: 22).

**Proposition 13:**

A success factor in the implementation of formalized project management is the ability of the project manager to utilize multiple forms of influence, such as knowledge, expertise, experience, negotiation, persuasion, and personal relationships due to the disparity in formal authority awarded and the responsibility assumed.

### **2.3.8.5 The skill requirements for the project manager**

Kerzner (1992: 10) suggests that, in view of the project manager's responsibility for coordination and integration of activities across multiple functional lines (Karaa & Abdallah, 1991: 48), both strong communicative and interpersonal skills are needed. The project manager must further become familiar with the operations of each line organization and should also have a general knowledge of the technology.

Effective project management may be considered more behavioural than quantitative (Kerzner, 1992: 9). Project managers need a good understanding of quantitative tools and techniques but also of organizational structures, work group behaviour and in general, of human group theories (Rwelamila, 1989: 21).

The selection of a project manager is an executive decision and a general management responsibility. Usually the selection of a project manager is based more on personal characteristics than on a particular job description

(Kerzner, 1992: 176). Kerzner (1992: 176) and Nicholas (1990:178-179) summarize the broad range of desired personal characteristics which a project manager should exhibit as proposed by Archibald (1976). These include: flexibility, adaptability, initiative, confidence, persuasiveness, ambition, forcefulness, enthusiasm, imagination and spontaneity.

Nicholas (1990: 179-180) suggests that, apart from these essential personal characteristics listed above, the successful project manager should also have behavioural skills (be an active listener and communicator, build trust and promote team spirit), general business skills (understand the organization, business and general management) and technical skills.

Pettersen (1991: 22-24) provides an integrated requirements profile designed specifically for selecting project managers. His requirements profile consists of twenty-one predictors, grouped into five sets, labelled problem solving, administration, supervision and project team management, interpersonal relations and other personal qualities.

Kerzner (1992: 181-188) identifies ten major skill requirements which project managers should possess to meet the challenge of managing projects. The skills are (1) **team building** - an effective team should be built by the integration of the various task groups from traditional functional organization into a single project management system (2) **leadership** - the ability to lead the team within a relative unstructured environment with little formal authority (3) **conflict resolution** - understand the determinants of conflict and be able to resolve dysfunctional conflict (4) **technical** - understand the technology and the environment of the business in the search for integrated solutions and technological innovations (5) **planning** - be able to compile the project plan (6) **organizational** - understand how the organization works and how to work with the organization (7) **entrepreneurial** - a general management perspective is needed where the

objectives are broader than merely profit, such as customer satisfaction and future business opportunities (8) **administrative** - experienced in planning, staffing, budgeting, scheduling, and other administrative control techniques (9) **management support building** - build favourable relationships with senior management and (10) **resource allocation** - needs to negotiate for resources which are generally controlled by the line or functional managers.

Zuberi (in Wideman, 1991: V-2) emphasizes the need for a project manager to better grasp the issues relating to organizational leadership, power and influence. Zuberi argues that, with such an awareness, they may avoid being overwhelmed by the unfavourable aspects of modern organizations, including bureaucratic infighting, and the destructive power struggles which reduce initiative, innovation, morale and professional excellence.

**Proposition 14:**

A success factor in the implementation of formalized project management is the personal characteristics of a project manager, including adaptability, initiative, confidence, persuasiveness, enthusiasm, and imagination.

**Proposition 15:**

A success factor in the implementation of formalized project management is the behavioural skills (which include skills in team building, leadership and conflict resolution), general business skills (which include organizational, entrepreneurial, administrative and management support building skills) and technical skills (which include knowledge of technology, planning and resource allocation skills) of the project manager.

### **2.3.8.6 Leadership of the project manager**

Kerzner (1992) identified leadership skills as a major skill requirement for a project manager (see subsection 2.3.8.5).

Kerzner (1992: 269) defines leadership as a style of behaviour which is designed to integrate organizational requirements and individuals' interests into the pursuit of some objective. Nicholas (1990: 196) views leadership as the ability to influence the behaviour of other people to accomplish objectives while leadership style refers to the way a leader achieves such influence.

Nicholas (1990: 196) further notes that leadership styles can be divided between two extreme poles, namely task-oriented and relations-oriented. Task-oriented leaders show a high concern for the achievement of goals and the work itself and tend to behave in an autocratic fashion. Relations-oriented leaders, however, show greater concern for people and tend to exercise a democratic kind of leadership.

While many studies have been undertaken to find the most appropriate leadership style in a project environment, Nicholas (1990: 196) concludes that the most effective style depends on the characteristics of the leader, the followers, the nature and the environment of the tasks. This perspective, referred to as the contingency approach, is based on Fiedler's (1967) contingency model. Given the likely situation a project manager would encounter (low formal authority granted, high respect by the team members for ability and expertise, and high task complexity), Fiedler's model would indicate that a relations-style would be most effective (Nicholas, 1990: 197).

**Proposition 16:**

A success factor in the implementation of formalized project management is for the project manager to follow a relations-oriented leadership style.

Both Kerzner (1992: 270-273) and Nicholas (1990: 197-199) describe the application of Hersey and Blanchard's (1979) situational leadership model in a project environment. Based on the task and relations behaviour of the leader and the maturity of the followers (ability and willingness to comply), four different leadership styles are identified. In simple terminology, these are delegating, participating, selling and telling. Kerzner (1992: 273) notes that the project environment is highly situational and that each employee should be treated differently. Nicholas (1990: 198) concludes that most members of the project team would demonstrate maturity and, given their level of ability and willingness, a participating and delegating leadership style would be most effective.

**Proposition 17:**

A success factor in the implementation of formalized project management is for the project manager to follow a leadership style based primarily on participation and delegation.

### 2.3.8.7 Management of conflict by the project manager

Kerzner (1992) identified conflict resolution skills as another major skill requirement for a project manager (see subsection 2.3.8.5)

Kerzner (1992: 412) notes that conflicts in the project environment are inevitable. This he explains is a natural occurrence resulting from the

differences in the organizational behaviour of individuals, the differences in the way functional and project managers view the work required, and the lack of time necessary for these managers to establish ideal working relationships.

Nicholas (1990: 218) agrees that conflict is inevitable but not necessarily always detrimental. It may help to produce better ideas, force people to search for new approaches, cause persistent problems to surface and be dealt with, force people to clarify their views, cause tension which stimulates interest and creativity, and give people the opportunity to test their capabilities.

Nicholas (1990: 219) further points out that, while conflict between groups in competition is beneficial because it increases group cohesion, spirit and loyalty, conflict between cooperating teams in a project situation may be destructive. Groups in conflict selfishly strive to achieve their own objectives and block the objectives of other teams. Left uncontrolled and unresolved, such conflict may foster lack of respect, lack of trust and may also destroy the communication between groups and individuals, all which are detrimental to the project spirit.

Kerzner (1992: 412) suggests that the most common type of conflicts in the project environment involve labour resources, equipment and facilities; expenditure of capital; technical solutions and trade-offs; priorities; administrative procedures; scheduling; responsibilities; and personality clashes. The relative intensity of these conflicts may vary over the life cycle of the project.

Kerzner (1992: 416-433) and Nicholas (1990: 219-220) report a study by Thamhain and Wilemon (1975) that determined the type and magnitude of a particular type of conflict that was most common at a specific life cycle

phase. This study indicated that, on average, the three greatest sources of conflict were project schedules, project priorities and the work force.

Kerzner (1992: 430) therefore recommends that to minimize the detrimental conflict, intensive prior planning of scheduling, priority setting and resource allocation should take place.

Referring to conflict-handling modes, Kerzner (1992: 432) suggests that it is less important to search for a single best mode of effective conflict management but rather that project managers, in their capacity as integrators of diverse organizational resources, employ the full range of conflict resolution modes (Baker, Tjosvold & Andrews, 1988: 167). While both Nicholas (1990: 220) and Kerzner (1992: 429) conclude that the confrontation mode appears to be the ideal approach in the project-oriented environment, other approaches, such as compromise, smoothing (or de-emphasizing), forcing and withdrawal, may be effective, depending on the situational content of the disagreement.

In summary, Nicholas (1990: 221) concludes that a presumption in project management is that conflict is inevitable and best resolved by confrontation. Kerzner (1992: 433) concludes that conflict is fundamental to complex task management. Project managers should not only be cognizant of the potential sources of conflict, but should also know when in the life cycle of a project they are most likely to occur and which conflict resolution mode to employ. The project manager should thus avoid the detrimental aspects of conflict but maximize its potential beneficial aspects.

**Proposition 18:**

A success barrier factor for the implementation of formalized project management is the high propensity of conflict in a project environment with regard to project schedules, project priorities and resource allocation.

### **2.3.9 The project team**

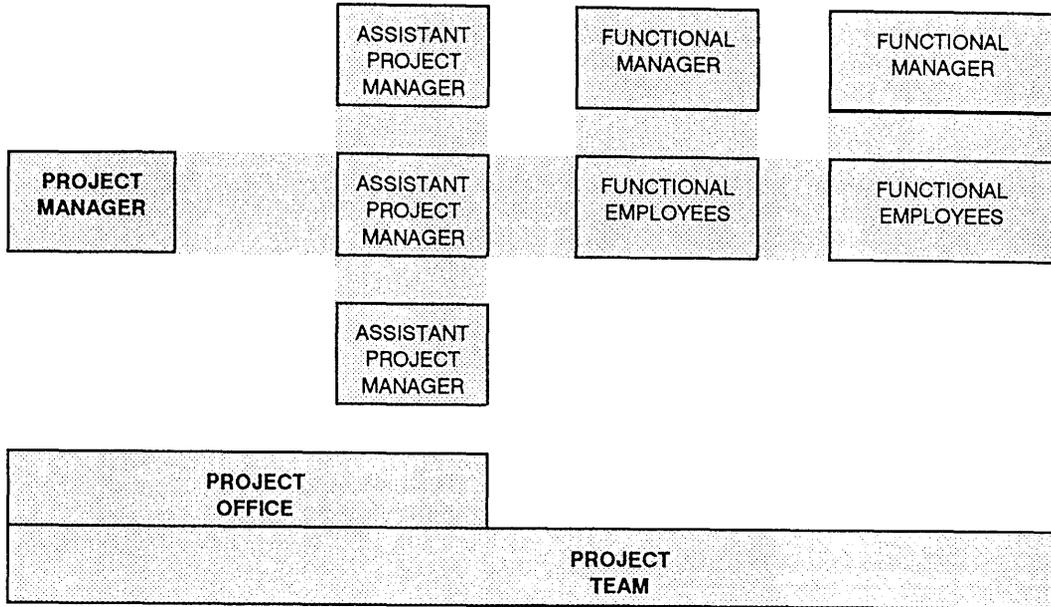
#### **2.3.9.1 The members of the project team**

Project management is not a one-person operation; it requires a participative group of individuals (Vogt & Hunt, 1988: 96) dedicated to the achievement of specific project objectives (Kerzner, 1992: 168).

The project team - with the project manager as team leader - consists of a combination of project office personnel and functional employees. While the project team members who work out of the functional units may spend only a portion of their time on the project, project office personnel in large project undertakings are assigned full-time to the project. The full-time project office personnel report directly to the project manager but may still be under the control of a line function for administrative control. Figure 2.3.4 illustrates the composition of the project organization.

Kerzner (1992: 517) suggests that, for high task efficiency and productivity, a project team should exhibit certain traits and characteristics. The project manager expects the project team to: be committed to the project; show the potential for innovative and creative behaviour; be results-oriented; interface effectively; and be change-oriented.

**Figure 2.3.4: The project organization**



Source: Kerzner, H. 1992. *Project management: a systems approach to planning, scheduling and controlling*. Van Nostrand Reinhold. Figure 4-8. p. 208.

Kerzner (1992: 516) also lists some expectations that the project team have of their team leader, the project manager. The project manager should assist in the problem-solving process; provide proper direction and leadership; stimulate group processes; reduce conflicts; defend the team against outside pressures; act as the group spokesperson; and provide representation with top-level management.

**Proposition 19:**

A success factor in the implementation of formalized project management is the creation of a cohesive participative project team which consists of a group of individuals dedicated to the achievement of the specific project objectives.

### 2.3.9.2 The project office

The project office is an organization developed to support the project manager in carrying out his duties. The personnel of this office should have the same dedication to the project as the project manager and further should also have a good working relationship with the functional managers.

The determination of the optimal size of the project office is an important consideration. The optimal size is determined by a trade-off between the maximum number of members necessary to assure compliance with the requirements and the minimum number for keeping the total administrative costs under control (Kerzner, 1992: 208).

Membership is determined by factors, such as the project size, internal support requirements, the type of project, level of technical competency, external customer support requirements and strategic importance of the project.

Although project managers would prefer to have all of their key personnel assigned full-time to the project, this may be both undesirable and impossible (Kerzner, 1992: 209). Many factors favour keeping the full-time project office as small as possible. Some of these factors identified by Archibald (1976) are summarized by Kerzner (1992: 210) as:

- The skills required by the project may vary considerably as the project progresses through each of its life cycle phases.
- Building up large permanently assigned project office personnel for each project inevitably causes duplication of certain skills, carrying personnel who are not needed on a full-time basis, and personnel difficulties in reassignment.

- The project manager may be diverted from his primary task and become involved in dealing with personnel problems of a large office rather than concentrating on the managing the project itself.
- Professionally trained people often prefer to work within a group devoted to their own professional area rather than become isolated from their speciality by being assigned to a permanent project office.
- Projects are subject to sudden shifts in priority or even cancellation, and full-time members of a project office are thus exposed to potentially serious threats to their job security.

According to Kerzner (1992: 207), the major responsibilities of the project office include:

- Acting as the focal point of information for both in-house control and customer reporting.
- Controlling time, cost and performance to adhere to contractual requirements.
- Ensuring that all work required is documented and distributed to all key personnel.
- Ensuring that all work performed is both authorized and funded by contractual documentation.

**Proposition 20:**

A success barrier factor in the implementation of formalized project management is the creation of a large project office with many full-time assigned professional specialists.

### 2.3.9.3 Staffing the project team

Organizing and staffing the project office and project team in a project environment (which by definition is a temporary situation) may become complex. Kerzner (1992: 169-170) concludes that conflicts and priority-setting become a way of life during the staffing process. He identifies two major kinds of problems related to the staffing process in a project environment:

- **Personnel performance.** Working in a project environment may be difficult for many individuals because it represents a change in the way things are normally done. Individuals find it difficult to adapt to continuously changing situations in which they have to report to multiple managers.
- **Personnel policies.** These may create problems in the organization, especially if the project environment is considered better than the functional environment. Usually the opportunities for advancement and bonuses for outstanding performance are easier to obtain in the project office than in the line organization. Conflict and jealousy may thus result between horizontal and vertical elements in the organization.

Kerzner (1992: 169) further observes that the project management process itself may cause problems during the staffing process. He argues that the

project management process allows each project to have its own policies, procedures, rules and standards, provided they fall within the broad organization's guidelines. The project manager must therefore have the delegated authority to enforce the policies, procedures, rules and standards.

Kerzner (1992: 259-262) identifies some barriers to effective team building. Briefly, they are differing outlooks, priorities of team members; role conflicts; unclear project objectives; team personnel selection; credibility of project leader; lack of team member commitment; and communication problems.

Ultimately, however, the person with the greatest influence during the staffing phase is the project manager himself. The personal attributes and abilities of the project manager will either attract highly desirable individuals working with a particular project manager or deter them from doing so. Some of these personal characteristics were listed in subsection 2.3.8.5.

**Proposition 21:**

A success barrier factor in the implementation of formalized project management is the complexities involved in staffing the project team, such as personnel performance evaluation and consistent application of personnel policies.

#### **2.3.9.4 The functional members of the project team**

Functional or interface members are not full-time members of the project team. They are usually only assigned to some specific phase of the project. Functional members report both horizontally to the project manager and vertically to their functional heads. Functional representatives performing

at the interface position also act as integrators (similar to the project manager and project office personnel) but at a closer position to where the work is actually accomplished in the line organization.

The functional managers are responsible for maintaining the technical competence of their disciplines (Jerkovsky, 1983: 91) and for staffing, organizing, supervising (Lehman, 1987: 18) and executing the project tasks within their respective functional areas (Nicholas, 1990: 186).

Kerzner (1992: 14) identifies two elements of the functional manager's role:

- The functional manager has the responsibility to define how and where the tasks will be done.
- The functional manager has the responsibility to provide sufficient resources to accomplish the project objective within the constraints, that is, to determine who will get the job done.

Once the project manager identifies the requirements for the project (i.e. what the work is and the constraints), it becomes the line manager's responsibility to identify the technical criteria. All resources, including personnel, are under the control of the line manager. Although the project manager may request specific staff (project team members), the final appointments usually rest with the line manager.

**Proposition 22:**

A success barrier factor in the implementation of formalized project management is the dual reporting relationship of team members who report both vertically to their functional heads and horizontally to the project manager.

### **2.3.9.5 The roles outside the project team**

Nicholas (1990: 187-188) identifies two roles outside the project team. They are the role of manager of projects and the role of top-level management.

The first role outside the project team, the manager of projects, oversees multiple projects and thereby relieves top-level management of many project responsibilities. The manager of projects directs and evaluates the activities of all the project managers; ensures that the stream of projects is consistent with the strategic objectives of the organization; resolves priority conflicts between projects; develops project management policies, planning and control techniques and ensures consistency among projects.

The second role outside the project team, top-level management, establish the organizational mission and goals as well as the policies and strategies to accomplish them. Their involvement with project management will vary depending on the size of the organization and the nature of the projects. In smaller organizations, top-level management usually take on the responsibilities of manager of projects.

Kerzner (1992: 515-516) discusses the expectations that top-level management have of project managers and vice versa, the expectations project managers have of top-level management. Top-level management expect the project manager to assume total accountability for the success or failure of the project; provide complete reports and information; and cause minimum organizational disruption during the execution of the project.

Project managers expect top-level management to provide clearly defined decision channels; facilitate interfacing with functional departments; provide sufficient resources and provide protection from political infighting.

Ultimately, top-level management are responsible for the successful implementation of project management. Nicholas (1990: 186) suggests that for project management to be effective, top-level management must define the project manager's responsibility and authority relative to other managers; define the scope and limitations of the project manager's decision-making responsibility; and support the project management system that provides the information necessary for planning, control, review, and evaluation of projects.

**Proposition 23:**

A success factor in the implementation of formalized project management is the appointment of a manager or director of projects, where multiple concurrent projects are undertaken, whose responsibility would include overseeing the activities of all project managers and ensuring that all projects are consistent with the strategic objectives of the department.

**Proposition 24:**

A success factor in the implementation of formalized project management is for project managers to assume total accountability for the success or failure of the project and cause minimum organizational disruption during the execution of a project.

**Proposition 25:**

A success factor in the implementation of formalized project management is for top-level management to accept overall responsibility for the successful implementation of project management.

## **2.3.10 The project management system**

### **2.3.10.1 Project organizations**

For the project manager and project team to perform effectively, a project management system is needed (Nicholas, 1990: 11). A part of this system, which provides for integrative planning and control, is the organizational structure.

As pointed out previously, project management is based primarily on the systems approach to management. This approach views organizations as human and physical elements which interact to achieve the goals of the organization. As with all types of systems, organizations can partly be described by their structure - that is, the form of relationships that bond their elements.

Nicholas (1990: 139) suggests that two types of structures coexist in organizations. The first type, which is the focus of this subsection, is the formal organizational structure. It is the published structure which describes the normal superior-subordinate relationships, chain of command, subdivisions and groupings of elements. The second type, the informal structure, comprises the relationships that evolve through the interactions of people and includes the groupings and communication lines that exist in the organization but do not appear on the formal organizational chart.

### **2.3.10.2 Organizational structures**

Kerzner (1992: 102) refers to the hidden organizational revolution which saw the introduction and development of new organizational structures. The revolution was in response to environmental factors and a requirement for better utilization and control of resources. These factors required

organizations to be more dynamic in nature and capable of rapid restructuring when conditions in the environment dictated change.

**Proposition 26:**

A success factor in the implementation of formalized project management is a dynamic organizational structure, capable of rapid restructuring when conditions in the environment dictate change.

Nicholas (1990: 140) suggests that the structures of organizations develop through a combination of planned and evolutionary responses to ongoing problems. Organizations create specialized roles and units, each with suitable expertise and resources needed to resolve certain types of problems efficiently (Kabasakal, Sözen & Üsdiken, 1989: 347). When organizations grow in size or the environment changes, additional and new groupings are implemented to better handle the emerging problems. While the subdivision into specialized areas refers to differentiation, the degree to which the subunits of the organization interact, coordinate and mutually adjust their actions to fulfil organizational goals is referred to as integration.

Nicholas (1990: 142) further identifies six bases for differentiation:

- **Functional differentiation.** The organization is divided into functional subunits, such as finance, marketing, and production. The integration between the subunits is handled by rules, procedures, coordinated plans and budgets, and the chain of command. This form of organization is well suited to repetitive-type operations with stable environments where little change occurs and the need for integration is low.
  
- **Geographic differentiation.** Most organizations have more than one

basis for differentiation. They may also subdivide according to geographic region in order to better direct themselves to the unique requirements of local customers, markets and competition.

- **Product differentiation.** This base is used where various products are produced. Each major subdivision designs, manufactures and markets its own product line. Within each subdivision a functional, geographic or other form of breakdown may also occur.
- **Customer differentiation.** Differentiation is by customer. The level of integration between customer divisions depends on the degree of interdependence between their product lines.
- **Process differentiation.** Some logical process or sequence of operation, such as design, development and assembly, is used as the basis for differentiation. A high level of integration is required among process-differentiated subunits since they are sequentially related and problems in one area will directly impact on other areas.
- **Project differentiation.** Projects require the resources and coordinated work efforts of multiple subunits and organizations. Changes in one area have consequences on all the others. Project organizations must be organic, which refers to the ability to respond to a large variety of potential problems involving multiple subunits and also be flexible to alter structural requirements as goals change. Two essential properties needed are (1) horizontal relations to integrate the subunits and (2) organizational structures which are suited to the unique requirements of the project and the project environment.

**Proposition 27:**

A success barrier factor in the implementation of formalized project management is a pure, functional, differentiated organization where integration is established primarily by rules, procedures and the chain of command.

**Proposition 28:**

A success factor in the implementation of formalized project management is a project-differentiated organization to accommodate flexibility in the structural requirements and incorporate formal horizontal relations to integrate the work efforts of multiple subunits.

Finally, both Kerzner (1992: 104) and Nicholas (1990: 139) contend that there is no such thing as a good or bad structure - only appropriate and inappropriate ones. The most appropriate structure depends on the organization's goals, type of work, and environment.

### **2.3.10.3 The development of the matrix structure**

Kerzner (1992: 107-138) describes the evolution of the traditional (classical) or functional structure, the pure product or project structure, to the matrix organizational form. A brief exposition of the evolution, described by Kerzner, is provided in order to identify some of the criteria which need to be considered when implementing formalized project management.

The main disadvantage of the traditional structure was that it had no strong central authority or an individual directly responsible for the total project. It therefore lacked the ability to integrate the activities of different functional groups. Other disadvantages were that coordination across functional lines

was complex; top-level management became involved in daily activities; conflicts occurred as each functional group struggled for power; decisions favoured the strongest functional group; no customer focal point was established; and it was difficult to pinpoint responsibility because of little or no direct project reporting.

However, advantages of the traditional form included the concentration of technical expertise through functional specialists; well-defined and understood policies, procedures and responsibilities; each employee reporting to one person only; and being well suited to mass production.

**Proposition 29:**

A success barrier factor in the implementation of formalized project management is the use of a traditional functional structure in a project environment.

Notwithstanding the advantages of the traditional form, management realized that the critical point in projects was the interface between the functional units. Consequently innovative methods, which could coordinate the flow of work between these units without modification of the existing structure, were first proposed. The coordination between units was achieved through integrating mechanisms, such as rules, procedures, detailed planning, hierarchical referral, and direct contact and interactions by functional managers.

These new methods proved ineffective in many organizations, however, because there was still a need for a focal point for the project to ensure that all activities would be properly integrated. The alternatives considered for the placement of such integrating positions were firstly, the appointment of temporary project leaders or coordinators within each functional

department, secondly, the creation of task forces in which each functional unit placed a representative on the task force, and thirdly, the establishment of liaison departments which would handle all transactions between functional units. For various reasons, these alternatives again proved ineffective.

**Proposition 30:**

A success factor in the implementation of formalized project management is the establishment of a focal point for the integration of work flow between subunits.

It then became obvious that the control of a project had to be given to personnel whose first loyalty was directed to the completion of the project. For this to be achieved, the responsibility for the management of projects had to be separated from any controlling influence of the functional units.

Two forms of line-staff project control were developed. In the first, the project manager was merely the focal point for activity control and information, and in the second, the project manager, although having more authority, still could not operate across functional boundaries.

**Proposition 31:**

A success factor in the implementation of formalized project management is the separation of the responsibility for the management of a project from the controlling influence of functional units.

Next was the development of the pure product or project organization where a separate division is created for each project. In this form, the project manager had complete line authority over the entire project. Other

advantages of this form were that project participants worked directly for the project manager; expertise was maintained on a project without sharing key personnel; personnel demonstrated loyalty to the project; and a focal point developed for outside customer relations.

The main disadvantage of the project organizational form was the cost of maintaining the organization. The inefficient use of resources through the duplication of effort, facilities and personnel, prohibited the general use of this structure. Other disadvantages were that technology was compromised without strong functional groups and top-level coordination of functional specialists was required.

**Proposition 32:**

A success barrier factor in the implementation of formalized project management is the creation of a separate, autonomous project organization for each project.

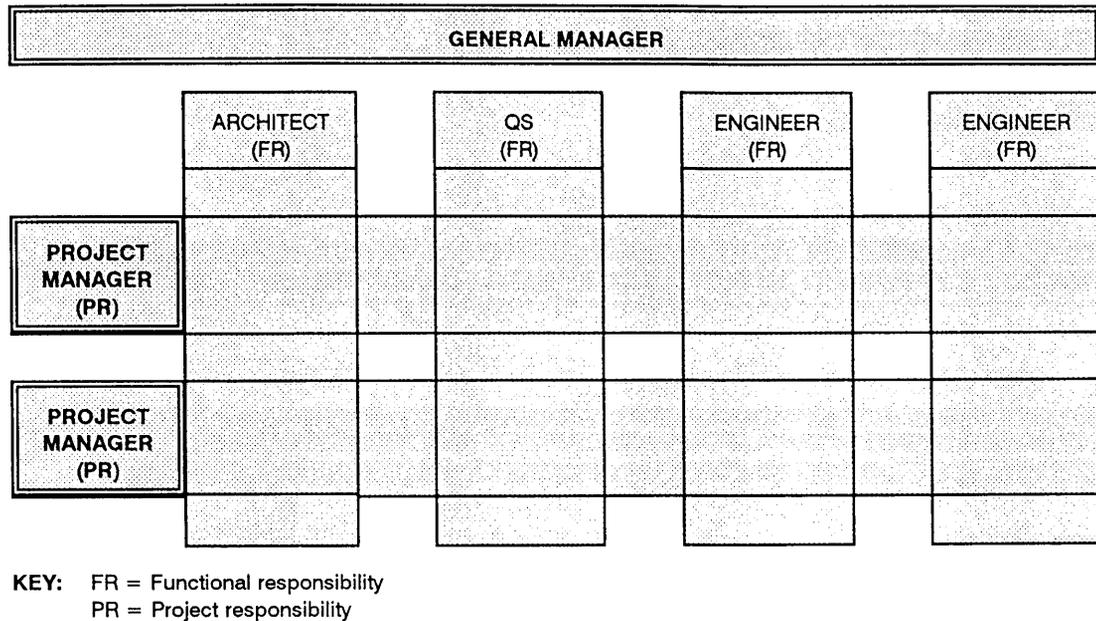
From the above exposition it may be seen that the birth of the matrix organizational form was thus inevitable. This form attempts to combine the advantages of the functional (traditional) structure and the pure project structure.

#### **2.3.10.4 The matrix organizational structure**

The matrix approach is an attempt to create synergism through shared responsibility between project (horizontal line) and functional (vertical line) management (Brown & McK. Agnew, 1982: 51). The matrix is simply horizontal lines superimposed over a traditional structure (Burns, 1989: 350). The horizontal lines present themselves as projects start up but disappear when they are completed. The traditional structure, however,

remains as long as the organization still exists. Figure 2.3.5 illustrates an example of a balanced matrix structure (terminology used by Larson & Gobeli, 1987: 128).

**Figure 2.3.5: The balanced matrix structure**



Source: Adapted from Kerzner, H. 1992. *Project management: a systems approach to planning, scheduling and controlling*. Figure 3-7. p. 121.

Kerzner (1992: 125-126) lists the following advantages of the matrix structure:

- Through the line or functional managers, the project manager maintains maximum project control over all resources, including personnel and costs.
- Policies and procedures can be set up independently for each project provided they do not contradict organizational policies and procedures.

- The project manager has the authority to commit organizational resources provided this does not cause conflicts with other projects.
- Rapid response to changes, conflict resolution and project needs is possible.
- The functional organization exists primarily as support for the project.
- Each person has a permanent position to return to after project completion. People are thus susceptible to motivation and end-item identification.
- Key people can be shared and the costs can thus be minimized.
- A strong technical base can be developed and maintained by functional managers. Knowledge is available for all projects on an equal basis.
- Although conflicts are inevitable, they can "easily" be resolved through hierarchical referral.
- A better balance between time, cost and performance objectives can be obtained.
- Rapid development of specialists (through functional line) and generalists (through project line) can occur.

The matrix structure provides the best of the functional and the pure project structure. Kerzner (1992: 126) argues that the advantages of the matrix structure eliminate most of the disadvantages of the traditional structure.

Nicholas (1990: 143-144) argues that the major drawbacks of traditional forms of organizations stem from their inherent design. These organizational forms work on the assumption that problems can be classified neatly and resolved within specialized areas. The subunits of these organizations, which tend to work independently and towards their own goals, can therefore only address anticipated, classifiable kinds of problems. When the environment changes and new kinds of unanticipated, unclassifiable problems arise which requires participation from multiple subdivisions, the organization reacts by further differentiating the subunits and adding more rules, procedures and levels of management.

This results in less flexibility and greater difficulty in integrating subunits. Traditional organizations, which are characterized by their verticalness, pyramidal "one-boss" structures (Denis, 1986: 148) and reliance upon up-and-down patterns of authority and communications, are thus not well suited for environments where there is a high degree of uncertainty and frequent change.

By contrast, matrix organizations are characterized by their horizontalness or use of direct communication between parties involved in a problem. Horizontal relations cut across the lines of authority and move decisions down to the parties affected. While most organizations have horizontal relations, such as personal contacts and friendships, these personal contacts, which bypass the formal structure, do not insure that all participants have access to the necessary information. Project organizations improve upon these informal, personal contacts by incorporating formal horizontal relations into the structure. This is done through the use of functions referred to as integrators, which reduce the number of decisions which are referred upward and facilitate communication between subunits. Like informal processes, integrators bypass traditional lines of authority and speed up communication. Nicholas (1990: 145-153) lists the following

integrators which may be used in projects:

- **Liaison role.** This is performed by a specialized person or group that links two departments at lower levels. The result is that informal contacts between departments are legitimized.
- **Task forces and teams.** A task force is a temporary group of representatives from several areas that meet to solve a problem. Once the problem has been worked out, the task force is dissolved. Problems which call for continuous coordinated interaction of subunits require the attention of more permanent teams. These teams have the same characteristics as task forces but they convene on a regular basis and for longer periods of time.
- **Project expeditors and coordinators.** Where a project affects only one functional area, the team is managed by a staff assistant selected by the manager of the area where the project lies and referred to as the project expeditor. The expeditor has typically no formal authority over team members and must rely on persuasion, personal knowledge and information about the project to influence team members. Where a project affects more than one functional area, a multifunctional team is created and located in either the functional area most responsible for the project or at a higher level position. This team is managed by a project coordinator. Though the coordinator has no line authority over the team members, he does have the authority to make decisions on project budgets, schedules, work performance and command action based on these decisions.
- **Project managers.** A project manager heads the pure project organization. Projects that entail a high level of complexity require major resource commitments and those that entail a large stake in the

outcome require a pure project form of organization. Three common variations of the pure project structure are (1) the project centre (where the structure of the parent organization remains the same except for the addition of a separate project "arm" and manager), (2) the stand-alone project (where a new organization is created from several participating organizations especially for the purpose of accomplishing the project), and (3) the partial project (where certain functions critical to the project are assigned to the project manager while other, support-oriented functions remain within the functional areas in a parent organization).

- **Matrix managers.** Organizations that continually operate on a project basis or are multiproject oriented because they are involved in more than one project at a time utilize matrix management. The primary effort of the project manager (also referred to as the matrix manager) is integration. The project manager works with the functional managers to accomplish the project.

Nicholas (1990: 153-154) elaborates on the problems with matrix organizations. The strong point of the organization, the vertical-horizontal structure, is at the same time the root cause of its problems. The matrix is not just a structure variation, but also a whole different way of doing things (Kur, 1982: 41). To be successful, it must be reinforced by information systems and human behaviour that support two-dimensional information flow and dual reporting relationships (Joyce, 1986: 536). Most organizations are accustomed to hierarchical decision making and vertical information flow. The matrix, by contrast, places its emphasis on horizontal relations, lateral information flow and decentralized decision making.

The matrix is also conflict inducing. While theoretically the two-dimensional structure promotes coordinated decision making among functional areas

and further assumes that a balance in power exists between functional and project managers, authority in the matrix is often unclear. Since each worker in the matrix has two managers (a functional and a project/matrix manager), the matrix violates a major principle of management, namely single, scalar chain-of-command (Pitts & Daniels, 1984: 54). The inevitable result is role conflict. Any attempt to adopt the matrix must be accompanied by both attitudinal and cultural change.

Kerzner (1992: 126-128) lists the following disadvantages of the matrix organizational form:

- Increased multidimensional information and work flow with dual reporting relationships.
- Management goals may differ from the project's goals should top-level management not be involved at the definition of the project's requirements in the planning phase.
- Continuous potential for conflicts in the matrix and the possible need for conflict resolution when priorities change.
- Possible difficulties for monitoring and control due to the complex, multidirectional work flow.
- A possible need for more administrative personnel which might cause the organizational structure to be cost ineffective.
- More effort and time needed initially to define policies and procedures than the traditional organizational form.
- Functional managers may possibly be biased according to their own

set of priorities.

- The greater need to monitor the balance of time, cost and performance closely.
- Employees and managers may be more susceptible to role ambiguity than in the traditional organizational form.
- Possible interruption of the stability of the organization and the long-range plans by project priorities and competition for talent as the organization gets involved in meeting schedules and fulfilling the requirements of temporary projects.
- Disruption of the training of employees and specialists through shifting people from project to project thereby hindering growth and development within their own fields of specialization.

The matrix is therefore a compromise in an attempt to obtain the best of two worlds. In pure project management, technology was compromised because of the absence of a strong functional group. In the pure functional structure, time and schedule requirements were sacrificed. Matrix management is an attempt to obtain maximum technology and performance in a cost effective manner within time and schedule constraints. It should be noted, however, that through proper top-level planning and control (Carpenter, 1983: 10), most of the disadvantages of the matrix may be eliminated (Kerzner, 1992: 129).

**Proposition 33:**

A success factor in the implementation of formalized project management is the use of a matrix organizational structure where the traditional, vertical structure is retained and formal horizontal project relations are superimposed.

**2.3.10.5 The selection of an organizational structure**

Kerzner (1992: 139-140) lists some basic factors that influence the selection of a project organizational form. These are the project size, project length, the experience with a project management organization, the philosophy and visibility of top-level management, project location, the available resources and the unique aspects of the project.

Nicholas (1990: 154-158) also lists criteria which may help to decide which form of a project organization is the most appropriate and applicable for a given project. These criteria, illustrated in figure 2.3.6, include:

- The frequency of new projects and to what degree the parent organization is involved in the project-related activities.
- The duration (length in time) of the project.
- The size of the project, including the level of human, capital or other resources in relation to the other activities of the organization.
- The complexity of relationships including the number of functional areas involved in the project and the degree of interdependence.

**Figure 2.3.6: Criteria for selection of project organizational forms**

COMPLEX	SIZE					
HIGH	LARGE		Partial Project		Pure Project	
MEDIUM	MEDIUM	Multi-task force	Temporary matrix	Multi-task force	Permanent matrix	
LOW	SMALL		Single function or team			
		SHORT	LONG	SHORT	LONG	DURATION
		INFREQUENT			FREQUENT	OCCURRENCE

Source: Nicholas, J.M. 1990. *Managing business and engineering projects: concepts and implementation*. Figure 7-9. p. 155.

Briefly, according to figure 2.3.6, matrix and pure project forms in general, are more applicable to projects of medium to higher complexity and also of medium to large size. The projects have greater resource and information requirements and need integrators with a strong central authority. The risk and uncertainty are high and the time and cost goals are critical. There is much at stake and such project forms better afford the obligatory high level of integration and control.

In particular, the matrix form works best where there is a variety of different projects simultaneously and where all can share functional resources on a part-time basis. By contrast, where there is less variety among projects, when specialists must be devoted full-time and when full project authority is desired, the pure project form is more applicable. The complexity of the matrix and the large human and facility requirements of the pure project form may present major problems to the parent organization, however, and should thus be avoided when simpler forms would work as well.

For smaller projects involving several functional areas where the project tasks involve high certainty and little risk, and time and cost are not major

factors, task forces and teams which basically link functional areas are more appropriate. Short-term projects in one or a few functional areas can be effectively managed by part-time task forces and an expediter in one functional area. Where several areas are involved, a multifunctional task team with a coordinator who reports to a higher level management is more suitable. Projects of longer duration, but small in scope and low in complexity are best handled by full-time project teams with coordinators. When the team size needed to accomplish the task becomes large and interrelationships become too complex, a temporary matrix or partial project organizational form could be used. Teams, task forces and project centres are appropriate when the normal structure and work flow of the organization may not be disrupted.

Kerzner (1992: 140-144) proposes that the following three fundamental parameters be analyzed when considering implementation of a project organizational form:

- **Integrating devices.** Project management is a means of integrating all organizational efforts by the selection of an appropriate organizational form. Informal integration, where the role of the integrator is simply to act as an exchange medium across the interface of two functional units, may work well only when effective collaboration can be achieved between separate units.
- **Authority structure.** Top-level management must decide on the authority structure that will control the integrating mechanisms. This may vary from the pure functional authority (traditional management) to project authority (project management) and finally to dual authority (matrix management).
- **Influence distribution.** Integration of activities across functional

borders may also be accomplished by influence and includes such factors as participation in budget planning and approval, design changes and salaries.

Project management with a matrix works well for the control of human resources and may thus be more applicable to labour-intensive projects than capital-intensive projects.

**Proposition 34:**

A success factor in the implementation of formalized project management is involvement in a large variety of different labour-intensive projects simultaneously, where the time and cost goals are considered critical.

Finally, Nicholas (1990: 158) concludes that project organizational structures should not be "cast in stone" and when ineffectual, the structure should be changed to best suit the requirements. Kerzner (1992: 147) concurs and indicates that management should realize that, whichever project management structure is selected, a dynamic state of equilibrium will exist.

### **2.3.10.6 Converting to a new organizational structure**

Should a traditional organization choose to convert to a new project-oriented organizational structure, Kerzner (1992: 150) notes that successful implementation requires good transitional management. This he defines as the art and science of managing the conversion period from one organizational design to another.

Kerzner (1992: 150-151) reports that a survey of executives, managers and

employees of organizations who had implemented matrix management indicated that the greatest success in transition was attributed to proper training and education during and after the transition. In addition, other key variables noted were smooth transfer of power; trust between functional and project managers; flexible policies and procedures; fixed priorities; solving personnel problems; multidirectional communication; acceptance of the project manager; avoidance of detrimental competition; integrated tools and techniques; avoiding contradicting demands; standardization of project reporting; promoting teamwork; utilizing appropriate leadership styles; and increasing management resources.

Kerzner (1992: 151-152) suggests that transition to a project-driven organization is difficult and managers should also consider the following: the planning must be done on a life cycle basis; employees must be trained in project management knowledge, skills and attitudes (also see Levine, 1992: 35); employee involvement and acceptance is a requirement; top-level management must demonstrate commitment to and involvement with project management; an intensive focus on organizational behaviour is a prerequisite; and increased conflict must be resolved.

Finally, it should be noted that Kerzner's (1992) focus on transitional management is primarily from an organizational restructuring viewpoint. Transitional management for the implementation of formalized project management, however, would require a more holistic perspective (Carpenter, 1983: 9) where attention is given to several of the organization's design variables (Galbraith & Kazanjian, 1986: 39). These will be described in subsection 2.4.7.3.

**Proposition 35:**

A success barrier factor in the implementation of formalized project management is the organizational restructuring required to convert to a project-driven matrix.

**Proposition 36:**

A success factor in the implementation of formalized project management is the training and education of personnel in project management before, during and after the transition to a project-driven matrix.

**Proposition 37:**

A success factor in the implementation of formalized project management is effective transitional management when converting to a new organizational structure through planning, employee involvement, top-level management commitment, focus on organizational behaviour and conflict resolution.

### 2.3.11 The functions of project management

PMI (PMBOK: 1987) distinguishes eight project management functions. The functions are divided into four core and four facilitating functions.

The core functions lead to specific objectives which are integrated with one another and with the project life cycle. Together they form the frame of reference against which the success of the project may be measured. From the project sponsor's perspective, they represent a set of requirements while from the project manager's perspective, they represent parameters or constraints. Achieving these respective objectives or working within

these parameters constitutes the four basic project management functions. The core project management functions are scope, quality, time and cost management (Wideman, 1987: II-4).

The facilitating functions are the means through which the objectives of the basic functions are achieved. The facilitating functions are risk, human resources, contract/procurement and information/communication management (Wideman, 1987: II-5).

In general, the core functions of project management reflect the objectives of the project or what is to be achieved while the facilitating functions provide the means for accomplishing these objectives or how it is to be achieved.

The process of project management is the integration of these two types of functions which leads to the ultimate goal of project success. The core functions tend to make use of mathematics (as in scheduling and cost control) but the facilitating functions, by contrast, require positive interaction between people and therefore depend much more on the management theory of the social sciences.

A brief description of each of the core and facilitating functions is given. Full details of each function (including a function chart, function impact matrix chart and a glossary of terms) are presented in the PMI's PMBOK document of 1987. The PMI's Standards Committee began work on an update of this document in 1991 and it was decided that the eight current knowledge areas (functions) be maintained (Duncan, 1993: 6). The detailed breakdown and description of each function are considered important contributions to the explanation of the contents and self-imposed limits of the PMBOK. Recently Lustig (1994: 36) proposed that these eight functions be used in evaluating the benefits of re-engineering efforts in organizations.

Project management core functions (Wideman, 1987: II-4,5):

- **Scope management.** This involves defining the project's required products or outputs and listing all activities to be performed within the resource constraints. Since the scope of a project must first be identified and developed and may then change during the project's life cycle, there is a need for continual scope management.
- **Quality management.** For a project to be considered satisfactory, certain standards of quality must be defined and achieved. This involves carrying out a project throughout the four basic phases of the project life cycle with zero deviation from the project specifications.
- **Time management.** The life of a project is finite - consequently the time available for completion is limited. Time is an inflexible resource, which means that activities required for the project must be carefully planned and scheduled if they are to be completed within the time available.
- **Cost management.** "Time is money" is a well-recognized phrase in the modern society which closely associates inflexible time with the more flexible monetary resource.

Project management facilitating functions (Wideman, 1987: II-4,5):

- **Risk management.** Because of the relative uniqueness of every project and the rapidly changing conditions during a project's life cycle, the final outcome of every project is uncertain. Uncertainty is associated with probability and risk. Management should take steps to mitigate the possibility that requirements will not be met by

reducing the project risk wherever this can be achieved in a manner compatible with the overall project objectives.

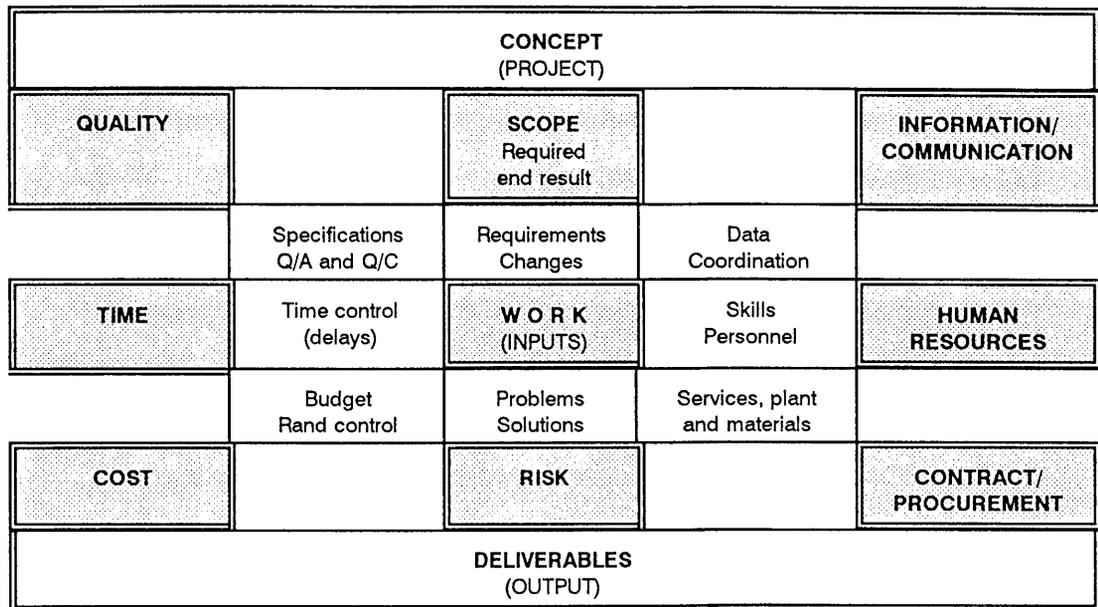
- **Human resources management.** Projects are achieved through the respective skills and talents of people. During the course of the project the number of people and their types of skill vary and, furthermore, many may only be required for a short period. These temporary alliances call for interactive and flexible relationships. For such an assembly of people, interactions and motivation to work together effectively requires a clear understanding of their respective roles and responsibilities.
- **Contract/procurement management.** The willing contribution of people's services is needed for the execution of a project. Services external to the organization may be purchased through contracts while the services of those within the organization also have to be acquired. This function involves the commitment of resources to a project as well as the administration of their conduct or delivery in order to produce the end product.
- **Information/communications management.** Control of projects requires the development of a plan, collecting information on the status of the work at any given time, comparing it to the plan and, if necessary, taking appropriate corrective action. Consistent and accurate feedback from both internal and external sources is important.

Although the functions of project management can be divided into core and facilitating functions, it should again be noted that the functions are interrelated and mutually supportive. Cockfield (1987: A-1) therefore argues that, in order for the objectives of a project to be achieved, the functions

be employed in an integrated manner.

Figure 2.3.7 illustrates this integrative nature of the functions in order to produce the required output (Wideman, 1991: II-8 after Quaife).

**Figure 2.3.7: Work as an integrator**



Source: Wideman, R.M. after Quaife, C. 1991. *A framework for project and program management integration*, The PMBOK handbook series - No. 1. Figure II.3. p. II-8.

**Proposition 38:**

A success factor in the implementation of formalized project management is the application of the integrated core and facilitating project management functions.

## 2.3.12 The project environment

### 2.3.12.1 Internal interfaces

Wideman (1991: V-1) notes that it should be clear from the generalized definition of a project that projects differ in their nature and size and that the internal environment in each varies accordingly. The internal environment is generally reflected in answers to the following questions: what, where, when, why, who, how and how much?

Referring to effective internal strategies, Wideman (1991: V-4) notes that through practical experience, a number of prerequisites for project management success can be identified. While these prerequisites do not necessarily guarantee success, their absence may well lead to sub-optimal results, if not outright failure of the project. The prerequisites are:

- **Executive support.** The executive must clearly demonstrate support for the project management concept by active sponsorship and control.
- **External authority.** The project manager must be seen as the authoritative agent in dealing with all parties and should be the single formal contact with them.
- **Internal authority.** The project manager must have the necessary managerial authority within his own organization to ensure response to requirements.
- **Commitment authority.** The project manager must have both the responsibility and authority to control the commitment of resources, including funds, within prescribed limits.

- **Involvement in all major decisions.** No major technical, cost, schedule or performance decision should be permitted without the project manager's participation.
- **Competence.** The project manager, his supporting team members, and other functional personnel assigned to the project should all be competent.
- **Project team.** The project manager should provide an input into the assembly of the project team to assure competence and further help in obtaining their personal commitment, support and required quality of service.
- **Management information system.** An effective project-oriented information and control system must be in place.

Finally, Wideman (1991: V-3) argues the need for the project manager to influence the project's internal cultural environment for the benefit of all the project participants. Every project team member and every member of the workforce should be persuaded to convey a caring attitude. All decisions and actions should be designed with a view to making the participants' experience better than it would have been, had the project not been implemented.

The focus of project management should thus be on the enhancement of the quality of each participant's experience at every stage of the project. The project's cultural environment may be improved by the training of personnel.

**Proposition 39:**

A success factor in the implementation of formalized project management is top-level management commitment and support for the project management concept.

**Proposition 40:**

A success factor in the implementation of formalized project management is the authority of a project manager to make final decisions, control committed resources and enforce compliance with requirements.

**Proposition 41:**

A success factor in the implementation of formalized project management is an effective project-oriented management information and control system.

**Proposition 42:**

A success factor in the implementation of formalized project management is the enhancement of the quality of each project participant's experience through all stages of the project life cycle.

### 2.3.12.2 External interfaces

Wideman (1991: VI-1) argues that the linkages of a project to its external environment are as important to the eventual outcome of the project as controlling the events within the project organization. The focus of the project manager is therefore not just confined to internal considerations but should also be outward looking.

A project's external environment involves forces outside the project. It includes the technology (the knowledge base from which it must draw), the customers and competitors, geographical settings, economic and political conditions, and even other projects. These factors and, in particular, changes in them may significantly affect the project process and its consequent success.

Generally, the more a project is dependent on the external environment, the greater the degree of uncertainty. However, the extent and mix of linkages will however vary from project to project. The purpose in analyzing the external forces is to define potential problems, assess the probability of their occurrence and solve them ahead of time. These issues are largely addressed within the project management function of risk management.

Wideman (1991: VI-2) lists some typical external environment influences of which the project manager and his team must constantly be aware, which may impact on the progress and ultimate success of the project. These external influences are:

- **Sponsor expectations.** Ensuring that the specified project objectives are congruent with the real project needs is an important prerequisite when the sponsor is represented by more than one group with differing perspectives within the sponsor's own organization.
- **Financial/economic conditions.** The viability on which the success of the project was predicted may change during the life of the project and may consequently require modification of objectives.
- **Technological/industrial conditions.** These may impact on the progress and effectiveness of the project process.

- **Legal and regulatory requirements.** These will impact on any goods or services which are contracted externally as well as the conduct of internal activities, such as the codes of conduct in response to environmental concerns.
- **Political implications.** These may be indirect or more obscured but may have a major impact, such as the change of a government at any level.
- **Health and safety standards.** These must be observed and, if well maintained, could have a favourable effect on project morale, progress and quality.
- **Natural environment protection.** The recognition that natural resources are finite and must be protected and conserved is important in the ultimate acceptability of infrastructure-type projects.
- **Changing workforce.** The workforce mix in terms of women, minorities and immigrants as well as educational levels and knowledge skills is changing.
- **Social responsibilities.** The recognition of shifting needs, such as reducing risk, providing interesting work, and improved opportunities, is important.
- **Ethical issues.** Hidden information, exposure of unacceptable practices of bribery or corruption are not acceptable to the information-conscious public. Honesty and integrity are of prime importance to the success of a project and to the ability to stand the scrutiny of both peers and society once the project is completed.

- **Project management knowledge.** The knowledge base is continually expanding similar to other disciplines and project managers have an obligation to remain current in both the art and science of project management.

**Proposition 43:**

A success factor in the implementation of formalized project management is a sensitivity to the environmental influences which may impact on the progress and ultimate success of the project.

Wideman (1991: VI-3) suggests that just as developing the right attitude was the means of influencing the project's internal cultural environment, so it should also be for developing a sound external stakeholders' environment. He states that:

" ... this attitude is best reflected by adopting a mind set that reverses the traditional organization chart hierarchy. In other words, place the project stakeholders at the top of the chart, followed by the front-line project team members, and on down to the project manager at the bottom. Perhaps the project team will then better visualize their truly service orientation, designed to serve the best interests of a successful project outcome, both perceived and in reality."

A technique suggested by Wideman (1991: VI-5) for effectively dealing with the project's external environment is to prioritize the various stakeholder linkages by conducting a stakeholder analysis. Such an analysis would first identify all the potential stakeholders who might have an impact on the project and then determine their relative ability to influence it. Stakeholders may be found in any of the following groupings:

- Those who are directly related to the project, such as suppliers of inputs, consumers of outputs, and all those involved in the project process itself.
- Those who have influence over the physical, infrastructural, technological, commercial/financial, socio-economic, or political/legal conditions.
- Those who have a hierarchical relationship to the project, such as government authorities at local, regional and national levels.
- Those individuals, groups and associations, who have vested interests, some even unrelated to the project, who see an opportunity to pursue their own ends, such as competitors and special interest groups.

Within each grouping, the stakeholders must further be rated by degree of significance according to their ability to influence the project outcome. Members of the project team should then accordingly prioritize their efforts in order to maintain healthy linkages designed to provide the greatest probability of ultimate project success.

**Proposition 44:**

A success factor in the implementation of formalized project management is to deal with the project's external stakeholders and their relative ability to influence the project process and ultimate project success.

Finally, Nicholas (1990: 37) notes that projects and the application of project management vary, depending on the environment. He explains the

significant differences in project management practice in the environments classified by Roman (1986). These environments and their differences are:

- **Commercial/For-profit project management.** The end-item is a clearly defined product or service often customized or one-of-a-kind, to satisfy a customer or an internal requirement. Motivation and success criteria are heavily profit-oriented. The project manager guides the project through its entire life cycle, coordinating efforts of the project team with functional areas, subcontractors and vendors. Close contact with the customer is maintained and top-level management are informed of the progress towards project and profit objectives. Once the project is completed, the group is dissolved.
  
- **Government and nonprofit project management.** Grouped together, these project environments differ from commercial activities in the following ways:
  - There is no profit incentive and economic factors tend to be less important. Project managers in these environments are frequently reassigned during projects, which causes problems with administrative continuity. In government work, the continuity of projects depends heavily on political considerations since funding is legislatively appropriated.
  - Many projects focus on the evaluation or testing of products or services since virtually all budgeted funds are spent on procuring products or services developed by commercial vendors. Where the design and development work is performed by contractors, the project manager's role is largely administrative. Here the project manager oversees and coordinates multiple, related projects that may be components of a larger system. The project manager may have little control over technical matters but is responsible for checking on the contractors' progress.

- **Military project management.** Like government projects, these may involve testing and evaluating hardware developed by contractors. Major criteria for evaluating projects are technical and political. Costs are of lesser importance and profit is not a consideration.

Many organizations operate in multiple project environments (i.e. in government/nonprofit, military and commercial environments) and utilize a variety of integrators, such as matrix managers, project/program managers, project expeditors/coordinators, and task forces/teams as discussed in section 2.3.10.4.

**Proposition 45:**

A success factor in the implementation of formalized project management is the acceptance of differences in project management practice in commercial and nonprofit/government project environments.

### 2.3.12.3 Trade-off analysis in the project environment

Kerzner (1992: 853-857) explains the need for trade-off analysis in a project environment. He suggests that successful project management is both an art and a science whereby the resources of an organization are controlled within the constraints of time, cost and performance.

However, projects are, by definition, non-routine, non-repetitive and unique activities where previous standards do not readily exist. Projects are further constantly influenced by occurrences in both the internal and external environments. The project manager must therefore continually pursue a delicate balance (or change the emphasis on attaining different goals at different stages of the project life cycle as noted by Kloppenborg & Mantel, 1990: 13) to attain the desired performance within the constraints of time

and cost. Trade-off analysis is thus an ongoing effort throughout the life cycle of a project. While cost and time deviations from the original estimate are normally overruns, a performance error is typically an underrun.

Trade-off analysis is based on the constraints of the project. The different options available are shown in table 2.2. Situations A and B are typical trade-offs that occur in the project environment. Where all constraints are fixed (situation C-1), no outcome other than the highly unlikely, total success is implicated. When all constraints are variable (situation C-2), there are actually no constraints and thus no need for trade-off analysis. It should be noted that it is not always possible to sacrifice one constraint without inducing an effect on the remaining two constraints.

**Table 2.2: Options available for trade-off analysis**

<b>(A) ONE ELEMENT FIXED AT A TIME</b>			
	<b>TIME</b>	<b>COST</b>	<b>PERFORMANCE</b>
A-1	FIXED	VARIABLE	VARIABLE
A-2	VARIABLE	FIXED	VARIABLE
A-3	VARIABLE	VARIABLE	FIXED
<b>(B) TWO ELEMENTS FIXED AT A TIME</b>			
	<b>TIME</b>	<b>COST</b>	<b>PERFORMANCE</b>
B-1	FIXED	FIXED	VARIABLE
B-2	FIXED	VARIABLE	FIXED
B-3	VARIABLE	FIXED	FIXED
<b>(C) THREE ELEMENTS FIXED OR VARIABLE AT A TIME</b>			
	<b>TIME</b>	<b>COST</b>	<b>PERFORMANCE</b>
C-1	FIXED	FIXED	FIXED
C-2	VARIABLE	VARIABLE	VARIABLE

Source: Kerzner, H. 1992. *Project management: a systems approach to planning, scheduling and controlling*. Van Nostrand Reinhold. Table 16-1. p. 856.

Finally, Kerzner (1992: 857-858) cautions that any process of managing time, cost and performance trade-offs should emphasize the systems approach to management by recognizing that a small change in one element of a project could have a major effect on all or only some of the other systems in the organization.

**Proposition 46:**

A success factor in the implementation of formalized project management is the need for and ability to perform trade-off analysis to attain the desired performance within the constraints of time and cost.

### **2.3.13 Successful project management**

#### **2.3.13.1 Project success**

A project may be considered successful when the project objectives, which commonly involve the dimensions or constraints of time, cost and performance, are satisfied (Ward, Curtis & Chapman, 1991: 345). Kerzner (1992: 6) proposes that, in addition to these criteria, project success is further implied by customer or user acceptance, when few or mutually agreed upon scope changes take place, and when little interruption in the main work flow of the parent organization occurs.

Project management may make trade-offs between objectives and, if these are mutually agreed upon by the developer and user, a project may still be considered successful even if portions of the original objectives were not met (Bresnen, 1991: 258).

Some organizations therefore measure project success by considering only the highest priority criteria and attach a lesser importance to other

measures. Projects which do not satisfy all criteria are therefore not necessarily regarded as project failures.

The triple constraint view of project success (budget, schedule and performance) alone can therefore not be regarded as an absolute accurate barometer of project success (Sidwell, 1990: 177).

The best overall criterion for project success advocated by Nicholas (1990: 472) is satisfying the expectations of all the parties involved. Should the user, project manager and the developing organization feel that their expectations were met or exceeded, the project should on most accounts be considered a success.

Wideman (1991: VIII-1) further explains the rationale behind participant satisfaction. Some dimensions, like cost or time, may be measured objectively to determine the success of a project. Others, however, are a matter of personal subjective judgment or opinion. Pinto and Pinto (1991: 15) also refer to these other dimensions as intangible psycho-social outcomes. For a favourable opinion to be formed, those associated with the project must be reasonably satisfied with the final outcome.

In an adaptation from Pinto by Quaife and Wideman (1991: VIII-1), a view of project success (illustrated in figure 2.3.8) which includes both the internal and external project environments, is suggested.

**Figure 2.3.8: The success target**

INTERNAL TRACKING			EXTERNAL TRACKING		
<b>STEERING PROJECT THROUGH PROJECT LIFE CYCLE</b>					
	QUALITY	SCOPE	VIABILITY	COMPETITIVE	
INTERNAL PERFORMANCE		<b>PROJECT SUCCESS</b>			EXTERNAL PURPOSE
		PARTICIPANT	SATISFACTION		
	TIME	COST	USE	EFFECTIVE	

Source: Adapted from Pinto, J. by Quaife, C. & Wideman, R.M. 1991. *A framework for project and program management integration*. The PMBOK handbook series - No. 1. Figure VIII-1. p. VIII-1.

Pinto and Prescott (1988: 7) conclude that project success comprises three basic dimensions. In a contributing letter to Wideman (1991: VIII-3), Pinto further illustrates these dimensions in tabular form (see table 2.3).

**Table 2.3: Project success measures**

PROJECT SUCCESS MEASURE	COMPRISED OF:	AS PERCEIVED BY:
IMPLEMENTATION PROCESS	Internal efficiency: Conformance to scope, quality, schedule and cost requirements	Project team
PERCEIVED VALUE	Positive impact and potential for clients to improve performance	Project team and clients
ACCEPTANCE AND USE	Acceptability to clients and actual usefulness	Clients

Source: Wideman, R.M. 1991. *A framework for project and program management integration*. The PMBOK handbook series - No. 1. Table VIII-3. p. VIII-3.

**Proposition 47:**

A success factor in the implementation of formalized project management is the accurate definition of project success, which includes achievement of project objectives and overall participant satisfaction.

### 2.3.13.2 Project failure

Nicholas (1990: 463) suggests that no failure occurs in isolation. All failures are actually system output failures where defects or other features in the system itself cause or allow the particular failure to occur.

Some failures are unavoidable by reason of their being outside any of the participants' ability and judgement to anticipate, avoid or influence (Skitmore, Stradling & Tuohy, 1989: 103). They occur as a result of forces that are neither foreseeable nor controllable. Nicholas (1990: 464) argues that most failures are, however, caused by defects in (1) the project and user organization or (2) the project end-item. Examples of project failures are when a result that is perceived as desirable is not produced or when the cost, schedule, performance, quality, safety or other related objectives are not met.

Nicholas (1990: 465-471) identifies fourteen factors which, as inadequacies or defects in project management, may be regarded as sources of project failure. Figure 2.3.9 illustrates the project management causes of failure. The factors are categorized into the following three levels:

- **Level I:** Failures in the project management context. The sources of failure are traceable to the inappropriate fit (incongruent or incompatibility) of the project organization to the project objectives,

project tasks, top-level management and the larger environment. The failures include:

- An inadequate project management model. Incorrect organizational structure, project manager, or project team is selected to meet the requirements of the project.
- Unsupportive top-level management. Top-level management do not give the active and continued support necessary to achieve the project goals.

**Figure 2.3.9: Project management causes of failure**

LEVEL I: PROJECT MANAGEMENT CONTEXT			
(1) Inappropriate project management approach		(2) Unsupportive top management	
LEVEL II: PROJECT MANAGEMENT SYSTEM			
(3) Wrong project manager	(4) Failure to use systems approach	(5) Misuse of management techniques	
LEVEL III: PLANNING AND CONTROL PROCESS			
CONCEPTION	DEFINITION	ACQUISITION	OPERATION
(6) Inadequate communication			
(7) Noninvolvement of user			
(8) Inadequate planning			
(9) Inadequate definition			
(10) Bad estimating			
(11) Incorrect scheduling/resources			
(12) Numerous changes			
(13) Inadequate control			
(14) Poorly planned termination			

Source: Nicholas, J.M. 1990. *Managing business and engineering projects: concepts and implementation*. Prentice-Hall, Inc. Figure 18-2. p. 466.

- **Level II:** Failures in the project management system. The sources of failure are traceable to project leadership, philosophy and practice, and

include:

- The wrong project manager. The person in the role of the project manager does not have the background, skills, experience or personality to lead the project.
  - Ignoring the systematic nature of projects. The project is not managed as a system. The elements and processes of the project through the project life cycle are compartmentalized without regard for their interaction.
  - Inappropriate use or misuse of project management techniques. The techniques are misunderstood, not accepted or not properly employed.
- **Level III:** Failures in the planning and control processes. The sources of failure involve the planning and control processes, and include:
- Inadequate communication in the project. The problems stem from lack of information quality, accuracy, timeliness, collection and documentation, or inadequate distribution of information to the project participants.
  - Failure to involve the user. The user or customer does not participate in the planning/definition/design/implementation process and user needs are therefore disregarded.
  - Lack of or inadequate project planning. Analysis of how and when things will be done is insufficient and reports and/or recommendations from previous projects are ignored.
  - Inadequate project definition. Vague, wrong, misleading or no project definition causes failure. There is no formal definition of technical requirements, tasks or project scope.
  - Incorrect estimating of time and resources. Estimates of resource requirements, activity durations and completion dates are incorrect or unrealistic.
  - Incorrect scheduling and handling of the resources. Schedules and

allocation of the resources are incorrect, resource skills or capabilities are unknown and there are no reserves or backup resources.

- Numerous changes during the acquisition phase. Changes are made to the original estimate without corresponding adjustments to the schedule, budget or other elements of the plan.
- Inadequate control. Problems are not anticipated before they occur, control is focused on daily issues without looking forward to potential problem situations.
- Project termination is poorly planned. It is not known what constitutes project completion or the end-item, what the acceptance criteria are, or how the project must be signed off.

Nicholas (1990: 471-472) further explains that a defect or inadequacy at one level may have a negative impact on the next lower level. A hierarchy of effects is implied and defects or problems at higher levels increase the chance of project failure even when there are no defects at lower levels. Emphasis should thus be placed on higher levels because, in general, it would help to eliminate or mitigate problems at lower levels.

The factors identified are not universal verities and their validity and importance should be weighed and assessed uniquely on a project-by-project basis. It should further be noted that the absence of failure factors does not necessarily mean success. Not having the factors will reduce the chance of failure but will not guarantee success, however.

Wideman (1991: C-3) identifies certain traps which should be avoided when the project management approach is utilized. The traps include possible disorganization and disruptive conflict which may result; special leadership skills are missing; project management knowledge is missing; trade-offs are not understood; timely decisions are not made; and an appropriate

cultural environment is not established.

Kerzner (1992: 513-514) also identifies certain major causes of project management failure. These causes are similar to those listed by Nicholas (1990).

**Proposition 48:**

Success barrier factors for the implementation of formalized project management are failures in the project management context, i.e. inappropriate selection and unsupportive top-level management of the project management approach.

**Proposition 49:**

Success barrier factors for the implementation of formalized project management are failures of the project management system, i.e. unsuitable project manager, disregarding the systematic nature of projects, and misuse of project management techniques.

**Proposition 50:**

Success barrier factors for the implementation of formalized project management are the failures in the planning and control processes, i.e. lack of communication, user not involved, inadequate planning and control, poor project definition, unrealistic estimates, insufficient resources, numerous changes, and termination not planned.

### 2.3.13.3 Successful project management

Project success is not necessarily equal to company, organizational or even project management success. Only when a continuous stream of

successfully managed projects occurs can mention be made of excellence (Holt, 1989: 234) in project management (Kerzner, 1992: 7).

Kerzner (1992:3) defines successful project management as having achieved the project objectives: within time, within cost, at the desired performance/technology level while utilizing the assigned resources effectively and efficiently.

Nicholas (1990: 472-477) identifies some characteristics which may be associated with project management success. The characteristics, illustrated in figure 2.3.10, are classified into the following three categories:

- **Project participants.** For a project to be successful, it needs strong commitment (also see Rossy & Archibald, 1992: 5) from all the participants to fulfil the project objectives. The commitment and involvement of the following participants are specifically implicated:
  - Top-level management. Their commitment is essential for project success because it affects the level of acceptance or resistance from others to the project.
  - Project manager. The project manager should be committed to meeting the time, cost, safety and quality goals.
  - Project team. The whole team should be involved in problem solving and decision making.
  - Users. The project team should identify and understand the user's requirements before the project begins. The user should be strongly committed to the project goals and be involved in the project management process until final approval of the installed end-item.

**Figure 2.3.10: Project management causes of success**

PROJECT GOALS				
TIME	COST	PERFORMANCE	QUALITY	SAFETY

PROJECT PARTICIPANTS			
TOP MANAGEMENT	PROJECT MANAGER	PROJECT TEAM	USER/CLIENT
COMMITMENT			
Support	Authority Skills	Skills Technology Teamwork	Authority Approval
INVOLVEMENT			

COMMUNICATION AND INFORMATION SHARING	
Timely meetings/reports Basis for action Continuous	High quality Open access Participation

PROJECT MANAGEMENT AND SYSTEMS DEVELOPMENT			
DEFINITION	PLANNING	CONTROL	IMPLEMENTATION
Clear Well understood Stable Quantitative Qualitative	Scope definition Schedules Budgets Resources Milestones Risks	Monitoring Feedback Troubleshooting Proactive Minimal changes	Advanced preparation Stopping point Follow-up Audit/evaluation

Source: Nicholas, J.M. 1990. *Managing business and engineering projects: concepts and implementation*. Prentice-Hall, Inc. Figure 18-3. p. 473.

- **Communication, information sharing and exchange.** Good communication implies a mechanism for effectively integrating the efforts of the project participants and facilitating project management and the systems development process. There should be continuous communication between all personnel within the project/user/top-level management team.
- **Project management and systems development.** The factors that relate to project management functions and the elements of the system

development process are:

- Project definition. There should be complete and clear definition of the project scope, objectives and work to be done. Project responsibilities and requirements are clearly defined and well understood by everyone involved.
- Project planning. There should be thorough planning followed by executing the plan with strong management control. Plans are related to time, cost and performance goals. Plans provide detailed descriptions of the work and the stages of the project as well as ways to measure performance and arrangements for project control.
- Project control. The project should have good control and reporting systems. The system provides for monitoring and feedback at all stages and enables assessment and comparison of schedules, budgets and team performance with project goals. The control system should be proactive and forward looking in order to anticipate problems, foresee and forestall them and then react as problems arise.
- Project implementation. Preparation for implementation is done in advance in the initial plan and throughout the project.

Slevin and Pinto (1986: 57) identified a number of factors which are critical to project success. The factors are categorized into those generally within the control of the project team, and those considered beyond the control of the project team. Beale and Freeman (1991: 25) labelled the first, endogenous variables and the second, variables exogenous to the project and project team.

■ Factors **within the control** of the project team:

- Project mission: initial clarity of goals and general directions.
- Top-level management support: willingness of top-level manage-

ment to provide the necessary resources and authority/power for the project.

- Project/schedule plan: a detailed description of the individual action steps required for implementation.
  - Client consultation: communication, consultation and active listening to all affected parties.
  - Personnel: recruitment, selection and training of the necessary personnel for the project team.
  - Technical tasks: availability of the required technology and expertise to accomplish the specific technical action steps.
  - Client acceptance: selling the final product to its ultimate intended users.
  - Monitoring and feedback: timely provision of comprehensive control information at each stage in the implementation process.
  - Communication: the provision of a suitable network and necessary data to all key actors in the project implementation.
  - Anticipating problems: ability to deal with unexpected crises and deviations from the plans.
- Factors **outside the control** of the project team:
- Characteristics of project team leader: the competence of the project leader by way of administrative, interpersonal and technical abilities, and authority available to perform duties.
  - Power and politics: the degree of political activity within the organization and the perception of the project as furthering an organization member's self-interest.
  - Environmental events: the likelihood of external organizational and environmental factors impacting on the operations of the project team either negatively or positively.
  - Urgency: the perception of the importance of the project or the need to implement the project as soon as possible.

Finally, Kerzner (1992: 509-510) lists the following actions which can be taken by the project manager and project team to stimulate project success:

- Key team members with proven track records in their respective fields should be selected.
- Commitment and a sense of mission should be developed from the outset of the project.
- Sufficient authority should be granted and a project-oriented organizational form utilized.
- Good relationships should be maintained with the client, parent organization and project team.
- The public's image of the project should be enhanced.
- Key members should assist in decision making and problem solving.
- Realistic cost, schedule and performance estimates and goals should be developed.
- A team structure that is appropriate yet flexible should be provided.
- Means other than formal authority should be used to maximize influence over people and key decisions.
- A workable set of project planning and control tools should be employed.

- The importance of meeting cost, schedule and performance goals should be emphasized but priority given to achieving the mission or function of the end-item.

**Proposition 51:**

A success factor in the implementation of formalized project management is acquiring the commitment and involvement of all key project participants.

**Proposition 52:**

A success factor in the implementation of formalized project management is communication, information sharing and exchange by all key project participants.

**Proposition 53:**

A success factor in the implementation of formalized project management is a clear project definition and effective project planning, control and implementation.

#### 2.3.13.4 Project force field analysis

An approach for improving the project performance advocated by both Kerzner (1992: 517) and Nicholas (1990: 477-480) entails force field analysis. The technique was originally developed by Kurt Lewin in 1947 as a means of overcoming resistance to change. It may also be used in project management, however, to investigate forces acting on a current project or forces that might influence an upcoming project and to determine where emphasis is needed to increase a project's likelihood of success.

The method is based on the assumption that at any point in the life cycle of a project forces exist which will either drive a project towards success or restrain a project and induce failure.

In a steady environment, the driving (or facilitating) and restraining forces are in balance or equilibrium. Whether the forces act independently or in combination, should the driving or the restraining forces increase, changes in the state of affairs are likely to occur.

Most of the forces affecting project performance are potentially either facilitating or restraining. This means that a factor could be a restraining force when absent but a facilitating force when present. However, the influence of a force depends on how strong and visible it is. Not all forces are of equal importance or influence. Forces are further independent and some tend to impact on other forces.

The method of force field analysis identifies all the restraining and driving forces in a situation and determines the relative strength of each. It is then possible to discover which restraining forces should be weakened or, by the same token, which driving forces must be strengthened to move the situation towards the ideal state, the equilibrium.

Project managers operate in a dynamic environment in which constant and rapid change becomes a way of life. To operate effectively under these circumstances, the project manager must be able to diagnose the situation, design alternative courses of action, provide the necessary leadership so that changes can be implemented, and develop an atmosphere that helps employees to adapt readily to these changes.

Nicholas (1990: 478) notes that the factors that cause project management to succeed or fail (see subsections 2.3.13.2 and 2.3.13.3) encompass most

of the forces which influence project performance. Kerzner (1992: 518-522) provides a brief synopsis of a research study by Dugan, Thamhain and Wilemon (1977) in which information on the forces in project environments was obtained. Driving forces were identified in the areas of personal drive; individual and team motivation; leadership; management and functional support; technical expertise; project objectives; financial resources; and client support and commitment.

**Proposition 54:**

A success factor in the implementation of formalized project management are the driving forces of project success, that is personal drive, motivation and leadership, management and functional support; technical expertise; project objectives; financial resources; and client support and commitment.

**2.3.13.5 Advantages of project management**

Wideman (1991: C-3) and Kerzner (1992: 145) identify the following potential advantages to be attained through the application of the project management approach:

- Improved scope definition for the project with a results orientation.
- Optimization of the allocation and use of resources.
- Greater quality conformance and reliability.
- Reduced cost and time with higher profit margins, where applicable.
- Improved risk handling and better control.

- Increased individual morale, greater team spirit and better mission orientation for employees working on the project.
- Increased visibility of the project with better customer relations.
- Improved functional integration and coordination amongst divisions with a higher chance of project success.
- Accelerated development of managers due to breadth of project responsibilities.

Kerzner (1992: 3) suggests that the potential benefits from project management are also:

- Functional responsibilities ensure that all activities are identified and accounted for regardless of personnel turnover.
- The need for continuous reporting is minimized.
- The time limits for scheduling are identified.
- A methodology for trade-off analysis is identified.
- Accomplishment against plans is measured.
- Problems are identified timeously and corrective actions follow.
- Estimating capability for the future is improved.

**Proposition 55:**

Success factors for the implementation of formalized project management are the perceived advantages of project management; i.e. optimization of resources, greater quality conformance, improved risk handling and better control, increased visibility of the project with better customer relations, and improved functional integration with a higher chance of project success.

**2.3.13.6 Disadvantages of project management**

Kerzner (1992: 145) lists the following major company or organizational disadvantages of project management:

- Internal operations are more complex and difficult to manage.
- Organizational policies are not applied consistently.
- There is a possible lower utilization of personnel by shifting personnel from project to project and duplicating of functional skills in project organization.
- Higher program costs may result in lower profit margins, where applicable.
- There is a tendency for functional groups to neglect their job and let the project organization do everything.

**Proposition 56:**

Success barrier factors for the implementation of formalized project management are the perceived disadvantages of project management; i.e. more complex internal operations, inconsistent application of organizational policies, lower utilization of personnel.

### **2.3.14 Applications and forms of project management**

#### **2.3.14.1 Criteria for the application of project management**

Nicholas (1990: 30) suggests that, although project management may have originated in the construction and aerospace industries by reason of their environments and kind of activities which demand flexible and imaginative forms of management, other industries and environments may also find the application of project management beneficial. He identifies two general conditions which, when present, would suggest that project management be applied:

- The more unfamiliar or unique the undertaking, the greater the need for project management to ensure successful completion.
- The more numerous, interdisciplinary and interdependent the activities of the undertaking, the greater the need for project management to ensure coordination, integration and successful completion.

Cleland *et al* (1983) identify five general criteria to be considered when deciding whether or not project management is appropriate. Nicholas (1990: 30- 31) further elaborates on these criteria as follows:

- **Magnitude of the effort.** When a project requires more resources than

are normally employed by an organization, or coordination and integration of resources are required over several functional areas, project management techniques may be necessary.

- **Unfamiliarity.** Projects are, by definition, something different from the ordinary and routine.
- **Changing environment.** Environments which change rapidly or are characterized by high innovation, shifting markets and consumer behaviour, present new "opportunities" for organizations. These organizations must be creative, innovative, flexible and capable of rapid response.
- **Interrelatedness.** Should the project require a joint effort between different functional areas, lateral relationships which expedite work and reconcile the conflicts inherent in multifunctional undertakings, project management can link together and coordinate the efforts of areas within the parent organization as well as the efforts of outside contractors, vendors and customers.
- **Reputation of the organization.** The stake of the undertaking may necessitate project management. If failure to complete the project satisfactorily would result in either financial loss, damaged reputation or loss of future contracts (the stake and consequences of failure are thus high), project management may, through integrative planning and control, provide a better chance for successful completion.

By contrast, however, the more familiar the undertaking, the more stable the environment; the less unique and more standardized the end-item and the lower the stake, the less need there is for project management.

Stuckenbruck (1981: 17-18) suggests that, by examining the characteristics of a particular effort, it may be determined whether the application or conduct of project management would be appropriate or not. The application of project management is appropriate when:

- The project meets the definition of a project proposed by having defined objectives which are to be achieved that will signal completion.
- The project is large, technically complex, and new technology is incorporated that is unique or relatively rare.
- Time and cost are critical while resources are limited and must be shared between organizational units.
- Specific ad hoc opportunities or problems must be dealt with.
- Results are critical or especially important and the project has strong top-level management support.
- Coordination across functional boundaries as well as goods and services from outside are required.
- Single point responsibility and reporting and single point representation to the customer are required.
- Quick response to changing conditions is necessary with a minimum organizational disruption.
- Multiple regulatory approvals are required and should be coordinated.
- Many other concurrent projects exist in the organization.

By contrast, Cleland (1990: 51) identified situations where project management should not be used. These are when:

- The business products or services are highly standardized.
- The production processes are routine or seldom change.
- The traditional organizational framework is effective in making strategic and key operating decisions.
- The technology is stable and well within the state of the art.
- The political, social, economic, technological and competitive environments are stable.
- Projects are not an integral part of the organization's operations and do not require project management techniques.
- The entity is small and the same results can be accomplished through the functional organization, even though informal project management techniques may be used.

**Proposition 57:**

A success factor in the implementation of formalized project management is an unfamiliar undertaking of large magnitude where many interdisciplinary and interdependent activities must be coordinated and integrated over functional divisions.

**Proposition 58:**

A success factor in the implementation of formalized project management is integrative planning and control where consequences of failure are high; i.e. financial loss and damage to the reputation of the organization.

**2.3.14.2 Industry application of project management**

Project management has found diverse application (Welsh, 1992: 5) and is used in many different industries or technologies. Wideman (1991: C-2) lists some of the industries as presented in table 2.4.

**Table 2.4: Project management industry application**

■ Aerospace	■ Agriculture/foods
■ Amusements/museums/zoos	■ Automotive
■ Banking/finance/insurance	■ Chemicals
■ Construction/real estate	■ Communications
■ Computers/hard & software	■ Defense/security
■ Design/instrumentation	■ Education
■ Electronics	■ Engineering
■ Government/civil service	■ Health/environment
■ Manufacturing	■ Marine/boats/ships
■ Media/printing/publishing	■ Mining
■ Petroleum	■ Pharmaceutical
■ Plastics & rubber	■ Pulp & paper/wood
■ Resource industries	■ Telecommunications
■ Transportation/land/sea	■ Textiles
■ Tourism/travel/hotel	■ Utilities/energy
■ Volunteer organizations	■ Wholesale/retail

Source: Wideman, R.M. 1991. *A framework for project and program management integration*. The PMBOK handbook series - No. 1. p. C-2.

Kerzner (1992: 27) identifies four types of industries where project management may generally be applied. The classification (see table 2.5) is based on the type of tasks (which vary from simple to complex) and operational environments (which vary from static to dynamic). Task complexity is seen as the key variable. Both C- and D-type industries have project management-related structures. Organizations that have complex tasks and operate in a dynamic operational environment normally find formal project management mandatory.

**Table 2.5: Classification of industry types**

TYPE OF INDUSTRY	TASKS	ENVIRONMENT
A	SIMPLE	DYNAMIC
B	SIMPLE	STATIC
C	COMPLEX	DYNAMIC
D	COMPLEX	STATIC

Source: Kerzner, H. 1992. *Project management: a systems approach to planning, scheduling and controlling*. Van Nostrand Reinhold. p. 27.

With informal project management, projects are managed on an informal basis by either a project manager, whose authority is minimized, or by the functional managers. These projects stay between one or two functional lines and communication is either unnecessary or informal.

When the size and complexity of activities grow to a point where they are unmanageable within the current organizational structures, organizations depart from informal project management and restructure in order to formalize their project management process. Kerzner (1992: 28) suggests

that, should any of the following conditions be present, some form of formalized project management may be necessary: complex tasks; dynamic environmental considerations; rigid constraints; many activities to be integrated; and several functional boundaries to be crossed.

Bresnen and Haslam (1991: 340) and Kerzner (1992: 29) argue that not all industries necessarily need project management. Industries with simple tasks, being in either static or dynamic operational environments (type A and B industries), usually have no need for formalized project management.

Kerzner (1992: 40) further distinguishes between project-driven and non-project-driven organizations. All organizations on a microlevel are either market, engineering or manufacturing-driven. On a macrolevel, however, they may be considered either project or non-project-driven. In project-driven organizations, everything revolves around projects (Dinsmore, 1993: 26) and each project is regarded as a separate cost centre with its own "profit or loss" statement. In non-project-driven organizations, profit and loss are measured on vertical or functional lines. Projects merely exist to support product or functional lines. Kerzner (1992: 40) further suggests that project management is generally more difficult in non-project-driven organizations because:

- Projects are few and far between.
- Not all the projects have the same project management requirements and cannot therefore be identically managed. There is also a poor understanding of project management and a reluctance to invest in proper training of personnel.
- Top-level management do not have sufficient time to manage all

projects but do not want to delegate authority to do so.

- Projects tend to be delayed because the vertical chain of command must be followed. Project work is delayed in functional departments.
- Only a portion of the organization understands project management and sees the system in action.
- There is a heavy dependence upon subcontractors and outside consultants or agencies for project management expertise.

Kerzner (1992: 42) illustrates the relationship between formal/informal project management, project/non-project driven organizations and organizational structures. From figure 2.3.11 it should be noted that:

**Figure 2.3.11: The decision-making influence**

PRODUCT INFLUENCE			
FUNCTIONAL INFLUENCE			
	FUNCTIONAL ORGANIZATION	<b>MATRIX ORGANIZATION</b>	PRODUCT ORGANIZATION
	NON-PROJECT-DRIVEN	<b>PROJECT-DRIVEN</b>	NON-PROJECT-DRIVEN
	INFORMAL PROJECT MANAGEMENT	<b>FORMAL PROJECT MANAGEMENT</b>	INFORMAL PROJECT MANAGEMENT

Source: Kerzner, H. 1992. *Project management: a systems approach to planning, scheduling and controlling*. Van Nostrand Reinhold. Figure 1-18. p. 42.

- Informal project management is generally applied in non-project-driven organizations with either a functional (traditional) or pure

product/project organizational structure.

- Formal project management is generally applied in project-driven organizations utilizing a matrix organizational structure.

**Proposition 59:**

A success factor in the implementation of formalized project management is the ability to deal with complex tasks in either static or dynamic work environments.

**Proposition 60:**

A success factor in the implementation of formalized project management is a project-driven organization which uses a matrix organizational structure.

### 2.3.14.3 Different forms of project management

Project management is applied in many different forms. The project organization may also vary considerably depending on the nature of the project and the project environment. However, Nicholas (1990: 32-33) identifies two common features:

- A project team or project organization is created uniquely for the purpose of achieving specific project objectives.
- A single person, the project manager, is assigned the responsibility for seeing that the objectives are accomplished.

Beyond these common features, other aspects may differ depending on

the specific application. Nicholas (1990: 33-38) identifies five major forms of project management. The first form, known as "basic project management" refers to what is commonly understood by the concept of project management. The other forms are project management variants which are very similar to project management. The different forms identified are:

- **Basic project management.** The most common project approach places the project manager and functional managers at the same level. The project manager is given formal authority to plan, direct, organize, and control the project from start to finish. The project manager works directly with any level of the organization in any functional area to accomplish project goals. The assignment of resources, such as personnel and facilities, has to be negotiated with functional managers. Basic project management is implemented in two widely used forms:
  - **Pure project management:** A complete, self-contained organization is created with all the necessary functional elements within.
  - **Matrix management:** The organization is created by using elements allocated from permanent functional units. The project must share resources with other concurrent projects and with functional areas from which they are borrowed.
- **Program management.** Program management is used interchangeably with project management because of the similarity between programs and projects. Both work towards a target specified in terms of a desired product or service output, a date of accomplishment and a related budget.

- **New venture management.** Project management resembles a type of management used in consumer-oriented firms for generating new products or markets. A new venture team is created to find new products or markets that fit the specialized skills, capabilities and resources of the organization.
- **Product management.** It involves giving a single person the authority to oversee all aspects of a product's production, scheduling, distribution and sales. The product manager coordinates and expedites efforts of manufacturing, distribution and sales to ensure uninterrupted flow of the product from its production to its delivery to the customer.
- **Ad hoc committees and task forces.** For projects that are small or span a short duration, a temporary team is created, usually within a specific functional department or as a separate "arm" of the organization. The teams are called task forces or interdepartmental committees. A leader and the members for the ad hoc committee are selected whereafter the leader is responsible for expediting and coordinating the effort.

Finally, based on a classification by Davis (1962), Nicholas (1990:29) identifies four types of project managers. These are:

- **Project expeditors.** These are individuals who speed up the work. Their purpose is to achieve unity of communications. They are not seen as managers but rather serve as translators of technical concepts into business concepts of costs, schedules, and markets. The expeditor role is usually restricted to smaller projects with low risks and less stake.

- **Project coordinators.** They act as staff leaders and their purpose is to achieve unity of control over project activities. They have authority to control project matters and disbursements from budget, but still have no line authority over workers.
- **Matrix managers.** They perform the full range of management functions and, in addition to the purpose of unity of communications and control, have the authority to plan, motivate, direct and control project work. Their purpose is thus to achieve unity of direction.
- **Pure project managers.** They direct pure project organizations. Their purpose is to achieve unity of command. These managers are primarily integrators and generalists rather than specialists. They must balance technical factors with schedules, costs, resources and human factors. They deal with top-level and functional managers, vendors, customers and subcontractors.

For the purposes of this research, formalized project management is defined as and refers to the application of basic project management in the form of matrix management in government/nonprofit project environments. (See subsections 2.3.14.2, 2.3.14.3 and 2.3.12.2). The type of project manager implicated, is a matrix and pure project manager as defined in subsection 2.3.14.3.

### **2.3.15 Summary**

Section 2.3 focused on the content-related issues of strategy formulation and implementation. The purpose was to describe the construct "formalized project management" (i.e. strategy formulation) and further to identify the tools for the implementation of formalized project management (i.e. strategy implementation).

In general, project management is concerned with the management of projects. A project is defined as any series of temporary, non-routine and non-repetitive activities which are undertaken to accomplish project objectives.

An integral part of a project is its life cycle. When divided into some logical phases of development, such as conceptual, development, execution and termination, the consistent application of management to all phases is enhanced.

The inherent characteristics of projects, as reflected by their complexity and uncertainty, necessitate that they be differently managed to simpler, ongoing, repetitive type operations. Project environments call for adaptability and rapid response to change. They require more organic and flexible forms of structure and management procedures.

Project management is defined as a systems approach to planning, organizing, leading and controlling human and material resources for the duration of a project established in order to achieve and complete the project objectives.

Project objectives must be specific, verifiable and attainable and stated in terms of budget (cost), schedule (time), performance (quality) and stakeholder's acceptance. A management-by-objective (MBO) approach may be utilized to achieve the all-embracing scope objective of a project.

The tools for the implementation of formalized project management are embodied in the three main elements of project management, namely the project manager, the project team and the project management system.

The different roles, responsibilities and authority of the project manager

determine the desired personal characteristics and important skill requirements. Skills in interface management and conflict resolution are viewed as critical elements of the leadership role required from the project manager.

The project team, with the project manager as team leader, consists of a combination of project office personnel and functional employees. Project office personnel provide support for the project manager while functional members are usually assigned to only some specific phase of the project. Roles outside the project team which are also important are the role of manager of projects and the role of top-level management.

The project management system should ensure that the project manager and project team perform effectively. A part of this system which provides for integrative planning and control is the organizational structure. While many different structures may be identified, the matrix form is deemed the most appropriate for project management. Conversion to such a new structure requires transitional management.

Eight project management functions may be distinguished. The four core functions of scope, quality, time and cost management lead to the specific project objectives but must be integrated with one another and with the project life cycle. The four facilitating functions of risk, human resources, procurement and communication management provide the means through which the objectives of the basic functions are achieved.

The project environment is composed of both internal and external interfaces. The internal environment reflects the events within the project organization. Linkages outside the project comprise the external environment.

Project success is implicated when the expectations of all the parties involved are satisfied. But project success is not equal to project management success. Only when a continuous stream of successfully managed projects occurs, can project management success be claimed. Several factors may either cause project management failure or project management success. Using the force field analysis technique, the forces which may influence projects may be identified and used to determine where emphasis is needed in order to increase the likelihood of success.

The characteristics of a particular effort are used to determine whether the application or conduct of project management is appropriate or not. Project management has found wide application in many industries and is further also applied in several forms. Generally, formal project management is applicable in project-driven organizations which utilize the matrix organizational structure.

Section 2.4 will describe the process-related issues of strategy formulation and implementation. The focus will thus be on how a strategy for formalized project management can be formulated and implemented.