

Project Variables in Performance of the Project Planning, Implementation and Controlling Processes

Muhammad Salim Javed, Ahmad Kamil Bin Mahmood, Suziah B. Sulaiman
Computer and Information Sciences Department, Universiti Teknologi PETRONAS
Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia
College of Computer Sciences and Information, Aljouf University, Kingdom of Saudi Arabia
msjgandapur@yahoo.com, kamilmh@petronas.com.my, suziah@petronas.com.my

Abstract-- *Project management provides an organization with power tools that improve its ability to plan, implement, and control its activities. In this paper, we have studied project variables and factors that affect the performance of projects. The main objective of this study is to identify those project variables and factors that were reported as contributing to the enhancement of the performance of the project in project planning, implementation and monitoring processes. These factors will become the independent variables in the model building process. A model of a development for the development project has been introduced which reflects how development project add value to the existing inputs by utilizing the internal resources efficiently and effectively to provide a more value-added output. In this paper, Different development project theories have been mentioned at various stages of a development project. Identification of each stage is helpful for more deep study of the system and processes. In order to achieve this objective, information related to different projects and models concerned with project planning, implementation, control, and suggestion for success/ performance of the project were reviewed.*

Keywords- Project Variable, Logical Framework, Project Cycle Management (PCM).

I. INTRODUCTION

The past several decades have been marked by a rapid growth in the use of project management as a mean by which organizations achieve their objectives. Project management provides an organization with power tools that improve its ability to plan, implement, and control its activities as well as the ways in which it utilizes its people and resources. Project management has emerged because the development of society becomes more complex and diversified. Non-cycled activities have become a part of the economic scenes. Such non-cycled activities are often adaptive to projectization. Therefore projects, as a vehicle to accomplish economic development become more pronounced operations: The governments in the third world countries like Pakistan desired to step up the development process of the economy and society in faster way. Developmental projects were considered a vehicle where resources can be diverted in comprehensive way to find the change. Barring change and development requires more comprehensive develop and

procedures in projects to achieve economic growth and development. For this purpose, Government of Pakistan implemented developmental projects of variant sizes and costs into various sectors of the economy. Project management processes such as planning, implementation, monitoring and evaluation remained important elements in almost all the activities undertaken by the government organizations. It is iterated that project management is an operational phenomenon, in which project processes, which are employed in more prosaic activities, will often fail unless modified or adopted in order to be responsive to their: unique operational environment. Therefore, project processes should be given high at motion and special importance. Careful planning of projects, appropriate implementations are better monitoring of these projects should result in better development, which may help to utilize resources efficiently and effectively, by bridging the developmental gaps in the country and brings economic Growth and prosperity in Pakistan.

The term project is widely used with a short definition which means a Plan or scheme. However, Lock [1989] defines it as: "A collection of linked activities carried out in an organized manner, with a clearly defined start point and end point to achieve some specific results desired to satisfy some clearly defined objective". It may make it easier to define a project's characteristics, which would include:

- Start and a finish date
- Budget
- Activities
- Roles and relationships

This entails generally a project's main characteristics which are usually a part represents its boundaries with that of non project activities. Projects are formed to achieve objectives. It is an ad hoc organizational arrangement that normally has a start and completion schedule. Depending on the technical challenge, a project may entail one or several tasks, involve a few or many people, span one or several functions, cover a short period or many years and cost an inconsequential sum. Brandt et al [1997] reinforce the aforementioned as: "a project organization is established for a limited period of time, generally to accomplish one specific purpose to bring a new idea or project from its conceptual

stage through development and cause of its inputs and full implementation".

The projects that command the most public attention tend to be large, complex and multidisciplinary endeavors. Often such endeavors are both similar to and different from previous projects with which familiarity will be more or less. Similarities with the past provide a base from which to start and how to implement but the difference imbues every project with considerable risk. The complexities and multidisciplinary aspects of projects require that the many parts be put together so that the prime objectives – performance, time, and cost are met. Therefore, primary consideration for all parties in a project (owner, stakeholders, project manager) is the completion of projects as efficiently possible. According to Archibald [1986], "Projects may be viewed as the entire process required producing a new product, new plant, new system or other specified results at a particular point in time and within established budget. Project cut across organizational lines. They are unique endeavors not completely repetitious of any previous efforts". Archibald elaboration of project point out three objectives or dimensions of a project which are:

- Time
- Cost
- Performance

It implies that project should be considered in these three perspectives; the performance (outcomes) is related to time at which the outcome is available; and the cost which entails in achieving the outcome. Considering these three factors on dimensional axes as shown in Fig-1, it can be mentioned that the efficient relatedness of them will enable an organization to achieve its specific targets. The above mention dimensions elaborate that for achieving any specific target, the three important factors that is time, cost and performance should be a predominant in project management processes. Therefore efforts must be directed towards the most efficient and effective planning, implementation and monitoring processes to achieve the targets.

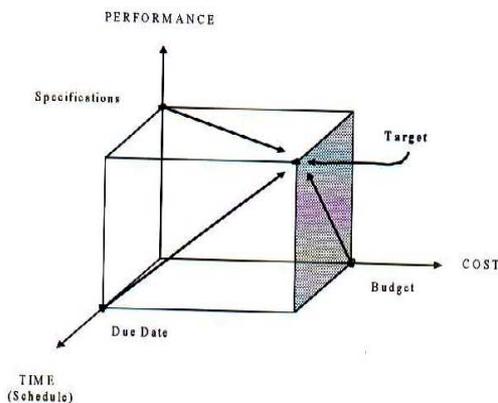


Fig. 1: Three Dimension of Project Performance, Cost and time (Archibald, 1986)

II. RELATED WORK

A. Development of Project

Development Projects constitute an integral part of economic development. The economic growth and

development is pursued through the execution of development project. European Commission [1997] defines a development project as, "a multi dimensional interventions which is intended to develop human, physical and economical potentials of a country to bring about the change leading to the improvement of economy, environment, communities and institutions".

In view of the above, Gittinger [1982] pictures a development project as a model as shown in Figure-2 wherein project primarily aims to add value through internal inputs / resources that are organized and operated by projects.

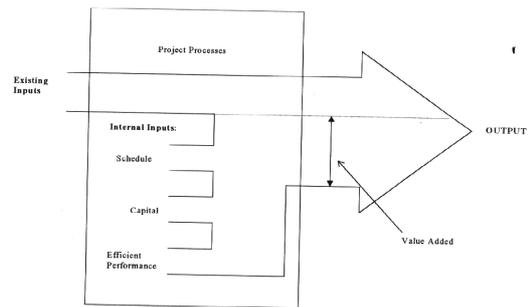


Fig. 2: General Model of a Development Project [Gittinger, 1982]

Thus development project consist of an optimum set of investment-oriented actions, based on comprehensive and coherent sector planning, by means of which a defined combination of human and material resources is expected to cause a determined amount of economic and social development. The component of a project needs to be precisely defined as to character, location and time. Both the resources required in the form of finance, materials and institutional development are estimated in advance. Cost and benefits are calculated in financial and economic terms or defined with sufficient precision to permit a reasoned judgment to be made as to optimum set of actions [Al-Jalay, 1991].

i) Types of Development Projects

The development projects aim to increase the production of goods and services such as industrial, agricultural, mining products, health care, urban, transport and socio-economic infrastructure and services. However, social projects results can only be subjective and can not be measured in quantitative terms such as improvement of primary education etc, therefore on the basis of such cases, development projects are distinguished in following two types [Salman, 1989].

a) Project with Tangible Product

Those projects which produce products that can be valued in monetary terms, generally aim to increase the production of goods and services.

- Which are sold or not sold but for which a market exists. For example industrial projects, power development projects, agricultural, tourism or small industry projects, or credit for firm projects etc
- Which are provided with out direct payment by beneficiaries or whose price is not determined by commercial considerations, but whose benefits can be

easily valued. For example road infrastructure, professional training and agricultural extension projects etc.

b) Project with Non -Tangible Product

The products which can not be accurately valued in monetary terms without carrying out research which exceeds the time and resources usually available to analyst, making major assumption of the project purpose. The utility of such projects need not necessarily be valued. The example includes project dealing with health, education, urban development, (e.g sewerage), social services, institutional reforms or environmental conservations. Different development models apply according to the type of the project. For example Long Frame Matrix is specially applied to non –tangible projects.

ii) Development Project Theories

The Project procedure provides description of how project task shall be done and the sequence of these tasks.

Comprehensive development planning necessitates the construction of procedures and methods that make the planning, implementation and monitoring functions systematic and capable of being performed according to logical order. The following types of system procedures have been presented by different researchers and institutions.

a) Six – Phase model

Eldin and Hamdy [1983] have suggested a descriptive model for project management and implementation. This model suggests six stages along with some objective to be reached in each stage (See table -1). They divided the below six into three phases viz preparation or initiation phase, implementation phase and operation phase. Some of the factors they organized are useful for further study.

TABLE I: Phases, stages & objectives of the development projects (Eldin & Hamdy, 1983)

Phases	Stage Nos.	Stages	Objectives
Initiation phase	1	Identification of Project Idea	Goals identified & Objectives are determined.
	2	Preliminary Selection	Ideas are developed into alternative concepts, Technical solutions are identified.
	3	Feasibility	Feasibility is assessed, evaluated and classified.
Implementation Phase	4	Detail Project Planning	Project planning with schedules, cost estimates are done.
	5	Startup & Implementation	The project is kicked off with time, cost & performance specifications.
Operation Phase	6	Project Operations	Product, facility or system kept operational at all the time and cost.

a) Five – Phase model

According to Seifoddini [1986], the system of project planning and implementation should consist of five phases: goal setting, project preparation, project evaluation and selection, project implementation and finally effectiveness assessment of the system.

iii) Goal Setting Phase

In the goal setting phase, development goals, targets and priorities are formulated according to need of the people. These needs can be determined using statistical technique of the survey sampling. As stressed by Seifoddini, people and their needs are only one component or subsystem constituting the environment which affects the goal setting efforts. Other components of the environment are economic, political technical and so on. These environmental subsystems together provide the inputs to the goal setting phase as well as to other phases of the planning system.

iv) Preparation Phase

Alternative development projects to achieve those goals and targets are explored in the preparation phase. Technological feasibility is determined of the proposed project. Seifoddini outlines the stages of the preparation phase as follows.

- Definition of the objectives and scope of the project.
- Formulation of the alternative course of actions
- Preliminary screening of the alternatives in terms of contribution to objectives, cost and degree feasibility.

v) Project Evaluation and Selection Phase

In the evaluation process, feasible projects need to be reviewed on the basis of economic efficiency and effectiveness. In the project selection process, a set of projects that satisfy the resources constraints are selected for implementation.

vi) Project Implementation Phase

The set of selected projects resulted from project selection phase are realized in what is called the project implantation phase. In this phase, Seifoddini recommends the project management techniques.

vii) Effectiveness Assessment Phase

The last phase according to Seifoddini is the assessment of the effectiveness of the system. In this phase, a comparison between actual accomplishment and intended goals is done. According to Seifoddini, effectiveness should be assessed at three levels.

1. Subsystem level - where each subsystem is accomplishing its objectives efficiency
2. Project level – where efficient implementation of each project should be assured.
3. National level -where the effectiveness of the whole system should be assessed.

Seifoddini proposes setting of indicators for the measurement of project success at national level assessment. These indicators will show the charge realized due to the development project implementation. So typical goal indicators or development indicators are in the field of agriculture, education, industry, health etc.

viii) Project Process Model

Projects are viewed as an integration of actions perfumed by the people. According to Duncan [1993] these integrated actions are composed of five (5) different processes within a project life cycle. He terms a process as, "a series of actions bringing about a result." He organized project processes in the following manner.

TABLE II: Project Processes

Initiating process	it recognizes that a project should begin & committing to do so
Planning process	It devises and maintains a workable scheme to accomplish the business needs that the project was undertaken to address.
Implementation process	it helps to coordinate people and resources to carry out plan.
Controlling process	It ensures that project objectives are met by monitoring and

	measuring progress and taking corrective action when necessary
Closing process	It formulizes the acceptance of the project and bringing it to an orderly end

He elaborates these process groups as, "linked together by the results they produce - the results of one become an input to another." However, he terms these processes as an overlapping activities as shown in the Fig-4, which occur at varying levels of intensity throughout the project.

The project processes as explained above present a generalized model of project life cycle, wherein the major processes are suggested.

ix) Project Cycle Management

European Commission [1993] presented a process model distinguishing different stages of activity, referring it as Project Cycle Management (PCM) as a criterion of the project success at each stage of activity (fig-5). Their proposed model consists of six phases:

Programming: it spell out the general guidelines and principles, based on analysis of the problems and opportunities, the ideas for project and programs are broadly outlined. the outcome is then a country strategy.

- Identification: Within framework of the country strategy, problems, needs and interests are analyzed and ideas for projects and other actions are identified and screened for eventual further study.
- Appraisal: All significant aspects of the idea are studied, detailed implementation activities and schedules are work out. The outcome is a decision on whether or not to propose the project for financing.
- Financing: The financing proposal is considered on the basis of appraisal and a formal agreement is then made with all financial arrangements.
- Implementation: The agreed resources are used to achieve the project purpose and overall objectives. The progress is monitored to keep the project on track.
- Evaluation: The aim of evaluation is to determine the relevance and fulfillment of Objectives, developmental efficiency and effectiveness. It can be performed during implementation and its end or afterwards either to help steer the project or to draw lessons for future projects and programming.

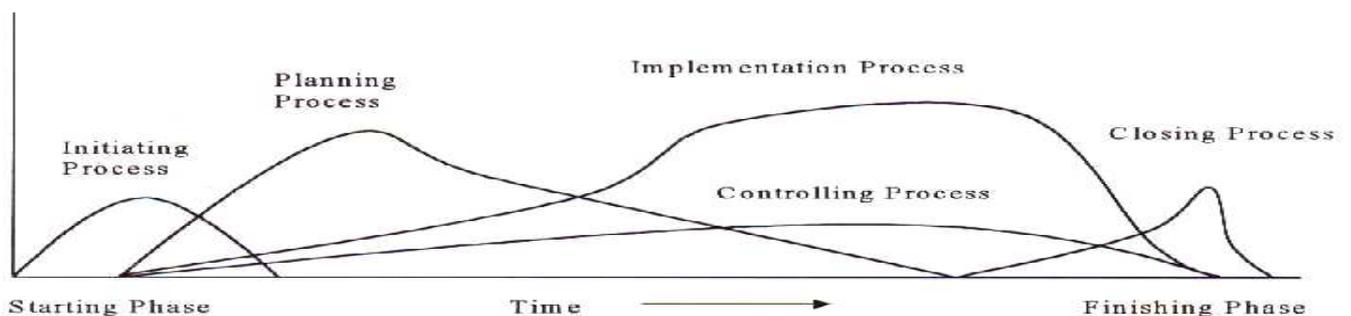


Fig. 3: Overlap of Process Group in a Project [Duncan, 1993]

The essential principles of PCM is to incorporate disciplined production of good quality key documents in each stages as shown in fig-5 and consulting and involving key stakeholders as much as possible.

Kijne [1995] has further elaborated these project processes and identifies planning implementation and controlling processes as the five (5) phases: goal setting, project preparation, project evaluation and selection, project implementation, and effectiveness assessment of the system. In the goal setting phase, development goals, targets and

priorities are formulated according to needs of the people. In the preparation phase, alternative plans to achieve those goals and targets are explored. In the evaluation process, projects labeled technologically feasible have to be viewed on the basis of whether they satisfy minimum requirements of economic efficiency and effectiveness. Direct pricing, cash flow techniques are used to evaluate and compare alternative projects. In the project selection process, as set of projects that satisfy such constraints are selected for implementation.

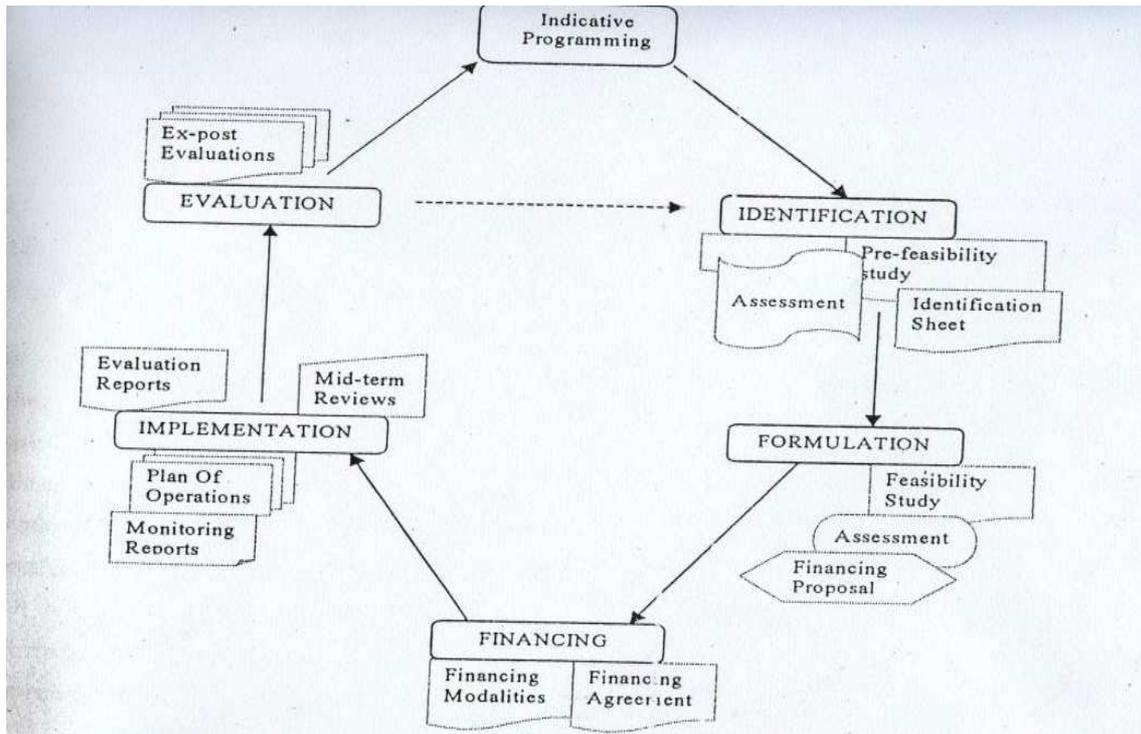


Fig. 4: Stages in Project Cycle Management [EF, 1993]

B. Planning, Implementation & Control Models

Many researchers have contributed to the modeling of different planning, implementation, and control processes. However, most of them are scattered and not represent a specific set of variable or factors that can be applied in the same manner to each and every project. A project system is not the development of something entirely new. It is more bringing together of many proven project management variables or factors. Since the exact combination of project factors varies significantly to meet the unique needs of each project, no single detail system is appropriate to every project environment. Eldin and Hamdy [1983] have suggested a descriptive model for project management and implementation of industrial projects. This model suggests six (6) project stages along with some objective to be reached in each stage (see Table-1). They suggested identification of project idea as an ultimate responsibility at top management level, whereas the feasibility studies are considered as peripheral activities. They divided the above six stages into three phases viz. preparation or initiation phase, implementation phase and operations phase. Some of the factors they recognized are useful for further study.

i) Logical – Framework Approach

In 1980's, United State Agency for International Development [USAID] had developed the Logical Framework Method (Log-Frame), which consists of a set of inter-linked concepts. This approach has the following characteristics:

- Facilitates the formulation of consistent and realistic program – project design.
- Functions as a guide for the management of program – project implementation.
- Lays the foundation for monitoring and evaluation – project achievements.

Its main element is the 'log frame matrix' which summarizes all the essential aspects of the program / project design in a table with four column and four rows (4x4 matrices) as shown in fig-3.

The four columns of the program and project log frame matrices

- Specifies the major cause-effect relationships between objectives at different levels (Narrative Summary)
 - Elaborates precise operational definitions and targets for every important objective (Indicators of Achievement)
 - Provides data sources in order to measure the achievements of the program/project (Sources of Information)
- Includes a clear definition of the "boundaries" of the program / project relative to other significant factors (Assumptions and Risks)

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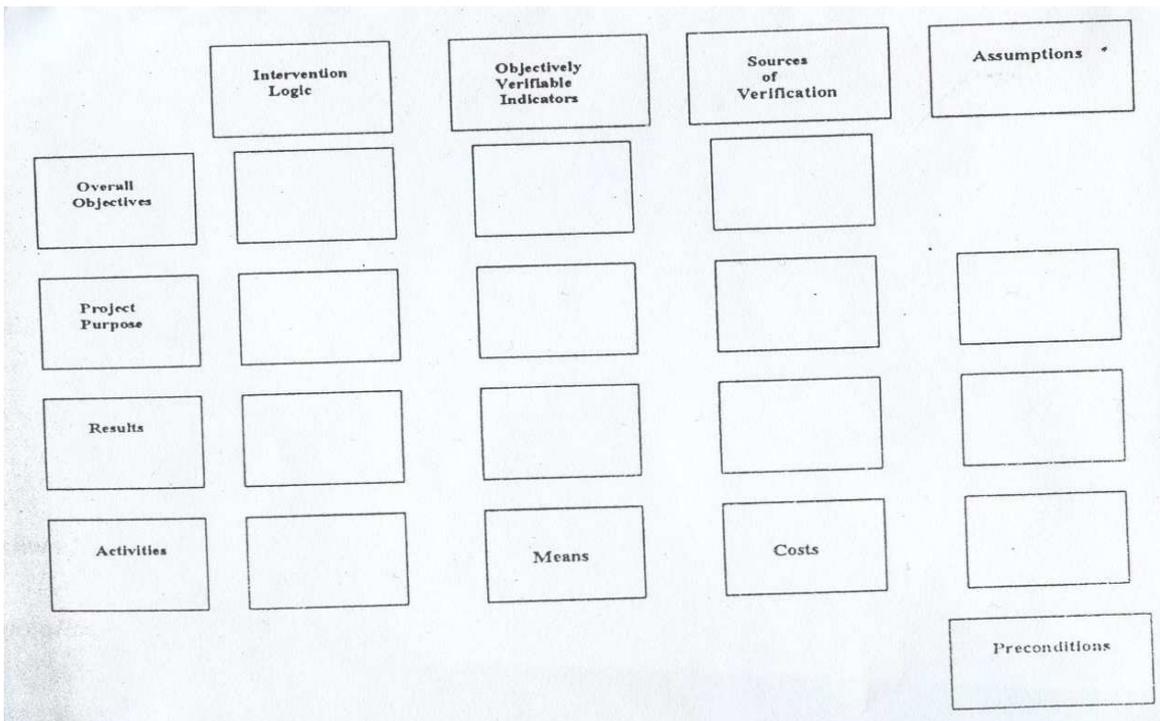


Fig. 5: The Logical Framework Matrix [USAID, 1980]

TABLE III: Structure of a log frame matrix (at project level)

Narrative Summary	Indicator of Achievement	Source of Information	Assumption and Risks
Immediate Objective	Indicator of Achievement	Source of Information	Assumption and Risks
Results of Project	Indicator of Achievement	Source of Information	Assumption and Risks
Outputs of Sub-Projects	Indicator of Achievement	Source of Information	Assumption and Risks
Implementation Schedule of Sub-Projects		Budget of Sub-Project	

When defining the log frame matrices' for different projects within a program the content of the objective levels of "Immediate Objective" and "Result" that is relevant for the respective project is transferred to the project matrix and further broken down into "Outputs" of sub-projects and a corresponding implementation "Schedule" that specifies the phases of activities for each sub-project.

How ever Log Frame Matrix is influenced by some factors, the weakness of which affects its success. These are:

- The information available
- The availability of the planning team
- Good consultation of stockholders
- Thorough consideration of lesson learnt

The Log Frame also needs to be re-assessed and revised as the project itself develops and circumstances change during implementation. However, despite its weakness this matrix is a powerful tool in development project strategy.

Sanvido [1988] presented a Conceptual Process Model, wherein he offered a format for the processes to be followed in order for the project to be successful. These processes were management planning, management control, resource

acquisition, resource allocation, operational control, and operational planning. However, this model does not provide detailed information of variables that contribute to the performance of each process (Fig-7). Followed for a complete project control

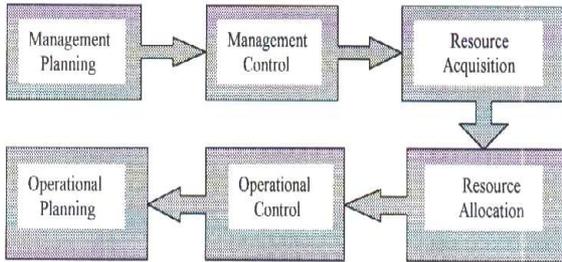


Fig. 6: Conceptual Project Process Model (Savido, 1988)

The four steps are:

- A plan;
- A method for measuring performance;
- A test for deviation of performance from the plan; and
- A decision and reaction process based on the test for the deviation.

However, this model did not offer control tools to be used at each step. Also, this model can be described as a reactive control process; however, it can also be extended to include a proactive control process by building forecasting technique into the process. Fig-3 illustrates this control process Havrland et al [2001] presented another project process model distinguishing different stages of activity, referring it as project cycle. He also proposed Project Cycle Management (PCM) as a criterion of the project success at each stage of activity (Fig-6). His proposed model consists of the following:

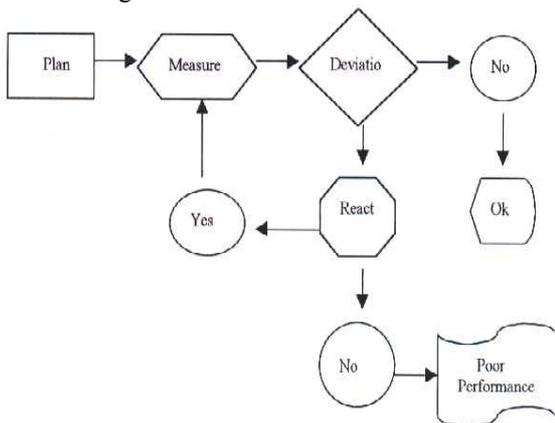


Fig.7: Project Control Process (McKim, 1990)

ii) Identification & Selection

The process of identification culminates in a project being selected as the most likely and/or least costly alternative means of achieving the planned objectives. It is also felt that the project has the possibility of being implementable and achieving its objectives at reasonable cost.

III. PREPARATION/FORMULATION

Project preparation covers the establishment of technical, administrative, economic and financial feasibility. Decisions have to be made on: scope of the project location and site,

- Project size,
- Input and output requirements, etc.
- Complete technical specifications of the above proposals of the project include the following:
 - Objectives,
 - Outputs, activities,
 - Inputs,
 - Costs and,
 - Assumptions.

The above are considered as the outcomes of the project preparation stage.

i) Appraisal

Appraisal stage consists of a comprehensive and systematic review of all aspects of a project proposal by the donor agency and/or the recipient country. He spelled out the following appraisal variables:

ii) Rationale

Do the development objectives of proposed project conform to the national development interest, policies and priorities? dq. the immediate objectives of the project clearly represent a contribution to achievement of the development objectives?

iii) Design

Design are the outputs of the project likely to contribute to achievements of the intended immediate objectives (effects) by the end of the project or shortly thereafter? Are the planned inputs and activities well designed (i.e. necessary and sufficient) to achieve those outputs?

iv) Realistic

Realistic are the inputs likely to be available as scheduled? Is the time horizon adequate, etc?

v) Assumptions

Assumptions are the project based on sound assumptions which are likely to be fulfilled, such as appropriate decisions by government and parallel supporting developments in other projects?

v) Risks

Risks what is the probability that the circumstances, under which the project should be implemented, will change? Have the estimate or costs realistic?

vi) Institutional

Institutional is the project placed in an institutional and legislative setting within the country where it is likely to achieve its objectives? Is the institutional framework within the project likely to achieve the maximum management efficiency and lasting effects from the project?

vii) Economic

Economic is the cost of the project justified to achieve the objectives? Is there a lower cost solution or could more be achieved at the same cost by alternative means?

viii) Negotiation & Approval

Following appraisal, additional points may be raised or disagreements arise on certain aspects of the project. Once agreement between all parties is reached, the project is approved and signed for implementation.

ix) Implementation

In this stage, inputs are made available to activate the project. A major priority during this stage is to ensure that the project is carried out in the way and within the period that was planned.

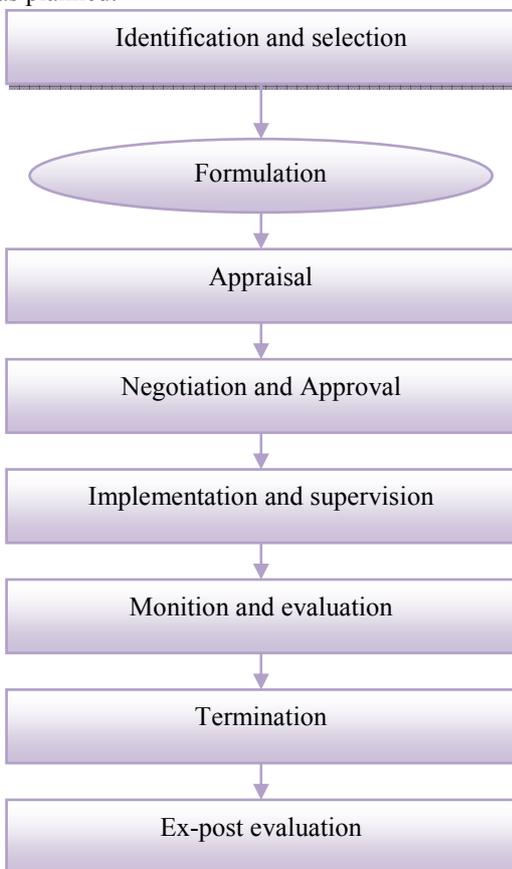


Fig-8. Activity Stages of Project Cycle Management Model (Havrland et al, 2001)

x) Supervision

Supervision is carried out through monitoring and evaluation. Effective monitoring and evaluation during implementation allows management to become aware of difficulties as they arise. This type of supervision ensures that input deliveries, work schedules, targeted outputs and other required actions are proceeding according to plan.

xi) Termination

Project termination can be after the planned period of the project implementation has passed or before if the project has been abolished.

xii) Ex-post evaluation

The main purpose in clarifying the project process is to assist with the clear delineation of responsibility for each major activity. It is essential that the different parties concerned with a project promoters, funding agent, beneficiaries, executing agency, staff and others are all represented in the project process, that participants are clear about where their roles begin and end, and that objectivity in the whole process is maintained.

IV. PROJECT PLANNING VARIABLES

Among other functions of management, planning is the most important and the basic managerial function. If this function is properly implemented, and controlled, then potential for achieving final objectives of an enterprise can be assessed. In addition to being a tool with which to design appropriate actions to achieve stated goals, planning is an educational process which can be used to learn, in advance, about hidden as well as obvious requirements of a complex venture. Proper planning establishes a solid foundation for the remaining managerial functions. Donnelly, Gibson & Ivancevich [1995J, contends that: "Planning focuses on the future: What is to be accomplished and how? In essence, it includes those managerial activities that determine objectives for the future arid the appropriate means for achieving those objectives. The outcome of the planning function is a plan, a written document that specifies the courses of action the firm will take." Further elaborating, they continued to say as: "The planning function requires managers to make decision about four (4) fundamental elements of plan: objectives which specify future conditions to be achieved; actions, which are the means, or specific activities planned to achieve the objectives; resources, which are constraints on the course of action; and finally implementation, which are ways & means to implement the intended actions."

The above definition suggests four concepts: goal, scope, definiteness, and direction. Since planning is performed to achieve, "desired results", then it is purposeful activity that must operate on some object (s). Ozbekhan [1979] stated that, "Planning is an activity which operates on something - an object or entity through some actions for specific purpose." He also argues that, "the performance of any planning system can be determined by these 'on', 'through', and 'for' parameters". However he considers 'through' & 'for' factors become more difficult to pin down "once planning is seen as encompassing even greater numbers of combinations into which physical objects, the environment, human activity, attitudes, movements, behavior, thinking, volition, institutions, procedures, etc. are introduced in the form of changing relationships."

Planning a project can be an extremely involved process. Platje and Seidel [1993] relied on organizational concepts of the factors to which the projects are affected, in planning and implementation. Using terms from chaos theory, they liken centralization to a strange attraction with ever increasing demotivation and disinterest. Payne [1995] has studied twenty four (24) projects. His study was also more concerned towards the social context of the critical project variables that

are important in project planning and control. The important factors which he recognized are: availability of sufficient and appropriate resources, commitment of individuals to project success, setting of the projects with relation to culture, procedures, and norms of the team groups, and the complexity of the projects and its relationship to the organization. Large manufacturers usually need to manage multiple projects in order to leverage their financial and engineering resource investments on new technologies and designs. Therefore a relationship between different multi-project strategies in planning and their effect on project performance was studied by Nobeoka & Cusumano in 1995. In their study, the multi-project strategy focuses on different ways of transferring core technologies and designs from one project to another within the firm during project planning process. A topology was proposed, which categorized new product development projects into four types: new design, rapid design transfer, sequential design transfer, and design modification. Then they conducted a survey of 103 different new product projects at 10 automobile firms in Japan and The US. Their study concludes those projects using the rapid design transfer strategy are the most efficient in terms of hours. Only through rapid design transfer can a preceding design be transferred from a base project to a new project with effective task sharing among engineers and mutual adjustments between the two projects? According to their conclusion, neither a pure project team approach nor a functional approach seen appropriate for the management of concurrent multiple projects. However, they did not suggest the .specific organizational approach for the multi-project management nor the other project variables role in the better project performance in multi-project environment. A significant stream of research has established the importance of goals in regulating the planning and resource allocation decision. Looking to this behavior; Hamid, Sengupta & Swett [1999] investigated the impact of different project goals on software project planning and resource allocation decision and, in turn, on project performance. They tested two multi-goal structures, one for cost/schedule and other quality/schedule. Their research revealed that the cost/schedule group opted for smaller cost adjustments and was more willing to extend the project completion time. The quality/schedule group, on the other hand, acquired a larger staff level in the later stages of the project and allocated a higher percentage of the larger staff level to quality assurance. A cost/schedule goal led to lower cost, while a quality/schedule goal led to higher quality. Their findings suggested that given specific software project goals, managers do make planning and resource allocation choices in such a way that will meet those goals.

Hobbarad [2000] offered a guide or model as to methodology to improve project planning. His procedure covers the following project variables:

- a) Assemble responsible representatives from all required supporting operations
- b) Define, describe, and identify factors that must be planned for to accomplish the project ,

- c) Establish technical objectives, areas of performance responsibility, schedule and budget commitments, and profit target goals and communicate committed project obligations
- d) Secure detailed planning from functional groups supporting the project.
- e) Coordinate the project components into a composite project plan
- f) Obtain approval of the project plan from the participating functions, the project leader, and management
- g) Issue, implement, and maintain the plan

He concluded that properly conceived and implemented, the project plan should establish an operational frame of reference for all the activities of the project.

Clear, precise and logical project planning contributes substantially to the overall success of a project in achieving its objectives (Havrland et al, 2001). In his words, "it makes implementation, and controlling of project considerably straight forward if the purpose and the scope of the project are clear at the outset." He argues that the correlation between good design and a project's successful implementation and achievement of the output is the main rationale of a project." In his studies, he found a close correlation between project output and project design and planning, wherein out of 10 projects with fully adequate design, 8 achieved satisfactory outputs. While out of 13 projects in which design was inadequate, 9 produced unsatisfactory output.

V. PROJECT IMPLEMENTATION-VARIABLES

Project implementation is an important process in the project life cycle. Implementation helps to coordinate people and other resources to carry out the plan. According to Duncan [1996], "implementation is the process required to transform the planned objectives and policies of a project into a well-organized activities, allocation of resources, efficient utilization of these resources, and the efficient and effective conduct of specific tasks through a well-coordinated people and the resources to achieve the project goals."

Shepard & Gonzalez [1984] assessed the effectiveness of organizations through interviews with managers of twenty (20) different projects. The projects covered energy, aerospace, and chemical endeavors. According to their study team management solving problems was found preferable to vertical management structure. They termed communication among the managers as a critical need. Furthermore, they found the project variables such as: clearly defined goals, role clarity, teamwork values, flexibility in response to need and a team commitment, as critical variables for success.

However, they consider a consistent management philosophy as an important strategy for achieving interim-goals and project progresses. However, question arises that what is the role of an organization strategy in project performance, and do the project variables have an effect on strategy and on the performance. Answering to this question, Pinto [1986] opined that implicit strategies are shaped by the project variables which act as an operation of the organization, under-performing of these variables are potential in affecting the project performance. For this

purpose, he constructed project profiles, which he used to compare with the following project variables, showing factor merits for a higher priority when managing next projects. These are: project mission, project planning, client involvement, technical activities, client acceptance, monitoring and feedback, communication, and handling of trouble shooting. A model for the determinants of project variables was developed by Ashley et al [1987]. It was concluded that the critical determinants of success are planning effort, project management capabilities, technical uncertainty, and legal political environment. Other determinants of project success were also identified such as project manager goal commitment, project team motivation, scope and work definition, control systems and risk identification. His model is presented in Fig-10.

This model was accompanied by a list of recommendations, which would be very beneficial for future efforts. These recommendations will be taken into account when developing this present study: Increasing the project sample size since a sample size of sixteen projects cannot produce results representative of all projects.

Collecting more objective data for each project. Identifying more factors and relationships.

The development of well conceived predictive models that capture the essence of project success such as the following format:

$$\text{Project Outcome} = C_1F_2 + C_3F_4 + C_5F_6 + C_7F_8$$

Where C1, C3, C5, and C7 are coefficients while F2, F4, F6, and F8 are prediction factors. In an attempt to identify factors related to project management, which may contribute to the success of reliability and maintainability improvement programs, Suchan [1989] conducted a study on the Air Force management programs. He identified following eight (8) factors that is; top-level management support, clearly defined R&M requirements, training in R&M issues, the government-contractor working relationship, assignment of R&M responsibilities within the program office, incorporation of technological advances, use of contract incentives, and including R&M requirements in the RFP evaluation criteria.

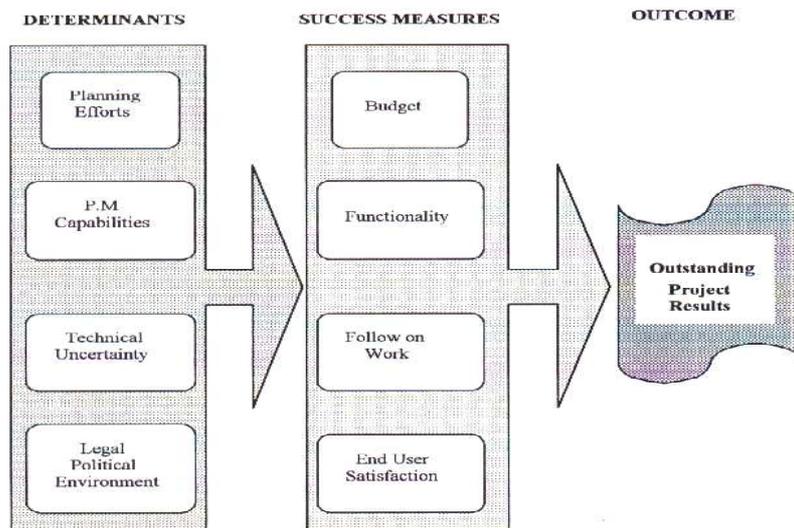


Fig. 9: Determinants of Project success (Ashley et al 1987)

In a research on 16 projects, Sanvido et al [1992] suggested a model with following (4) variables, these are:

- a. A well organized, cohesive facility team to manage, plan, design the facility.
- b. A series of constructs that allows and encourages the various specialists to behave as a team without conflicts of interests and differing goals.
- c. Experience in the management, planning and operation.
- d. Timely and valuable information from the owner, user, manager, and operator in the planning.

However, in this study, there was no analysis performed on the utilization of certain tools that may satisfy the mentioned variables. Table-3 summarizes the findings of this study:

In an exploratory study, Bryson and Bromeliey [1993] have reported the results of a quantitative cross-sectional analysis of 68 case descriptions of major project. Variables describing the context of the project, project planning and

implementation processes, and project outcomes were coded using information contained in the case descriptions. Factor analysis was used to identify major factors associated with context, process and outcomes. The influences of context on process, and context and process on outcomes were estimated using regression. Their results indicated that a number of contextual variables strongly influence aspects of the project planning and implementation process, and then indirectly influence project outcomes through the planning and implementation process. In addition, both process and contextual variables affect the outcomes directly. In an investigation of 121 diverse rural projects, Isham, Narayan & Pritchett [1995] found that increasing beneficiary participation directly causes better project outcomes. Their further estimation using instrumental variables, data on project timing and documentation of case studies also

supported the cause-effect relation between participation and better project performance.

TABLE IV: Critical Project Success Factors (Sanvido et al, 1992)

No.	Critical Project Success Factors
1	Cohesive Facility Tea
2	Flexible Contracts
3	Experience
4	Information Input From All Stakeholders

A subjective study on the determination of the project variables in thirty five (35) projects was explored by Bingham, Kay & Murray [1997]. In their words, "the variables help to provide a means of valuating the overall management of the project and it's positioning in the wider management research system". They have the following factors for the project management:

1. Compliance with Work Plan

- Adherence to plan
- Ongoing review
- Quality assurance

2. Visibility and Dissemination

- Dissemination channels
- Web presence
- Partner involvement

3. Viable Exploitation Plans

- Partners' plan
- Partners roles and motivation
- Proactive management

The above project variables were viewed to be important for ensuring the projects objectives are met and can be reviewed continuously with the review of project performance through an appropriate mechanism.

Dey [2000] draws to the challenging job of completing projects faster than the normal duration, because of the demands of paradigm shifts. In his words, "Opportunities of globalization, competition from private sectors and jniultinationals force the management of public sector organizations to take various aggressive strategies to maintain their profitability....." He went on to say, "To remain competitive, to get faster return on investment, and to give longer project life; such projects need to be completed in faster duration as compared to normal schedules." For this purpose, he proposes the management of projects concurrently/simultaneously instead of in a series. However, he suggests some of the project variables such as: restructured project organization, improved management commitment, strengthened project planning activities, ensured project quality, and risk management for the purpose. Fricke and Shenhar [2000] findings provide insight into how the most important project success factors affect the management of projects. In their words, "knowing the factors

of success is but the first step toward improving project management ownership, staff experience, and communication as an important factors. However, its dimensions of affect are more in multi-project environment. However, some other factors such as division and assignment of resources, prioritization, and customized management style have little relevance in relation to single projects as compared to multi-project management where it plays major roles. Their conclusion is that single projects needs separate and different project variables as compared to multi-projects. Project performance determinants with respect to project implementation have been the subject of debate by Yetton et al [2000], They conducted a survey of IS projects in the UK and New Zealand to test the hypothesis concerning project performance in terms of project completion and budget (time-cost) variances during the implementation phase. In their secondary analysis, they built an empirical model of project performance. Their findings highlighted the importance of project team dynamics, risk management; senior management support for strategic projects and user participation during the implementation process, in ensuring successful IS project performance. There are a lot of components involved in the development process in complex products with many groups of people with different backgrounds. Therefore to explore factors that can help the integration of the different groups and the tasks leading to project success, Nellore & Balachandra [2001] conducted five in-depth studies. They focused on internal as well as on the external management of integrated development projects. Their study identified many key areas such as brand or vision deployment, understanding of customer needs or specification, supplier involvement in the implementation process, project management that can contribute to the success of integrated development projects. Organizations need some operational strategies to complete projects faster than normal duration, to achieve competitive advantage. For this purpose, the critical variables that constitute an operational strategy need to be synthesized in a manner to improve project effectiveness in achieving competitive advantage. Therefore Saeed, Linhart & Ticha [2001] proposed Project Operational Strategy (POS). They suggested project variables such as meeting critical needs of the project by realizing coordination among the schedules, optimization of costs, justification of overtime, and balancing cost and schedule by linking each other to achieve balanced time and operations. Furthermore, they also suggested reducing product-cycle time through parallel implementation of project activities. They further maintained that flexible budget, and people involved will help to control processes dynamically. These factors will in turn improve the project effectiveness in terms of quality, cost, team building and time saving, consequently overall productivity of project organization.

VI. PROJECT CONTROL VARIABLES

Control is the last element in the project cycle of planning -implementation - control process. Control generally means to check a system whether or not it is going according to

criteria. The exact definition of control is, "to check or verify, and hence to regulate" [Shorter Oxford English Dictionary]. It is also defined as, "making situations behave according to certain desired performance criteria" [Meredith, Samuel & Mantel, 1995]. In control process, information is collected about the system performance, compared with the desired (or planned) level, and action taken if actual and desired performance differ enough that the controller (manager) wishes to decrease the difference [Beer, 1996]. In essence, control is the act of reducing the difference between plan and reality.

Monitoring and supervision are important elements in controlling process. Therefore their impacts are equally reflected on the performance of projects. Coulter [1990] focuses on organization issues in his analysis which play crucial role in project outcome. He advocates the use of "no-nonsense management" with monthly reviews of project progress and its performance. The author does provide sample reports and suggests a green-yellow-red signaling system for management to, "take charge", though the author does not state what action should be taken. Control process represents a loop system of acceptance and rejection wherein any action is measured according to the laid down criteria. Tuijl {1997} in this regard developed a Productivity Measurement and Enhancement System as a method for the development of control loops for self-management: "accepted control loops". However, according to him, the practical application of the ProMES method will depend on the course of the development process. He went on to say that the people involved in the development process adhere to diverging patterns of values. The development process offers possibilities to test to what extent actual behaviors reflect these values in a consistent way. Depending on the results of these tests, one of three reactions to the method is more likely to occur: "acceptance", "compliance", or "rejection".

Laufer, Woodward & Howell [1999] consider the project team's decision-making process as critical to project planning. They identify insidious elements of uncertainty and demand, which so often affect project performance and success, although they not mention specifically these insidious elements. Gutierrez and Paul [2000] has studied control process effect upon the project outcomes. They opined that project control has important implications for project success. Their study addressed the problem of designing a contract mechanism to allocate the components subprojects of a large project to a pool of different contractors to mitigate and diversify the uncertainty and risks during project implementation. Their study analyzed the effect of activity variances on expected project duration, characterizing the cases when an increase in activity variances pushes up the expected project duration. In the case of a homogenous project consisting of serial subprojects, their study showed that desegregating the project and assigning the subprojects to the contractors on a piecemeal basis reduces variance of project duration while leaving the mean unchanged. On the other hand, in the case of a homogenous project consisting of parallel subprojects, aggregating the subprojects and assigning the aggregate

project to one of the contractors reduces mean project duration.

Kilby [2000] also gave a look to this aspect of management. Therefore he carried out a study of the impact of donor supervision on development project performance of the World Bank funded projects. He used the maximum likelihood estimation of a restricted ordered probit function. The results disclosed that early supervision has a positive impact on performance. Given the size of World Bank-funded projects, gains from increasing supervision showed a far outweigh the costs. The results also provided an evidence of an institutional bias toward lending at the expense of increased development impact. In his further investigation, Kilby [2001] pointed out of the importance of the agency problem in determining project importance. He compared the predictions of an adversarial model with those of a cooperative model. He found an importance of information in the adversarial model links World Bank supervision to project performance. The data analysis supported the relevance of the agency problem and the role of supervision as monitoring. He concluded that to reduce agency problems, modification in project selection and implementation should be done.

Loker [2000] has studied the impact of a major environment and development project in the El Cajon region of Central Honduras. His main concern in this study was to know what types of mismanagement in the implementation of a project cause the failure of projects. His study revealed that ignoring the key variables of projects in terms of social and environmental aspects led to failure of projects. He suggested the improved designing of projects' monitoring and evaluation of different project activities during different time intervals and involvement of the people and social scientists during project implementation process as key variables to improve project performance. Howell & Shea [2001] conducted study to predict the performance of 47 product innovation projects by using Delphi method.

The research also included the study of behavior of experts (termed as champions) involved in the study. Results revealed a positive relationship among internal locus of control and innovation as an opportunity; interest and environmental scanning; and environmental scanning with champion behavior. However, the findings also stress upon the champion's personal behavior and their interaction with inside and outside of organization for accurate prediction of project performance.

In project management, integration mechanism also plays a greater role. However, it is important to know what is the most potential variable needed for this integration? Furthermore, if there exists, any uncertainty and equivocally in this integration mechanism with what type of effects upon the project performance? To explore these and similar questions, Sicotte & Langley [2000] carried out an experiment with a sample of 121 R&D projects. Their study found that formal leadership, planning and process specification, and to a lesser extent information technology use are related to project performance, while the positive effects of horizontal structures a>e apparently balanced out

by their costs. The integration mechanisms studied, act on performance partly through their effect on horizontal structures, planning and process specification, and informal leadership to project uncertainty but not to project equivocally. The positive effects of horizontal communications on performance were found to be greatest under high project equivocally as would be predicted by information processing arguments. Moreover, with the exception of formal leadership, the use of integration mechanisms did not enhance performance in contexts of low uncertainty and low equivocally.

VII. CONCLUSION

In this paper, the results of the literature review were presented. The prime objective of the literature review was the search for traditional and non-traditional integrated factors that could include all the three main processes together, which can further be used as tools for predicting the performance of a project. Furthermore, the researched models were more fragmented and uncorrelated with each other thereby giving no such model where all these variables could be brought comprehensively less than one model reflecting the overall performance of a project. It is also important to say that such model will be helpful to predict the performance of any other project with respect to this model. The comprehensive nature of the planning, implementation, and control processes justifies further investigation and exploration. This exploration will provide better understanding of the entire system and generate the ingredients necessary to improve proper functioning of each phase. It will further help in a precise assessment of different variables that get the impact from the previous processes and contribute further into project outcomes.

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