Research Article

THE EFFECTIVENESS OF COST-ORIENTED PROJECT MANAGEMENT PROCESS IN BUSINESSES[1]

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ABSTRACT

In the process of globalization, important distances have been taken in subjects pertaining to project management in the scope of achieving and sustaining international development and economic growth. From the past to the present, projects which could be called outdated have been used and are still being used. Similar to all world countries, the disadvantages have been experienced due to this in our country, and it can be observed that the realized projects do not meet the criteria of "Time, Cost and Scope". Defects in relation to cost can cause great disadvantages for businesses. Not only companies but also workers and other stakeholders are also adversely affected by this situation. With the recent changes happening in Turkey, outdated project management methods have been replaced by PMI (Project Management Institute) Project Management Standards which have become the standard. In numerous fields many companies have started to have CMMI (Capability Maturity Model Integration) and the need for managing projects in this direction has emerged. In the study, Project Management Processes and issues to be realized in these processes have been examined in detail.

Keywords: Project management, project management institute (PMI), costing of projects, project management in businesses.

[1] The study has been conducted by the first author's master's thesis completed with the second author's counseling.

INTRODUCTION

A large variety of projects are being carried out in our country. Support for projects carries great importance for decreasing our foreign trade deficit and increasing the level of economic welfare. The transformation from being a consuming country to a producing country is of great importance. Keeping the country's economy buoyant and supporting production is also very important. In order to utilize the aforementioned supports properly, project constraints have to be followed during the execution of projects. By determining project constraints correctly, both our companies and our country's economy is going to reach the desired levels. In the case of wrong determination of project constraints or failure to follow the constraints, both the project and its stakeholders and the companies carrying out the project and indirectly the economy of the country would be negatively affected.

Through the experience gained in years with projects in various sectors, it has been observed that when companies and stakeholders do not implement project management processes in projects or when they implement them wrongly, they experience many disadvantages. The primary disadvantages experienced in projects are expressed below:

- Failure to determine the scope of the project or constantly making changes in the scope of the project.
- Vagueness of activities, wrong estimation of activity durations, and wrong determination of activity costs because Work Breakdown Structure is not determined or is determined incompletely.
- Perception of Quality or Quality Management in the project or within the company as an expense.
- Because of not properly determining human resources, wrong and late recruitment of human resources,
- Not planning supply method or wrong planning and obtaining supplies very late,
- Not being able to determine risks in the project or company, not monitoring risks until project closure,
- Not being able to control momentary project constraints and many other reasons not written on this list are known to cause the project stakeholders to be negatively affected and the project to fail.

CONCEPTUAL FRAMEWORK AND DEFINITIONS

Project and its Characteristics

Projects are temporary enterprises which are carried out in order to reach a unique product, service or outcome. Since they are temporary, projects have exact starting and finishing dates. That the project is temporary does not exactly state the time limit of the project but also its participation and life span. Many projects could have social, economic and environmental effects which are older than the project itself as well as being undertaken in order to bring about a permanent outcome (PMBOK, 2013: 3).

Every planned activity in life can be called a project. Since the beginning of life until today numerous projects have been developed. From the Egyptian Pyramids dating back to the ancient times in history to the planned

activities that students do in order to pass the university entrance exam today all planned activities could be called projects.

In order for us to call planned activities projects, they should carry certain characteristics. These are:

Time: It is the most valuable and limited concept in life for us. For an activity to become a Project, it has to have a starting and a finishing date.

Cost: Every planned activity that we realize has a cost for us and the issue of cost carries great importance in Projects and this cost is limited.

Goal: Our every planned activity must have a goal. The need for a project emerges from various reasons. Projects incorporate the activities to be done to reach these goals.

Outcome: Our planned activities must have an outcome. For a project an outcome is a product or service. When the outcome is obtained, the project is terminated and ends. Each project brings out a specific outcome. Since projects have a start and end, they start when it is decided what is to be done and they end when the product is obtained. Projects are never constant, they reach a specific outcome and mature progressively.

Project Process Groups

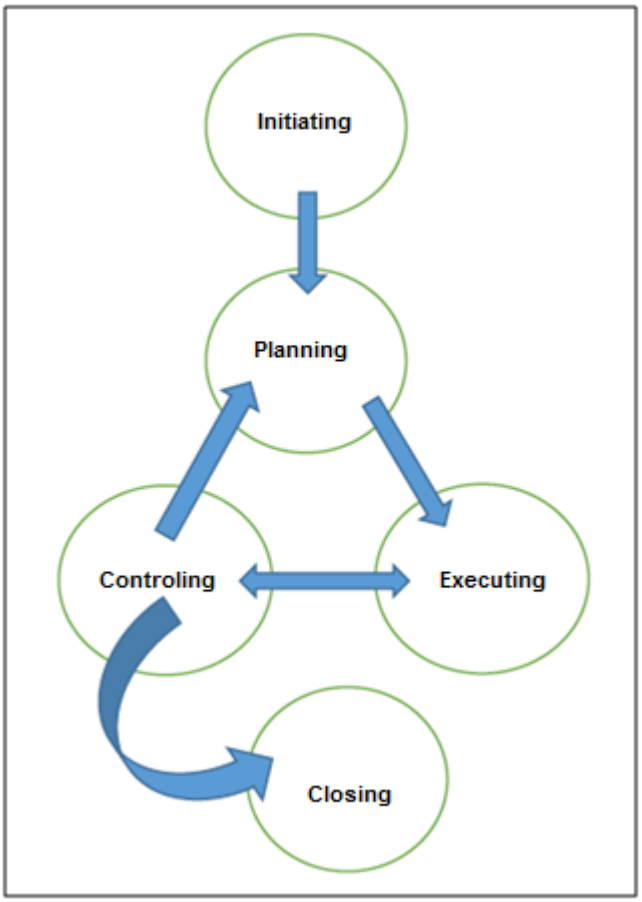

Figure 1: Project Management Processes

Source: PEM, 2014:17.

To the extent that people working in the project understand thoroughly what activities are to be done in the project and pay attention to what is to be done in the processes, they work happily and eagerly in a successful project (Benson, 2015).

Initiation

The initiation process reflects the first of the process group. The initiation is assigned by the project manager, project sponsor in the process group. Project manager prepares the project initiation document in this process. The prepared project initiation document is approved by the project sponsor and the project reaches its formal status. The project manager organizes the project initiation meeting by also setting up the project management team.

Planning

Planning is the second of process groups through which Project Scope is defined. After the definition of Project Scope, Work Breakdown Structure is created. After the Work Breakdown Structure is determined it is required to define and order activities. When the ordering of activities is completed resource and time estimations are made for each activity. After the relationships between activities are determined Project Schedule and Basic Budget Line is produced.

Execution

In these process groups; actions and activities defined in the project planning are realized and activities are managed. A large portion of the project time and budget is spent in these process groups.

Control

In the Monitoring and Control process group, corrective actions and prospective outcomes are deduced in relation to the outcomes and plans of the previous actions completed in the project.

While Monitoring and Control affects future outcomes, it cannot correct defects which may have occurred in the past. The principal benefit of this process group; is the detection of deviations which have happened in the project management plan and the measurement and analysis of emerging issues in the project performance within certain intervals, at suitable (Crowe, 2005: 38).

Closing

In the Closing Process Group, processes which are previously defined and validated are completed. There are certain tasks to be done in the Closing process group relating knowledge areas (PMBOK, 2013: 61).

In the Closing process group, the product owner is expected to accept the product. The Project Team and

Project Manager prepare the program document which will guide the company for the future. The project group which prepares the project closing report terminates its duty with the project closing report and the closing of the project is made official.

Project Constraints

The project is under the influence of time, scope, cost, quality and risk constraints. There is a special relationship between the project constraints. As shown in Figure 2 below, a probable lack of competence emerging in one of the constraints would affect other constraints in the work done (Greene and Stellman, 2013: 54).

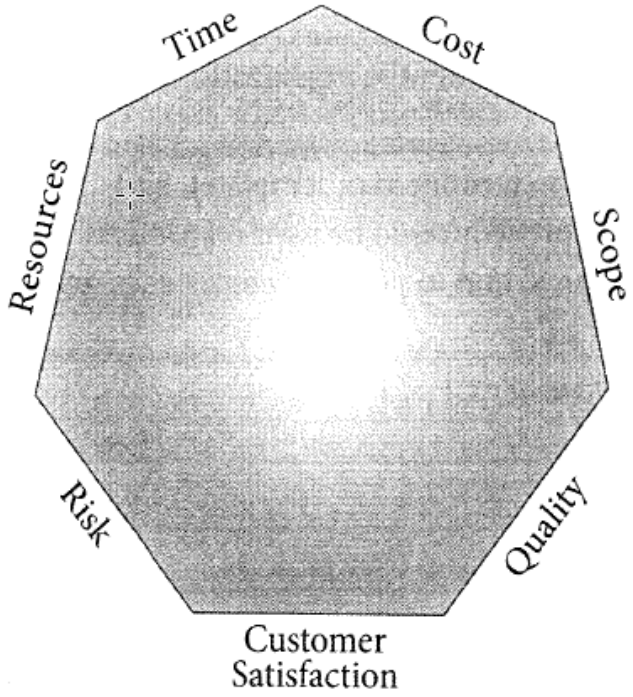

Figure 2: Project Constraints

Source: Rita, 2013:28.

We could explain the Project Constraints briefly as follows;

Time: The project should be completed according to the schedule.

Cost: The project should always stay within the limits of the budget.

Scope: The work scope for the project should be managed.

Resources: People and materials are needed in order to complete the project.

Quality: If the product or service does not provide the expected efficiency the project is not a successful one.

Risk: Project risks should be managed and unexpected situations should be evaluated within the project.

Examination of Knowledge Areas in Cost-Based Primary Project Management in Businesses

Project Management processes encompass process groups and knowledge areas defined by the Project Management Institute (PMI). The study is going to deal with what the knowledge areas are, why they are used as well as cost-based examinations.

Integrated Project Management

Integrated project management is a project management process which coordinates all aspects of a project. When the integrated project management is realized properly all the processes in the project work without problems (Bowen, 2009).

Project Integration Management is composed of six management processes:

Development of Project Initiation Document

When the project is initiated, the first task to be done for the project to become official is the preparation of the project initiation document. Project Charter is an official document which gives authority to the project manager.

Development of Project Management Plan

The development of Project Management Plan is in the planning process group and it is characterized as the most important document for the project. While it acts as a guide for all situations that can arise during the project, it includes all knowledge areas. The purpose for developing the Project Management Plan is that is possesses information related to solutions for occurring problems in the project. Project Management Plan gives detailed information to the project team regarding which methods to use to carry out tasks and operations to be done and when to do them.

Orientation and Management of Project Tasks

The orientation and management of project tasks is in the execution process group. It is the section where tasks in order to deliver a product are done and where the planning done in the knowledge areas comes together. It helps the project group to carry out day to day tasks. The orientation and managing process of project tasks is a process through which actual work is done for the production of deliveries.

Monitoring and Control of Project Tasks

As its name suggests, the monitoring and control process in within the Monitoring and Control Process group. In the monitoring and control process of project tasks, each ongoing activity within the project is monitored and controlled. The sooner problems are detected in the project the more properly does the project proceed;

adversely, the later they are detected the more difficult and costly it becomes to resolve them.

Realization of Integrated Change Control

The realization of integrated change control is in the Monitoring and Control Process group. It is the process where it is realized how problems detected during the monitoring and control of project tasks are to be solved, whether they are to be solved or not and it is the process where problems have to be solved. In this process, it is decided whether changes are to be done or not.

Closure of the Project or Phase

The closure of the project or phase is within the Closure Process Group. The last tasks done on the project are carried out in the closure process. A "Lessons Learnt Template" has to be prepared for the project to become a reference for future projects. With this document prepared by Project Manager and the project team, what is to be done and not to be done in future projects is highlighted.

Scope Management

In the Scope Management Process, the definition and planning of how the project is to be monitored and controlled and how the changes are to be managed is made. In the Scope Management Plan document, it is explained how the project scope is defined and how it is going to be controlled. The key benefit of this process is that it guides and directs the scope throughout the project (Elison, 2011).

The Goal of the Scope Management

The goal of the Scope Management is to determine project requirements and solutions for project requirements and present them in written form. In this way, The Project Manager and project team is prevented from doing unnecessary tasks and deviate from the scope.

Product and Project Scope

Product Scope is the details of the product. Product scope includes what the product is going to look like, how it is going to work and product characteristics (Usmani, 2012). On the other hand, Project Scope includes all information about the project. It states product requirements and tasks required to manufacture the product. It also defines the scope. While the Project Scope relates what is going to be done (functional requirements), Project Scope relates how it is going to be done.

The Creation of the Work Breakdown Structure

Work Breakdown Structure allocates tasks to be carried out by the project team according to work packages or the tasks that the project team is going to do. All work packages of the project should be shown in the Work

Breakdown Structure. A task which is not included in the Work Breakdown Structure is not included in the project scope.

Benefits of Work Breakdown Structure

Work Breakdown Structure includes all work packages related to the project. The responsibilities of the project team are determined and Resource Planning, Time Planning and Cost Planning are done by looking at the Work Breakdown Structure.

Control of the Scope

In the Scope Control knowledge area, it must be ascertained that the project includes only the tasks to be carried out in order for the project to be completed successfully. In order for the Scope Management to be effective, it must be known what the project scope includes and what it does not include (Warner, 2010). The process of Scope Control controls the tasks carried out by the project team. Scope Management process deals with the scope of the project but not the scope of the product.

Approval of the Scope

Work packages are defined in the Work Breakdown Structure and in the product scope statement it is controlled whether the requirements are met or not. (Nielsen, 2010).

Time Management

The determination of under which method or conditions are the project tasks are to be carried out, under which cases the resources are to be utilized and the estimation of total project time are done within the Time Management process. The determination of project activities, their ordering and timing and the creation of Project Schedule are also addressed in the scope of this process.

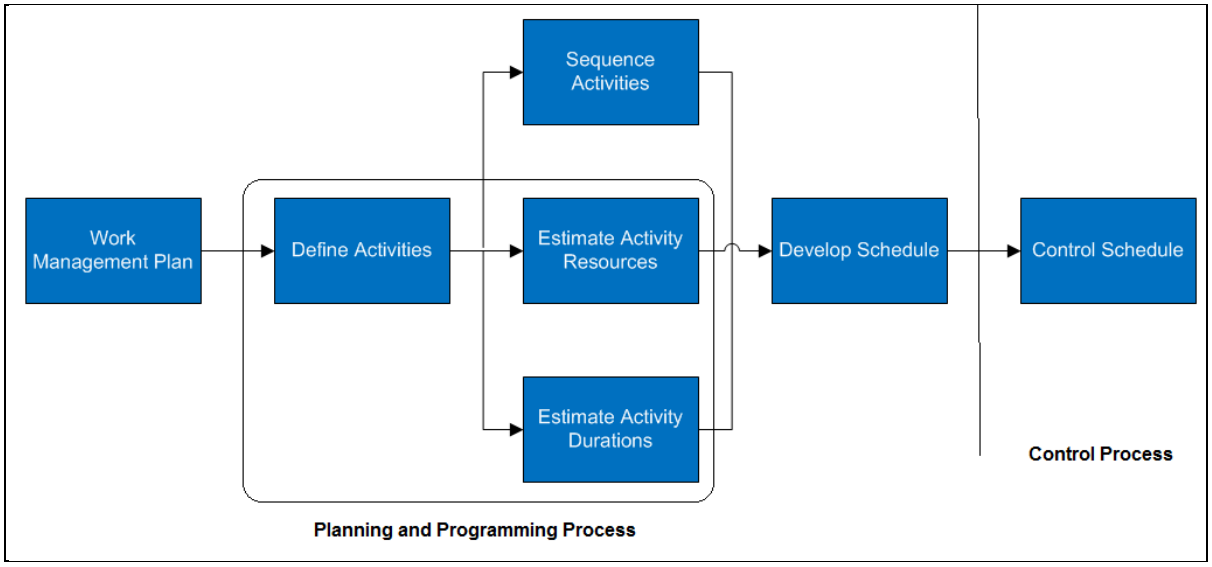

Figure 3: Time Management Process

Source: Rita, 2013:74.

Planning of Schedule

Schedule Management Plan includes how work packages are to be predicted, progress schedule and the way of reporting these tasks which are carried out. It is envisaged that the accuracy of the first schedule to be done is +/- %10. When time progresses in the project process with updates of schedule, the accuracy level of the pre-determined issues increases. In order to decrease risk of unexpected situations, %10 or %15 should be added to the prediction in the initial schedule prepared by the project team (Greene and Stellman, 2014: 191).

Definition of Activities

Activities which are at the secondary level of work packages defined in the Work Breakdown Structure are defined. In this process, activities to be done in order to produce the project outputs are defined and documented. Activities are defined by using the documents created in the project tasks and scope processes (Harrin, 2017).

Ordering of Activities

After activities are determined, it is required to organize them according to a certain order and systematic. If the need arises secondary activities under activities could be created (Warner, 2010).

Relationship Types between Activities

There are various relationship types between activities. These relationship types are defines as follows (PMBOK, 2013: 157):

- Finish to Start (Finish to Start = FS): In order for an activity to start, another activity must have finished.

- Start to Finish (Start to Finish = SF): In order for an activity to finish, another one has to start.

- Start to Start (Start to Start = SS): In order for an activity to start another one has to start too.

- Finish to Finish (Finish to Finish = FF): In order for an activity to finish, another one has to finish too.

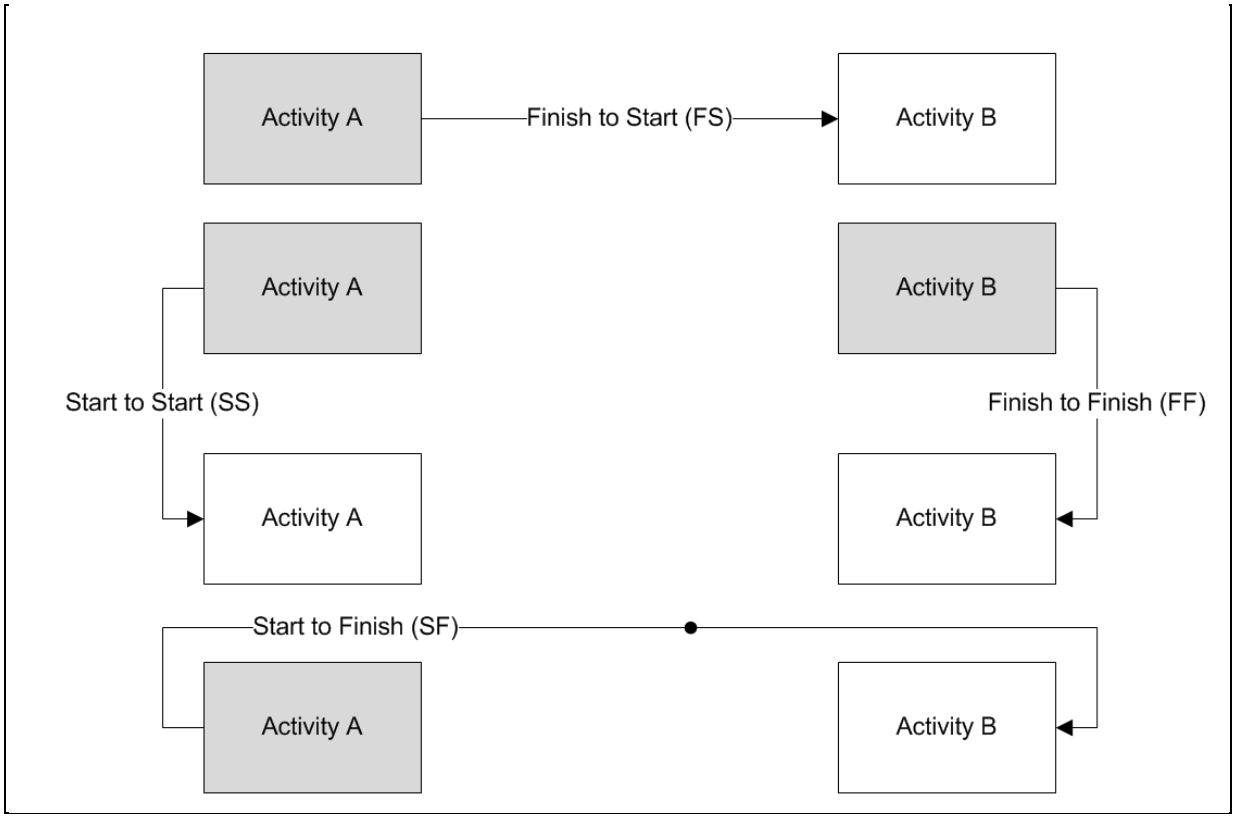

Figure 4: Prioritized Diagram Method Relationship Types

Source: PMBOK, 2013:157.

Critical Path Method

The activity network diagram shows which activity or series of activities are critical. In this way, while it can be decided at which level and when extra effort is to be spent, that this situation can be pre-determined allows opportunities for timely intervention into the project (Bonacorsi, 2010).

Time Reduction Techniques

There are two types of time reduction techniques. The first of these is resource loading and the other is parallel execution. These techniques are applied according to critical path time. The project time is equal to the critical path time. If a reduction of this time is desired, this time should be examined (Bingöl, 2015).

Resource Loading: It is increasing resources which do a piece of work. Resources should be loaded upon activities on the critical path. It must not be overlooked that loading resources would increase cost. For this reason, loading resources should be started from the activity with the lowest cost on the critical path. In this way, while loading resources increase of cost can be kept at the minimum level.

Parallel Execution: It is the execution of two subsequent activities at the same time. During parallel execution cost does not increase as in resource loading, risk increases. The risk is transformed into cost or another parameter in the long run. The effect of increasing risk on the project should definitely be examined and submitted to the approval of the sponsor.

Estimation of Activity Resources

After the activities are ordered, in order to carry out the ordered activities successfully, the estimation of resources should be done. In the estimation of resources, human resource, equipment resource and required material resource and the amount of need should also be indicated (Harrin, 2017).

Activity Resource Estimation Tools

Expert Opinion: It is an estimation method based on taking opinions of experts who have worked on similar projects (Holohan, 2010).

Alternative Analyses: It is the selection of methods which have different requirements in order to carry out the activities.

Inductive Reasoning: It is the estimation method in which the activity is evaluated in detail and calculated as such. The activity is divided into very small pieces and requirements for each piece is added up.

Project Management Programs: Activity needs are determined according to the depth of the program used. It is usually beneficial for resource planning and organization.

Prediction of Activity Times

By using resource estimations of each activity, it is predicted how much time it will take. It should not be forgotten to include accessibility of resources at the activity dates and holidays in the estimation (Pelletier, 2016).

Activity Time Prediction Tools

Expert Opinion: Activity prediction is done by talking to an expert on the activity (Holohan, 2010).

Analogy Prediction: It is an estimation method done according to realized activity times in similar projects by considering variables such as time, budget, size, complexity. It is a tool generally used at the initial step of the

project when detailed information about the project is not yet available.

Parametric Prediction: It is a prediction method done by using parameters with a high correlation with each other which have been developed based on previous experiences. There must be more than one parameter and should be associated with each other in the framework of a model. Parametric prediction method yields the most accurate prediction data.

Three Point Analysis (PERT: Program Evaluation Review Technique): It is a practical method to use when the work to be done in the work package is not clear and different predictions exist at the same time. The most probable prediction is the optimistic prediction which shows the best scenario and the pessimistic prediction which shows the worst scenario. The emerging prediction on the other hand is the average of these (Holohan, 2010).

- Most Probable Time: Most probable activity time (s)
- Optimistic Time: Most optimistic activity time (o)
- Pessimistic Time: Most pessimistic activity time (p)
- Expected Activity Time (e)

$$e = (o + 4s + p) / 6$$

Quality Management

The Quality Management of the project, defines the processes, activities, quality policies and responsibilities in an organization. With the defined Project Quality Management it is determined whether or not the requirements of the project are met.

What is Quality?

Quality is the sum of qualities of the product which have the ability to meet desired or implied customer requests (Kotler, 1996:56).

- In order to understand quality more than tests are needed.

- If the function of the product is understood properly, it would be easy to determine which test it passed and which one it failed

- The most important concept in order to define quality is compatibility with requirements. The product should be as good as the requirements determined in the project. To indicate that a product has high quality means that it meets the requirements determined by the project team when they started work.

- Quality is the measurement of to what extent the product meets the requirements.

How is Quality Planned?

Quality planning must definitely be made for all projects. When planning quality, quality criteria should be used. It must be planned which activities in the Work Breakdown Structure and which quality criteria are going to be used and at the end of activities one must be sure of the benefits of the used quality criteria. If the quality plan is made properly and quality activities that are going to be used are determined, activity requirements and project cost would also be planned. By determining the product requirements with the quality plan, it can be seen what needs to be tested and to what extent the requirements are met.

Cost-Benefit Analysis

Cost-Benefit Analysis is also known as rate of Return Analysis. It compares how much budget is going to be allotted to quality activities and how much profit can be made from them. Benefit is the high productivity of a manufactured product with fewer defects and the project team providing customer satisfaction by spending less effort (Psacharopoulos, 1985: 583).

Benchmarking

The concept known as “Benchmarking” or “comparisons between businesses” is a one of the new methods used today. Benchmarking is put forward as examining other institutions with superior performance, comparing the working procedures of these businesses and applying the results obtained from this comparison in order to raise a company’s own performance (Camp, 1989: 10).

Experiment Design

Scientific experiments are used in order to minimize the defects that could occur in project deliveries. During the planning of experiments, it is required to create a control list. In an experiment design none of the steps created in the control list are independent from each other. In some cases, it may be needed to return to the previous step on the list and if necessary it is revised and application continues again (Voss, 1999: 7).

Risk Management

Risk planning is done in order to define probable problems that may occur in the project. The probability of risk occurrence is analyzed, action is taken in order to prevent risks that could be avoided and risks that could not be avoided are minimized. In the project, even a simple activity could bring about unexpected problems. A situation that can change the outcome of the project activity could always occur. For these reasons, risk planning should always be done in the project (Greene and Stellman, 2014: 552).

Controlling Risk

There are three strategies which deal with the threats and risks that could have adverse effects on the project

goals. These are: Avoidance, reduction and turnover. On the other hand, the adoption strategy creates awareness (PMI, 2015: 343).

1) Avoid: Risk avoidance is the best thing to be done and best way to follow. If its occurrence is prevented, it would not cause any harm to the project.

2) Mitigate: If the **Risk** cannot be avoided reduction work is done. Reduction means taking action in order to cause the minimum harm to the project.

3) Transfer: Another effective way of handling **Risk** is making a payment to another company to accept the risk on behalf of the company. Most widespread way of doing this is insuring the risk.

4) Accept: If the **Risk** cannot be prevented, reduced or turned over, it should be adopted as it is. When the risk is adopted, at least alternatives will have been discussed and it will be known which results could occur when the risk emerges.

Risk Management Plan

Risk Management Plan gives information about who detects and resolves the risks, through which criteria these risks are determined and risk frequency, ways of analyzing the risks, who is responsible of these risks and with which intervals re-planning has to be done (Götsch, 2015).

Risk Records

Management tools are used to monitor risk management processes. Through the use of risk records, examination and updates, risks are defined up to acceptable levels, are evaluated and managed (Chandana, 2017).

Risk list is created according to the following processes:

Definition of Risks: While all risks emerging during the planning of risk management are not negative, there are also positive risks. Positive risks are opportunities.

Doing Qualitative Risk Analysis: When the list of risks is created, the probability and effect of each risk is determined.

Doing Quantitative Risk Analysis: Better decisions can be made with more sensitive information. In this process, numerical values are assigned for the probability and effect of each risk.

Planning of Risk Responses: It is decided which of the avoidance, reduction, turnover or adoption options are going to be used and how this option is going to be implemented.

Each project has to have risk records. By these means risks are easily monitored. Businesses should have risk record document templates and for each project risk records should be filled out according to this template.

Human Resources Management

Human Resources Management is the effective and productive use of the human resources working in the company. Human resource management includes recruitment of people, retention of the sustainability of the people, determination of pay and bonuses and performance management.

The main objectives of the Human Resources Management:

It is developing abilities, creativity, skills and existing capabilities and ensuring their most effective use (Edward and Lawler, 2010:10).

Planning of Human Resources Management

There are a number of tools used in human resources management.

Using these tools, human resources management is planned. Tools required for this planning are listed as shown below:

Organization Diagrams and Position Definitions: The structure of the project team is described.
Building Relationship Network: It is establishing formal and informal communications with the workers in the company and other workers in the sector in order to keep up with the current information.
Organizational Theory: It is taking proven principles as a reference.
Expert Opinion: It is used in order to determine resource requirements and position definitions.
Meetings: They ensure that the project team comes together and reaches consensus on the project needs (Hayton, 2016: 47).

RACI Matrix in Project Management

RACI Matrix is also called responsibility allocation matrix. RACI Matrix is made up of the initials of the variables used (Anderson, 2005: 376).
(R - Responsible): Does the job **–** It includes the individuals who are responsible for doing the job.
(A - Accountable): Main Accountable **–** For each job, one person can be accountable.
(C - Consulted): It defines people who are consulted and whose opinion is taken about the project.
(I - Informed): It includes people whose knowledge about progress is updated

Communication Management

Communication Management ensures that everybody gets the correct message at the correct time. It ensures that reports about the situation of the project are shared with the stakeholders. Communication Management process (Greene and Stallman, 2014: 515).

Communication management Tools

Communication Management Tools are explained under the following titles.

Communication Requirements Analysis: It ensures finding out what kind of communication the stakeholders need to make correct decisions.

Communication Models: It shows through which method people involved in the project use the knowledge.

Communication Technologies: It plays a principal role in keeping people in the project cycle. It is easier for people to reach information concerning the project through a website rather than through internal correspondence. In order to inform project stakeholders about the situation of the project and emerging problems, existing technologies in the company should be used actively.

Communication Methods: It shows how information is shared with the stakeholders. Knowledge is transmitted to project stakeholders through e-mail, internal correspondence, fax or other one-way communication tools. Large amounts of knowledge is transmitted to people through websites, intranet, e-learning courses or libraries.

Meetings: Meetings are useful for the project team to think about communication (Carroll, 2010:69).

Supply Management

Supply means receiving products, services, outcomes or making purchases outside the project team in order to complete the project. On the other hand, Project management is the execution of a series of operations such as products or services.

Planning Supply Management

It is determined what kind of contracts is suitable for the project and all sections of the project which have to be included in the contracts. Each contract in the project has to be planned and how these contracts should be managed should be determined. Planning means estimating which criteria have to be followed, how the seller is to be selected and how it should be managed in order for the work to be regarded as successful (Reame, 2010).

- Cost predictions and Schedule play an important role in deciding which method to use for supplies.
- Resource Requirements and Requirement Documentation give information about the suitability of work to be done and the contract.
- The expertise level concerning work or tender offer market of operation should also be considered.

Make or Buy Analysis: It is the evaluation of whether the work should be done by another company or by the project company itself. This situation also means creating a project company solution or buying an existing solution. In order to make a decision, the following questions are examined (Kidd, 2005).

- If doing the work or buying it are compared, how to costs change?
- How does the decision to be taken affect the scope of the project?

- How is the project schedule affected?
- Could time be allocated for doing the work and also meeting the commitments?

It is necessary to consider the reasons when planning what is to be bought and what is not to be bought.

Stakeholder Management

In Stakeholder Management, individuals or institutions who take part in the project or share stakes should be clearly defined. For this reason, project team members, subcontractors, suppliers and customers always carry great importance. Stakeholder Management is an important part of the strategic management of institutions (Cleland, 1986).

Cost Management

Cost management is planning of resources in order to ensure completion of the project within the approved budget, prediction of costs, creating a budget based on costs and monitoring this budget throughout the project.

Planning Cost Management

In the Project Cost management Plan the following information in the project management plan is used:

Basic Scope Line: Basic Scope Line includes Project Scope Statement and the details of the Work Breakdown Structure for cost prediction and management.

Basic Time Line: Basic time line determines the payment dates of project expenses.

Environmental Business Factors: Environmental business factors affect cost management plan.

Organizational Process Assets: Process assets such as historical knowledge, financial control procedure and financial database affect cost management (Sanghera, 2010: 353).

Prediction of Costs

The process of cost prediction means finding out how much each activity is going to cost. Prediction is made based on time, equipment cost and other factors to be determined. The cost of the activity is estimated after job allocation is done and it is determined how much time it takes in order to make a precise prediction (PMI, 2013:203).

Exemplary Prediction: In exemplary cost prediction, scale values such as the scope, cost, budget, time, size or complexity obtained from a similar completed project are used.

Parametric Prediction: In order to calculate cost prediction for the project work, the relationship between related historical data or other components are used. With this technique higher accuracy can be obtained based on the basic data applied in the model and versatility.

Bottom-Up Prediction: Bottom-up prediction is a time-consuming and costly technique in cost prediction but it is the most accurate one. In this technique, the cost of each activity is determined with most detail at the

bottom level and later added in order to calculate project cost.

Three Point Prediction (PERT): PERT technique is used in order to reduce prejudices and uncertainties in the prediction of probabilities. Instead of making one prediction, three predictions are made and their average is taken in order to reduce uncertainties, risks and prejudices.

- Most Probable Time: Most probable activity time (M)
- Optimistic Time: Most optimistic activity time (O)
- Pessimistic Time : Most pessimistic activity time (P)
- Expected Activity Time : (E)

$$E = (O + 4M + P) / 6$$

Back-up Analysis: Cost predictions include unexpected situation back-ups in order to take into account cost uncertainties. Unexpected situation back-ups can include a specific activity, the whole project or both of them.

Basic Cost Line: Basic cost line is an approved version of time-based project budget which can only be changes with formal change procedures and which does not include any management back-up that could be used as the basis of existing results (Kamin, 2015).

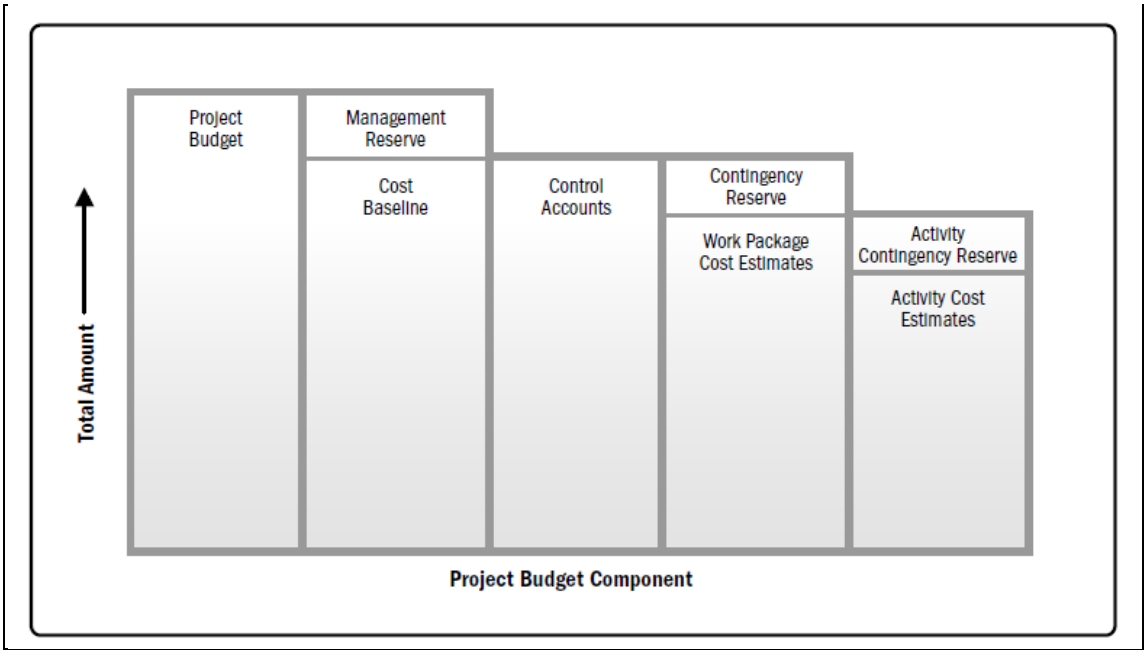

Figure 5: Components of Project Budget

Source: PMI, 2013:212.

Cost Control

Cost control ensures the monitoring and detection of project budget, inclusion of only suitable project changes in the basic budget line, transmission of information about changes to authorized people and responsible people by taking corrective precautions. The act of cost control is a process used to manage the budget. (https://www.pm4dev.com, 2017).

Cost Estimates

When a company takes on a project, it has to allocate costs related to resources. In order to reach its goals, the company has to use the expenses out of an accurate budget prepared based on predictions regarding financial planning and outcomes. Project budgets are based on the inventory of required materials for the work to be completed as well as real values, standard costs and unit costs based on costs which are obtained from previously completed exemplary projects (Markgraf, 2015).

Planned Budget (BAC – Budget at Completion)

Planned budget is the budget which has been planned for all activities included in the Work Breakdown Structure. BAC value gives the total budget which is going to be spent for the project. Planned budget prediction is made at the planning process. When the BAC value is prepared for the project, it gives the final cost of the project (Raadchfat, 2015: 273).

Planned Value (PV – Planned Value)

When the schedule is viewed at a specific time in the project and the planned completion percentage of the project is seen, this percentage means that the project has been achieved at this percentage of the budget. This value is called planned value. What is the predicted value of the work to be done as of today in the project? The PV value answers this question (Mulcahy, 2012: 267).

PV = BAC x % of Planned Completion

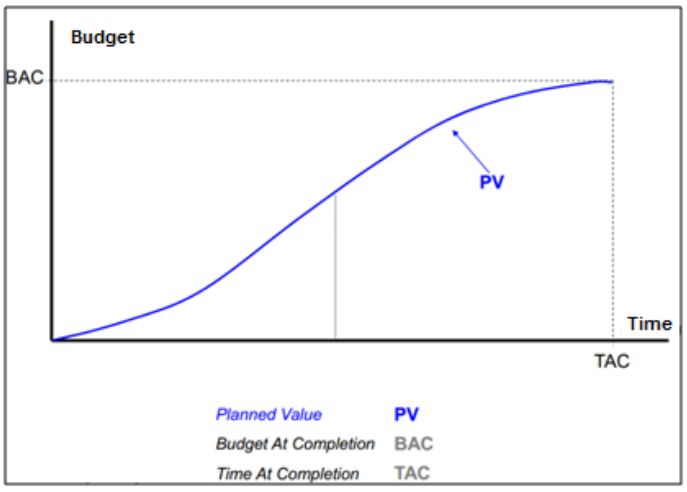

Figure 6: Planned Work (PV)

Source: PEM, 2015:131.

Earned Value (EV – Earned Value)

It is the value of the work completed as of today in the Work Breakdown Structure. EV value shows to what extent the value produced in the project until now has been transferred to the customer. Existing performance

is the best indicator of future performance. For this reason, by using tendency values, it is possible to predict cost or plan transition times at early stages. Most comprehensive trend analysis technique is earned value method. What is the predicted value of the work done in the project as of today? The EV value answers this question (Haughey, 2015).

EV = BAC x % of Realized Completion

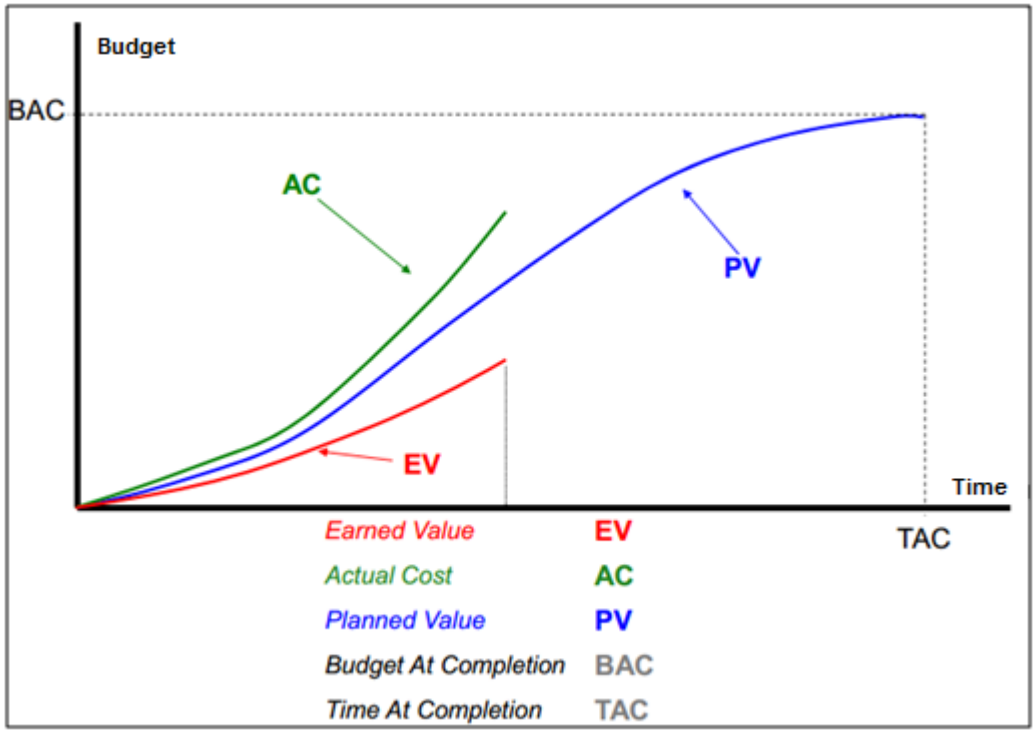

Figure 7: Earned Value (EV)

Source: PEM, 2015:133.

Schedule Performance Index (SPI)

It is used in order to detect where the activities done are located on the schedule. If it is ahead, it means more value than planned has been earned. In this case, the Earned value (EV) is larger than the Planned Value (PV) (Dave, 2009).

- If SPI is higher than 1, it shows that the Earned Value is larger than the Planned Value, that is the project is ahead of schedule.
- If SPU is lower than 1, the project is behind schedule. Because work done EV is smaller than PV.

SPI = EV / PV

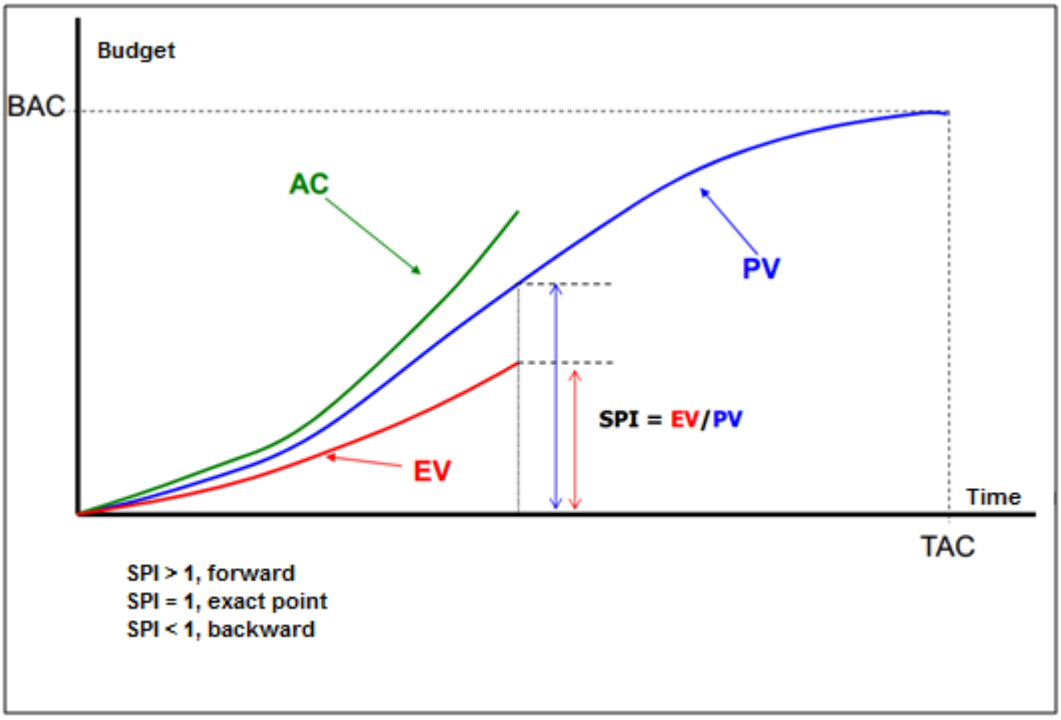

Figure 8: Schedule Performance Index (SPI)

Source: PEM, 2015:138.

Schedule Variance (SV)

Schedule Variance provides the measurement of probable delays in the schedule by using cost values. While SV value is an important parameter in terms of tracking the time, it also creates a value for project risk management. Schedule Variance is an important analytic tool. By using this tool, it can be understood whether the project is ahead of schedule. That is to say:

SV = EV – PV

The following inferences are drawn from the formula above:

- If the schedule change is positive, it means the project is ahead of schedule.
- If the Variance Diagram is negative, it means the project is behind schedule.
- If the Schedule Variance is zero, it means the project is on schedule (Usmani, 2012).

When the project is completed, the schedule variance is zero. This is because all planned value is earned at project closure.

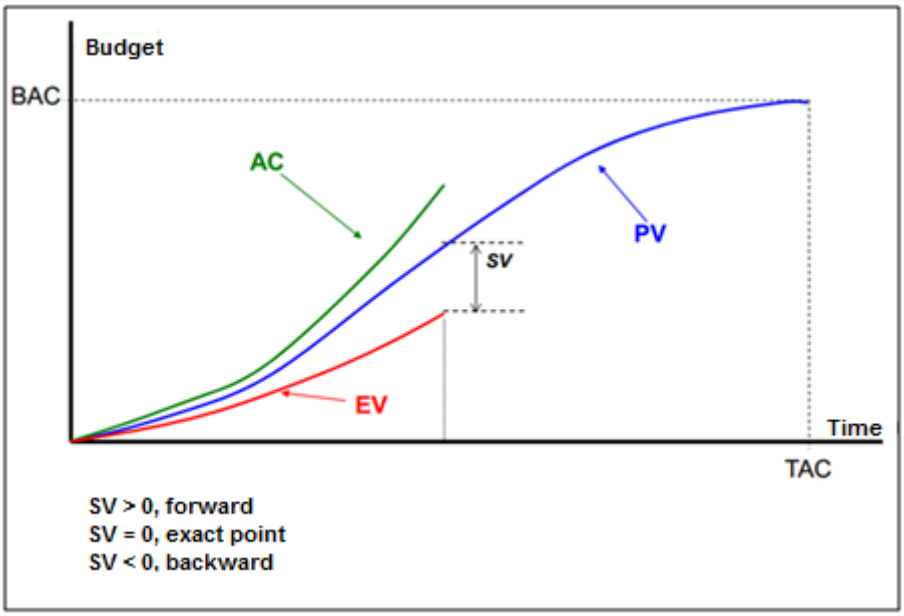

Figure 9: Schedule Variance (SV)

Source: PEM, 2015:135.

Actual Cost (AC)

Actual cost in project management is the total cost spent for the completed project work as of today. Actual Cost is composed of various types of project costs (http://study.com, 2018).

Direct Costs: Costs directly related to the project can be verified clearly and generally; fixed costs and variable costs are examples of direct costs.

Indirect Costs: Cost related to supporting the project are generally calculated like official services and cannot be measured easily.

Constant Costs: Costs in the project such as equipment rental that will stay the same.

Variable Costs: Costs which change throughout the project.

Sunk Costs: The cost occurs only in case of highly probable defects or scope changes. This cost should also be included in the total cost of the project.

AC = Direct Costs + Indirect Costs + Constant Costs + Variable Costs + Sunk Costs

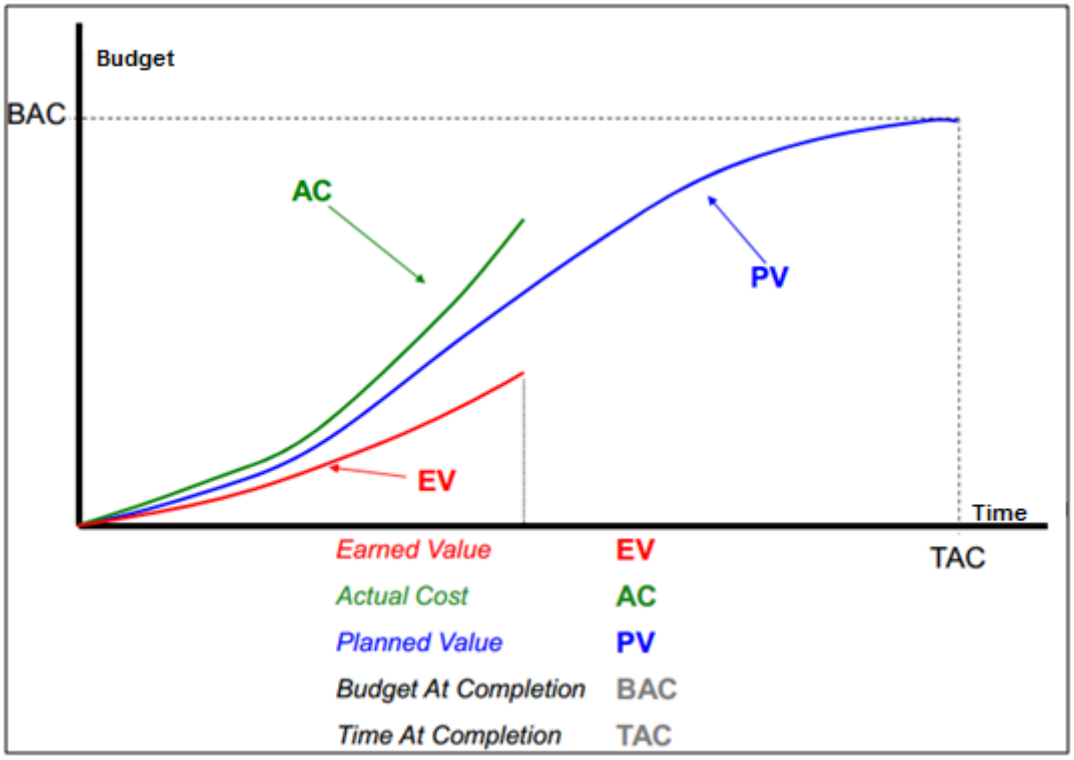

Figure 10: Actual Cost (AC)

Source: PEM, 2015:133.

Cost Performance Index (CPI)

Cost Performance Index helps the analysis of the cost activity that the project has used. When it is compared with the actual cost spent in the project, it calculates the value of the completed work. Cost Performance Index indicates how much is going to be earned for each cost spent in the project. Cost Performance Index is an indicator which shows how well the project stays within budget (Usmani, 2012).

Its formula is indicated as;

CPI = EV / AC.

The following inferences can be drawn from the above formula:

- CPI < 1, less is earned than spent amount. Above budget.
- CPI > 1, more is earned than spent amount. Under budget.
- CPI = 1, cost and earnings are equal. Although this situation happens rarely, the project is progressing within planned budget costs.

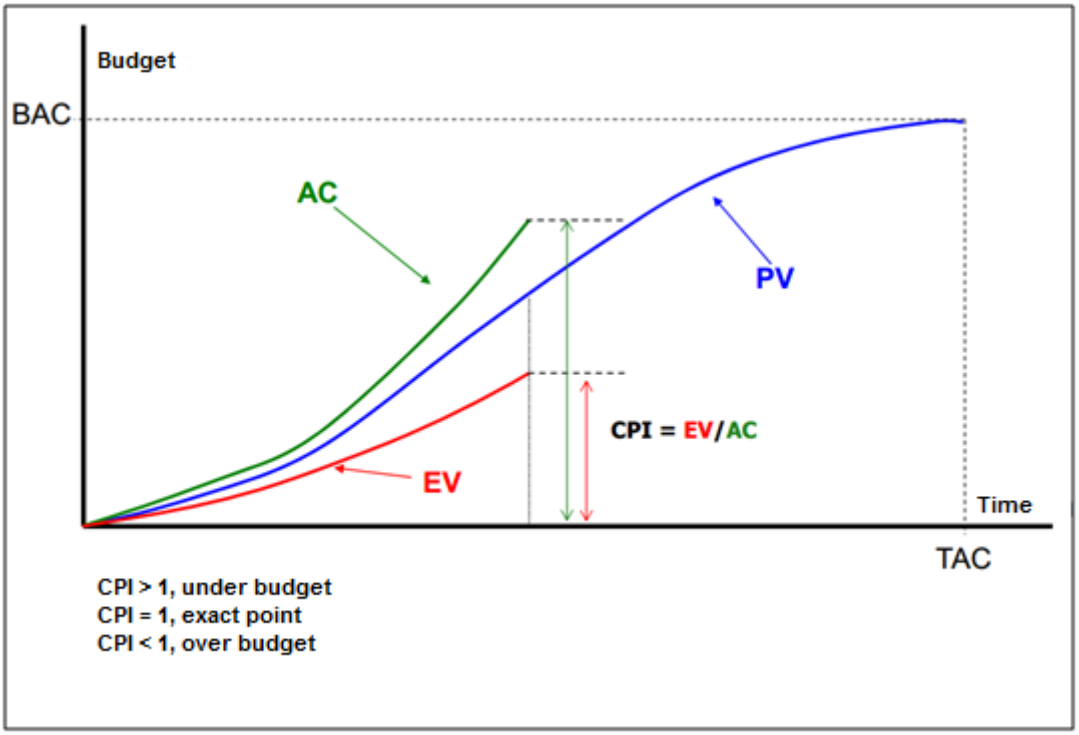

Figure 11: Cost Performance Indicator (CPI)

Source: PEM, 2015:139.

Cost Variance (CV)

Cost Variance implies the difference between the earned value and the actual cost that is the difference between the estimated budget cost of the completed work and the cost of the actual work done (Chriantan, 2015).

Its formula is as follows;

CV = EV – AC

- CV > 0, under budget.
- CV < 0, above budget.
- CV = 0, budget is exact.

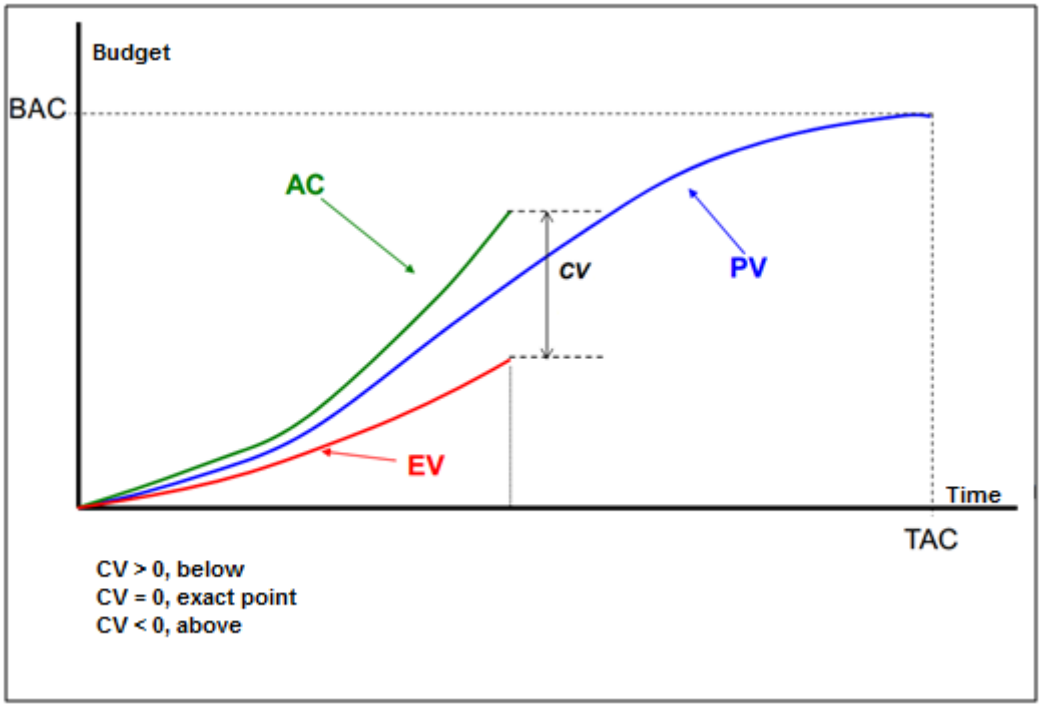

Figure 12: Cost Variance (CV)

Source: PEM, 2015:136.

To-Complete Performance Index (TCPI)

TCPI, shows how efficiently the project has to perform in order to stay within the budget. If the TCPI is desired to be completed with the allocated budget, it indicates the cost performance index required for the remaining work (Lipke, 2005).

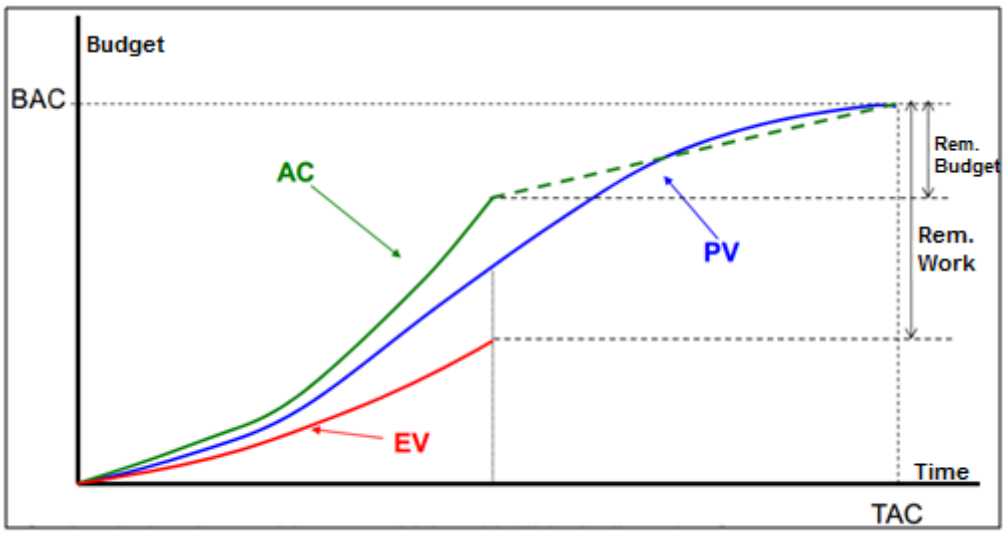

Figure 13: To-Complete Performance Index (TCPI)

Source: PEM, 2015:143.

-TCPI has two formulas. First one relates to the case when the project is completed within the original budget (BAC) and the other relates the case when it is completed within EAC calculated with Earned Value estimates.

- BAC Based:
  - **TCPI = (BAC – EV) / (BAC – AC)**
- EAC Based:
  - **TCPI = (BAC – EV) / (EAC –AC)**

- If the TCPI of a project is a high value, this shows that cost management has to be tighter. The higher the value, the more necessary it is to keep expenses under control and reduce costs.

- TCPI < 1, means the budget is within borders.

RESULTS AND DISCUSSION

In our study, the scope, characteristics and the place of projects in businesses has been generally defined and the project and its importance have been discussed by first giving examples from the literature. The project management processes of PMI whose leadership has been accepted worldwide and which has become a standard and authority have been examined with support from many international sources. The importance of each process in project management and what has to be done at each step has been examined in detail.

- If a project is managed without applying PMI processes;
  - Not knowing the limitations of the project means the project may fail before it starts or the project can never be measured and evaluated.
  - Since scope cannot be determined in the project, it is not known what is to be done in the project which causes the project to fall behind schedule and end in failure after requests made by the stakeholders are included in the project.
  - That a Work Breakdown Structure has not been prepared for the project and that the activities in the project cannot be shown to the smallest (atom) activity, prevents the creation of proper time and cost predictions for the activities.
  - It Time Management is not done in the project, it will not be clear when an activity in the project is to be done, what the priorities are between activities and the project will fail as a result of problems emerging between stakeholders.
  - If Cost Management is not done in the project, it will not be known how much an activity in the project is going to cost and the project will fail because of project budget.
  - If Quality Management is not done in the project, it will not be known whether the requirements of the project have been met as planned in the project and the project will fail.

When a project was managed by using PMI processes, the following results and evaluations were reached:

- Integrated Project Management is where project management processes are controlled and project management is planned. It acts as a guide for every situation that emerges during the project. By this means the duties of the project team and the way they will execute them is defined in detail. If Integrated Project Management is not done in the project, the duties of the project team and the way they will execute them will not be known. In case of a problem in the project, there will not be a guide to help the project team.

- That companies preparing for a tender offer determine project costs according to project management processes and prepare their budget and that the expenses are made according to the determined budget guarantees companies not to face losses. On the other hand, risk management and taking necessary precautions in costs ensures that the expected profit is gained. That this project cannot be executed or executed wrongly causes the project to face losses and to fail.

- The necessity of a charter for a project to take part in a company indicates that a project can only become official and come to life with a project charter.

- The responsibilities of the project manager appointed to the project and the qualifications that a project manager has to carry have been examined. However, in this respect, it was pointed out that the project can be successful by appointing the correct person for the correct project.

- It has been put forward in the study that project processes should not be separated from each other, that in integrated project management each process is connected in some way, that the output of one process is the input of another and that proper and healthy decisions can only be taken when processes are integrated with each other. Otherwise, a missing process or failure in one process can cause the project to fail.

- The issues of how scope statement should be planned, how requirements should be created and tracked were examined. Additionally, how scope should be controlled was discussed and it was pointed out that in case of scope change there should definitely be an approval process and although it is not approved it has to be documented. In both cases of approval or disapproval of scope changes, it has been pointed out that the reasons should be reported. In this way, since new requirements requested by the stakeholders have gone through an approval process, successful progression of the project will be provided.

- In the Time Management Process, issues such as references for predictions, how progress will be tracked and principles for reporting work done has been highlighted. With this process, prediction methods applied in the activities provides opportunities for project management to make accurate predictions and to report them. That activity predictions are done wrongly can cause failure of the project.

- It has been pointed out that for the initial Schedule, accuracy level should be +/- 10%, and that when operations progress in the project process the accuracy level increases with schedule updates. For this reason, it was suggested that unexpected situation risks should be reduced by adding 10% or 15% to the initial schedule.

- Issues such as how activities are defined and what the relationships between activities are have been highlighted and it has been suggested that by determining relationships between activities, the critical path can be developed.

- It has been discussed how the critical path which has an important place in project schedule is determined and what needs to be done in order to shorten the times.

- Quality management issue has been examined in detail and it was explained that product or services are improved with quality management which is not emphasized by companies very much and considered as an extra expense when on the other hand it has great importance. It has been stated that in a project where Quality Management is not done, it cannot be known whether requirements have been met or not and that the project will end in failure.

- Subjects such as reasons why risk planning should be done, how to handle risks in the project, which issues should be considered when doing risk planning, the importance of determining risks with priority and what techniques are used to reach solutions for risks have been emphasized.

- Detecting at which stages in the project risks are probable to happen, how risks are defined and by which criteria risk controls should be done were explained.

- In the communication management process, how important communication is for the project and the importance of delivering the right information to the right person at the right time was highlighted.

- Subjects such as the working principles of supply management process, the importance of make or buy analysis, types of contracts and their features and additionally how supply chain should be executed and controlled were explained.

- In the process of predicting costs, it is necessary to make a prediction of cost by including all resources in the scope of the project such as work force, materials, equipment, services, inflation share, financing cost and unexpected situation cost. Tools and techniques suggested to be used in these predictions were explained. Not following these processes, causes the project to fail because of the difference between the project budget and

the actual cost at project closure and the company to face losses.

- A commentary of how costs are calculated, planned budget and value, earned value, schedule, performance index, schedule variance, what actual cost means, cost performance index, cost index and the performance index required to complete the project was made.

İŞLETMELERDE MALİYET ODAKLI PROJE YÖNETİM SÜRECİNİN ETKİLİLİĞİ

TÜRKÇE GENİŞ ÖZET

GİRİŞ

Ülkemizde hemen her alanda çok çeşitli projeler yapılmaktadır. Dış ticaret açığımızı azaltmak ve ülkemizin refah düzeyinin yükseltilmesi için projelere destek verilmesi büyük önem arz etmektedir. Tüketici ülke durumundan, üretici ülke durumuna geçmek büyük önem taşımaktadır.

Ülke ekonomisini canlı tutmak ve üretime destek vermek çok önemlidir. Söz konusu desteklerin yerinde değerlendirilmesi için de projelerde proje kısıtlarına uyulmalıdır. Proje kısıtlarının doğru belirlenmesi ile hem firmalarımız hem de ülke ekonomimiz istenilen güçlü seviyelere ulaşabilecektir. Proje kısıtlarının yanlış belirlenmesi veya kısıtlara uyulmaması durumlarında projenin hem kendisi hem de paydaşları, projeyi gerçekleştiren firmalar ve dolaylı olarak da ülke ekonomisi olumsuz yönde etkilenecektir.

Kavramsal Çerçeve ve Tanımlar

Proje ve Özellikleri

Projeler, özgün bir ürün, hizmet ya da sonuca ulaşmak için yürütülen geçici bir girişimdir. Geçici nitelikte olmalarından dolayı projelerin kesin başlangıç ve bitiş tarihleri vardır. Projenin geçici olması, mutlaka projenin süresini değil ayrıca projenin katılımını ve ömrünü ifade eder. Çoğu proje kalıcı bir sonuç oluşturmak için üstlenilmiş olup ayrıca kendisinden daha eski olan sosyal, ekonomik ve çevresel etkilere de sahip olabilirler (PMBOK, 2013:3).

Yaşamda planlı her faaliyete proje denilebilir. Yaşamın başlangıcından günümüze kadar sayısız projeler geliştirilmiştir. Tarihin ilk çağlarında Mısır Piramitlerinden, günümüzde öğrencilerin üniversite sınavını kazanmak için yaptıkları planlı faaliyetler de proje olarak tanımlanabilir.

Planlı faaliyetleri, Proje olarak isimlendirebilmemiz için belirli özellikleri taşıması gerekmektedir. Bu özellikler:

Zaman: Bizim için yaşamda en değerli ve sınırlı olan bir kavramdır. Bir faaliyetin Proje olabilmesi için belirli bir başlangıç ve bitiş tarihinin olması gerekmektedir.

Maliyet: Gerçekleştirdiğimiz her planlı faaliyetin bize bir maliyeti vardır ve Projelerde maliyet konusu büyük önem taşımakta ve bu maliyet de sınırlıdır.

Hedef: Planlı her faaliyetimizin bir hedefi olmak zorundadır. Çeşitli nedenler ile proje ihtiyacı doğmaktadır. Bu hedeflere ulaşmak için de yapılacak olan faaliyetleri Projeler içermektedir.

Sonuç: Planlı faaliyetlerimizin bir sonucu olmalıdır. Proje için bir sonuç; bir ürün, bir hizmettir. Sonuç elde edildiğinde proje sonuçlanır ve biter. Her bir proje kendine has bir sonuç verir.

İşletmelerde Maliyet Odaklı Temel Proje Yönetimi Bilgi Alanlarının İncelenmesi

Proje Yönetim süreçlerinde, Project Management Institute (PMI)'ın tanımlandırdığı süreç grupları ve bilgi alanları bulunmaktadır. Bilgi alanlarının neler olduğu, neden kullanıldıkları ile birlikte maliyet odaklı incelemeler ele alınacaktır.

Bütünleşik Proje Yönetimi

Bütünleşik proje yönetimi, bir projenin tüm yönlerini koordine eden bir proje yönetim sürecidir. Bütünleşik proje yönetimi, düzgün bir şekilde gerçekleştiğinde, bir projedeki tüm süreçlerin sorunsuz çalışması sağlanır (Bowen, 2009).

Kapsam Yönetimi

Kapsam Yönetimi sürecinde, projenin nasıl izlenmesi ve nasıl kontrol edilmesi gerektiğinin, değişikliklerin nasıl yönetileceğinin tanımı ve planlaması yapılmaktadır.

Kapsam Yönetimi Planı dokümanında, proje kapsamının nasıl tanımlanacağı ve kontrol edileceği anlatılmaktadır. Bu sürecin anahtar faydası, proje süresi boyunca kapsamın yönetilmesine rehberlik etmesi ve yol göstermesidir (Elison, 2011).

Zaman Yönetimi

Projede işlerin hangi usul ve şartlarda yapılması gerektiğinin belirlenmesi, kaynaklardan ne surette istifade edileceği ve projenin toplam süresinin hesaplanması Zaman Yönetim süreci içerisinde yapılmaktadır. Proje aktivitelerinin belirlenmesi, sıralanması, sürelerinin belirlenmesi ve Proje Takviminin oluşturulması da bu süreç kapsamında ele alınmaktadır.

Kalite Yönetimi

Projenin Kalite Yönetimi, bir organizasyondaki süreçleri, aktiviteleri, kalite politikalarını ve sorumluluklarını tanımlandırır. Tanımlanmış olan Proje Kalite Yönetimi ile projenin ihtiyaçlarının karşılanıp karşılanamadığı belirlenir.

Risk Yönetimi

Projede meydana gelebilecek olası problemleri tanımlamak için risk planlaması yapılır. Risklerin ortaya çıkma ihtimalleri analiz edilir, kaçınılabilecek riskleri önlemek için harekete geçilir, kaçınılamaz riskler ise en aza indirilir. Projede, basit bir aktivite bile umulmadık problemler çıkartabilir. Her zaman projede ortaya çıkabilecek ve proje aktivitesinin sonucunu değiştirebilecek herhangi bir durum oluşabilir. Projede, bu nedenlerden dolayı risk planlaması yapılmalıdır (Greene ve Stellman, 2014:552).

İnsan Kaynakları Yönetimi

İnsan Kaynakları Yönetimi, firmada çalışan insan kaynaklarının etkin ve verimli bir şekilde kullanılmasıdır. İnsan Kaynakları Yönetimi, insanların işe alınması, insanların kalıcılığının sürdürülmesi, ödeme ve ikramiyelerin belirlenmesi ve performans yönetimini içerir. İnsan Kaynakları Yönetiminin temel hedefleri:

Beceri, yaratıcılık, yetenek ve mevcut yetenekleri geliştirme ile bunların en etkin şekilde kullanılmasını sağlamaktır (Edward ve Lawler, 2010:10).

İletişim Yönetimi

İletişim Yönetimi, herkesin doğru zamanda doğru mesajı almasını sağlamaktadır. Projenin durumu hakkında raporların proje paydaşları ile paylaşıldığına emin olunmasını sağlar. İletişim Yönetimi ile birlikte proje çalışanları doğru kararlar verebilirler. İletişim Kontrol süreci, projede üretilen verileri izlemek ve bu verilerin paydaşlara nasıl paylaştırıldığını kontrol etmek için kullanılır (Greene ve Stellman, 2014:515).

Tedarik Yönetimi

Tedarik, projeyi tamamlamak için proje ekibinin dışında, ürün, hizmet veya sonuç alma ya da satın alma anlamına gelir. Tedarik Yönetimi ise, projeyi tamamlamak için ürünler ve hizmetler gibi bir dizi işlemi yürütmektir.

Paydaş Yönetimi

Paydaş Yönetimi'nde, projeye katılan ya da çıkarları paylaşan bireyler ve kurumlar açık bir şekilde tanımlanmalıdır. Bu nedenle, proje ekibi üyeleri, taşeronlar, tedarikçiler ve müşteriler her zaman büyük önem taşırlar. Paydaş Yönetimi, kuruluşların stratejik yönetiminin önemli bir parçasıdır (Cleland, 1986).

Maliyet Yönetimi

Maliyet Yönetimi; Projenin onaylanan bütçesi içerisinde tamamlanmasının sağlanması için; kaynakların planlanması, maliyetlerin tahmini, maliyetlerden bütçe oluşturulması ve proje süresince bu bütçenin takip edilmesidir.

SONUÇ VE DEĞERLENDİRME

Çalışmamızda, genel olarak projenin, kapsamı, özellikleri ve işletmelerde projenin yeri başlıkları tanımlanmış olup, önce literatürden örnekler verilerek proje ve önemi makalede tartışılmıştır. Dünya genelinde liderliği kabul edilmiş ve günümüzde bir standart, otorite haline gelmiş olan PMI'ın proje yönetim süreçleri bir çok yurtdışı kaynak ile desteklenerek incelenmiştir. Proje yönetiminde, her bir sürecin ne kadar önemli olduğu ve her bir süreçte neler yapılması gerektiği detaylı bir şekilde ele alınarak incelenmiştir.

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