Course Title

Project Engineering

Chapter 4

PROJECT MONITORING AND CONTROLLING

Lecture 8 (Week 8)

Introduction to project monitoring and controlling, project control system, project control cycle and schedule control.

Lecturer: Associate Prof Ishwar Adhikari

Learning Objective

The main objective of this lecture is to understand about:

- Concept of monitoring and controlling
- Project control system.
- Project control cycle.
- Project schedule control.

Prepared By: Associate Prof. Ishwar Adhikari/Department of Civil Engineering/Kathmandu Engineering College (Affiliated to Tribhuvan University), Kathmandu, Nepal.

4.1 INTRODUCTION TO PROJECT MONITORING AND CONTROLLING

After completion of all the paper works until the engineering and design phase in a project life cycle, project enters into the implementation phase. During the implementation phase the paper works are translated into reality or physical form. The major role of the project manager is to observe the performance of the project is in accordance with the planned standard or not. The process of comparing the actual field performance with the planned data and taking some actions is called the project monitoring and controlling.

Monitoring and Evaluation are essential tools, which helps to improve the efficiency of on-going projects and the selection and design of future projects. Project management monitoring and controlling means actively reviewing the status of the project as it proceeds, evaluating potential obstacles, and implementing necessary changes. [1]It also helps the project team to make a rational and improved decision about the project performance. It is must for achieving the objective of the project.

Monitoring

Monitoring simply means to maintain a constant check on the progress of the project activities systematically. It involves gathering information on the progress of the project to review and analyse the project implementation. Monitoring means to make sure sufficient intelligence is gained on the status of the project so that an accurate and timely evaluation can be conducted. [2]It aims to ensure that project inputs, schedules, outputs and other actions are proceeding according to the plan.

Evaluation

Evaluation simply means to appraise or set value. It is the appraisal of how the project work is going on. Evaluation is an objective and systematic judgmental process for determining relevance, efficiency effectiveness and impact of project performance. [3] It is done to improve project implementation and to improve future project planning and decision making. Monitoring is usually an ongoing activity throughout the life of the project whereas evaluation is periodic.

The objectives of project evaluation are:

a) To verify whether the project implementation progress is as planned.

b) To take corrective measures for deviations in performance.

c) To ascertain that actual costs are within the budgets.

d) To ensure that quality standards are being attained.

e) To report project progress status to customer as needed.

f) To identify unexpected problem areas and manage them.

g) To bring about overall improvement in project performance to achieve project objectives.

Types of Evaluation

a) **On-going**: It is conducted during the implementation phase and its purpose is to correct deficiencies as they occur to improve project performance.

b) **Mid-term**: It is carried out mid-way during implementation and its purpose is to improve implementation.

c) **Terminal**: It is conducted after project completion and it provides lessons for future project planning.

d) **Ex post**: It is conducted some years after project completion to evaluate the impact of the project.

Controlling

Controlling is the management function of comparing the actual achievements with the planned ones at every stage and taking necessary action, if required, to ensure the attainment of the planned goals. Controlling ensures that right things are done in right manner at right time. [4]The main purpose of controlling is to regulate results by changing activities and to conserve the project's resources. [5]

Controlling includes three step processes – measuring, evaluating and correcting. [6]

Measuring: Determining through formal and informal reports the degree to which the progress towards objective is being made

Evaluating: Determining cause of and possible ways to act upon significant deviations from planned performances

Correcting: Taking control action to correct an unfavorable trends or to take advantage of an unusually favorable trend

Areas of control

While managing a project three important resource parameters - quality (performances), cost, and progress (time) - need control. So the areas of control are:

- Progress (time) control (according to schedule)
- Cost control, (according to allocated budget) and
- Quality (performance) control (according to specification)

Management must control these three resource parameters – progress (time) cost, and quality (performances),) – in an integrated manner, not in isolation.

4.2 PROJECT CONTROL SYSTEM

Project Control System is a process or mechanism for continuing regular monitoring and controlling of a project. It is a process to guarantee that the design requirements, budget and schedule are met by the project team. [7]If any project objective begins to slip, the project control system should identify the deviation early and allow a correction to be made. It serves two major functions

(a) Ensures regular monitoring of performances

(b) Motivates project personnel to strive for achieving project objectives

Project control system should be designed by considering question such as:

1. Who set the standards?
2. How realistic are the standards?
3. How clear are they?
4. What output activities, behaviour should be monitored?
5. Should we monitor people?
6. How rapidly should be reported?

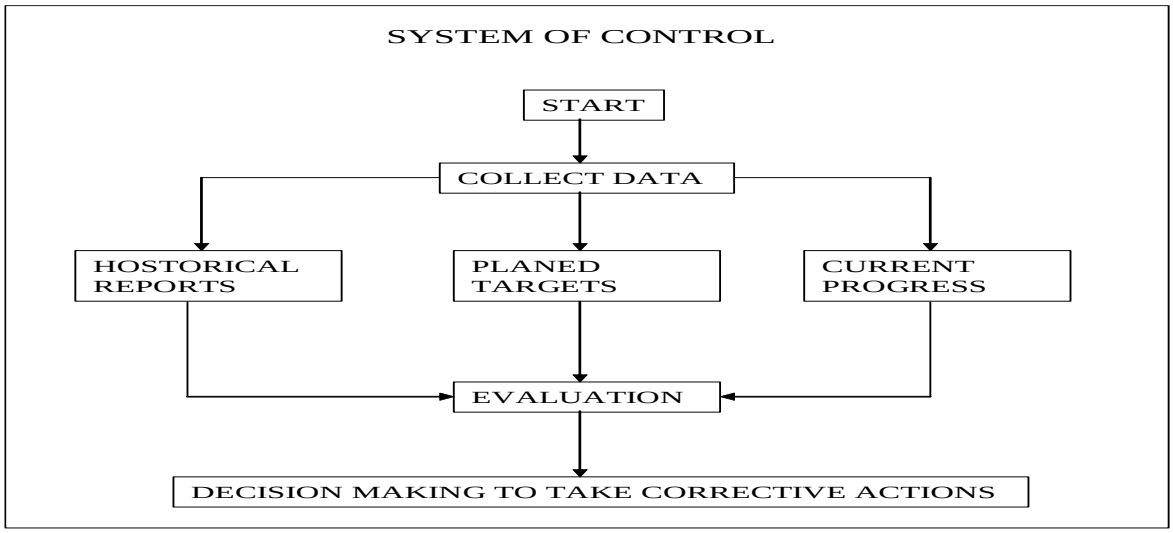

Figure: Project Control System (PCS) [5]

Followings are some of the important information a project control system should provide to the project manager:

- True picture of work progress.
- Relationship between cost and schedule performance.
- Potential problems.

- Practical level of summarization of the problems and action take.
- Validity of milestone in terms of time and audit requirements (auditability)

Prerequisites of Project Control System

1. Thorough planning of the work to be performed to complete the project.
2. Accurate estimation of time, labours and costs.
3. Clear communication of the scope of required tasks.
4. Timely accounting of physical progress and cost expenditures.
5. Periodic re-estimation of the time and cost to complete the remaining work.
6. Frequent periodic comparison of actual progress with the standard.

Difficulties in implementing project control system:

- Departmental and management gaps
- Uniqueness of the project and its organization
- Human factors: training, philosophies, culture, attitude, intensions, norms, values, resistance to change etc.
- Complex characteristics of project
- Difficulties in keeping track of performance and expenditure of complex project.
- Difficult coordination and communication because of several organizations involved.
- Uncertainty and change and poor control and information system

Necessity of control mechanism

S.N.	TIME	COST	PERFORMANCE
1.	Technical difficulties take longer than planned to solve.	Technical difficulties requires additional cost.	Unexpected technical problem arise.
2.	Initial time estimates were optimistic.	The scope of the work increases.	Sufficient resources are not available in time.
3.	Task sequencing was incorrect.	The initial bids or estimates were low.	Quality or reliability problem arise.
4.	Change in client specifications required additional work.	Reporting was untimely and poor.	Client requires changes in the specification.
5.	Changes in government policies.	Control was not exercised in time.	Pace of technological changes is too fast.

6.	The required input were not available when needed.	Price of inputs increased.	

Table source: [8]

4.3 PROJECT CONTROL CYCLE

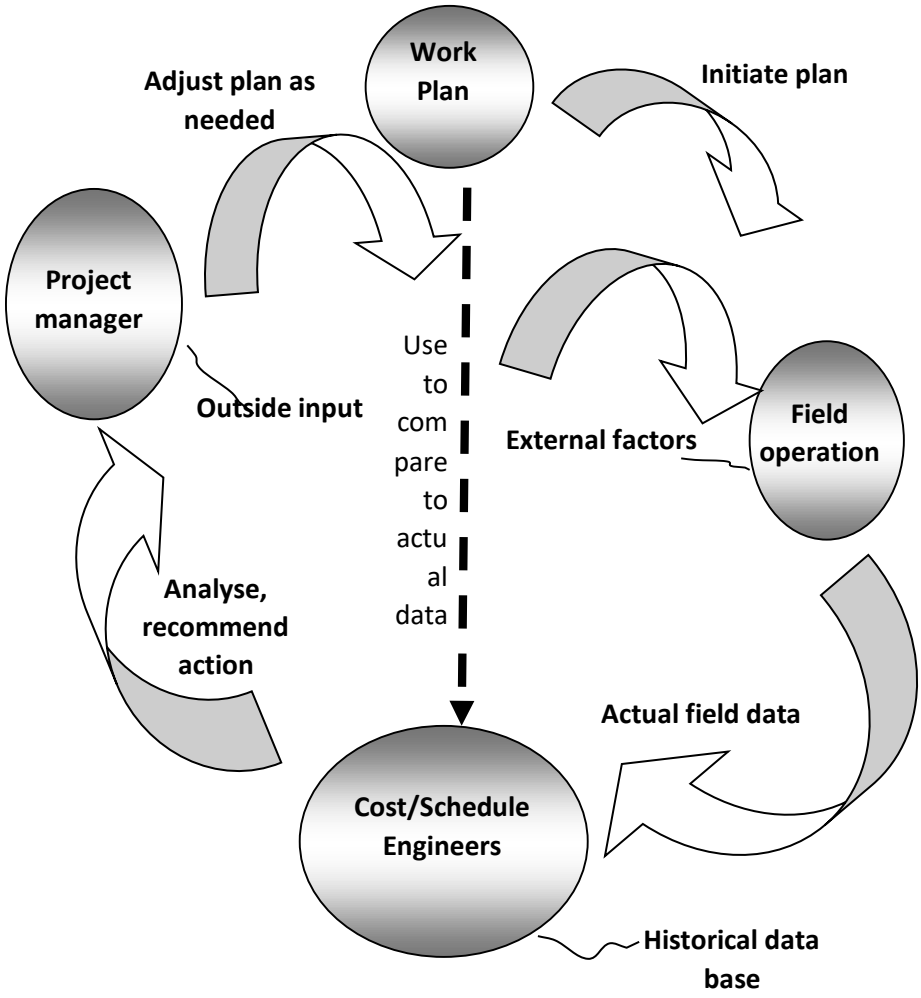

Figure Source: [7]

The project control cycle begins with the initial project plan.

Project plan includes a budget, schedule and other planning information such as staffing and administrative procedures. It identifies the resources such as equipment, people and materials that are needed at job site.

The project plan is used to initiate the **field operations**. The field supervisors are responsible for the productive utilization of resources.

External factors represents the factors such as labor strike, vandalism, bad weather or other events that are difficult to predict and affect the field operations.

The arrow between field operation and cost/schedule engineers block represents the processing of the actual information from the field.

The cost/schedule engineer block represents the coordination of data from the field and comparison with the initial plan.

Historical data base represents the permanent storage of information for use by the company in future job planning.

The arrow between the cost/schedule engineers and project manager block represents the distribution (spreading) of status reports to the project team**.**

Project manager block represents the final decision point in the control process. The goal of the project control system is to deliver to the decision makers accurate and timely project status information so that intelligent decisions can be made.

Outside input should come in the form of technical staff or consultant support.

The arrow from the project manager back to field operation represents the completion of project control cycle. Management has made a decision and final instructions are now being given to the field.

The project control cycle is a **feedback loop** providing all the participants with a measure as to the success of their past decision.

Considering the project control cycle as three step process of measuring, evaluating and correcting, the project control cycle may also be presented as follows:

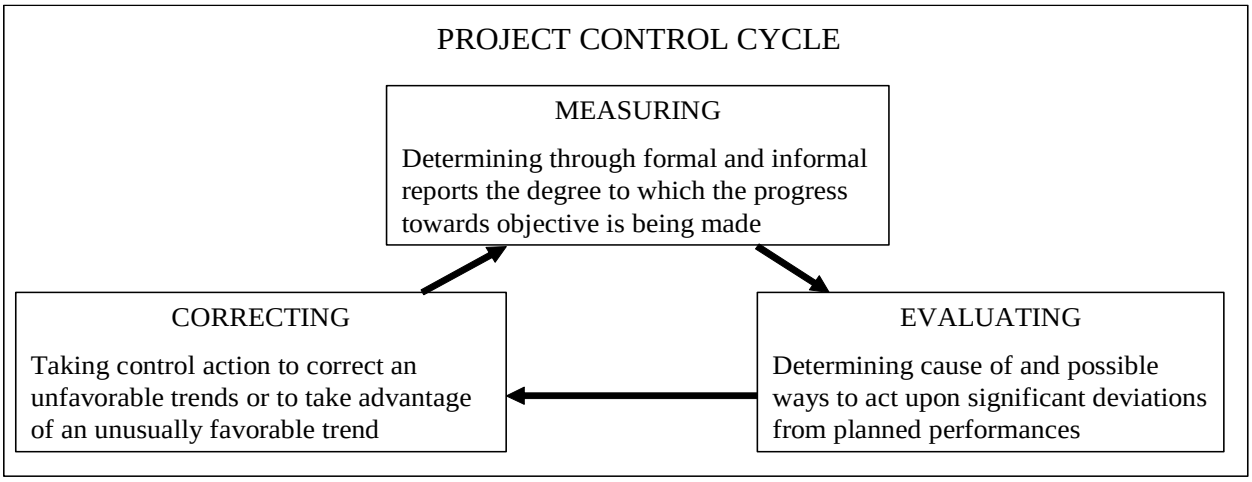

Figure: Project Control Cycle

FEEDBACK CONTROL SYSTEM

Feedback is the process of extracting information from the output level and then feeding it back to the input. Hence the results of the execution process are feedback. In feedback control system, direct variance is obtained by subtracting plan data from implementation data to be given a positive or negative variance. It can be used to show differences between actual progress and planned target, the resources use against estimated quantities or budget.

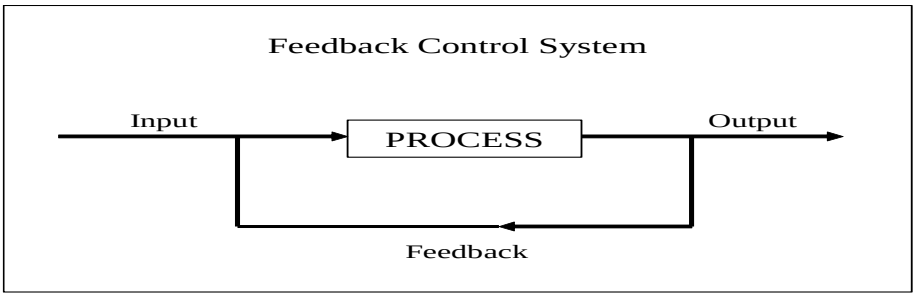

Figure: Feedback Control System

4.4 PROJECT SCHEDULE CONTROL

The process for monitoring schedule progress against the baseline is called control schedule. [9]Comparing the progress of the project against a scheduled baseline allows project managers to determine if a particular project activity is ahead or behind the schedule. [10]If all activities are progressing according to the schedule, there is no need for the updating the schedule / network but this is seldom the case. Therefore, based on the progress of the work and revised durations of unfinished activities due to delays, the schedule has to be redrawn. Hence the update of schedule has to be done to control the delays in schedule.

UPDATING

The process of re-planning and rescheduling based on the results which serve as a guidance for decision by performing calculations made by taking into consideration of new knowledge and latest information at an intermediate stage of the project thus modifying the original schedule / network, is known as the process of Updating

Data required for updating

The following information is necessary to update the plan at an intermediate stage of execution of a project:

- Original Schedule / Network
- Original Schedule / Network calculation chart
- Stage at which the updating is being done (Monitoring completed)
- Execution position of the project at that stage and
- New information and knowledge, that affects the duration time of the activities to be performed.

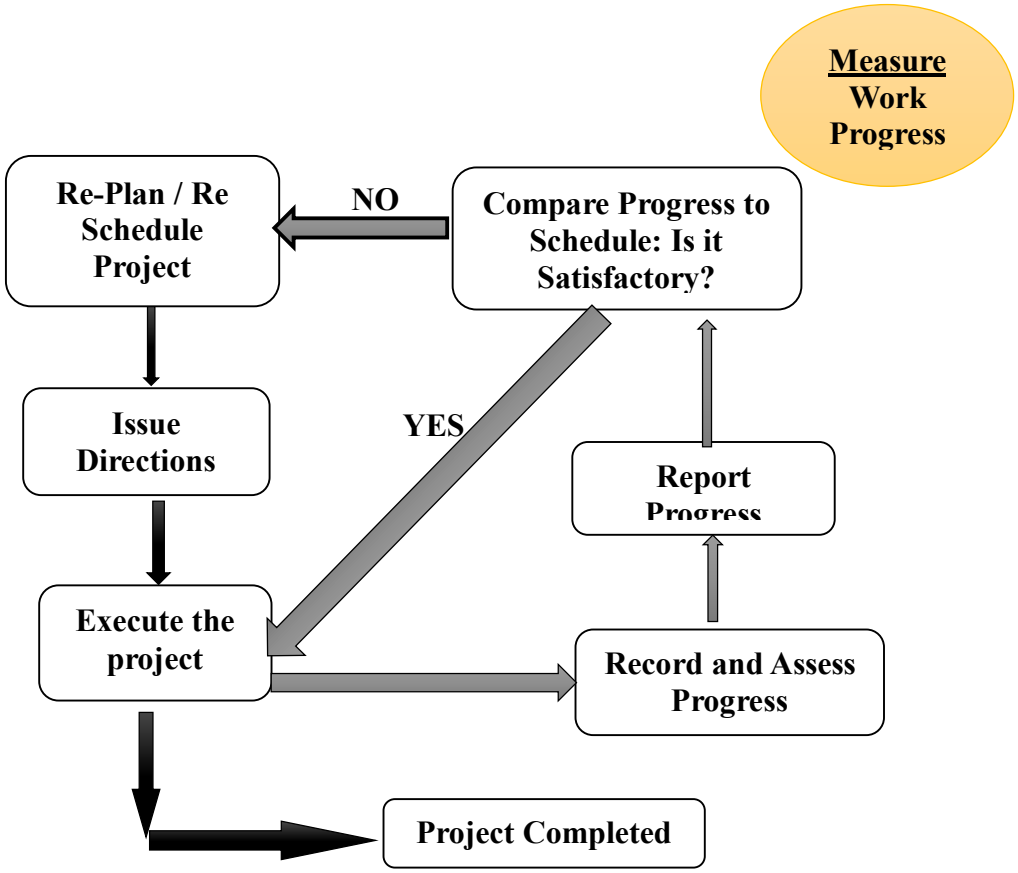

Figure: Updating Cycle

Scheduling Control: They control technical performance.

- The techniques are:
- Work Breakdown Structure (WBS)
- Bar chart

There are several steps a project manager needs to take to monitor and control the schedule: [11]

- Review the schedule and schedule baseline regularly.
- Identify variances and take corrective action if needed.
- Monitor the progress of the project and make necessary adjustments.
- Communicate with all stakeholders about the status of the project.
- Keep the project on track and ensure its successful completion.

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