UNIT 8 MANAGEMENT OF CBI DEVELOPMENT PROJECTS

Structure

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8.1 INTRODUCTION

Courseware development broadly requires three types of resources (i) Hardware resources (computer, printer and furniture etc.), (ii) software resources (various software tools assist the courseware developer in their work) and (iii) manpower resources (software professional, technical writer, teacher etc). Courseware development is one time effort and if something goes wrong at the time of development, amendment of the courseware is very costly affair. Sometime amendment is costlier than the development of new courseware. Secondly resources required for courseware development are costly and limited. Proper management and control of the courseware development process is very significant for the survival of the courseware. Under project control we evaluate the CBI development process and make sure that activities in the project are going as per the development schedule. It also makes sure that utilization of the resources is optimal.

In earlier time courseware developer did not realize the significance of the teacher's participation in CBI development process to standardize their product. Teacher participation is essential for good courseware designing. Only a teacher knows the effective ways for implementation of the courseware, what are the expected problems a CBI may face and their possible solutions. Now course developers have realized the significance of teacher's participation in software development. Recently all the major companies in this field have given proper weightage to teacher involvement in the process of courseware development and as a result they have come up with very popular software.

8.2 OBJECTIVES

After going through this unit, you will be able to understand.

- different type of project management strategies;
organizing project control entities;

- tools used in project control; and

- involvement of use in project control.

### 8.3 SIGNIFICANCE OF PROJECT CONTROL

Courseware is like a hen. Hen provides food resources for human beings, but in itself hen is consumer of resources. As the hen grows up consumption of resources also comes down. The owner of farmhouse is mainly interested in such hens that grow very fast and consume fewer resources, irrespective of the quality and taste of its meat and egg. A consumer is always interested in good quality of meat and egg. He/She is least concerned with the growth rate of hen. As consumer is the end user of the product the farmhouse owner has to give privilege to user’s need, but at the same time he keeps his interest in mind. The resources for adapting hens are limited and costly so it requires a lot of planning and control in maintaining of a farmhouse. Similarly, development of CBI is one time effort; once you develop a courseware it is used for several years by the students. The resources in terms of hardware, software and human beings used in development process are limited and costly. The CBI development process requires a lot of planning and control for proper utilization of these resources at the development stage.

Project control is an important part of courseware development. It sets clear objective and provides adequate resources for the project. It also supports design methodologies and motivates the development team that they are going in the right direction.

Remember that courseware design is a process of implementation of computer-based education. Its goal is to create a new system that meet a set of objectives. These objectives are the driving force behind the designing process. You are already aware of the common practice of making long-terms and short-terms planning for improving the system in courseware development. The long-term plans are defined over a long period that is for one year or more. The short-term plans are usually for one or two months duration. But all these planning are done to achieve the objective of the project and are oriented towards a single delivery date. So do not treat them as two separate entities.

In short-term planning we implement only a portion of a plan that lies within the time window between now and the next time. In short-term planning we evaluate whether the activities during that time period is going as per the long-term planning and objective of the designing process. Here, we will have another chance to replace the activities in the long range planning in order to bring it back on the right track. We should be careful not to plan frequently, allowing sufficient time to judge the impact of the decision we made and determine whether our decision was on the right track or not. In other words, we need the feedback, which is indispensable to our planning, the next time around.

It is very easy to control a project if it has the following features:

- Can be demonstrated on a pilot basis.
- Allow the organizations to go back to pre-project status if it does not work.
- Can be done in step or phase.
- Should be tangible and discrete.
- Consistent with a successful past experience.
- Fits the organization’s direction.
- Publicity value (visible potential if it works).

### 8.4 VARIOUS PROJECT CONTROL STRATEGIES

Project control process starts with the breakdown of the whole project into a number of well-defined management entities. These entities may be called phase, task, activities etc. Each management entity has a clear objective, resource allocation schedule and time schedule. It
is our duty to organize the phase in the most suitable manner and monitor them to ensure that the proposed goals are being achieved.

Project control must fit in the project life cycle strategy. So, first we will explain the different project life cycle style along with project control strategy used under different circumstances.

### 8.4.1 Linear Strategy

A linear strategy project has well-defined objectives, resource allocation plan and a clear beginning and end of each phase of the development process. Each sub-phase of the project meet the requirements of a project entity. The linear strategy supports the top down approach, which you are already aware. Each courseware development plan include a broad project plan. A broad project plan is defined very early in development process. This plan includes a broad initial resources allocation strategy along with its starting and finishing time. Detail allocation of the resources for a particular phase is done just before the starting of the phase, but it is broadly based on the original broad allocation plan. Resources use is monitored and recorded as the phase proceeds. There are a number of readymade software available in the market for recording all these activities. Actual utilization of resources is then compared with the planned resource utilization. If the variation between the actual and planned resource utilisation is significant then we have to replan the activities to bring back the project on the right track. We will explain different mathematical tools used for computing the various project activities after some time. Mathematically it is very easy to implement linear strategy for project planning. But in real life it is very difficult to get such a project where objectives, resources allocation and time schedule are very well defined even before the starting of the project. If linear strategy project work is very difficult to get, then we have to apply alternative strategy in order to achieve our target.

### 8.4.2 Evolutionary Strategy

Evolutionary strategy does not assume that we can sub-divide the problem into distinct and loosely coupled phase. Here the system is developed gradually. We develop a part of the system and learn more about the problems by operating of that part. The knowledge gained from the operation is used in defining the next part to be developed. This process continues until all the objectives of the project are not met. For effective strategies, it tends to emerge step by step from an interactive process where developer learns from a series of partial commitments rather than through global formulation of total strategies. We will explain the project control technique used during this strategy after explaining the next strategy.

### 8.4.3 Prototype Strategy

In prototype strategy we provide a model of the proposed system. It is limited to check the feasibility and expected problems that may arise in the implementation of the proposed model. Unlike the evolutionary approach here we discard the prototype model. The experience gained from the prototype model is used for designing a new system. This strategy is mainly used for such system where we do not have experience with similar system. If our project size is big then we should develop our prototype in multiple phases. It also consumes less time, and result ultimately in the development of reliable and practical system.

Project Control is very difficult to apply for evolutionary or prototype strategy because their objective, time schedule, resource allocation are not as well defined as in the linear strategy. In such situation, here, it is very difficult to design a global plan and allot the resources for different sub-system. It is advisable to sub-divide the required knowledge into smaller components. So that we commit funds in a gradual manner rather than in wholesale manner. All the resources are gathered in a common pool in such a manner that one can pull out resource at a short notice. Resources are therefore often allocated in piece meal fashion, for a fixed period and the results are closely monitored. If nothing emerges after that time then the project may be terminated if a structure manage to evolve, more resources many be added to the project.
8.5 ORGANIZING PROJECT MANAGEMENT ENTITIES

During project control it is necessary to estimate resources, need, allocate these resources and monitor project progress. A number of activities are closely monitored and analyzed for this purpose. These activities are as follows:

8.5.1 Estimating

Estimating involves evolution of amount and complexity of the work to be done in a phase. This information is used for finding out resources need. If we have worked on such project earlier then easily we can estimate the amount of work by using linear strategy. If we do not have any experience in such project and, activities in the project are uncertain then we can use evolutionary or prototype approach for getting the estimation of workload.

8.5.2 Organizing

For development of courseware we require a variety of resources. It includes hardware, software and manpower resources. The important issue here is to define the manpower skill and computer resources needed in different phase and find out the people who are trained for these skills. There must be an appropriate mixture of teacher and computer professional in each phase.

8.5.3 Monitoring

Monitoring keeps track of project progress. Monitoring uses the result of estimation of resource allocation and actual use of resources to check whether the objectives of the project are met or not.

8.6 PROJECT MANAGEMENT TOOLS

Before attempting to use these tools, the project’s information must be assembled in a certain way. The project planning process consists of the following:
Design, Issues and Strategies

1. Setting the project start date
2. Setting the project completion date
3. Selecting the project methodology or project life cycle to be used
4. Determining the scope of the project in terms of the phases of the selected project methodology or project life cycle
5. Identifying or selecting the project review methods to be used
6. Identifying any pre-determined interim milestone or other critical dates, which must be met
7. Listing tasks, by project phase, in the order in which they might be accomplished
8. Estimating the personnel necessary to accomplish each task
9. Estimating the personnel available to accomplish each task
10. Determining skill level necessary to perform each task
11. Determining task dependencies
   — Which tasks can be done in parallel
   — Which tasks require the completion of other tasks before they can start
12. Project control or review points
13. Performing project cost estimation and cost-benefit analysis.

Work Breakdown Structures

The development of a project plan is predicated on having a clear and detailed understanding of both the tasks involved, the estimated length of time each task will take, the dependencies between those tasks, and the sequence in which those tasks have to be performed. Additionally, resource availability must be determined in order to assign each task or group of tasks to the appropriate worker. One method used to develop the list of tasks is to create what is known as a work breakdown structure.

A work breakdown structure is a hierarchical breakdown of the major activities of a project into successive levels, in which each level is a finer breakdown of the preceding one. In final form a work breakdown structure is very similar in structure and layout to a structure of the unit in your course material. Each item at a specific level of a work breakdown structure is numbered consecutively (e.g., 10, 20, 30, 40, 50). Each item at the next level is numbered within the number of its parent item (e.g., 10.1, 10.2, 10.3, 10.4).

The work breakdown structure begins with a single overall task representing the totality of work to be performed on the project. This becomes the name of the project plan work breakdown structure. Using a methodology or system life cycle (analysis, design and implementation) steps as a guide, the project is divided into its major steps. The first phase is project initiation; the second major phase is analysis, followed by design, construction, testing, implementation, and post-implementation follow-up. Each of these phases must be broken in their next level of detail, and each of those, into still finer levels of detail, until a manageable task size is arrived at. The first work breakdown structure level for the life cycle would be:

<table>
<thead>
<tr>
<th>Work breakdown structure number</th>
<th>Task Description</th>
</tr>
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<tbody>
<tr>
<td>1.0</td>
<td>Project initiation</td>
</tr>
<tr>
<td>1.1</td>
<td>Draft project plan</td>
</tr>
<tr>
<td>2.0</td>
<td>Analysis phase</td>
</tr>
<tr>
<td>2.1</td>
<td>Plan user interviews</td>
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<tr>
<td>2.2</td>
<td>Schedule user interviews</td>
</tr>
<tr>
<td>3.0</td>
<td>Examination and test</td>
</tr>
<tr>
<td>4.0</td>
<td>Design</td>
</tr>
<tr>
<td>5.0</td>
<td>Test</td>
</tr>
<tr>
<td>6.0</td>
<td>Implementation</td>
</tr>
<tr>
<td>7.0</td>
<td>Post implementation review</td>
</tr>
</tbody>
</table>
Tasks at each successively finer level of detail are numbered to reflect the task from which they were derived. Thus, the first level of tasks would be numbered 1.0, 2.0, 3.0, and so forth. Each of their sub-tasks would have a two-part number: the first part reflecting the parent task and the second part, the sub-task numbers itself, such as 1.1, 1.2, or 1.3. As each of these, in turn, decomposed or broken down into its component tasks, each component receives a number comprised of its parent number plus a unique number of its own.

8.6.1 Gantt Charts

A Gantt chart is a matrix, which lists on the vertical axis all the tasks to be performed. Each row contains a single task identification, which usually consists of a number and name. The horizontal axis is headed by columns indicating estimated task duration, skill level needed to perform the task, and the name of the person assigned to the task, followed by one column for each period in the project's duration. Each period may be expressed in hours, days, weeks, months, and other time units. In some cases it may be necessary to label the period columns as period 1, period 2, and so on.

The graphics portion of the Gantt chart consists of a horizontal bar for each task connecting the period start and period ending columns. A set of markers is usually used to indicate estimated and actual start and end. Each bar on a separate line, and the name of each person assigned to the task is on a separate line. In many cases when this type of project plan is used, a blank row is left between tasks. When the project is under way, this row is used to indicate progress, indicated by a second bar, which starts in the period column when the task is actually started and continues until the task is actually completed. Comparison between estimated start and end and actual start and end should indicate project status on a task-by-task basis.

Variants of this method include a lower chart, which shows personnel allocations on a person-by-person basis. For this section the vertical axis contains the number of people assigned to the project, and the columns indicating task duration are left blank, as is the column indicating person assigned. The graphics consists of the same bar notation as in the upper chart indicates that the person is working on a task. The value of this lower chart is evident when it shows slack time for the project personnel, that is, times when they are not actually working on any project.

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>21</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>meet with client</td>
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<tr>
<td>develop Storyboard</td>
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<td>brainstorm ideas</td>
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<td>final proposal</td>
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<td>assign team jobs</td>
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<tr>
<td>develop templates</td>
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<tr>
<td>create time line</td>
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<tr>
<td>develop index page</td>
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<td>photograph animals</td>
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<tr>
<td>scan photos</td>
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</table>

![Fig. 8.1: Gantt Chart](image)

8.6.2 PERT Charts

Program evaluation and review technique (PERT) charts depict task, duration, and dependency information among the various activities performed during the project. It is a network of nodes connected with lines. Each node represents an event i.e. something that happens at a particular point of time. The lines connecting nodes representing task, which states its name or other identifier, its duration, the number of people assigned to it, and in some cases the
initials of the personnel assigned. The other end of the task line is terminated by another node, which identifies the start of another task. Each chart starts with an initiation node from which the first task, or tasks, originates. If multiple tasks begin at the same time, they are all started from the node or branch, or fork out from the starting point. The chart is complete when all final tasks come together at the completion node. When slack time exists between the end of one task and the start of another, the usual method is to draw a broken or dotted line between the end of the first task and the start of the next dependent task.

A PERT chart may have multiple parallel or interconnecting networks of tasks. If the scheduled project has milestones, check points, or review points (all of which are highly recommended in any project schedule), the PERT chart will note that all tasks up to that point terminate at the review node.

When drawing up the plan, be sure to include tasks for documentation writing, documentation editing, project report writing and editing, and report reproduction. These tasks are usually time-consuming; so don't underestimate how long it will take to complete them.

PERT charts are usually drawn on ruled paper with the horizontal axis indicating time period divisions in days, weeks, months, and so on. Although it is possible to draw a PERT chart for an entire project, the usual practice is to break the plans into smaller, more meaningful parts.

Many PERT charts terminate at the major review points, such as at the end of the analysis. Many organizations include funding reviews in the project's life cycle. Where this is the case, each chart terminates in the funding review node.

Funding reviews can affect a project in that they may either increase funding, in which case more people have to be available, or they may decrease funding, in which case fewer people may be available. Obviously more or less people will affect the length of time it takes to complete the project.

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**Fig. 8.2: PERT Chart**

- Numbered rectangles are nodes and represent events or milestones.
- Directional arrows represent dependent tasks that must be completed sequentially.
- Diverging arrow directions (e.g. 1–2 & 1–3) indicate possibly concurrent tasks.
- Dotted lines indicate dependent tasks that do not require resources.
8.6.3 CPM Charts

Critical Path Method (CPM) charts are similar to PERT charts and are sometimes known as PERT/CPM. Now both are referred as network planning. In a CPM chart, the critical path is indicated. A critical path consists that set of dependent tasks (each dependent on the preceding one), which together take the longest time to complete. Tasks, which fall on the critical path, should be noted in some way, so that they may be given special attention. One way is to draw critical path tasks with a double line instead of a single line. The characteristic of events on critical path is that if any of the time estimates are not met, the completion date of the project will be affected. Tasks, which fall on the critical path, should receive special attention by both the project manager and the personnel assigned to them.

8.7 TEACHER PARTICIPATION

In earlier times orientation of courseware development team was more often towards the machine structure and the deadline of the project. The team neglected the role of teacher in courseware system. Most teachers did not interact with CBI software developers. Now situation is changing. The developer is especially interested in listening to teacher’s reactions about developed courseware. Teachers are expert in content and pedagogic aspect of a programme. Teacher can help identifying specific points at which learner typically encounter difficulties or have misconception in their mind. He/She may make proper changes in the courseware for making it more beneficial, thus the teacher can play a direct role in the development process. Sometime ideas given by a teacher gives a new track to the development. The outcome of active participation of teacher in project control is the courseware, which fulfills the needs of the user i.e. of students.

Effective participation of teacher is necessary for standardization of courseware. The two main problems in this area are the lack of financial resources earmarked for teacher involvement and awareness among teachers about their role in project control. In order to provide effective teacher participation following points must be kept in mind at the time of planning.

- Project control must be more teacher and student centered.
- Sufficient financial resources must be made available to enable effective teacher’s participation.
- Teachers involved in the courseware development must be given relevant training.
- Some form of coordination must be provided to facilitate end user influence.

Value of the suggestions given by the teachers should increase as the teachers gain experience in development process. The strategy of a teacher’s participation in courseware development project depends on a number of factors. Some of the factors are as follows:
Design, Issues and Strategies

- Courseware is developed on contract basis.
- Courseware is adopted from the readymade solution available in the market.
- Courseware is developed in house.
- Size, character and structure of the development organization.
- Knowledge of computer based education to the teachers involved in courseware development.
- Physical separation of teacher and developer.
- The degree of design novelty or uncertainty.
- Commitments and agreements among the groups involved.

There may be some other factors, which may also influence the user participation in the project management. First we have to evaluate all the factors mentioned above and then decide how we can use the potential of teacher’s knowledge in a better way.

8.8 LET US SUM UP

- Courseware development is one time effort.
- Resources are limited and costly so we have to apply project management technique to control the proper utilization of resources.
- A linear project control is used where objective; resources allocation and time schedule of the activities are well-defined at the starting of the project.
- Evolutionary and prototype project strategy is used where objective and time schedule is not clear. In evolutionary system we develop the system on the current system in an interactive manner but in prototype we design another system once prototype model is successful.
- During project control following entity are closely evaluated
  - Estimating
  - Organizing
  - Monitoring
- PERT, CPM and GANTT are among some of the mathematical tools, which are used for project control.
- User interaction is necessary for standardization of the courseware.

8.9 UNIT-END EXERCISES

1. Organize a discussion on “The Role of Teacher in the Management of Project Controls” in your study centre.
2. Write a report highlighting the issues emerges during discussion. Select any school activity where you would like to use project control strategies. Write a report highlighting the major points you have considered in it.

8.10 ANSWERS TO CHECK YOUR PROGRESS

1. The linear project control is used in such projects where objective, resources allocation and time schedule of the activities of the development process are well-defined at the starting of the project.
2. It is very easy to control a project if it has following features:
   - Can be demonstrated in a pilot basis.
   - Allowing the organization to go back to pre-project status if it does not work.
- Can be done in step or phase.
- Should be tangible and discrete.
- Consistent with a successful past experience.
- Fits the organization's direction.
- Publicity value (visible potential if it works.)

3. During project control following entity are closely evaluated:
   - Estimating
   - Organizing
   - Monitoring

4. The mathematical tools, which are used for project control, are as follows:
   - Program evaluation and review technique (PERT) charts
   - Critical Path Method (CPM) charts
   - Gantt chart

5. Critical Path Method (CPM) charts are almost similar to PERT charts. In CPM chart the critical path is indicated by double line among all the paths mentioned in PERT chart.

8.11 SUGGESTED READING