Unit 4:
Multimedia Project Development and Case Studies

4.0 Objective

After going through this unit you will able to understand:

- The responsibilities of a software product manager
- Project planning
- Different project estimation techniques
- Different types of software testing mechanism

4.1 Introduction

This step is often overlooked but can be very important, especially for videos. A multimedia project is like an outline for an essay. You plan out, step by step, what someone viewing your project will see, hear, and experience. Basically, in this unit the students will learn the various steps of project planning till its testing. You will learn various responsibilities of a software project manager, sliding window planning, request for proposal and different types of testing.

4.2 Responsibilities of a software project manager

Software project managers take the overall responsibility of steering a project to success. It is very difficult to objectively describe the job responsibilities of a project manager. The job responsibility of a project manager ranges from invisible activities like building up team morale to highly visible customer presentations. Most managers take responsibility for project proposal writing, project cost estimation, scheduling, project staffing, software process tailoring, project monitoring and control, software configuration management, risk management, interfacing with clients, managerial report writing and presentations, etc. These activities are certainly numerous, varied and difficult to enumerate, but these activities can be broadly classified into project planning, and project monitoring and control activities. The project planning activity is undertaken before the development starts to plan the activities to be undertaken during development. The project monitoring and control activities are undertaken once the development activities start with the aim of ensuring that the development proceeds as per plan and changing the plan whenever required to cope up with the situation.

4.3 Skills necessary for software project management

A theoretical knowledge of different project management techniques is certainly necessary to become a successful project manager. However, effective software project management frequently calls for good qualitative judgment and decision taking capabilities. In addition to having a good grasp of the latest software project management techniques such as cost estimation, risk management, configuration management, project managers need good communication skills and the ability get work done. However, some skills such as tracking and controlling the progress of the project, customer interaction, managerial presentations, and team building are largely acquired through experience. None the less, the importance of sound knowledge of the prevalent project management techniques cannot be overemphasized.

4.4 Project planning

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment. Initially, the project scope is defined and the appropriate methods for completing the project are determined. Following this step, the durations for the various tasks necessary to complete the work are listed and grouped into a work breakdown structure. Project planning is often used to organize different areas of a project, including project plans, work loads and the management

of teams and individuals. The logical <u>dependencies</u> between tasks are defined using an <u>activity network diagram</u> that enables identification of the <u>critical path</u>. Project planning is inherently uncertain as it must be done before the project is actually started. Therefore, the duration of the tasks is often estimated through a weighted average of optimistic, normal, and pessimistic cases.

Once a project is found to be feasible, software project managers undertake project planning. Project planning is undertaken and completed even before any development activity starts. Project planning consists of the following essential activities:

- Estimating the following attributes of the project:

  o Project size: What will be problem complexity in terms of the effort and time required to develop the product?

  o Cost: How much is it going to cost to develop the project?

  o Duration: How long is it going to take to complete development?

  o Effort: How much effort would be required?

The effectiveness of the subsequent planning activities is based on the accuracy of these estimations.

- Scheduling manpower and other resources

- Staff organization and staffing plans

- Risk identification, analysis, and abatement planning

- Miscellaneous plans such as quality assurance plan, configuration management plan, etc.

4.5 Precedence ordering among project planning activities

Different project related estimates done by a project manager have already been discussed. Fig. shows the order in which important project planning activities may be undertaken. From fig. it can be easily observed that size estimation is the first activity. It is also the most fundamental parameter based on which all other planning activities are carried out. Other estimations such as estimation of effort, cost, resource, and project duration are also very important components of project planning.
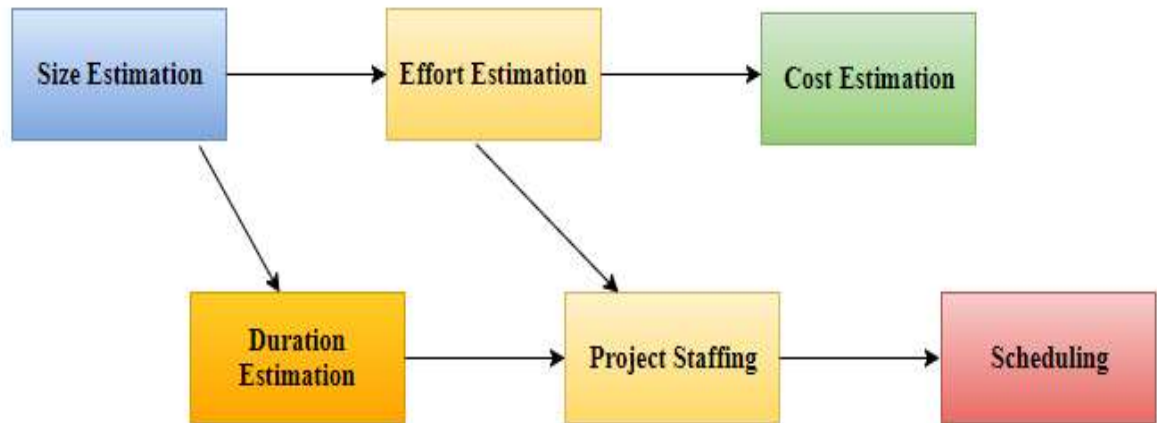
Figure: Precedence ordering among planning activities

4.6 Sliding Window Planning

Project planning requires utmost care and attention since commitment to unrealistic time and resource estimates result in schedule slippage. Schedule delays can cause customer dissatisfaction and adversely affect team morale. It can even cause project failure. However, project planning is a very challenging activity. Especially for large projects, it is very much difficult to make accurate plans. A part of this difficulty is due to the fact that the proper parameters, scope of the project, project staff, etc. may change during the span of the project. In order to overcome this problem, sometimes project managers undertake project planning in stages. Planning a project over a number of stages protects managers from making big commitments too early. This technique of staggered planning is known as Sliding Window Planning. In the sliding window technique, starting with an initial plan, the project is planned more accurately in successive development stages. At the start of a project, project managers have incomplete knowledge about the details of the project. Their information base gradually improves as the project progresses through different phases. After the completion of every phase, the project managers can plan each subsequent phase more accurately and with increasing levels of confidence.

For an effective management accurate estimation of various measures is a must. With correct estimation managers can manage and control the project more efficiently and effectively.

Project estimation may involve the following:

4.6.1 Software size estimation

Software size may be estimated either in terms of KLOC (Kilo Line of Code) or by calculating number of function points in the software. Lines of code depend upon coding practices and Function points vary according to the user or software requirement.

4.6.2 Effort estimation

The managers estimate efforts in terms of personnel requirement and man-hour required to produce the software. For effort estimation software size should be known. This can either be derived by managers' experience; organization's historical data or software size can be converted into efforts by using some standard formulae.

4.6.3 Time estimation

Once size and efforts are estimated, the time required to produce the software can be estimated. Efforts required is segregated into sub categories as per the requirement specifications and interdependency of various components of software. Software tasks are divided into smaller tasks, activities or events by Work Breakthrough Structure (WBS). The tasks are scheduled on day-to-day basis or in calendar months.

The sum of time required to complete all tasks in hours or days is the total time invested to complete the project.

4.6.4 Cost estimation

This might be considered as the most difficult of all because it depends on more elements than any of the previous ones. For estimating project cost, it is required to consider –

- Size of software
- Software quality
- Hardware
- Additional software or tools, licenses etc.
- Skilled personnel with task-specific skills
- Travel involved
- Communication
- Training and support

4.7 Project Estimation Techniques

We discussed various parameters involving project estimation such as size, effort, time and cost. Project manager can estimate the listed factors using two broadly recognized techniques.

4.8 Decomposition Technique

This technique assumes the software as a product of various compositions. There are two main models -

- **Line of Code** Estimation is done on behalf of number of line of codes in the software product.

- **Function Points** Estimation is done on behalf of number of function points in the software product.

4.9 Empirical Estimation Technique

This technique uses empirically derived formulae to make estimation. These formulae are based on LOC or FPs.

- **Putnam Model**

    This model is made by Lawrence H. Putnam, which is based on Norden's frequency distribution (Rayleigh curve). Putnam model maps time and efforts required with software size.

- **COCOMO**

    COCOMO stands for Constructive Cost Model, developed by Barry W. Boehm. It divides the software product into three categories of software: organic, semi-detached and embedded.

4.10 Request for proposal (RFPs)

A request for proposal (RFP) is a document that an organization posts to elicit bids from potential vendors for a desired IT solution. The RFP specifies what the customer is looking for and establishes evaluation criteria for assessing proposals. An RFP generally includes background on the issuing organization and its lines of business, a set of specifications that describe the sought-after solution, and evaluation criteria that disclose how proposals will be graded. RFPs may also include a statement of work, which describes the tasks to be performed by the winning bidder and a timeline for providing deliverables.

An RFP may be issued for a number of reasons. In some cases, the complexity of an IT project calls for a formal RFP. An organization can benefit from multiple bidders and perspectives when seeking an integrated solution calling for a mix of technologies, vendors and potential configurations. A business moving from a paper-based system to a computer-based system, for example, might request proposals for all the hardware, software, and user training required to

establish and integrate the new system into the organization. A simple hardware upgrade, in contrast, may only involve issuing a request for quotation to a single vendor.

Some entities such as government agencies may be required to issue RFPs to provide full and open competition. An organization may also release an RFP to boost competition to drive down the cost of a solution. That said, a proposal accepted on the basis of being the most responsive to an RFP's specifications may not always be the lowest-priced bid.

The skill with which a customer creates an RFP can dictate the success or failure of the resulting IT solution. If the specified requirements are too vague, the bidder may miss the mark when it designs and implements the solution. Overly detailed and restrictive requirements, however, limit the bidders' creativity and stifle innovation.

The RFP process may start with a draft RFP; bidders review the draft solicitation document and submit suggestions for improvement. The final RFP, reflecting feedback received during the draft stage, is then issued and bidders submit proposals. The customer may down-select bidders to a smaller group and enter negotiations on pricing and technical details. The customer may then invite the remaining bidders to submit a best and final offer in preparation to award a contract.

4.11 Bid Proposal

A bid proposal is an explanation of the services or products offered at an estimated cost to a company. When the bid proposal is unsolicited, there is no contractual agreement between the bid recipient and its author. If the proposal is submitted in response to a request for proposal (RFP), it can be accepted as a bid later in the contracting process. The bid proposal is often submitted with the use of a bid form. This can be handwritten or printed from software used for professional bidding. Generally, the form is completed in duplicate, with the one copy being kept on file by the bidder and the other sent to the business requesting the bid. Such a business proposal can include key points related to the completion of the job, including the time frame for completion, total cost, and materials needed to complete the job.

Depending on the type of job, the bid proposal could include a lot or a little information. A construction estimate, for instance, could include a complete list of materials needed to complete the project. A freelance writing bid, on the other hand, may list only the estimated time needed and total estimated cost. The professional bid proposal often includes many key elements. The bidder may choose to begin the form with an executive summary, which can be used to explain why the bidder should be chosen for the job. This may be followed with a list of qualifications, the names of any subcontractors to be used on the project, and an overview of how the bidder will accomplish the major points of the bid request.

Next, a bidder can explain the terms of the bid and include a list of similar jobs that have been completed, along with details of any past projects that are relevant to the proposed work. A safety plan may also be added, if applicable, to describe the steps that will be taken to minimize injury and any loss of work time. Such a plan is typically included only if a job will require physical work.

After the bid form is written, proofreading the information may help to ensure it is complete and eliminate any spelling or grammatical errors that could be seen as unprofessional. Following this step, the bidder usually signs and submits the form. Proofreading can be a vital step because many bid proposals are not accepted because they are incomplete.

4.12 Software Testing

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of A software item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words, software testing is a verification and validation process.

4.12.1. Verification

Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

4.12.2. Validation

Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

4.12.3. Basics of software testing

There are two basics of software testing: Blackbox testing and Whitebox testing.

4.12.4. Blackbox Testing

Black box testing is a testing technique that ignores the internal mechanism of the system and focuses on the output generated against any input and execution of the system. It is also called functional testing.

4.12.5. Whitebox Testing

White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and glass box testing.

Black box testing is often used for validation and white box testing is often used for verification.

4.13   Types of testing

There are many types of testing like

- Unit Testing

- Integration Testing

- Functional Testing

- System Testing

- Stress Testing

- Performance Testing

- Usability Testing

- Acceptance Testing

- Regression Testing

- Beta Testing

4.13.1   Unit Testing

In computer programming, unit testing is a software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine whether they are fit for use.

Intuitively, one can view a unit as the smallest testable part of an application. In procedural programming, a unit could be an entire module, but it is more commonly an individual function or procedure. In object-oriented programming, a unit is often an entire interface, such as a class, but could be an individual method. Unit tests are short code fragments created by programmers or occasionally by white box testers during the development process. It forms the basis for component testing.

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

4.13.2 Integration Testing

Integration testing is testing in which a group of components are combined to produce output. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation. It may fall under both white box testing and black box testing.

4.13.3 Functional Testing

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.

4.13.4 System Testing

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

4.13.5 Stress Testing

Stress testing is the testing to evaluate how system behaves under unfavorable conditions. Testing is conducted at beyond limits of the specifications. It falls under the class of black box testing.

4.13.6 Performance Testing

Performance testing is the testing to assess the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements. It falls under the class of black box testing.

4.13.7 Usability Testing

Usability testing is performed to the perspective of the client, to evaluate how the GUI is user-friendly? How easily can the client learn? After learning how to use, how proficiently can the client perform? How pleasing is it to use its design? This falls under the class of black box testing.

4.13.8 Acceptance Testing

Acceptance testing is often done by the customer to ensure that the delivered product meets the requirements and works as the customer expected. It falls under the class of black box testing.

4.13.9 Regression Testing

Regression testing is the testing after modification of a system, component, or a group of related units to ensure that the modification is working correctly and is not damaging or imposing other modules to produce unexpected results. It falls under the class of black box testing.

4.13.10 Beta Testing

Beta testing is the testing which is done by end users, a team outside development, or publicly releasing full pre-version of the product which is known as beta version. The aim of beta testing is to cover unexpected errors. It falls under the class of black box testing.

4.14 CD-ROM Technology and Standards

CD-ROM stands for Compact Disc Read-Only Memory, a mass storage medium utilizing an optical laser to read microscopic pits on the aluminized layer of a polycarbonate disc. The same format is used for audio Compact Discs. Because of its high storage capacity, reliability, and low cost, CD-ROM has become an increasingly popular storage media. The storage capacity of a CD-ROM disc is approximately 650 megabytes, equivalent to over 500 high densities 3.5" floppy disks or roughly 250,000 typed pages. First generation drives (known as single speed), provided a transfer rate of approximately 150 kilobytes per second. Hardware manufacturers then introduced double speed (300 kB/sec), quad speed (600 kB/sec), and higher. Current drives operate at up to 40 times speed, although the maximum rate is only achievable over certain portions of the disc surface.

Most CD-ROM drives use either the Small Computer Systems Interface (SCSI), ATAPI enhanced IDE interface, or a vendor proprietary interface. They also typically support playing audio CDs via an external headphone jack or line level output. Most drives also allow reading the frames of data from audio CDs in digital form.

CD-ROMs are usually formatted with an ISO-9660 (formerly called High Sierra) file system. This format restricts filenames to the MS-DOS style (8+3 characters). The Rock Ridge Extensions use undefined fields in the ISO-9660 standard to support longer filenames and additional UNIX style information (e.g. file ownership, symbolic links, etc.). Microsoft has defined a proprietary ISO file system extension called Joliet which supports long filenames using the 16-bit UNICODE character encoding.

PhotoCD is a standard developed by Kodak for storing photographic images as digital data on a CD-ROM. With appropriate software, you can view the images on a computer, manipulate them, or send them to a printer. Information can be added to a PhotoCD at a later date; this is known as multi-session capability.

CD recordable (CD-R) drives allow writing onto a special "gold" CD which can then be read by any CD-ROM drive. Data can only be written once, although using multi-session new data can be appended to a disc.

CD-RW (rewritable) drives can be erased and rewritten with new data. They use special discs which can be read by most recent CD-ROM drives (but not older ones or most audio CD players).
DVD-ROM expands the storage of a CD to as much as 17 gigabytes. They are commonly used as a medium for distributing full length motion pictures encoded using the MPEG-2 format. The MPEG video decoding is performed using specialized decoder software and/or hardware. DVD-RAM is a writable version of DVD.

4.15 Summary
This unit explained the steps of multimedia project developments. In particular you have learnt the responsibilities of a software project manager and skills necessary for project management. You have also learnt the project planning which includes project size, cost, duration and effort required. After project developments the next

essential part is testing. You learnt the various types of testing like unit testing, system testing and so on. Finally the unit explored the CD-ROM technology and standards.

4.15 Question

1. What do you mean by project planning? Why does it required?
2. Explain Bid proposals.
3. What do you understand by project estimation and product designing?
4. What are different types of software testing? Explain at least five main testing procedure.
5. Differentiate White box testing and Black Box testing.
6. Explain the CD-ROM technologies and their standards.