








UNIT - 5: Software Project Management









Project Planning

- **Project Planning includes:**
 -  Estimation of cost, time and resources
 -  Specifying procedure and modules
 -  Arranging activities to be performed
 -  Assigning time and resources for each activity
 -  Establishing milestones to review project progress
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Types of Project Plan

-  **S/W Development Plan:** Central plan to describe how the system will be developed.
 -  **Testing & Validation Plan:** Defines s/w testing schedule and how s/w will be validated by the clients.
 -  **Quality Assurance Plan:** Specifies quality procedures and standards to be maintained.
 -  **Configuration Management Plan:** Defines how changes will be managed while maintaining consistency.
 -  **Maintenance Plan:** Defines how maintenance will be performed.
 -  **HR Plan/ Staff Development Plan:** Describes the procedure to determine the number of people required and skills needed for s/w development.
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Activities for S/W Development Plan

-  Estimate Attributes of the Project
-  Make Work Breakdown Structure (WBS)

-  Schedule Project Work Components
 -  Determine the H/w and S/w resources
 -  Risk Management Plan
 -  Project Monitoring & Control
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Earned Value Monitoring

- **Earned Value Analysis (EVA)** is one of the key tools and techniques used to have an understanding of how the project is progressing.
 - Earned Value Analysis is an objective method to measure project performance in terms of scope, time, and cost.
 - EVA provides a common value scale for every project task.
 - Total hours to complete the project are estimated and every task is given an Earned Value, based on its estimated (%) of the total.
 - Earned Value is a measure of 'Progress' to assess 'Percentage of Completeness'.
 - Earned Value is an approach where you monitor the project plan, actual work, and work completed value to see if a project is on track.
 - Earned Value shows how much of the budget and time should have been spent, considering the amount of work done so far.
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Key Elements of Earned Value Monitoring

- **Planned Value (PV)** – also known as budgeted cost of work scheduled or BCWS (Budgeted Cost of Work Scheduled). Amount of approved cost that is to be spent on project during decided time.
 - **Actual Cost (AC)** – also known as actual cost of work performed or ACWP (Actual Cost of Work Performed). Total cost incurred in accomplishing project in decided time.
 - **Earned Value (EV)** – also known as Budgeted Cost of Work Performance at a specified point (BCWP) value of the work actually completed.
 - **Work Breakdown Structure (WBS)**: it is a hierarchical distribution of the total work to be performed by a team to achieve a project's final objective. It is usually presented in the form of a document or spreadsheet.
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17 Earned Value Monitoring – Indicators of Schedule

- **Schedule Variance (SV):** It is the variance between Earned Value and Planned Value. It lets us identify how much you are ahead or behind schedule in terms of costs.
 - **$SV = EV - PV$**
 - If **$SV < 0$** then the project is behind the schedule.
 - If **$SV = 0$** then the project is on schedule.
 - If **$SV > 0$** then the project is ahead of the schedule.
- **Schedule Performance Index (SPI):** It is the measurement of progress achieved against progress planned.
 - **$SPI = EV / PV$**
 - If **$SPI < 1$** then the project is running behind the schedule.
 - If **$SPI = 1$** then the project is progressing exactly as planned.
 - If **$SPI > 1$** then the project is progressing well against the schedule.

💰 Earned Value Monitoring – Indicators of Cost

- **Cost Variance (CV):** It is calculated by subtracting the Actual Cost (AC) from Earned Value (EV). It lets us know whether you are under or over budget.
 - **$CV = EV - AC$**
 - If **$CV < 0$** then the project is over the budget.
 - If **$CV = 0$** then the project is on budget.
 - If **$CV > 0$** then the project is under the budget.
- **Cost Performance Index (CPI):** It is the measurement of the value of work completed against the actual cost.
 - **$CPI = EV / AC$**
 - If **$CPI < 1$** then the project is over the budget.
 - If **$CPI = 1$** then the project cost is on budget.
 - If **$CPI > 1$** then the project is under the budget.

Earned Value Monitoring – Indicators of Project Completion

- **Estimated at Completion (EAC):** It is an indicator for forecasting how much the total project will cost.
 - $EAC = BAC / CPI$
 - **Estimate to Complete (ETC):** It is an estimation of funds required to complete the remaining work in a project. This EVM metric is used for forecasting the budget needed for the remaining project work.
 - $ETC = (BAC - EV) / CPI$
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Steps in Earned Value Monitoring

1. **Collect the inputs:**
 - Budget at Completion (BAC)
 - Planned Value (PV)
 - Earned Value (EV)
 - Actual Cost (AC)
2. **Analyze the schedule status:**
 - Schedule Variance (SV)
 - Schedule Performance Index (SPI)
3. **Analyze the cost status:**
 - Cost Variance (CV)
 - Cost Performance Index (CPI)
4. **Forecasting the project status:**
 - Estimate to Complete (ETC)
 - Estimate at Completion (EAC)
5. **Prepare some reports with the analysis and plans:**
 - Collect the % complete of each task.
 - Collect Planned Value (PV) for each task.
 - Calculate Earned Value (EV) for each task.
 - Obtain Actual Cost (AC) for each task.

- Perform schedule status for each task.
 - Perform cost status for each task.
 - Perform forecasting for each task.
 - Compile the results and create a global report.
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Earned Value Monitoring – Example

- Let's consider a very simple example of a software project **A** which is to be completed in one year (12 months) and the total cost is **\$300,000**.
 - The start date of the project is **01 October 2019** and the end date of the project is **30 September 2020**.
 - We will assume that the budget is the same for each month (**\$25,000**).
 - Let's consider that the analysis of the project is performed after **6 months (31 March 2020)**.
 - The review performed on the project has shown that only **40%** of the work has been completed after 6 months and the actual cost is **\$100,000**.
 - **Calculate the indicators and make the Earned Value Analysis.**
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Earned Value Monitoring – Example Solution

- The first step for EVM is to **collect the inputs (initial data)**:
 - **Budget At Completion (BAC) = \$300,000.**
 - **Earned Value (EV) = (0.4 * BAC) = \$120,000.**
 - **Planned Value (PV) for 6 months is \$150,000.**
 - **Actual Cost (AC) = \$100,000.**
- **Schedule Variance (SV):**
 - **$SV = EV - PV = \$120,000 - \$150,000 = -\$30,000$.**
 - The result is negative, so the project is behind the schedule. It is also easy to observe that the Earned Value is lower than the Planned Value.
- **Schedule Performance Index (SPI):**
 - **$SPI = EV / PV = 0.8$.**

- **SPI = 0.8** means that the project has performed **80%** of the work it was supposed to at this status point.
 - SPI is less than 1, which means that the project is behind the schedule. For every estimated hour of work on the project, the project team is completing only **0.8 hours** (48 minutes), meaning the project is running behind schedule.
 - **Cost Variance (CV):**
 - **$CV = EV - AC = \$120,000 - \$100,000 = \$20,000$.**
 - The value of project **A** at the current state is greater than the money spent on it, meaning the project is under budget.
 - **Cost Performance Index (CPI):**
 - **$CPI = EV / AC = 1.2$.**
 - The CPI for the analyzed project is greater than 1, so the project is performing well against the budget.
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Earned Value Monitoring – Example Conclusion

- **Estimate at Completion (EAC):**
 - **$EAC = BAC / CPI = \$250,000$.**
 - Based on this analysis, if the project continues in the same conditions, then at the end of the project the budget will be **\$250,000**.
 - **Estimated at Completion (EAC)** is a forecast of how much the total project will cost. So, the total cost will be less than estimated if the project continues in this direction.
 - **Estimate to Complete (ETC):**
 - **$ETC = (BAC - EV) / CPI = \$150,000$.**
 - **Estimate to Complete (ETC)** is a forecast of how much more money will need to be spent to complete the project. If the work continues at this pace until the next evaluation after 6 months, the total amount needed to finalize the project will be **\$150,000**.
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Summary of the Example:

Example: Earned Value Monitoring

- **Scenario:** Software project A is scheduled to be completed in 12 months with a total cost of \$300,000.
- After 6 months, only 40% of the work is completed, with an actual cost of \$100,000.
- **Earned Value Analysis:**
 - Budget at Completion (BAC): \$300,000.
 - Earned Value (EV): \$120,000.
 - Planned Value (PV) for 6 months: \$150,000.
 - Actual Cost (AC): \$100,000.
 - **Schedule Variance (SV):** $SV = EV - PV = -\$30,000$ → Behind schedule.
 - **Cost Variance (CV):** $CV = EV - AC = \$20,000$ → Under budget.
 - **Schedule Performance Index (SPI):** $SPI = 0.8$ → Project is at 80% of the planned progress.
 - **Cost Performance Index (CPI):** $CPI = 1.2$ → Project is performing well on budget.



Gantt Chart

- It represents project schedule graphically.
- A Gantt chart is a bar chart that provides a visual view of tasks scheduled over time.
- A Gantt chart is used for planning projects of all sizes.
- It is a useful way of showing what work is scheduled to be done on a specific day.
- It can also help you view the start and end dates of a project in one simple chart.

- Gantt charts are most commonly used for tracking project schedules.
 - It was developed by Henry Gantt.
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Causes Of Project Failure

- 🕒 Incorrect time estimation.
 - 📅 Unrealistic schedule.
 - 💰 Insufficient budget.
 - 🔗 External dependencies.
 - 🚀 Unexpected project scope expansion.
 - 🖋️ Insufficient software testing.
 - 🗣️ Poor communication.
 - 📝 Poor understanding of user requirements.
 - 🛠️ Improper monitoring and control.
 - 🧑 Lack of experience and training.
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⚠️ Types of Risk

- 📅 **Schedule-related risk**
 - 💰 **Financial risk**
 - ⚙️ **Technical risk**
 - 🛠️ **Operational risk**
 - 🔄 **Other risks**
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