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Key Concepts Learned

- **Effort Estimation in Software Project Management**

Effort estimation in software project management refers to forecasting the workload required to complete a project. This plays a vital role in scheduling, budgeting, and allocating resources effectively. Several methods are used for effort estimation, including expert judgment, analogous estimation, parametric estimation, and three-point estimation. Expert judgment is based on the experience of skilled professionals, analogous estimation draws comparisons from past projects, parametric estimation applies mathematical models, and three-point estimation considers the best-case, worst-case, and most probable scenarios.

- **Cost Estimation in Software Project Management**

Cost estimation involves determining the financial resources needed to complete a software project.

Common approaches include:

- **Function Point Analysis (FPA):**

FPA measures software functionality based on user inputs, outputs, queries, file interactions, and interfaces. It provides a standardized, technology-independent evaluation, making it useful for accurate cost and effort estimation.

- **COCOMO (Constructive Cost Model):**

COCOMO is a structured model that predicts cost by factoring in project size, complexity, team expertise, and environmental influences. It assists in early-stage planning by estimating the required effort, duration, and resources.

- The effort calculation formula: **Effort = $2.94 \times \text{EAF} \times (\text{KLOC})^E$**

- **EAF** (Effort Adjustment Factor) is derived from cost considerations.
 - **E** is an exponent based on project scale.
 - **KLOC** (Kilo Lines of Code) measures the software's size.
 - To determine the schedule duration: **Duration = $3.67 \times (\text{Effort})^{SE}$**

- **Wide Band Delphi Technique:**

This consensus-driven approach gathers insights from a panel of experts to refine project estimates, including effort and duration. By incorporating multiple perspectives, it minimizes biases and enhances accuracy in planning.

- **Schedule Estimation in Software Project Management**

Schedule estimation focuses on approximating the time needed for project completion. Techniques include expert judgment, analogous estimation, and three-point estimation. Expert judgment relies on experienced professionals for time predictions, analogous estimation utilizes data from past projects, and three-point estimation evaluates optimistic, pessimistic, and most probable timeframes to determine a realistic duration.

- **Resource Estimation in Software Project Management**

Resource estimation identifies the necessary resources—both in type and quantity—for a software project. Techniques for this process include expert judgment, bottom-up estimation, and parametric estimation. Expert judgment leverages industry expertise, bottom-up estimation assesses resources at the component level before aggregating them, and parametric estimation applies statistical models to estimate needs based on project characteristics.

As we transition from Chapter 3, which focused on estimating effort, cost, schedule, and resources for a project, Chapter 4 builds upon this foundation by exploring the uncertainties that can affect these estimates—risks. In this chapter, we will examine the nature of project risks, their potential impact, and the strategies required to manage them effectively.

Risk on a Project

A project risk is any unpredictable factor or event that has the potential to affect project outcomes, such as extending timelines, exceeding budgets, or compromising deliverables.

Kinds of Risks for a Project

Projects may face several risk categories, including:

- **Technical Risks:** Issues like system failures, integration problems, or unproven technology.
- **Financial Risks:** Constraints related to budget limitations or unexpected cost escalations.
- **Schedule Risks:** Delays caused by resource shortages, scope changes, or dependencies.
- **Resource Risks:** Challenges such as lack of skilled personnel, material shortages, or inadequate infrastructure.
- **External Risks:** Uncontrollable factors like economic downturns, regulatory shifts, or supplier disruptions.

Impact of Risks on a Project

Risks can negatively influence project success by causing timeline extensions, financial overruns, lower product or service quality, decreased stakeholder confidence, reputational damage, and, in extreme cases, project termination.

Strategy to Deal with Risks

A robust risk management approach includes identifying potential threats, evaluating their likelihood and impact, ranking them by severity, and implementing strategies to address them. Mitigation efforts may involve developing contingency plans, transferring risk through contracts or insurance, eliminating risks by modifying project scope, sharing risk through collaboration, and continuously monitoring conditions to adjust responses accordingly.

Applications in Real Projects

The principles of effort, cost, schedule, and resource estimation, as well as risk management, were directly applied in our Autonomous Delivery Drone Management System project. Understanding these concepts helped us allocate resources efficiently, estimate workload accurately, and mitigate potential risks affecting project timelines and deliverables.

Peer Interactions

Throughout the project, we maintained effective communication and collaboration to ensure smooth progress. In our second group meeting, we divided responsibilities among team members based on individual expertise and interests. Each team member conducted research and analysis related to their assigned tasks, ensuring a well-rounded approach to the project.

Challenges Faced

One of the key challenges we faced was adjusting our workflow after our group expanded from four to five members. To ensure a smooth transition, we held a team meeting where we redistributed tasks based on individual strengths and provided the new member with a detailed overview of the project. Also, another challenge was data accuracy in competitor analysis. Given the rapidly evolving nature of the autonomous drone market, ensuring that our market trends, financial projections, and SWOT evaluations remained up to date was difficult. To mitigate this, I cross-checked multiple sources and incorporated the latest industry reports to support my findings.

Personal Development Activities

This week to enhance my understanding of project estimation, risk management, and competitor analysis, I actively studied Chapters 3 and 4, focused on estimation techniques and risk mitigation strategies. I conducted in-depth research for the Competitor Analysis section, evaluating market trends and key industry players to strengthen our project's positioning.

Goals for the Next Week

For the upcoming week, my goals include reading Chapters 5, 6 and 7 thoroughly, ensuring a strong understanding of key concepts and completing necessary preparations before the next class. Also, I will meet with group members to discuss project updates, review progress, and address any challenges that arise. Moreover, I will prepare for the upcoming project presentation, ensuring clear communication of key findings, analysis, and strategic insights.