

**SOEN 6841**

# **SOFTWARE PROJECT MANAGEMENT**

**TOPIC ANALYSIS AND SYNTHESIS - FALL 2023**

**How do I keep my project from slipping? If it does, how  
do I recover its schedule?**

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# Abstract

The act of missing deadlines or milestones when managing a task or sequence of tasks is called Project schedule slippage [1]. This can happen during the project planning or requirement elicitation stages or execution, resulting in a delay between the scheduled timeline and the actual completion dates. Preventing and managing project schedules is a critical aspect of successful project management. Delays and schedule slippages can have cascading effects on project timelines, resource allocation, and overall project success. This report addresses strategies for preventing and recovering from project schedule slippage. Effective schedule management involves proactive tracking, quick responses to adverse variances, and close monitoring of schedule performance. The report emphasizes the importance of early detection of scheduling problems and provides insights into managing critical path activities. It also discusses recovery options, including the use of contingency plans, revising dependencies, and escalating severe issues with project sponsors. Clear and honest communication is highlighted as a crucial element in managing schedule problems, with a focus on regularly updating stakeholders on the status of schedule-related issues and the actions being taken to address them.

## 1. Introduction

Project schedule slippage is a challenge faced by organizations during the execution of complex projects. This report delves into critical aspects of preventing and recovering from schedule delays, offering a comprehensive approach to mitigate risks and enhance project success. The report provides strategies for schedule management and recovery with effective planning, risk identification, and better communication. Additionally, it addresses the importance of continuous schedule monitoring and control mechanisms to identify deviations and implement corrective actions.

The success or failure of a project depends largely on delivering within the scheduled timeline and budget. A software project is deemed successful if the final product is delivered with all its success criteria—schedule, budget, etc.—within an acceptable range. The project is considered challenged if the final product is delivered but falls outside the acceptable criteria range. However, if the final product is not delivered, then the project is deemed a failure. Maintaining a project on schedule is a critical success factor for project success. The success rates of projects are alarming, as indicated in the CHAOS report from 1994 [3], where only 16.2% are completed within budget and on time. Understanding the reasons for project failure and how much schedule variance can affect project success, is crucial

Figure 1a, extracted from Steve McConnell's "Software Estimation" [4], provides insights into the outcomes of software projects spanning the decade from 1994 to 2004. Observing the figure reveals that only a minority of projects finished on schedule and within budget, while more than 60% of projects were delayed and over budget. This underscores the need to comprehend the reasons for maintaining the schedule to ensure timely project delivery within budget constraints.

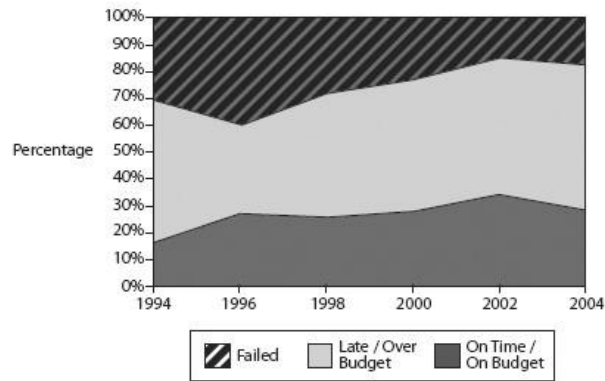


Fig 1: Software Project Outcomes, 1994 - 2004, Source: Software Estimation, by Steve McConnell [4]

## 2. Common Causes of Project Schedule Slippage

Project schedules can slip for various reasons, and identifying these causes is crucial for effective schedule management. Here are some of the major causes for project schedule slippage as listed in [2] - Chapter 1, each with a real-life example,

- **Inaccurate Planning:** Unrealistic project timelines or insufficiently detailed project plans can lead to underestimation of the time required for tasks. For instance, envision a scenario where a software development project sets an overly optimistic timeline without considering the intricacies of coding and testing.
- **Scope Changes:** Alterations to project scope mid-execution, either due to client requests or internal decisions. Imagine a construction project where the client decides to add an extra floor after the construction has already commenced. This unforeseen change in project scope can disrupt the existing plan, requiring adjustments in materials, resources, and timelines, ultimately causing project schedule slippage.
- **Dependencies and Constraints:** Insufficient resources, such as manpower and outdated tools, can impede progress, causing delays in tasks and milestone achievement, as seen in a limited personnel marketing campaign. Similarly, external dependencies, like regulatory approvals in a product launch, can introduce delays, affecting the overall project timeline.
- **Unforeseen Risks:** Risks that were not adequately identified, assessed, or mitigated during the planning phase can disrupt the project schedule. Picture a construction project that encounters unexpected weather challenges, such as unseasonal heavy rains. If these risks were not considered in the initial planning, the project could face setbacks in construction activities.
- **Poor Communication:** Ineffective communication within the project team or with stakeholders can lead to misunderstandings and misalignment. Think of a software development team where crucial information about a change in coding standards is not effectively communicated. This lack of communication can result in developers working on incompatible code, causing rework and delays in the project schedule.

- **Lack of Stakeholder Involvement:** Insufficient feedback or involvement. Consider a website redesign project where key stakeholders, including marketing and sales teams, are not actively involved in providing feedback. Without their insights, the project may fail to meet the expectations of end-users, causing rework and delay in schedule.

### 3. Methodologies

We have explored how the success or failure of a project depends on adhering to its schedule and the factors contributing to schedule slips in a project. A project experiencing delays not only affects its stakeholders and outcomes but is also likely to have a ripple effect on subsequent projects or features in the pipeline. In the following section, we will delve into specific methods to realign a project with its intended schedule.

#### 3.1 Monitoring Schedule Variance

Monitoring schedule variance is a crucial aspect of effective project management. Schedule variance [8] refers to the **deviation** between planned project timelines and the actual progress. Employing best practices in monitoring schedule variance is essential for proactive decision-making and successful project delivery. Some of the best practices for monitoring schedule variance include

##### **Weekly Status Updates:**

Regular status meetings (e.g., weekly) should be conducted to collect progress reports from team members with information on completed tasks, ongoing activities and any potential challenges affecting the schedule.

##### **Anticipate Future Work:**

Proactively inquire about and assess tasks scheduled to commence in the next two weeks for potential delays or challenges. This forward-looking approach ensures early identification and mitigation of issues before they escalate

##### **Informal Communication:**

Open communication through informal discussions with team members must be established. Conversations about current and future concerns and actively seeking insights that could impact the project schedule must be encouraged.

##### **Risk Management Integration:**

Integrate schedule monitoring seamlessly with risk management processes. Actively monitor identified risks and trigger timely responses to prevent their adverse impact on the project schedule. Aligning schedule monitoring with risk mitigation enhances overall project resilience.

**Early Detection and Response:**

Emphasize early detection of scheduling problems to address them when they are still manageable. Timely intervention is crucial in minimizing the impact on the project timeline. Implementing a proactive stance toward issue detection ensures swift responses for effective resolution.

**Stakeholder Communication:**

Maintain transparent communication with stakeholders about schedule variances. Keeping all parties informed fosters understanding and cooperation, especially when adjustments to project timelines are necessary.

## 3.2 Monitoring the Critical Path

Effectively managing the critical path is crucial for ensuring the timely completion of a project. The critical path is the sequence of tasks that, if delayed, will directly impact the project's overall timeline. To monitor and manage the critical path, several strategies and techniques can be employed:

**Regular Critical Path Analysis:**

Regularly conduct Critical Path Analysis to identify and assess tasks critical to the project timeline, measuring their schedule variance, whether minor or significant. By analyzing the dependencies and durations of critical tasks, project managers gain insights into the project's schedule slip.

**Resource Reallocation and Optimization:**

Ensure that resources are allocated optimally to tasks on the critical path or swapping of resources can be done between critical and non-critical activities. Resource constraints can often be a cause of delays. Therefore, future tasks that are not critical can be scheduled for the next iteration or cancelled. Project managers can mitigate risks associated with critical path activities by closely monitoring resource availability and redistributing work efficiently.

**Early Identification of Critical Path Changes:**

Establish mechanisms for early identification of changes or delays in the critical path. Regularly review and update the project schedule to reflect any adjustments in task dependencies or durations. This proactive approach allows project managers to adapt to changes swiftly and implement necessary measures to maintain the integrity of the critical path.

**Parallel development:**

To mitigate delays in the overall project schedule, consider conducting some critical path activities simultaneously, especially those not dependent on previous tasks. This approach, known as parallel development, accelerates progress by allowing independent tasks to operate concurrently. By identifying critical path activities that can run in parallel, project managers optimize resource utilization and expedite project timelines. This strategic allocation of tasks ensures that certain aspects of the project can advance concurrently, reducing the overall duration and enhancing efficiency.

### Informing the Sponsors:

In situations where the project faces a significant delay, it is imperative to promptly inform the sponsors about the current status. Providing transparent and clear communication ensures that sponsors are aware of the challenges and enables collaborative decision-making to address the issues at hand. This approach fosters a supportive environment and allows sponsors to contribute valuable insights or resources that may aid in the successful recovery of the project.

## 3.3 Effective communication

Clear and transparent reporting ensures that all stakeholders are well-informed about the project's current status and the recovery plan. Open communication with stakeholders enables transparency, and rebuilding trust through conversations about successes and challenges. Addressing concerns and questions promptly, coupled with empathetic and supportive communication, contributes to a positive team environment during challenging times.

## 4. Tools and Techniques

### 4.1 Earned value management

Earned Value Management (EVM) is a "Project Management tool that enables managers to identify and control problems before they become irrecoverable" [7]. It provides a comprehensive way to measure a project's progress by integrating information about the work performed, the budget allocated, and the actual costs incurred. The key components of EVM include,

- **Planned Value (PV):** The estimated value of the work scheduled to be completed at a specific point in time, based on the project plan.
- **Earned Value (EV):** The value of the work that has **actually** been completed at a given point in time. It is often expressed in monetary terms.
- **Actual Cost (AC):** The total costs incurred for the work performed up to the reporting date.

By comparing these values, EVM provides essential metrics such as:

- **Cost Performance Index (CPI):** The ratio of EV to AC, indicating the cost efficiency of the work completed.
- **Schedule Performance Index (SPI):** The ratio of EV to PV, measuring the schedule efficiency.
- **Variance Analysis:** Examining the differences between planned, earned, and actual values in both schedule i.e Schedule variance i.e **SV** and cost i.e Cost variance i.e **CV** helps in identifying potential issues and forecasting the project's future performance [10].

The chart in Figure 2 shows the relationships between (1) the interpretations of some of the EVM metrics, and (2) budget and schedule. Both the schedule and cost variance should ideally be zero for a project to finish on time and within budget.

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.0
Cost	CV > 0 & CPI > 1.0	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	CV = 0 & CPI = 1.0	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	CV < 0 & CPI < 1.0	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

Fig 2: The values and interpretations of some of the EVM metrics [9]

Even the slightest variances in cost or schedule can have adverse effects, necessitating recovery mechanisms. EVM is a powerful tool for project managers as it offers a holistic view of project health, helping them make informed decisions and take corrective actions to keep projects on track. It's widely used in industries where projects involve complex scopes, significant budgets, and tight schedules.

## 4.2 Communication and the Digital Culture

**Project Management tools** are designed to assist teams in planning, organizing, and executing projects effectively. Popular project management tools include **Jira**, known for its issue-tracking and agile project management capabilities; **Trello**, a visually intuitive platform for task organization using boards and cards and Asana, which offers a variety of project planning and tracking features.

**Version control systems** such as Git, along with platforms like **GitHub**, **GitLab**, and **Bitbucket**, ensure collaborative coding and streamlined code review processes.

**Video conferencing** tools like **Zoom**, **Microsoft Teams**, and **Google Meet** are essential for virtual meetings and discussions.

**Collaboration Platforms** such as **Slack** and **Discord** offer real-time messaging, creating channels for specific topics or projects.

These tools, along with digital communication protocols like email and wiki pages, create a powerful digital environment for software teams. The seamless integration of these tools promotes clear communication, efficient collaboration, and successful project outcomes.

## 5. Case studies

### 5.1 Case Study: Earned Value Management (EVM) Implementation in ERP Project Recovery [5]

The case study [5] focuses on an Enterprise Resource Planning (ERP) implementation for one of the largest universities in Asia, referred to as the Client. The university, consisting of over 50 institutes, decided to implement an ERP system in 2004 to enhance efficiency in Finance, HR, and Student Admin processes, as well as to establish a common process across all institutions.



## **Project Challenges:**

1. The diverse business processes in educational institutions with a federated structure made change management challenging. Coordinating among stakeholders was especially demanding due to the culture of decentralized decision-making
2. Some processes did not align well with the ERP product, leading to unforeseen customization efforts.
3. Ownership in a federated organizational structure, where academic and administrative aspects are handled separately, was challenging.
4. Slow engagement of the senior management due to the initial perception that the implementation was primarily an IT project.
5. The departure of a key sponsor midway affected project continuity and credibility.

We can look at different phases of the project the schedule slip and the recovery actions that were taken to bring the project back on track

### **Phase 1: The First Signs of Trouble**

Initial project planning and requirements gathering proceeded smoothly, with minor deviations in effort. However, customer sign-off delays were encountered, but the project continued to progress. Midway through the design phase, scope changes led to schedule slippage.

**Recovery Initiatives:** Senior management from both the Client's and Satyam's side intervened and established a more frequent review process. This enabled better communication among the team and the stakeholders and early detection of any schedule-related problems.

### **Phase 2: The project slipped into deep red**

The departure of the client's sponsor, coupled with scope and design changes, pushed the project into a critical state.

### **Recovery Initiatives:**

- **Earned value management (EVM)** was introduced to provide integrated status on project parameters and to track the project overrun and recovery progress.
- People in a project have major importance in recovery too, a new project manager was appointed to take control of the recovery.
- Frequent and regular progress review meetings were conducted with the Senior management. Clients and sponsors were aware of the project's current status and this helped manage expectations and speed up the recovery. Also, the client's Project Manager and sponsor were involved in the recovery process to ensure cooperation across all institutions.
- A lot of team-building activities were conducted to keep the team's motivation at a high
- Re-baselining the project schedule considering scope changes.
- Redesigning processes where regulatory approvals were not required, preventing implementation delays. Reallocating resources to critical tasks to decrease the project schedule delay.

Fig 3 extracted from [5] shows the EV, PV and AC as the project progresses. We can see towards the end the recovery methods paid off and the project was back on track to successful completion. The effective use of EVM, quickly addressing scope changes, stakeholder involvement and better communication played a pivotal role in steering the project toward successful completion. It indicates the significance of proactive project management and recovery and the need for tools like EVM to monitor, assess, and guide project recovery efforts in real-world scenarios.

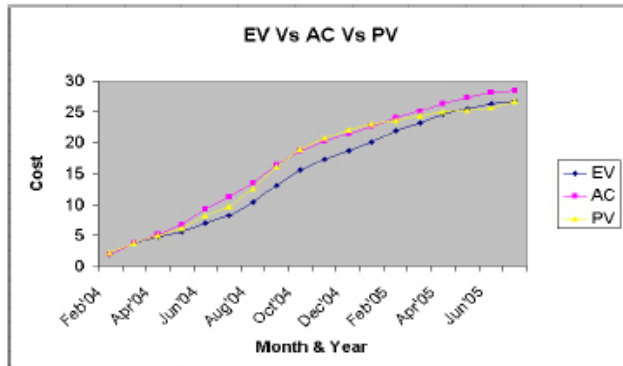


Fig 3: EVM Chart towards the end of the project Source: [5]

## 5.2 Case Study: GTE's Transition from Milestone Tracking to Critical Path Tracking [6]

GTE (now Verizon) went through a significant shift in its project management approach due to critical issues with its existing milestone tracking system named CRIMES (Conversions, Reports, Interfaces, legacy Modifications, Extensions, and Security profiles) [6]. The major issues that pushed the need for a new system included the absence of early warning for delays, resource shortage, and a limited ability to provide insights into project progress. They wanted a system which could accurately measure the project's progress and improve the early detection of delays in schedule and resource shortages.

### Transition to Critical Path Tracking

The team identified issues from the milestone tracking system and recognized the need for a new approach to project progress tracking. A major research was carried out on critical path management and buffer tracking and management theories proposed by Eli Goldratt were explored in detail. After analyzing the importance of Critical path analysis, the team decided to shift from milestone tracking to critical path tracking. The Estimate to complete (ETC) was determined as a measure of work remaining and safety buffers were introduced, squeezing out excess safety to a single buffer before system integration testing.

### Outcomes:

- Critical path tracking provided timely indications of potential progress delays. Management could act as soon as issues were detected, preventing them from becoming critical.
- The focus shifted from past accomplishments to challenges ahead.
- Buffer management helped in determining ripple effects and addressing delays effectively.
- This system provided flexibility for resource reallocation based on critical path activities as the Management received more predictive and specific information.
- Shifted from reactive to proactive management, taking corrective action as soon as progress delays were indicated.

## 6. Recommendations

After careful consideration, the following recommendations are provided for preventing project schedule slips and facilitating recovery from them.

- **Use of appropriate techniques:** The impact of EVM implementation on the course of the project is evident from Case Study 1. It is important to monitor the project schedule closely and detect the schedule slips as early as possible.
- **Resource re-allocation:** Both case studies indicate the importance of closely monitoring critical tasks and re-allocating resources for their timely completion, leading to the project's successful completion.
- **Fast-Tracking:** The tasks and dependencies that can be overlapped without compromising quality must be identified to mitigate some of the project schedule delays.
- **Effective communication:** The success of both case studies contributes a significant portion of their achievements to effective, honest, and open communication within the team.
- **Scope Adjustment:** The project scope must be evaluated and adjusted to meet critical deadlines. Postpone non-essential features or functionalities to a later phase to expedite delivery.
- **Regular Status Reviews and Stakeholder Involvement:** Regular status reviews with all the stakeholders i.e. clients, and sponsors help in managing expectations.
- **Buffer Allocation:** Introduce buffers or slack into the project schedule to account for unexpected delays. We can see how buffer allocation played a major role in the recovery of the GTE case study. Allocate additional time for tasks that are critical or have a higher risk of delay.
- **Contingency Planning:** Develop contingency plans for potential disruptions or setbacks. Having predefined strategies in place can expedite response and recovery efforts.
- **Lessons Learned Documentation:** Encourage the documentation of lessons learned from past projects. This institutional knowledge can guide future projects and help in avoiding similar pitfalls.

## 7. Conclusion

The success and failure of a project largely depend on its timely delivery. Therefore, a proactive approach to schedule management is crucial to reduce the risks of schedule slips and enhance successful recovery. By implementing the outlined recommendations, teams can not only recover the schedule from potential setbacks but also prevent future slips, ensuring a more robust and timely delivery of project objectives. Continuous monitoring of the schedule and the critical path, adaptive strategies, risk management, and effective communication serve as the pillars for maintaining project momentum and achieving overall success.

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