

Incremental Model for Developing a Project Management Tool:

Increment 1: Project & Task Basics

Functionalities Added

- Create/edit/delete projects
- Create/edit/delete tasks
- Basic dashboard layout
- Initial database design

Challenges Faced

- Confusion in defining task/project structure
- Basic UI lacked consistency
- Database relationships unclear

Proposed Improvements

- Standardize UI/UX layout
- Redesign clean entity relationships
- Add input validations

Increment 2: User Management & Permissions

Functionalities Added

- User authentication (login/register)
- Role-based access (Admin/Manager/Member)
- Assign tasks to users
- Basic email notifications

Challenges Faced

- Complexity in authorization rules
- Conflicts when multiple users edited same task
- Email notifications causing delays

Proposed Improvements

- Implement JWT-based secure login
- Use optimistic locking for concurrent edits
- Introduce background job scheduler for emails

Increment 3: Tracking & Visualization Tools

Functionalities Added

- Task progress tracking
- Gantt chart for timelines
- Kanban board for workflow
- Activity logs for task updates

Challenges Faced

- Difficulty calculating overall project progress
- Gantt chart performance issues
- Kanban drag-drop inconsistency

Proposed Improvements

- Weighted progress calculation
- Optimize chart rendering with caching
- Upgrade drag-drop library for stability

Increment 4: Collaboration, Reports & Advanced Features

Functionalities Added

- Real-time chat/discussion
- File sharing & document uploads
- Auto-generated project reports
- Analytics (workload, burndown charts)

Challenges Faced

- Real-time communication required WebSockets
- File uploads causing server latency
- Report generation slow for large projects
- Analytics required heavy data processing

Proposed Improvements

- Integrate WebSocket or Firebase for chat
- Use cloud storage for files (S3/Cloud)
- Add pagination & filters before generating reports
- Preprocess analytics data with batching/caching

