

# **Internship Progress Report – 1**

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**Internship Role:** Research Intern

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## 1. Introduction

During this week, the primary focus was on performing a **comprehensive analysis of the Smart Contact Manager codebase** to identify potential **new features, architectural improvements, and optimization opportunities**.

This activity was carried out using **AI-assisted agents**, which explored the entire project structure, including controllers, entities, services, configuration files, and documentation.

The outcome of this work was a **feature improvement roadmap** that outlines short-term enhancements, long-term feature additions, and architectural refinements to improve scalability, usability, security, and maintainability.

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## 2. Objectives

- Perform a full codebase analysis to understand existing functionality and limitations.
  - Identify missing or improvable features relevant to real-world usage.
  - Propose scalable, modular, and secure feature enhancements.
  - Use AI tools to generate structured technical documentation and roadmaps.
  - Translate technical analysis into actionable development plans.
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## 3. Codebase Analysis Performed

The AI agent systematically reviewed:

- Project configuration (`pom.xml`, application properties).
- Core modules including controllers, entities, services, and repositories.
- Existing features such as contact management, authentication, APIs, and file handling.
- Code quality, performance considerations, and architectural patterns.

Based on this analysis, multiple documentation artifacts were generated, including:

- Feature Improvement Roadmap
- Technical Implementation Guide
- Code Quality Audit
- Executive Summary
- Visual and navigational documentation

This ensured both **technical depth** and **high-level clarity**.

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## 4. Proposed New Features and Improvements

### 4.1 User-Facing Feature Enhancements

- **Advanced Contact Search and Filtering** (tags, categories, partial matches).
- **Bulk Operations** such as mass delete, import, and export.
- **Contact Tagging System** for improved organization.
- **Analytics Dashboard** to track contact usage and trends.
- **Enhanced Notifications** via email or in-app alerts.

### 4.2 Security and Access Improvements

- Role-based feature access refinement.
- Optional **multi-factor authentication (MFA)**.
- Improved session handling and audit logging.

### 4.3 Performance and Scalability Enhancements

- Caching frequently accessed contact data.

- Resolving potential N+1 query issues.
- Optimized database indexing strategies.

#### 4.4 Developer Experience Improvements

- Swagger/OpenAPI documentation for REST APIs.
  - Global exception handling and standardized error responses.
  - Improved logging and monitoring integration.
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### 5. AI's Role in Feature Roadmap Generation

AI tools such as GitHub Copilot and ChatGPT were heavily utilized to:

- Automatically explore and understand the entire codebase.
- Identify gaps between current functionality and industry best practices.
- Suggest realistic and scalable features aligned with the existing architecture.
- Generate multiple structured documentation files.
- Provide estimated implementation effort and prioritization guidance.

This allowed rapid generation of **high-quality technical and executive-level insights** with minimal manual overhead.

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### 6. Insights on AI Usage

#### Advantages

- Accelerated understanding of a large and complex codebase.
- Produced well-structured documentation automatically.

- Helped translate low-level code details into high-level product features.
- Improved planning accuracy and prioritization.

## Limitations

- AI suggestions required developer validation for feasibility.
  - Some proposed features needed contextual refinement.
  - Business priorities still require human decision-making.
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## 7. Outcomes & Learning

By the end of this week:

- A **clear, structured roadmap** for future development was established.
- The project gained a vision for scaling beyond basic contact management.
- Documentation quality and project clarity improved significantly.
- Deeper understanding was gained on how **AI can assist in system design and planning**, not just coding.

This phase highlighted AI's effectiveness in **strategic software engineering tasks**, such as planning, auditing, and architectural evolution.

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## 8. Future Work

- Select and implement high-priority roadmap features.
- Integrate roadmap milestones into sprint planning.
- Validate performance improvements through benchmarks.

- Continue using AI tools for architectural reviews and design validation.
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## Conclusion

This week successfully transitioned the project from maintenance and stabilization toward **future-focused growth planning**.

The AI-assisted roadmap generation demonstrated how intelligent tools can meaningfully contribute to **feature ideation, system analysis, and long-term project strategy** when guided by human expertise.