CSE307: System Analysis & Design

Tenant Management: A systematic Design and Machine-Learning Based Predictive Approach

Group 08

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A1: Software Development Methodology

The "Tenant Management: A Systematic Design and Machine-Learning-Based Predictive Approach" project involves designing and implementing a robust information system with predictive analytics features.

Selected Software Development Methodology:

The **Waterfall** model has been selected as the software development methodology for this project. The Waterfall model offers a linear and sequential approach, ensuring a clear and well structured process from project initiation to completion.

The reason we are using waterfall methodology is because-

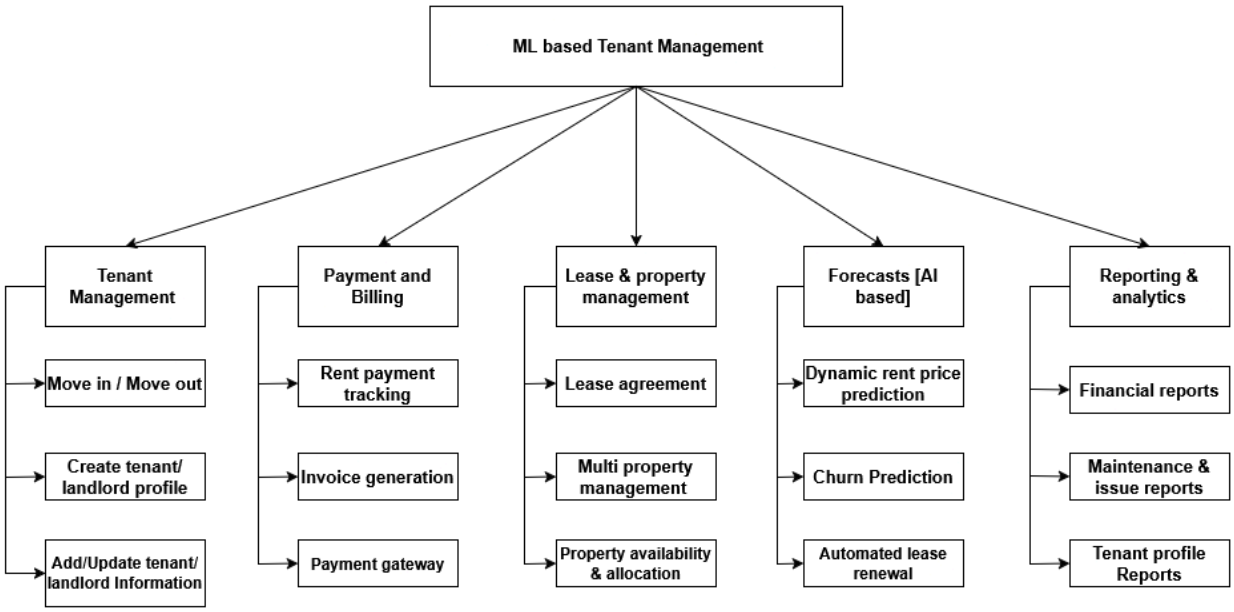
1. **Requirement Analysis and Planning** : The Waterfall model is ideal for this project as it gives well defined requirements and a strong emphasis on documentation. The Waterfall model provides a solid foundation for systematic planning and requirement gathering.
2. **Design, Development, and Testing**: The Waterfall model ensures that each phase is completed before moving on to the next, promoting discipline, timeliness and minimizing risks associated with requirement changes during development. This is particularly useful for this Tenant Management System, where a clear structure and thorough testing of predictive analytics features are needed.
3. **Structured Approach and Risk Managemen**t: The Waterfall model's sequential process allows for early identification and mitigation of risks during the analysis and design phases. It also provides a clear roadmap and timeline, which is advantageous for managing the project's scope and resources effectively.
4. **Predictive Model Implementation**: While the Waterfall model is not typically associated with iterative development, it can still support the integration of a machine learning based predictive approach through dedicated testing and validation phases. By following a structured approach, the project can ensure that the predictive model is thoroughly tested before deployment.

Hence, the Waterfall model offers a structured and disciplined approach, fitting well with the requirements of the "Tenant Management System." It supports the project's goals of achieving a

clear, predictable outcome with well defined stages and milestones, ensuring that all aspects of the system are thoroughly documented, designed, and tested before implementation.

B1. Project Plan & WBS (Work Breakdown Structure)

🗋 File WBS is based on Software Modules.



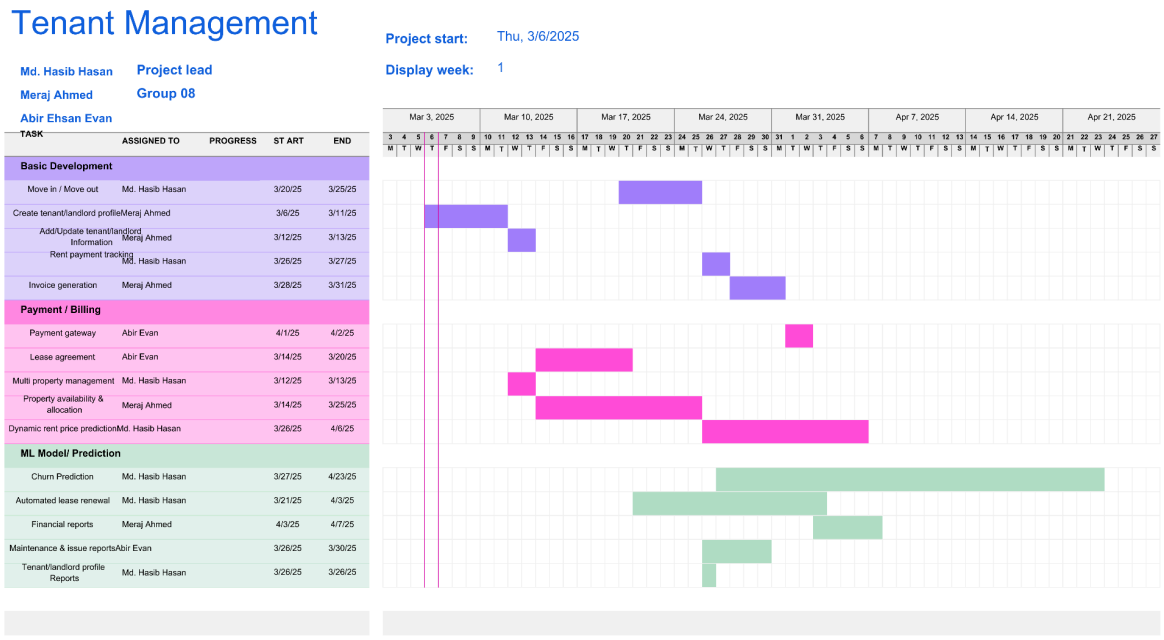
B2. Activity List, Duration, Dependencies & Costing

🗋 File Key Activities with Dependencies & Estimated Duration

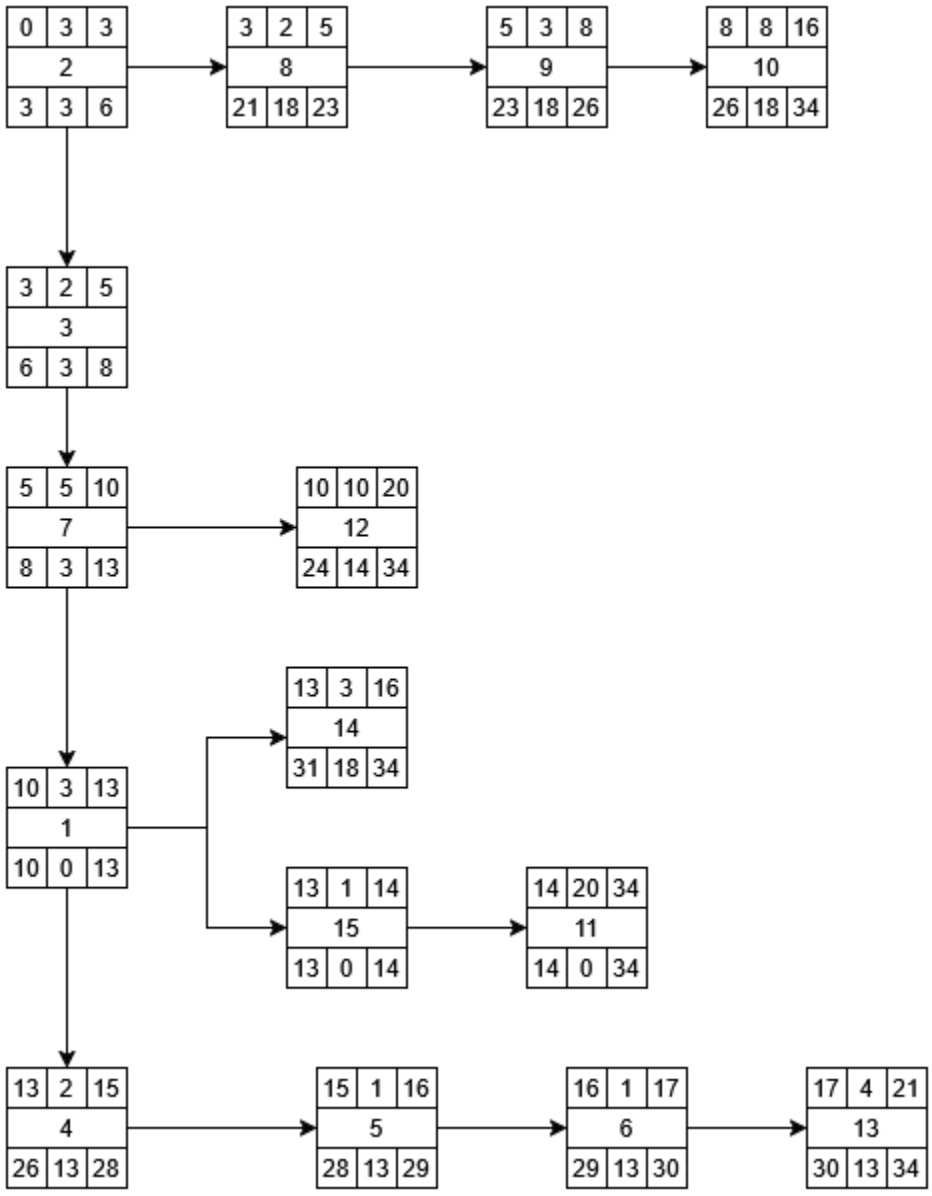
SL	Name of the Activity	Duration (Hours)	Dependencies	Resources	Costing (BDT)
01	Move in / Move out	72	07	Sr. Backend Developer	11835 BDT
02	Create tenant/landlord profile	72		Frontend Developer	8876 BDT
03	Add/Update tenant/landlord Information	48	02	Jr. Frontend Developer & Backend Developer	3945 BDT
04	Rent payment tracking	48	01	System Analyst	9863 BDT
05	Invoice generation	24	04	Jr. Finance Advisor	1578 BDT
06	Payment gateway	24	05	Software APIs	66 BDT
07	Lease agreement	120	03	Law Firm	1643 BDT
08	Multi property management	48	02	System Designer	9863 BDT

09	Property availability & allocation	72	08	Cloud Database	2613 BDT
10	Dynamic rent price prediction	192	09	ML Developer	37873 BDT
11	Churn Prediction	480	15	GPU-Based Cloud Server	23671 BDT
12	Automated lease renewal	240	07	Optimization Engineer	44712 BDT
13	Financial reports	96	06	Sr. Finance Advisor	9468 BDT
14	Maintenance & issue reports	72	01	Jr. Finance Advisor	4734 BDT
15	Tenant/landlord profile Reports	24	01	Cloud Hosting Server	3484 BDT

B3. Gantt Chart



B4. Network Diagram



C. Feasibility Analysis

File **C1. List of Expense Heads**

Expense Head	Estimated Cost (5 years)
Senior Software Developer	7,200,000 BDT
Junior Software Developer	3,600,000 BDT
Cloud Hosting Server	6,360,000 BDT

Cloud Database	1,590,000 BDT
GPU-Based Cloud Server	2,160,000 BDT
Law Firm	600,000 BDT
Senior Finance Advisor	4,320,000 BDT
Optimization Engineer	8,160,000 BDT
ML Developer	8,640,000 BDT
System Designer	9,000,000 BDT
System Analyst	9,000,000 BDT
Software APIs	120,000 BDT

C2. Possible Benefits

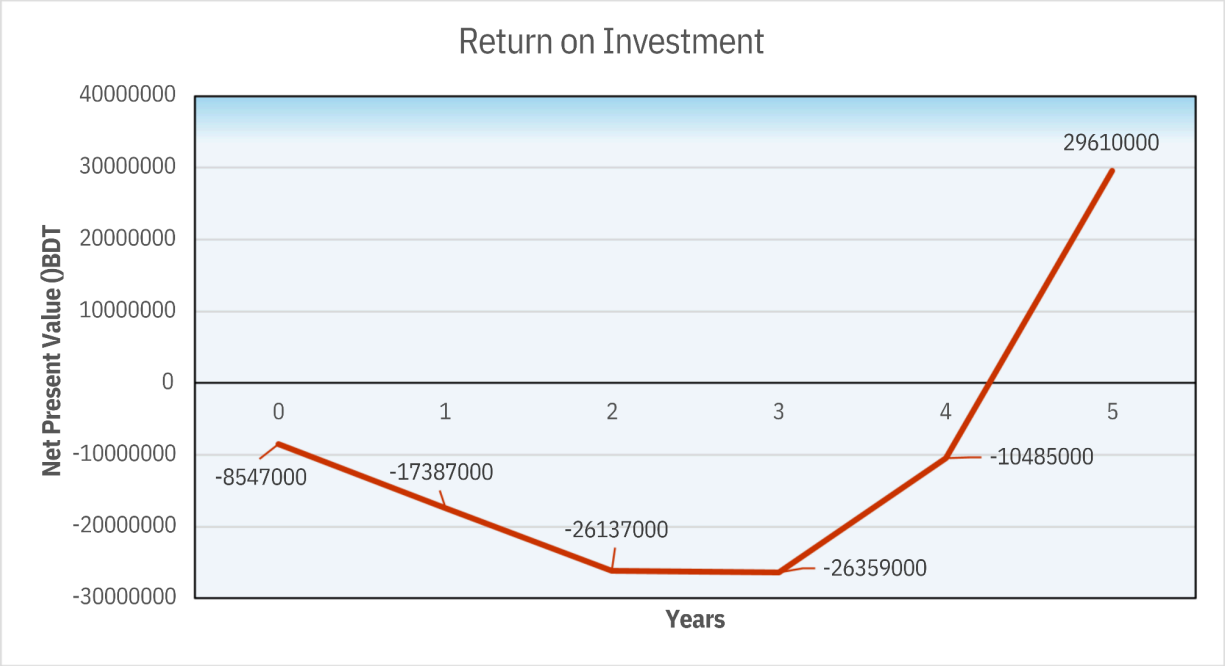
Benefit	Estimated Annual Value
5000 Subscription Based Benefit (Year 0)	50,000 BDT
25000 Subscription Based Benefit (Year 1)	2,50,000 BDT
100000 Subscription Based Benefit (Year 2)	10,00,000 BDT
1000000 Subscription Based Benefit (Year 3)	1,00,00,000 BDT
2500000 Subscription Based Benefit (Year 4)	2,50,00,000 BDT
5000000 Subscription Based Benefit (Year 5)	5,00,00,000 BDT

C3. Net Present Value (NPV) Calculation

SL.		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1	Senior Software Developer	1,200,000 BDT	1,200,000 BDT	1,200,000 BDT	1,200,000 BDT	1,200,000 BDT	1,200,000 BDT
2	Junior Software Developer	600,000 BDT	600,000 BDT	600,000 BDT	600,000 BDT	600,000 BDT	600,000 BDT
3	Cloud Hosting Server	100,000 BDT	500,000 BDT	960,000 BDT	1,200,000 BDT	1,440,000 BDT	1,800,000 BDT
4	Cloud Database	25,000 BDT	50,000 BDT	150,000 BDT	250,000 BDT	450,000 BDT	665,000 BDT
5	GPU-Based Cloud Server	32,000 BDT	100,000 BDT	200,000 BDT	332,000 BDT	596,000 BDT	800,000 BDT

6	Law Firm	100,000 BDT	100,000 BDT	100,000 BDT	100,000 BDT	100,000 BDT	100,000 BDT
7	Senior Finance Advisor	720,000 BDT	720,000 BDT	720,000 BDT	720,000 BDT	720,000 BDT	720,000 BDT
8	Optimization Engineer	1,360,000 BDT	1,360,000 BDT	1,360,000 BDT	1,360,000 BDT	1,360,000 BDT	1,360,000 BDT
9	ML Developer	1,440,000 BDT	1,440,000 BDT	1,440,000 BDT	1,440,000 BDT	1,440,000 BDT	1,440,000 BDT
10	System Designer	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT
11	System Analyst	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT	1,500,000 BDT
12	Software APIs	20,000 BDT	20,000 BDT	20,000 BDT	20,000 BDT	20,000 BDT	20,000 BDT
13	Total Cost	85,97,000 BDT	90,90,000 BDT	97,50,000 BDT	1,02,22,000 BDT	91,26,000 BDT	99,05,000 BDT
14	Cumulative Cost	85,97,000 BDT	1,76,87,000 BDT	2,74,37,000 BDT	3,76,59,000 BDT	4,67,85,000 BDT	5,66,90,000 BDT
15	Subscription Based Benefit	50,000 BDT	250,000 BDT	100,00,000 BDT	1,00,00,000 BDT	2,50,00,000 BDT	5,00,00,000 BDT
16	Total Benefit	50,000 BDT	250,000 BDT	100,00,000 BDT	1,00,00,000 BDT	2,50,00,000 BDT	5,00,00,000 BDT
17	Cumulative Benefit	50,000 BDT	3,00,000 BDT	13,00,000 BDT	1,13,00,000 BDT	3,63,00,000 BDT	8,63,00,000 BDT
18	Net Present Value	-8547000 BDT	-17387000 BDT	-26137000 BDT	-26359000 BDT	-10485000 BDT	29610000 BDT

C4. Return on Investment (ROI) Chart



D1. Suitable Method of Requirement Discovery & Justification

For discovering the requirements of the **Tenant Management System**, a combination of interactive and unobtrusive methods should be used:

1. **Interviews (Interactive method):** Direct communication with landlords, tenants, and property managers to understand their needs.

2. **Joint Application Design (JAD) (Interactive method) :** Collaborative workshops with stakeholders for rapid requirement gathering.

3. **Questionnaires (Interactive method)** : Used to collect structured feedback from a large number of users.

4. **Document Analysis (Unobtrusive methods) :** Reviewing existing lease agreements, rental policies, and tenant records for system requirements.

5. **Observation (STROBE) (Unobtrusive methods) :** Observing how landlords and tenants currently manage rental processes to identify gaps.

Since the system involves multiple stakeholders (landlords, tenants, property managers), interviews, JAD, and questionnaires help gather direct input, while document analysis and observation ensure accuracy in requirements.

D2. Plan for Selected Methods

Phase	Method	Activities	Participants	Expected Output
Requirement Gathering	Interviews	Conduct structured interviews with landlords, tenants, and property managers.	System Analyst, Landlords, Tenants	Key pain points and user needs.
Collaboration	JAD Sessions	Conduct workshops to define system scope and workflows.	Analysts, Developers, Stakeholders	Initial system requirements and UI wireframes.
Data Collection	Questionnaires	Distribute surveys to tenants and landlords on system expectations.	Tenants, Property Owners	Structured input on desired features.
System Review	Document Analysis	Review rental agreements, tenant records, and financial records.	System Analyst, Legal Team	Functional and compliance requirements.

Validation	Observation (STROBE)	Observe how rent collection, maintenance requests, and tenant management are handled.	Analysts, Property Managers	Identify inefficiencies and automation opportunities.

D3. Possible Functional Requirements :

- **User Authentication & Role Management** – Secure login for landlords, tenants, and administrative team.

- **Real-Time Rental Payment & Status Updates** – Digital rent payments with automatic status updates.

- **Tenant Information Management** – Store and manage tenant profiles, rental history, and lease agreements.

- **Property & Lease Management** – Add, update, or remove properties and lease agreements.

- **Maintenance Request System** – Tenants can submit maintenance requests and track their status.

- **Automated Notifications & Alerts** – Reminders for rent due dates, lease expirations, and maintenance updates.

- **Machine Learning Predictions** – Predict rental price trends and tenant churn likelihood.

- **Reporting & Analytics Dashboard** – Generate rent collection reports, occupancy trends, and lease status.

- **Document Storage & Management** – Land/Flat lease agreements, rental receipts, and compliance documents.

- **Multi-Property Support** – Manage multiple rental properties from a single dashboard.

D4. Non-Functional Requirements

- **Security** – The system must use encryption for sensitive tenant and financial data.
- **Scalability** – The system should handle multiple properties and users without performance degradation.
- **Usability** – The interface must be user-friendly for landlords and tenants with minimal training.
- **Availability** – The system should be accessible 24/7 with minimal downtime.
- **Compliance** – Must adhere to data protection laws (e.g., GDPR, CCPA) and rental regulations.