TITLE PAGE

CERTIFICATE FROM THE COMPANY

STUDENT DECLARATION

I hereby declare that this report entitled **"API for Billing System,"** submitted to the Office of the Dean, Faculty of Management, Tribhuvan University, is an original work completed as partial fulfilment of the requirements for the **Bachelor in Information Management** (BIM). This work was done under the supervision of **Mr. Prakash Chandra Prasad**, CEO at Infography Technologies, and **Mr. Ramesh Singh Saud**, IT Director at Nagarjuna College of Information Technology.

Date:

Signature:

Name: Abhishek Chhetri

LETTER OF APPROVAL

CERTIFICATE FROM THE SUPERVISOR

ACKNOWLEDGEMENT

This intern report is prepared in partial fulfilment of the requirements for the degree of **Bachelor of Information Management** (BIM). The satisfaction and success of completing this task would be incomplete without heartfelt thanks to the people whose constant guidance, support, and encouragement made this work successful. I would like to express my sincere gratitude to our Head of the Department and internship supervisor, **Mr. Ramesh Singh Saud**, and all teachers for providing their most valuable time, suggestions, and guidance during the preparation of this report.

Finally, I would like to thank all the other staff members of Infography Technologies Pvt. Ltd., family members, and seniors for their constant encouragement and suggestions throughout the project work and for providing a welcoming atmosphere. They have always been a source of inspiration and motivation for me. Without the help of the individuals mentioned above, I would have faced many difficulties while doing the work.

Lastly, I would like to thank all my teachers and co-workers who directly or indirectly supported me during the internship period.

ABSTRACT

This internship report describes the work done during the internship period at Infography Technologies Pvt. Ltd. This internship report is prepared in partial fulfillment of the requirements for the degree of Bachelor of Information Management (BIM).

This report focuses on building an API for the “Billing System” at Infography Technologies Pvt. Ltd. The main objective was to develop billing system software as a service (SaaS) using Django REST Framework. The API developed serves as the backbone for the billing system, providing functionalities such as invoice generation and user management. Based on specific requirements, clients can interact with the API to perform various billing-related tasks, ensuring efficiency and accuracy in financial transactions. Through this internship, practical skills in software development, particularly in building robust APIs, were gained, contributing to the enhancement of professional competencies in the field of information management.

The API developed for the billing system includes several important features that make it user-friendly. Key concepts such as simple design, data exchange using JSON, and user authentication are central to its function. The clear design allows for easy communication between the client and server, making the system flexible and scalable. JSON is used for straightforward data sharing, helping clients interact easily with the API. Strong user authentication ensures that only authorized users can access important billing information. Overall, these features help improve the system’s functionality and create a better experience for users.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interface
BIM	Bachelor of Information Management
DRF	Django REST Framework
FNCCI	Federation of Nepalese Chambers of Commerce and Industry
ICT	Information and Communication Technology
IoT	Internet of Things
SaaS	Software as a Service
TU	Tribhuvan University

CHAPTER ONE

INTRODUCTION

1.1 Background

This internship report offers an in-depth exploration of the meticulous development process behind a tailored REST API for Infography Technologies Pvt. Ltd. "Billing System." The overarching goal was to create a seamless billing system software as a service (SaaS) using the powerful capabilities of Django REST framework, renowned for its scalability and comprehensive API-building support. This framework allowed for the creation of a robust and flexible billing system that could easily adapt to the evolving needs of the business.

The resulting API serves as the resilient backbone of the billing system, providing essential functionalities such as invoice generation, payment processing, and user management. In today's dynamic business landscape, the billing system plays a crucial role by enabling the systematic recording and processing of financial transactions. Its reliability ensures accuracy in financial operations while offering valuable insights into the organization's overall financial performance. This ensures that all financial activities are recorded accurately and efficiently, contributing to better financial management and decision-making.

Empowered by intuitive interaction with the API, clients can efficiently execute diverse billing-related tasks tailored precisely to their unique requirements. From effortlessly generating invoices to managing user accounts with ease, the API streamlines operations, ensuring both efficiency and accuracy. This enriching internship experience has not only honed practical skills in software development, with a particular emphasis on constructing robust APIs, but has also deepened the understanding of fundamental information management principles. As a result, professional competencies in the field have been refined, laying a solid foundation for future endeavors.

Additionally, the experience provided invaluable insights into the real-world application of theoretical concepts, bridging the gap between academic learning and professional practice. By working closely with industry experts and engaging in hands-on projects, a deeper understanding of the complexities involved in software development and API integration was gained. This practical knowledge not only enhances technical proficiency but also builds confidence in tackling future challenges in the rapidly evolving field of information technology.

1.2 Problem Statement

In previous times, billing systems relied heavily on manual processes, leading to inefficiencies and errors. Tasks such as invoice generation, payment processing, and user management were labour-intensive, often resulting in discrepancies and delays. Moreover, the lack of integration with other systems made it challenging to maintain consistency and scalability as businesses expanded.

Through the adoption of a REST API for the billing system, these challenges were overcome. The REST API facilitated seamless communication between systems, automating tasks and reducing the risk of errors. Invoice generation became automated, triggered by predefined events, while payment processing became faster and more secure. By centralizing management capabilities, the REST API streamlined user account management and enabled real-time access to billing data. Incorporating the billing system as a Software as a Service (SaaS) model provided businesses with scalable, on-demand billing solutions, reducing upfront costs and maintenance efforts. Overall, the implementation of a REST API revolutionized billing processes, enhancing productivity, accuracy, and scalability for business.

1.3 Objectives of the Study:

In response to the challenges posed by manual billing processes, the study aims to leverage modern technology to streamline and optimize billing operations. By implementing a REST API, the study seeks to achieve the following objectives:

- To automate manual billing processes and reduce errors by establishing seamless communication between systems, ensuring accurate and efficient data exchange.
- To enhance efficiency in key areas such as invoice generation, payment processing, and user management through the utilization of the REST API's automation capabilities, thereby improving overall productivity.
- To centralize management functionalities and enable real-time access to billing data, facilitating streamlined user account management and enhancing the scalability of the billing system.

1.4 Scope and Limitations

1.4.1 Scope:

The scope of this study includes addressing inefficiencies in traditional billing systems through the implementation of a REST API. Modernizing billing processes aims to enhance accuracy and efficiency while integrating with existing systems seamlessly.

- Implementing a REST API to automate invoice generation, payment processing, and user management.
- Enhancing scalability and adaptability of the billing system through centralized data management.
- Providing real-time access to billing information for improved decision-making.
- Exploring the potential for the billing system to transition into a Software as a Service (SaaS) model.

1.4.2 Limitations:

Some of the limitations that can be encountered include technical complexities during API integration with legacy systems, potentially requiring significant development and testing efforts.

- Integration challenges with existing IT infrastructure.
- Security concerns related to data privacy and transactional security.
- Adoption barriers among users accustomed to traditional billing methods.
- Dependence on stable internet connectivity for API functionality and user accessibility.

1.5 Methodologies

This section primarily deals with the methodologies employed in the preparation of internship report, focusing on the rationale behind choosing the organization, placement, and study approach.

1.5.1 Selection of the Organization

Selecting the right organization for an internship involves critical factors such as industry reputation and commitment to valuable learning experiences. For my internship, I chose Infography Technologies Pvt. Ltd. in Kupondole, Lalitpur, renowned for innovative software solutions. They assessed a software project I developed, showcasing my capabilities and leading to an internship focused on software development. Infography Technologies Pvt. Ltd. provided a collaborative environment with supportive supervision, ideal for professional growth and hands-on industry experience.

1.5.2 Placement

During my internship at Infography Technologies Pvt. Ltd. in Kupondole, Lalitpur, I focused on API development for the billing system. I was tasked with designing and implementing RESTful APIs for invoice generation, user management, and data retrieval. Throughout this experience, I received comprehensive support from the team, enabling me to make meaningful contributions to the project. This hands-on opportunity not only enhanced my technical skills but also provided valuable insights into the complexities of software development in a professional, SaaS-oriented environment.

1.5.3 Duration

The internship duration spans three months, as stipulated by university requirements, ensuring a minimum of three credit hours. This timeframe is in accordance with the guidelines set by Tribhuvan University (TU), providing students with ample opportunity to gain practical experience and apply classroom knowledge in a professional setting.

Table 1

Internship Duration

Start Date	5th May 2024
End Date	5th August 2024
Total Duration	3 months
Position	Software Developer
Supervisor	Prakash Chandra Prasad

1.5.4 Activities Performed

Table 2

Tasks Assigned

Weeks	Task Assigned
Week 1	Understanding the overall scope of the project, identifying its goals, and reviewing initial project documentation.
Week 2	Familiarizing with the tools and technologies required for the project, such as Django, SQLite (default database), and API development tools.
Week 3	Deciding to use SQLite as the default database for the project, ensuring it meets the needs for local development and testing.
Week 4	Designing and setting up the models required for the project, focusing on data structure and relationships between entities within the SQLite database.
Week 5	Defining the relationships between models, creating entity relationships, and ensuring database integrity using SQLite's capabilities.
Week 6	Gaining a clear understanding of how APIs will be integrated into the project, including endpoints and their functionalities.
Week 7	Developing RESTful APIs, writing code for the various endpoints, and implementing the necessary CRUD operations with SQLite as the database.
Week 8	Testing the APIs created by performing Create, Read, Update, and Delete (CRUD) operations in the SQLite database to ensure they function as intended.
Week 9	Exploring and understanding the Django admin interface for potential customization and ease of project management.
Week 10	Customizing the admin section, adding features like status tracking, user roles, and permission settings to control access, with data stored in SQLite.
Week 11	Implementing Swagger for automatic API documentation, making the API easily understandable and accessible for developers.
Week 12	Finalizing the project, preparing the API for review, and presenting it to the supervisor for feedback.

CHAPTER TWO

INTRODUCTION TO INDUSTRY

2.1 Introduction

The industry, in general terms, refers to the production of goods and services within an economy. It encompasses a wide range of sectors, including manufacturing, construction, mining, and services. Each industry operates within a specific market, governed by supply and demand, regulatory frameworks, and technological advancements. The primary goal of any industry is to generate economic value, create jobs, and contribute to the overall growth and development of a country. Industries vary greatly in their methods of production, scale, and market dynamics, but they all play a crucial role in shaping the economic landscape.

The evolution and growth of civilization have been deeply intertwined with industrial development. From the early days of the agricultural revolution to the industrial revolution in the 18th and 19th centuries, advancements in technology and production methods have driven societal progress. The rise of the Information and Communication Technology (ICT) sector, particularly in the late 20th and early 21st centuries, has revolutionized industries worldwide. Organizations such as the Federation of Nepalese Chambers of Commerce and Industry (FNCCI) have played a significant role in promoting industrial growth and innovation. The ICT sector, in particular, has seen tremendous growth, with advancements in software development, telecommunications, and digital services transforming how industries operate and compete globally.

In recent years, the emergence of technologies like Artificial Intelligence (AI), cloud computing, and the Internet of Things (IoT) has further accelerated industrial transformation. AI is enabling smarter, more efficient decision-making processes, while cloud computing offers scalable and flexible computing resources that enhance operational capabilities. IoT is connecting devices and systems, allowing for real-time data collection and analysis, leading to improved efficiency and innovation across various sectors. These technological advancements are reshaping industries, driving productivity, and opening new avenues for economic growth and development. As industries continue to evolve, staying abreast of these innovations and integrating them effectively will be crucial for sustaining competitiveness and fostering future growth.

2.2 Information Technology Industry in Nepal

The IT industry in Nepal has seen substantial growth and transformation in recent years, becoming a major contributor to economic progress and technological innovation. The National Information and Communications Technology (ICT) Policy 2024 has played a crucial role in this development by enhancing digital infrastructure, supporting entrepreneurship, and promoting ICT education. These initiatives have significantly boosted the IT sector, fostering a surge in start-ups specializing in software development, digital marketing, and mobile applications, which in turn has led to increased employment opportunities and economic growth (Ministry of Communications and Information Technology, 2024).

Organizations like the Federation of Nepalese Chambers of Commerce and Industry (FNCCI) have been pivotal in supporting IT businesses by facilitating networking opportunities, promoting industry best practices, and advocating for favourable regulatory frameworks. Their efforts have not only strengthened local IT capabilities but also encouraged international partnerships and investments. Additionally, the establishment of IT parks and incubation centres has provided start-ups with the necessary infrastructure and support services, creating a thriving environment for innovation and entrepreneurship (Federation of Nepalese Chambers of Commerce and Industry, 2024; Nepal IT Business Association, 2024).

Nepal's IT landscape is rapidly evolving with the integration of emerging technologies such as Artificial Intelligence (AI), cloud computing, and data analytics. These advancements are transforming business operations by improving efficiency, decision-making, and customer experience. The rise of e-commerce platforms and digital payment solutions has further accelerated the digital economy, expanding access to services across the population. To sustain this momentum, ongoing investment in digital infrastructure, continuous skills development, and proactive policy interventions will be essential to harness Nepal's growing potential in the global IT market (Nepal Digital Economy Report, 2024).

2.3 Scope, Opportunities and Threats

2.3.1 Scope

The IT industry in Nepal has expanded its scope significantly, encompassing software development, digital marketing, e-commerce, and more recently, emerging technologies like AI and blockchain. This growth is supported by increasing digital literacy, government initiatives promoting ICT infrastructure, and a rising number of IT start-ups. Nepal's IT sector aims to foster innovation, create employment opportunities, and enhance global competitiveness through continuous technological advancement and digital transformation initiatives.

IT graduates in Nepal can find opportunities across various sectors, including software development firms, IT consulting companies, government agencies focusing on digital services, telecommunications companies, and educational institutions integrating technology in learning environments. Following are the common career paths for IT graduates:

- Software Developer
- Web Developer
- Mobile Application Developer
- Cybersecurity Analyst
- Data Analyst
- Database Administrator
- AI Engineer

2.3.2 Opportunities

The opportunities for IT to grow in Nepal are significant, driven by increasing digitalization across sectors, supportive government policies, and a growing tech-savvy population. The expanding market for IT services, coupled with advancements in infrastructure and connectivity, creates a fertile ground for innovation and entrepreneurship in the following ways:

- Businesses across industries are adopting digital solutions to streamline operations, enhance customer experiences, and gain competitive advantages.
- Policies promoting IT infrastructure development, e-governance, and digital literacy programs foster an environment conducive to IT growth.
- Opportunities abound in AI, machine learning, blockchain, and IoT, as these technologies drive innovation in sectors like healthcare, agriculture, finance, and education.
- The rise of e-commerce platforms and digital marketplaces presents opportunities for IT solutions in logistics, payment gateways, and online retail, catering to a growing consumer base.
- Continued improvements in telecommunications infrastructure, such as 4G expansion and upcoming 5G networks, bolster connectivity and pave the way for IoT applications, smart cities, and digital communication solutions.
- Increasing focus on IT education and skill development programs nurtures a pool of qualified professionals, supporting the industry's demand for skilled manpower and fostering innovation in education technology (EdTech).

2.3.3 Threats

Some of the major challenges and threats faced by the IT sector in Nepal stem from both internal and external factors impacting its growth and sustainability. Some of the major challenges and threats are as follows:

- Inadequate infrastructure, including unreliable electricity supply and limited internet connectivity in rural areas, hinders widespread adoption of digital technologies and IT services.
- Despite advancements in IT education, there remains a gap between industry demands and the skills possessed by graduates. This mismatch challenges the sector's ability to innovate and meet evolving technological needs effectively.
- Complex regulatory environments and bureaucratic hurdles can delay project implementation and investment, discouraging potential investors and hindering the ease of doing business in the IT sector.
- With the increasing digitalization, cybersecurity threats such as data breaches, malware attacks, and phishing scams pose significant risks to businesses and individuals
- Limited access to venture capital and funding opportunities for start-ups and IT firms restricts their growth potential
- Intense competition both domestically and globally challenges local IT companies to differentiate themselves and maintain competitive pricing while delivering high-quality services.
- Rapid technological advancements necessitate continuous upskilling and investment in new technologies. Failing to keep pace with technological trends may render existing solutions obsolete, affecting market relevance and competitiveness.

CHAPTER THREE

INTRODUCTION TO ORGANIZATION

3.1 Introduction

Infography Technologies Pvt. Ltd. is an Information Technology company incorporated on March 28, 2017. The company aims to apply and leverage computing power and Information Technology to solve complex business, social, and economic problems. The company's segments include cognitive solutions, technology services, solutions, and training. Since its establishment, the company has steadily moved forward by applying emerging technologies to various domains and providing unique and cost-effective solutions.

Infography Technologies Pvt. Ltd. is passionate about transforming innovative ideas into reality. As a leading provider of cutting-edge technology solutions, the company specializes in web development, AI-based solutions, data analytics, and more. The focus is on empowering businesses and individuals with the latest technological advancements to help them thrive in today's fast-paced digital world.

3.2 Mission, Goals and Objectives

3.2.1 Mission

Infography Technologies Pvt. Ltd. is dedicated to utilizing technology to address complex challenges in business, society, and the economy. The company's mission revolves around providing innovative and effective technological solutions. The mission of Infography Technologies Pvt. Ltd. includes:

- Delivering high-quality, cost-effective technology solutions.
- Leveraging AI and data analytics to drive business growth.
- Promoting digital literacy and technology adoption.
- Enhancing client satisfaction through customized services.
- Fostering innovation to solve real-world problems.
- Building long-term relationships with clients and stakeholders

3.2.2 Vision

Infography Technologies Pvt. Ltd. envisions becoming a global leader in the IT industry by continuously pushing the boundaries of innovation and technological advancement. The company's vision is to create transformative solutions that not only address current challenges but also anticipate future needs, ensuring sustainable growth and development for clients and communities. By staying at the forefront of emerging technologies, Infography Technologies Pvt. Ltd. aims to set new standards in the industry, inspiring others to follow their lead.

A core aspect of Infography Technologies Pvt. Ltd. vision is to foster a culture of continuous improvement and learning. The company aspires to empower businesses and individuals by providing cutting-edge technology solutions that enhance efficiency, productivity, and competitiveness. Through a commitment to excellence and a customer-centric approach, Inf Infography Technologies Pvt. Ltd. seeks to build a future where technology seamlessly integrates into everyday life, creating opportunities for innovation and success in an increasingly digital world.

3.2.3 Goals

Infography Technologies Pvt. Ltd. has set clear goals to drive its growth and success in the competitive IT industry. These goals are designed to ensure the company remains innovative, customer-focused, and ahead of technological trends. The main goals of Infography Technologies include:

- Leverage emerging technologies to develop unique and cost-effective solutions.
- Increase presence in both domestic and international markets.
- Provide superior service and support to meet client needs effectively.
- Foster a culture of continuous learning and professional growth.
- Collaborate with industry leaders to enhance technological capabilities and offerings.
- Implement eco-friendly and socially responsible initiatives in business operations.

3.3 Organization Structure

The organization structure of Infography Technologies Pvt. Ltd. includes several key roles. The CEO is responsible for overseeing strategic decisions and company-wide management, while the MD handles operational management and project execution. Software Developers are responsible for technical tasks and coding, and Project Team Leads coordinate project activities to ensure timely delivery. The Training role focuses on employee development and skill enhancement, and the Research role drives innovation and explores new technologies. Additionally, Interns play a crucial role in supporting various departments, gaining hands-on experience while contributing to projects under the guidance of senior team members. This setup supports effective leadership, development, project management, and the growth of emerging talent within the organization.

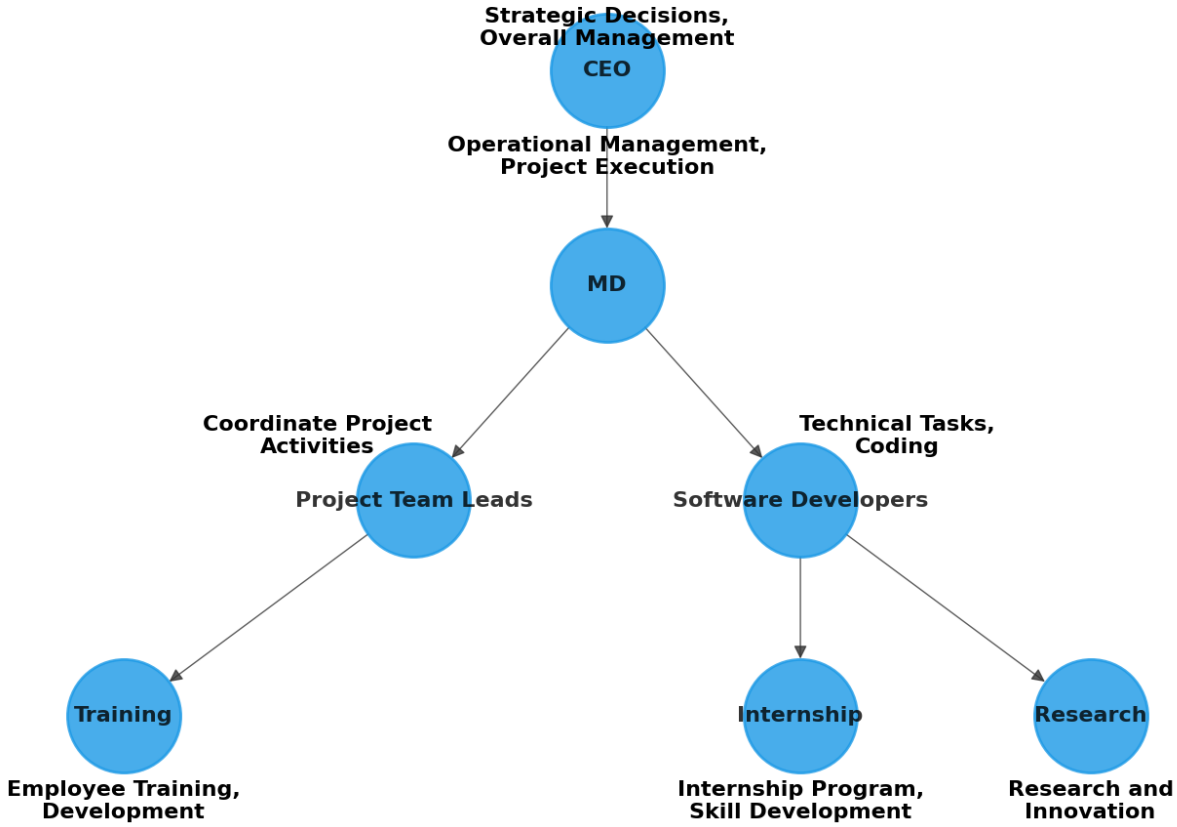

Figure 1 Organizational Structure of Infography Technologies Pvt. Ltd.

3.4 Service Provided by Organization

Infography Technologies Pvt. Ltd. offers a range of comprehensive IT services designed to enhance business efficiency and innovation. Some of the services provided by Infography Technologies Pvt. Ltd. include:

- Web Development
- Web Applications
- Data Analytics
- AI-based Software Solutions
- Professional IT Training

3.5 Opportunities and Threats

3.5.1 Opportunities

Infography Technologies Pvt. Ltd. provides ample opportunities for professional growth and skill development within the company. Employees will have the chance to:

- Advance their technical skills in web development and software engineering.
- Gain expertise in building scalable web applications tailored to diverse business needs.
- Deepen their knowledge of data analytics and extracting actionable insights.
- Innovate with AI-based solutions, contributing to cutting-edge projects.
- Receive comprehensive training in IT methodologies and industry best practices.

3.5.2 Threats

Threats to Infography Technologies Pvt. Ltd. stem from internal and external challenges that impact operational efficiency and growth potential. Some of the threats include:

- Time management issues affecting project deadlines and deliverables.
- Rapid technological advancements requiring constant adaptation and upskilling.
- Cybersecurity risks and data breaches posing threats to client trust and company reputation.
- Talent acquisition and retention challenges in a competitive IT industry.

3.6 Contact Details

Table 3

Contact Details of Organization

Company Name	**Infography Technologies Pvt. Ltd.**
Address	Kupondole-10, Lalitpur, Nepal
Phone Number	9840143772
Email	infographytech9@gmail.com
Website	https://infographytech.com/

CHAPTER FOUR

ANALYSIS OF ACTIVITIES PERFORMED

4.1 Activities Performed

During the three-month internship at Infography Technologies Pvt. Ltd., I gained comprehensive experience in various aspects of software development. I focused on understanding and implementing REST APIs, utilizing SQLite databases for data management, and deploying APIs using Swagger for efficient documentation and testing. I also worked extensively with serializers to handle data conversion and ensure seamless API functionality. The primary project involved providing API as a SaaS for the billing system, enhancing my skills in API design, deployment, and management. This hands-on experience not only solidified my technical expertise but also provided valuable insights into the practical applications of these technologies in a professional environment.

4.2 Requirement Analysis

The requirement analysis encompasses a systematic approach to identify, document, and prioritize the needs and expectations of stakeholders for a software project. This process is pivotal in defining the scope and functionalities of the REST API for their billing system, which include:

- Understanding REST API principles and applying them to billing functionalities.
- Integrating SQLite databases for efficient data management.
- Employing Swagger for API documentation, deployment, and testing.
- Implementing serializers for seamless data conversion.
- Offering the API as a scalable Software as a Service (SaaS) solution.

4.2.1 Functional Requirement

Functional requirements analysis involves systematically defining what the software system must do to meet the needs of its users. This phase ensures that all essential functionalities are identified and prioritized for implementation. For a billing system API, the functional requirements include:

- Companies must be able to register, update their data, and manage associations such as customers and categories.
- Companies can add product categories to organize their offerings effectively.
- Companies can add products under specific categories for clarity and organization.
- Companies must register individuals involved in transactions for accountability and tracking purposes.
- Customers should be able to view their activities, such as purchase history and account details.
- Customers can place orders through the API, facilitating seamless transactions and user interaction.

Use-Case Diagram

According to figure 4.2, the actors are the one who interact with the system and is represented by the stick diagram on the left-hand side of the figure. Oval or Ellipse symbol represent the use-cases which involves the interaction with the system. All the use-cases are enclosed within the system boundary, which is represented by the rectangular box.

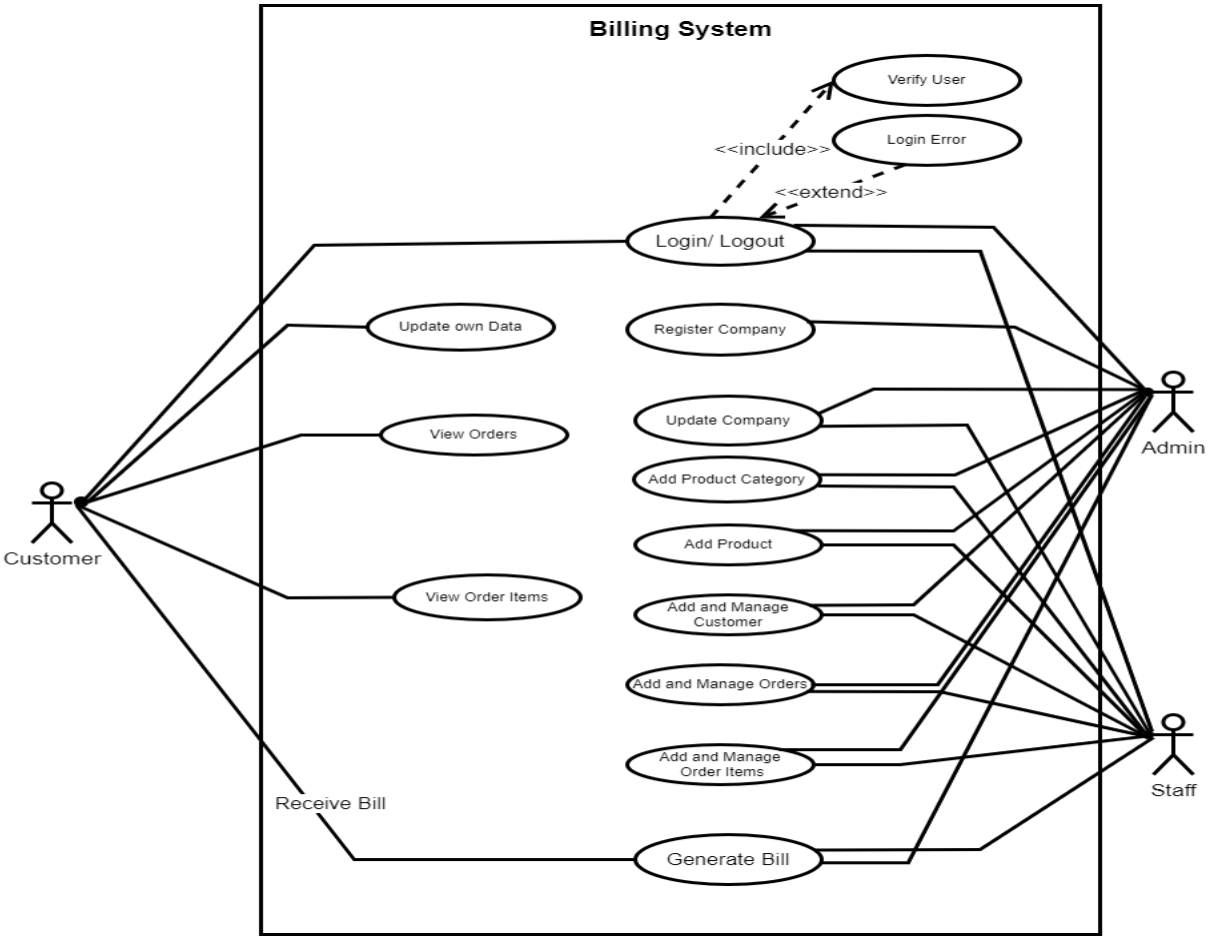

Figure 2 Use Case Diagram of Billing System

Table 4

Use Case Diagram Description

Field	Description
Name	Billing System
Actors	Admin, Staff, Customer
Purpose	Complete system interaction
Overview	This use case diagram shows the entire interaction of primary and secondary actors and the system
Pre-conditions	Actors must be logged in.
Policies	A valid system user is recognized through logging in only.
Post-conditions	Update site database
Priority	High
Frequency	High

4.2.2 Non-functional Requirement

Non-functional requirements specify the operational characteristics and constraints that guide how a software system should perform. These requirements are crucial for ensuring that the system operates effectively in real-world scenarios. For a billing system API, these non-functional requirements focus on aspects such as performance, security, reliability, scalability, and usability:

Performance: The API efficiently handles high transaction volumes with minimal latency by leveraging asynchronous processing and optimizing database queries.

Security: Data confidentiality and integrity are ensured through encrypted communication (HTTPS), role-based access control (RBAC), and token-based authentication, mitigating unauthorized access risks.

Reliability: The API achieves high availability through load balancing across multiple servers and implementing fault-tolerant architecture to minimize downtime during updates or maintenance.

Scalability: The API supports horizontal scaling by allowing deployment on multiple servers, where resources can be dynamically allocated based on demand spikes. This ensures the system can handle increased loads without sacrificing performance.

Usability: Clear and concise API documentation is provided using tools like Swagger UI, ensuring developers can easily understand and integrate the API into their applications. Additionally, consistent API design patterns and error handling mechanisms enhance usability.

4.2.3 Software Requirement

In software requirements, it's essential to define the environment and tools necessary for building and deploying the API. Django, as the framework of choice, aligns with the following specifications:

OS Server: Compatible with macOS and Windows environments for development and deployment.

Database Server: SQLite is used for data storage and management due to its lightweight nature and ease of integration with Django ORM.

Clients: The API should be accessible and functional across web browsers such as Google Chrome and Mozilla Firefox.

Software: Django, leveraging its REST framework, fulfils the requirements for developing scalable and efficient APIs, ensuring compatibility and flexibility in software development.

4.3 Feasibility Study

Before embarking on the development of an API for a billing system, it is crucial to conduct a feasibility study. This study evaluates various aspects to determine if the project is technically feasible, operationally viable, and economically sound.

- **Technical Feasibility:** The API will leverage Django's robust framework, known for its scalability and extensive libraries, ensuring efficient development and integration of billing functionalities. Utilizing SQLite as the database server supports complex data management and retrieval, crucial for handling transactional data securely and reliably.
- **Operational Feasibility:** The API's design will prioritize user-friendly interfaces and clear documentation, facilitating seamless integration with existing systems and minimal disruption to operational workflows. Continuous testing and deployment through tools like Swagger ensure reliability and performance under varying operational conditions, enhancing overall system usability and adoption.
- **Economic Feasibility:** Cost-effectiveness is achieved through open-source technologies like Django and SQLite, minimizing licensing expenses while maximizing scalability and performance. The API's implementation as a Software as a Service (SaaS) model offers scalable solutions to businesses, reducing upfront costs and aligning expenses with usage, thereby enhancing economic viability and sustainability.

4.4 System Design

The system design consists of all the models such as sequence diagram, activity diagram, and class diagram which collectively aid in analysing the overall functionality of the proposed system. The analysis is accomplished through the scenarios presented in the activity diagram, sequence diagram, and class diagram.

4.4.1 Sequence Diagram

In the below figure 4.3, the actors and objects are placed on the top of the figure in a rectangular box. The dotted vertical line shows the lifeline of actors and objects. The pointed thick arrow shows the message and the dotted arrow shows the response of the message. The ALT represents the alternatives i.e. used for checking the conditions. The cross at the bottom indicates the end of the action.

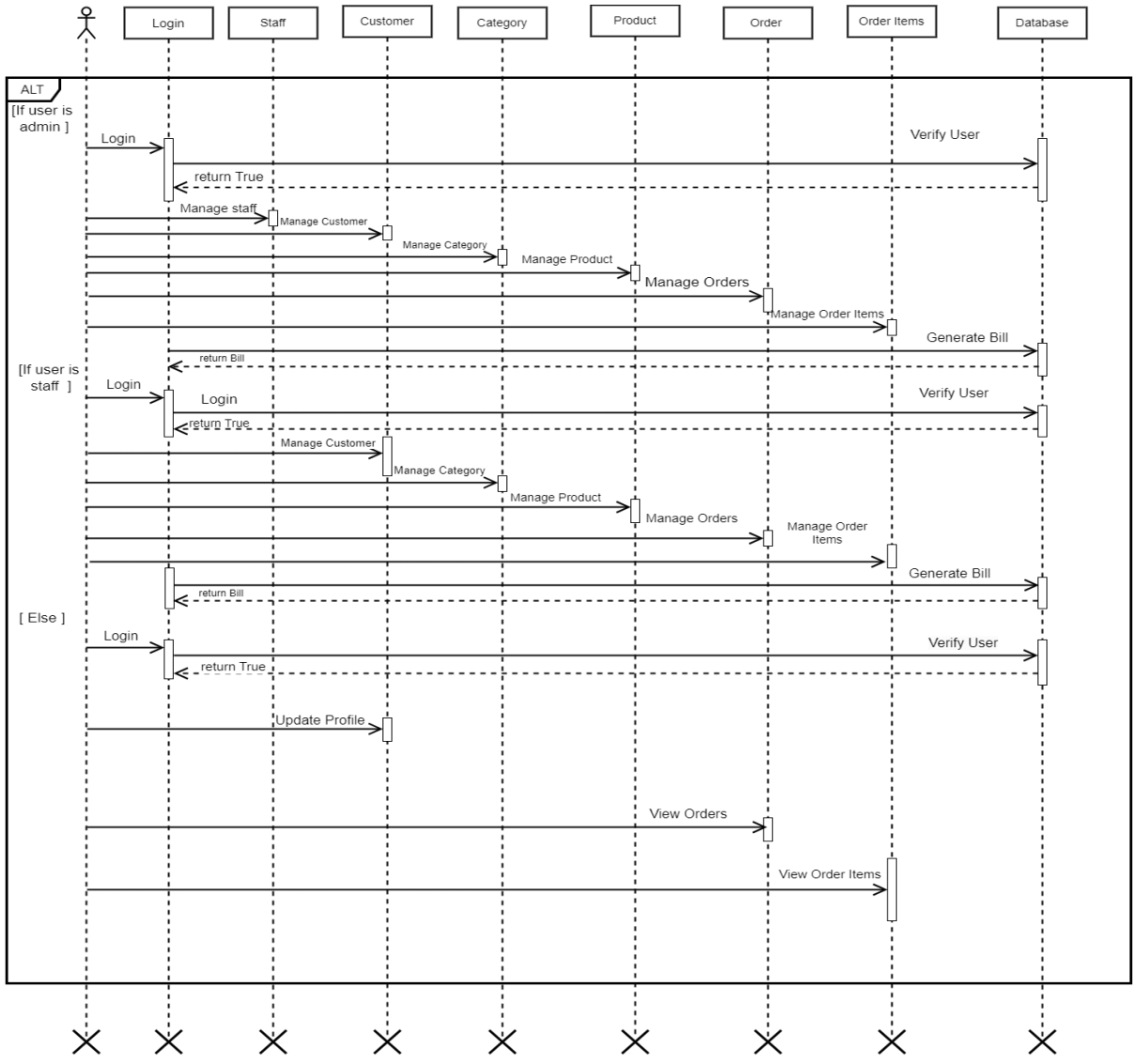

Figure 3 Sequence Diagram of Billing System

4.4.2 Activity Diagram

The figure 4.4, 4.5. and 4.6, shows the activity diagram, the process begins with admin, staff and customer logging into the system. Once logged in, the system checks their credentials for authentication and authorization to ensure that they have the appropriate privileges. If successfully authenticated and authorized, users can engage in various activities based on their roles and permissions granted by admin.

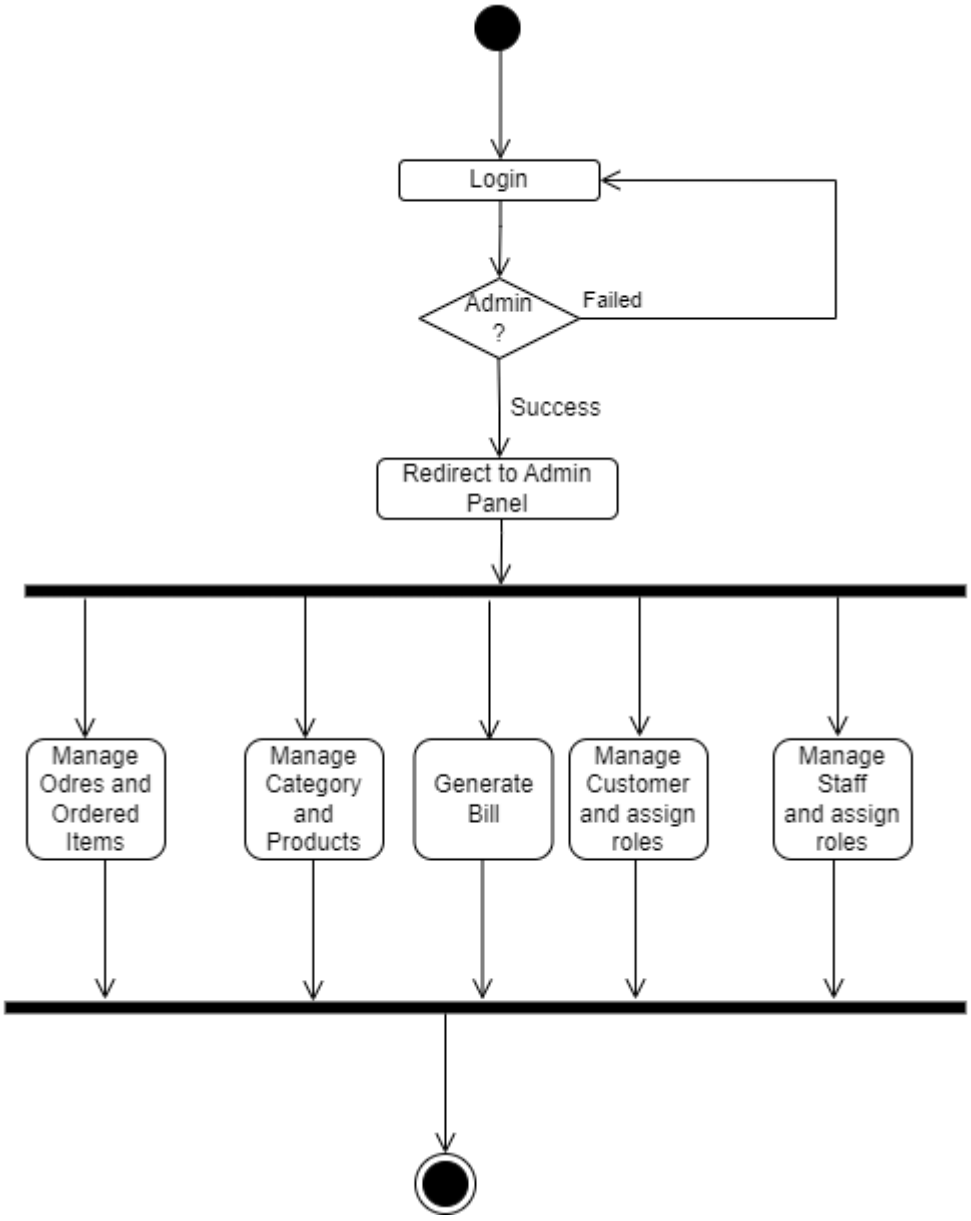

Figure 4 Activity Diagram of Admin

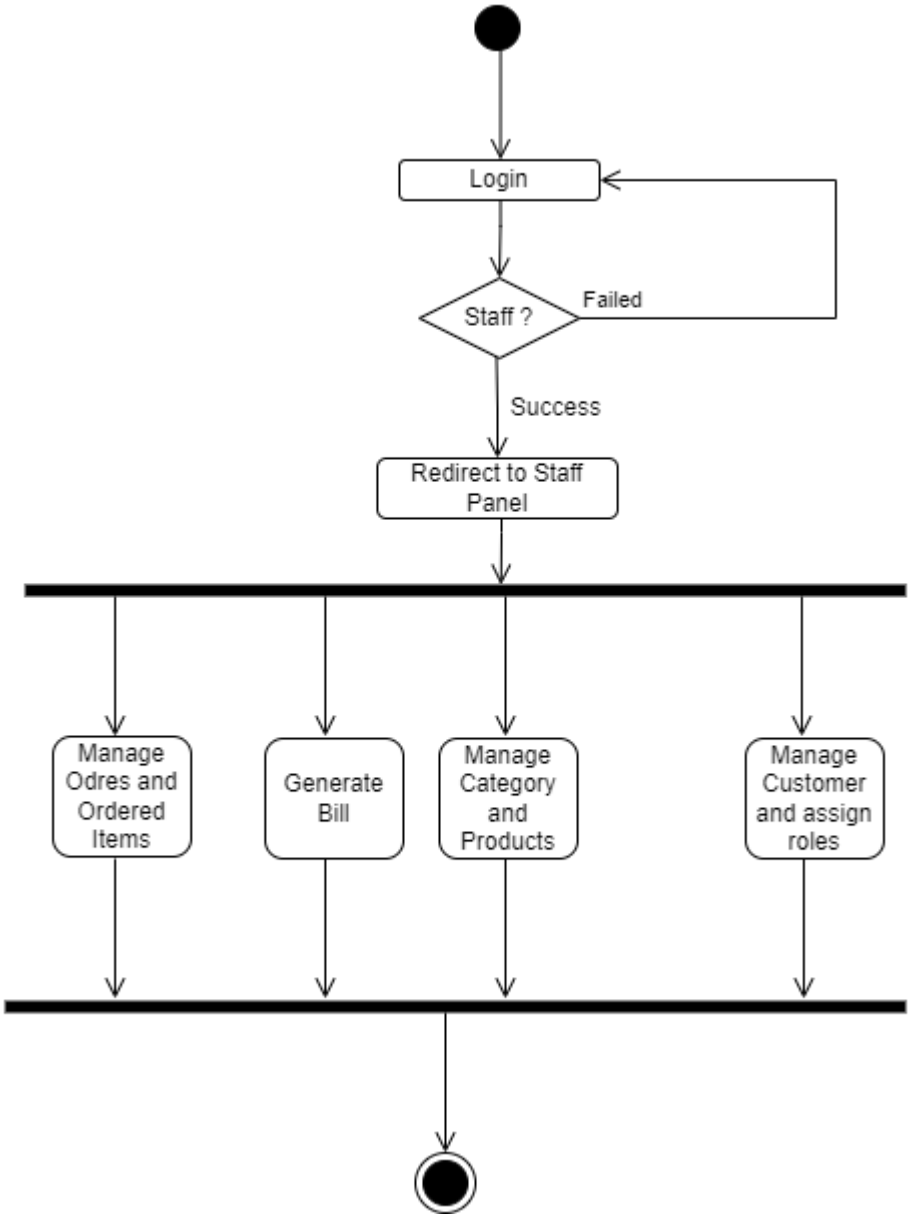

Figure 5 Activity Diagram of Staff

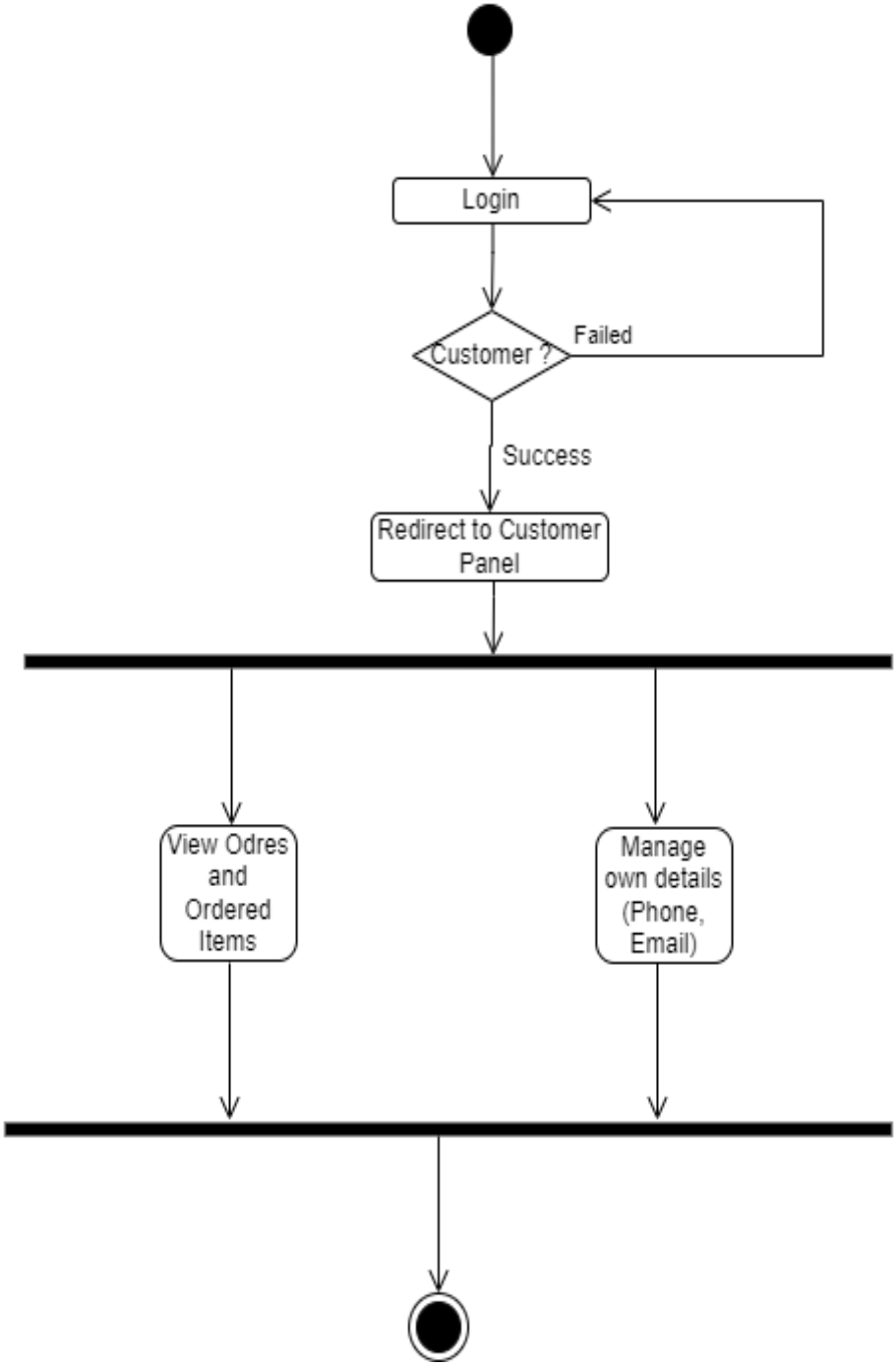

Figure 6 Activity Diagram of Customer

4.4.3 Class Diagram

The figure 4.7, shows the class diagram of "Billing System". The rectangular box represents the classes i.e. Company, Customer and so on. The line between class shows the relationship between each other. Each classes have their own primary key i.e. Company Type class has Code as primary key, Company class has ID as well as each class has its own methods such as Company class has get (), post () etc. The access modifier (-) represents private whereas access modifier with (+) represents public.

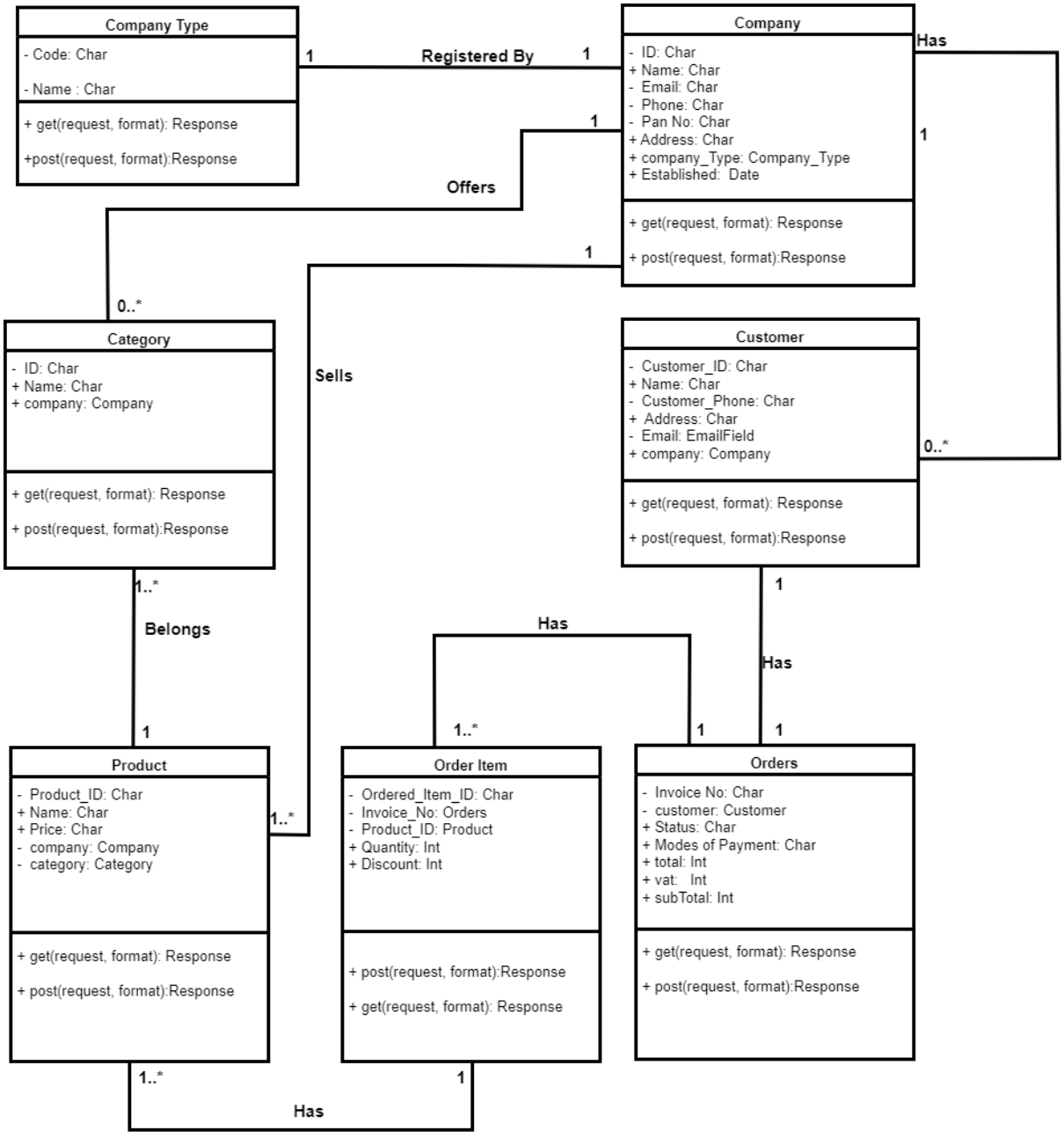

Figure 7 Class Diagram of Billing System

4.5 Database Design

A database is essential for any software because it provides a structured mechanism to store, manage, and retrieve data efficiently. It allows applications to store large amounts of information in an organized manner, ensuring data consistency, integrity, and security. Database design for a billing system API, using SQLite, involves structuring and organizing data to ensure efficient storage, retrieval, and management of information. Some of the key overview considered ensuring database design are as follows:

- **Entity-Relationship Modeling:** Entities like customers, products, and transactions are defined, along with their relationships (e.g., one-to-many, many-to-many). This modelling ensures the database schema reflects real-world interactions and data dependencies.
- **Normalization:** Data is organized into tables and normalized to minimize redundancy and dependency issues. This improves data integrity and reduces storage space, ensuring efficient updates and queries.
- **Indexing:** Indexes are created on frequently queried columns to speed up data retrieval. This optimization technique enhances query performance by allowing the database engine to locate data quickly.
- **Data Integrity:** Constraints such as unique constraints and foreign key constraints are enforced to maintain data consistency and accuracy. Validation rules ensure that only valid data can be entered into the database.
- **Scalability Considerations:** The database design supports scalability by employing techniques like partitioning to distribute data across multiple servers. This approach improves performance and accommodates increasing data volumes and user traffic.
- **Security Measures:** Database security measures, including access controls, data encryption, and regular backups, are implemented to protect sensitive information from unauthorized access, ensuring data confidentiality and integrity.

4.6 System Development

After completing the system design phase, development begins by implementing planned functionalities and features. This documentation focuses on building APIs using Django rest_framework, detailing API endpoints, data models, serializers, authentication methods, and technical specifications crucial for efficient billing system implementation. This approach ensures the effective translation of design requirements into a functional API that closely aligns with system capabilities and user needs.

4.6.1 Tools and Technique Used

In system development, leveraging appropriate tools and techniques is essential to effectively build and deploy software solutions. Each tool serves a specific purpose in enhancing development efficiency and ensuring the system meets its requirements.

- **Django:**

  In building APIs, Django is used as a backend framework for its robustness in handling web development tasks, including URL routing, database management (via ORM), and templating. It facilitates rapid development and scalability of web applications.

- **DB SQLite:**

  SQLite is utilized as the database management system (DBMS) for storing and managing structured data. It supports simple queries and provides lightweight data storage, making it suitable for small to medium-sized applications in the billing system. SQLite is easy to set up and does not require a separate server, which simplifies the deployment process while still ensuring data integrity and reliability.

- **Django REST Framework (DRF):**

  DRF is employed for building APIs in Django applications. It provides powerful tools and libraries for serializing data, handling authentication, and creating API endpoints. DRF simplifies the development of RESTful APIs by providing reusable components and enforcing best practices.

- **Swagger/OpenAPI:**

Swagger or OpenAPI specifications are used for API documentation, describing endpoints, request/response formats, authentication methods, and other technical details. It ensures clear communication and integration between different components of the billing system.

- **Git/GitHub:**

Git version control and GitHub repository hosting are used for collaborative development, version tracking, and code management. They enable team members to work concurrently, manage changes, and ensure code integrity throughout the development lifecycle.

- **VS Code:**

Integrated Development Environments (IDEs) like VS Code provide comprehensive tools for writing, debugging, and testing Python code. They enhance developer productivity by offering features such as code completion, debugging tools, and version control integration.

4.6.2 Module Description

Effective billing systems rely on well-defined modules to organize and manage various aspects of business operations and customer interactions. These modules play a crucial role in ensuring efficient data management and transaction processing within the system. Some of the modules that plays a crucial role in billing system are as follows:

- **Company Module:**

  This module deals with managing different types of companies registered in the system, including their details and categorization based on company types. It facilitates organization-specific functionalities and permissions within the billing system.

- **Product Module:**

  The Product module focuses on categorizing and managing various products offered by companies. It includes functionalities for adding new product categories, managing product details, pricing, and inventory information, ensuring effective product catalog management.

- **Customer Module:**

  The Customer module encompasses functionalities related to managing customer information, including registration, profile management, and transaction history. It enables personalized customer interactions and facilitates order placement and tracking within the billing system.

- **Transaction Module:**

  The Transaction module is responsible for recording and managing financial transactions within the billing system. It includes functionalities for processing payments, generating invoices, tracking transaction status, and maintaining transaction history for audit and reporting purposes.

- **Order Module:**

  The Order module focuses on handling customer orders placed through the billing system. It includes functionalities for creating, updating, and tracking orders, managing order items, handling order cancellations or modifications, and ensuring seamless order fulfilment processes.

4.7 System Testing

System testing involves ensuring that the developed software meets specified requirements and functions correctly within its intended environment. It aims to identify defects or inconsistencies that could impact system performance or user experience before deployment.

The components of System Testing are:

4.7.1 Test Data:

Test data includes sets of inputs, preconditions, and expected outcomes used to validate the functionality of the system. It aims to cover various scenarios and edge cases to ensure comprehensive testing.

4.7.2 Test Case

Test cases are specific conditions or scenarios under which a tester determines whether a system satisfies requirements and works correctly. Each test case outlines steps, inputs, and expected results, serving as a blueprint for executing tests systematically.

4.7.3 Test Result

After executing test cases with specified test data, testers collect and analyse results to verify if the system behaves as expected. Test results document actual outcomes compared to expected outcomes, identifying discrepancies or defects that need resolution.

Table 5

Test Specification for Login

Module Name	Login Test
Test Case Overview	• Admin should be logged in to the dashboard • Staff should be logged in to their dashboard • Customer should be logged in to their dashboard
Test Data	Email: admin@mail.com Password: admin@123 Email: staff@mail.com Password: staff@123 Email: customer@mail.com Password: customer@123
Test Result	Success Success

Table 6

Test Specification for Registering Company

Module Name	Add Company
Test Case Overview	New Company is registered to the database successfully.
Test Data	Fill out all the required fields with valid data and submit the form.
Test Result	Success

Table 7

Test Specification for Adding Product Category

Module Name	Add Category
Test Case Overview	New Product Category is added to the database
Test Data	Fill out all the required fields with valid data and submit the form.
Test Result	Success

Table 8

Test Specification for Adding Product

Module Name	Add Product
Test Case Overview	New Product is added to the database
Test Data	Fill out all the required fields with valid data and submit the form.
Test Result	Success

Table 9

Test Specification for Adding Order

Module Name	Add Order
Test Case Overview	New Order is added to the database
Test Data	Fill out all the required fields with valid data and submit the form.
Test Result	Success

Table 10

Test Specification for Adding Ordered Product

Module Name	Add Ordered Product
Test Case Overview	Product is added to the customer's order
Test Data	Customer provides list of products and staff adds product to ordered product
Test Result	Success

CHAPTER FIVE

CONCLUSION AND LESSON LEARNED

5.1 Conclusion

This report summarizes the comprehensive process involved in developing a billing system API, detailing stages from requirement analysis and system design to implementation and testing. The tools and methodologies utilized, such as Django, SQLite, and RESTful APIs, are outlined, with a focus on the importance of well-structured database design and clear module definitions. The documentation emphasizes non-functional requirements, including performance, security, reliability, scalability, and usability, to ensure a robust and efficient system. Overall, a methodical approach to software development is illustrated, demonstrating how careful planning and execution result in an API that meets business needs and user expectations while maintaining high standards of quality and performance.

During the internship at Infography Technologies Pvt. Ltd., the focus was on building and refining the billing system API, providing hands-on experience in API development and system integration. Responsibilities included designing and implementing RESTful APIs, managing databases, and ensuring secure and efficient data transactions. This practical exposure facilitated the application of academic knowledge to real-world scenarios, enhancing technical skills and understanding of professional software development. The supportive environment and collaborative teamwork at Infography Technologies Pvt. Ltd. contributed to aligning technical solutions with business requirements, preparing for future industry challenges. Additionally, adaptability to new technologies and methodologies was developed, which is crucial in the ever-evolving tech landscape. This internship experience has been invaluable in bridging the gap between academic learning and practical application, providing a solid foundation for a future career in software development.

5.2 Lesson Learnt

During the internship period, it was recognized that continuous learning is essential in the ever-evolving field of technology. Adapting to new technologies and embracing changes broadened the skill set and deepened the understanding of software development. This experience reinforced the importance of being proactive in seeking knowledge and staying updated with industry trends. Some of the key lessons learned during this internship are highlighted as follows:

- Collaboration with teams was emphasized, leading to improved communication skills and a deeper appreciation for the value of teamwork.
- Insight was gained into the management and execution of real-world projects, providing a practical understanding of industry practices.
- The importance of responsibility and accountability was underscored, as tasks were approached with ownership and diligence.
- The ability to quickly adapt to new technologies and methodologies was developed, showcasing flexibility in a dynamic environment.
- The necessity of continuous improvement was recognized, highlighting the importance of ongoing learning to stay competitive in the tech industry.

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APPENDIX