

”Heaven’s Light is Our Guide”



**Department of Computer Science & Engineering
Rajshahi University of Engineering & Technology**

System Analysis of Tech Rajshahi Ltd.

Course Code: CSE 4110

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Design Sessional**

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List of Figures

1	Tech Rajshahi Logo	7
2	Leadership Structure of Tech Rajshahi Ltd.	9
3	Tech Rajshahi Website	20
4	Tech Rajshahi Contact Information	20
5	On-site Observation	21
6	Md. Shahinur Rahman – Business Development Manager	22
7	Employee satisfaction levels with current roles at Tech Rajshahi	25
8	Employee ratings of the overall work environment	25
9	Employee perceptions of professional growth opportunities	26
10	Employee assessment of work-life balance	26
11	Perceived level of management support for professional goals	27
12	Employee alignment with Tech Rajshahi's vision and mission	27
13	Employee feedback on inter-departmental collaboration	28
14	Employee evaluation of workplace tools and resources	28
15	Employee satisfaction with recognition and rewards system	29
16	Employee involvement in stages of the system development life cycle	29
17	Effectiveness of training programs for employee skill enhancement	30
18	Suggested areas for personal and organizational improvement	30
19	Employee willingness to recommend Tech Rajshahi as a workplace	31
20	Context Diagram of Tech Rajshahi's Project Management System	33
21	Level 1 DFD – Project Management Workflow for Tech Rajshahi	34
22	Level 2 DFD – Process 1.0: Process of Sourcing	34
23	Level 2 DFD – Process 2.0: Skill Matching to the Project	35
24	Level 2 DFD – Process 3.0: Training Employee for the Project	35
25	Level 2 DFD – Process 4.0: Assigning and Scheduling Tasks	36
26	Level 2 DFD – Process 5.0: Checking for Completion of Project	36
27	Level 2 DFD – Process 6.0: Handing Over the Project	37
28	Decision Tree for Tech Rajshahi	42
29	Decision Table for Tech Rajshahi	43
30	DFD for Candidate System 1	46
31	DFD for Candidate System 2	47
32	System Architecture for AI-Powered Project Management and Automation	64
33	Database Schema Design for Tech Rajshahi's System	65
34	Structure Chart of the Proposed System	67

List of Tables

1	Data Elements – page 1 of 2	38
2	Data Elements – page 2 of 2	39
3	Data Stores	39
4	Data Flows	40
5	Data Structures	41
6	Characteristics of Candidate Systems	48
7	Qualitative Evaluation Matrix	48
8	Performance/Cost Evaluation Matrix	48
9	Project Cost Estimates	49
10	Weighted Candidate Evaluation Matrix	49
11	Cost Breakdown for Candidate System 1	52
12	Cost Breakdown for Candidate System 2	52
13	Comparative Cost–Benefit Summary of Candidate Systems	55
14	Technology Stack for Tech Rajshahi’s System	63

Table of Contents

1 Chapter 1: Introduction to Systems	6
1.1 Introduction	6
1.2 What is a System?	6
1.3 Tech Rajshahi Ltd.	6
1.4 Services Provided by Tech Rajshahi Ltd.	7
1.5 Mission, Vision and Values	8
1.5.1 Mission	8
1.5.2 Vision	8
1.5.3 Core Values and Principles	8
1.6 Qualities Defining Tech Rajshahi Ltd.	8
1.7 Leadership Structure	8
1.8 Work Showcase	10
1.9 Clients and Success Stories	10
1.9.1 Developed Applications & Websites - Detailed Portfolio	10
1.10 Conclusion:	13
2 Chapter 2: Initial Feasibility Analysis	14
2.1 Introduction	14
2.2 Problem Analysis	14
2.3 Problem Statements	14
2.3.1 Talent Retention	14
2.3.2 Lack of E-commerce Knowledge in Interested People	15
2.3.3 Challenges in Achieving Profitability	16
2.3.4 Facing Challenges to Attain Client's Satisfaction	16
2.4 Conclusion	17
3 Chapter 3: Information Gathering	18
3.1 Introduction	18
3.2 Information Gathering	18
3.3 Information Gathering Tools	19
3.4 Review of Literature, Procedures, and Forms	19
3.5 On-site Observation	21
3.6 Interviews	22
3.7 Questionnaire	25
3.8 Conclusion	31
4 Chapter 4: Structured Analysis	32
4.1 Introduction	32
4.2 Data Flow Diagram (DFD)	32
4.2.1 Introduction	32
4.2.2 Overview of the Present System	32
4.2.3 Context Diagram	33
4.2.4 Level 1 DFD	33
4.3 Data Dictionary	37
4.3.1 Data Elements	38

4.3.2	Data Stores	39
4.3.3	Data Flows	40
4.3.4	Data Structures	41
4.4	Decision Tree	41
4.5	Decision Table	42
4.6	Conclusion	43
5	Chapter 5: Feasibility Study	44
5.1	Introduction	44
5.2	Feasibility Considerations	44
5.2.1	Economic Feasibility	44
5.2.2	Technical Feasibility	44
5.2.3	Operational Feasibility	44
5.3	Steps of Feasibility Analysis	44
5.4	Initial Feasibility Study	45
5.4.1	Existing System Constraints	45
5.4.2	Proposed System Goals	45
5.5	Feasibility Analysis Steps	46
5.5.1	Characteristics of Candidate Systems	48
5.5.2	Candidate Qualitative Evaluation Matrix	48
5.5.3	Performance/Cost Evaluation Matrix	48
5.5.4	Project Cost Estimates	49
5.5.5	Weighted Candidate Evaluation Matrix	49
5.6	Feasibility Report	50
5.7	Conclusion	50
6	Chapter 6: Cost–Benefit Analysis	51
6.1	Introduction	51
6.2	Objectives of Cost–Benefit Analysis	51
6.3	Types of Costs and Benefits	51
6.3.1	Costs	51
6.3.2	Benefits	51
6.4	Cost Estimation (in BDT)	52
6.5	Benefit Estimation (in BDT)	53
6.6	Financial Metrics Formulas	54
6.7	Comparative Cost–Benefit Summary	55
6.8	Interpretation and Analysis	55
6.9	Recommendation	56
6.10	Conclusion	56
7	Chapter 7: System Design	57
7.1	Introduction	57
7.2	Objectives of System Design	57
7.3	Types of System Design	57
7.3.1	Logical Design	57
7.3.2	Physical Design	57
7.4	Stages of System Design	58
7.4.1	Stage 1: Requirement Review	58
7.4.2	Stage 2: Architectural Design	58

7.4.3	Stage 3: Database Design	58
7.4.4	Stage 4: Interface Design	58
7.4.5	Stage 5: Security and Control Design	58
7.4.6	Stage 6: Design Verification	58
7.5	Design Methodology	58
7.6	Logical Design for Tech Rajshahi	59
7.6.1	Process Design	59
7.6.2	Data Design	59
7.6.3	Interface Design	60
7.6.4	Security Design	60
7.7	Physical Design for Tech Rajshahi	61
7.7.1	Hardware and Network Setup	61
7.7.2	Database Implementation	62
7.7.3	Software and Technology Stack	62
7.7.4	Deployment Environment	63
7.8	System Architecture Diagram	63
7.9	Database Schema Design	64
7.10	Input/Output Design	65
7.10.1	Input Design	65
7.10.2	Output Design	66
7.11	Structure Chart	67
7.12	Coupling and Cohesion	67
7.12.1	Coupling	67
7.12.2	Cohesion	68
7.13	Design Verification and User Review	68
7.14	Design Deliverables	69
7.15	Conclusion	69

1

Chapter 1: Introduction to Systems

1.1. Introduction

In the rapidly evolving digital landscape, technology companies serve as catalysts for innovation, designing and delivering transformative products and services that reshape how businesses operate and how people interact with the world. These organizations specialize in diverse areas including software development, hardware solutions, telecommunications infrastructure, and comprehensive IT services, driving revolutionary advancements in artificial intelligence, cloud computing, cybersecurity, and digital transformation.

Tech Rajshahi Ltd. stands as a testament to this technological revolution, proudly positioned as the No. 1 technology company in Northern Bangladesh. Since its establishment, the company has become synonymous with cutting-edge innovation and excellence in the IT industry. Located strategically at the 4th Floor, Sheikh Kamal IT Training and Incubation Center, Bangabandhu Sheikh Mujib Hi-Tech Park in Rajshahi, Tech Rajshahi has carved a distinctive niche in delivering world-class, future-ready solutions.

The company's journey reflects a commitment to quality business solutions, where innovation meets execution. Tech Rajshahi's futuristic work capability has empowered numerous businesses to accelerate their growth trajectories, establishing the company as a trusted technology partner across multiple sectors including healthcare, education, e-commerce, and enterprise solutions. Their comprehensive service portfolio encompasses software development, e-commerce management, Amazon marketplace solutions, digital marketing, mobile application development, and professional website development—all underpinned by modern approaches and industry best practices.

1.2. What is a System?

In today's interconnected world, systems are fundamental building blocks that shape how we work, communicate, and solve problems. A *system* can be understood as an organized collection of interrelated components that work together toward achieving a common goal or purpose. These components take inputs from their environment, process them through various operations, and produce meaningful outputs. Systems are everywhere around us—from the smartphone in our pocket to the complex networks that power the internet. In the business world, organizations rely on various systems to manage their operations, serve customers, and drive growth. This report focuses on Tech Rajshahi Ltd., demonstrating how a well-designed system can transform business ideas into successful digital solutions.

1.3. Tech Rajshahi Ltd.

Tech Rajshahi Ltd. has been a prominent player in the technology industry for over five years, spearheading digital transformation for software and hardware companies alike. Their expertise spans launching market-leading digital products, platforms, and experiences that not only meet current demands but also anticipate future needs. Based in Rajshahi, this company has become synonymous with cutting-edge digital transforma-

tion, pushing the boundaries of technology to foster growth and enhance various sectors including healthcare, education, and commerce. Tech Rajshahi prides itself on its ability to revolutionize sectors through world-class, cloud-based services while maintaining a strong commitment to innovation and excellence.



Figure 1. Tech Rajshahi Logo

1.4. Services Provided by Tech Rajshahi Ltd.

Tech Rajshahi offers a diverse range of services tailored to meet the evolving demands of the digital age:

- **Software Development:** Utilizing modern approaches and best practices, Tech Rajshahi excels in creating customized software solutions that are innovative and effective.
- **E-Commerce Management:** They are a top provider of e-commerce design and development services, recommended for their user-friendly and profitable solutions.
- **Digital Marketing:** Tech Rajshahi is committed to delivering the highest quality in digital marketing services to ensure maximum customer satisfaction and return on investment.
- **Mobile Apps Development:** The company provides cutting-edge mobile solutions, helping clients capitalize on mobile technology through expert development and consulting services.
- **Website Development:** Their team assists businesses in telling their stories effectively online, ensuring each website is crafted to the highest standards.

1.5. Mission, Vision and Values

1.5.1. Mission

Tech Rajshahi Ltd. is dedicated to delivering unparalleled digital experiences, meticulously crafted to meet and exceed the unique needs of their clients. Each project reflects their commitment to excellence, with a focus on achieving the highest levels of customer satisfaction and impactful results.

1.5.2. Vision

The vision of Tech Rajshahi Ltd. is to harness the transformative power of technology to change the world. They are committed to leading the charge in digital innovation, aiming to revolutionize industries and enhance everyday lives through advanced technological solutions.

1.5.3. Core Values and Principles

The operational ethos of Tech Rajshahi is grounded in innovation, teamwork, and customer-centricity. The company fosters a collaborative and inclusive workplace, encouraging creativity and problem-solving among its employees. This culture is not only about advancing technology but also about building sustainable relationships with partners and clients through trust and mutual respect.

1.6. Qualities Defining Tech Rajshahi Ltd.

- **Digital Transformation:** Tech Rajshahi is committed to changing the world through digital transformation. They empower software and hardware companies, revolutionize healthcare and education, and deliver world-class cloud-based services.
- **Innovative Solutions:** Their innovative work capability helps businesses grow faster. They offer services in software development, e-commerce management, Amazon sales, digital marketing, mobile app development, and website development.
- **Unforgettable Experiences:** Tech Rajshahi's commitment to creating unforgettable experiences and cutting-edge solutions sets them apart from competitors.

1.7. Leadership Structure

CEO: Mahfuzur Rahman

Business Development Manager: Md. Shahinur Rahman

E-Commerce Manager: Md. Mahfuzur Rahman

The leadership hierarchy of Tech Rajshahi Ltd. demonstrates a well-defined managerial framework that ensures efficient coordination, task distribution, and workflow control across departments.

At the top of the structure stands the Chief Executive Officer (CEO), Mr. Mahfuzur Rahman, who oversees the entire organizational operation and strategic direction. Reporting directly to him are two key managerial positions:

- **Business Development Manager – Md. Shahinur Rahman:** Responsible for client acquisition, partnership management, and overall business growth.
- **E-Commerce Manager – Md. Mahfuzur Rahman:** Oversees online business operations, digital marketing, and marketplace performance.

Under these managers, the organization branches into several specialized operational roles:

- **PPC Manager:** Handles pay-per-click campaigns and online advertisement performance.
- **E-Commerce Account Coordinators:** Manage client accounts, listings, and marketplace activities.
- **Senior Graphic Designer and Graphic Designer:** Ensure creative consistency and brand identity across all digital platforms.
- **Content Writers:** Develop product descriptions, promotional content, and SEO-oriented materials.
- **Data Entry Operators:** Maintain accuracy and integrity of business and client data.

This hierarchical model promotes accountability and smooth communication from top management to operational teams, enabling Tech Rajshahi Ltd. to deliver efficient and cohesive digital services.

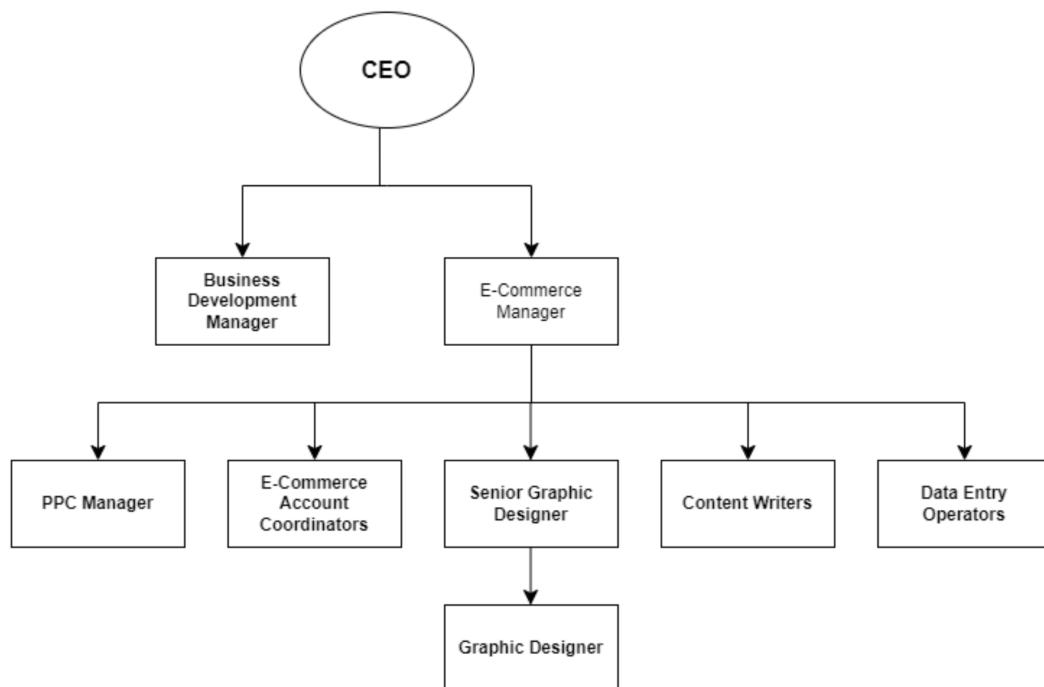


Figure 2. Leadership Structure of Tech Rajshahi Ltd.

1.8. Work Showcase

- **Ecommerce services**
 - Product sourcing
 - Content creation for online sales
 - Management and marketing integration
- **Software development**
 - Custom software solutions
 - Development of AI tools for internal advertising automation
- **Game development**
 - Creation of engaging gaming applications
- **Graphics projects**
 - High-quality graphic design services

1.9. Clients and Success Stories

- **Apex Footwear Collaboration (since 2020):** Tech Rajshahi assisted Apex Footwear in entering the USA marketplace. Despite obstacles such as customs challenges and political issues in Bangladesh, the collaboration generated significant revenue after 1.5 years of effort.
- **Global Client Base:** Tech Rajshahi serves clients in Canada, Australia, Saudi Arabia and beyond, reflecting its global reach.
- **Referral System:** New clients are often referred by existing clients, highlighting the company's reputation for quality and reliability.

1.9.1. Developed Applications & Websites - Detailed Portfolio

Tech Rajshahi has successfully developed numerous applications and websites across various sectors, demonstrating their expertise in mobile and web development:

Mobile Applications

S-Finder Mobile Schematic App

- **Platform:** Android (Google Play Store)
- **Category:** Education/Technical Tools

- **Description:** A comprehensive mobile schematic diagram app specializing in mobile phone repair, providing access to detailed circuit diagrams (schematics), PCB layouts, and hardware repair solutions
- **Key Features:**
 - Detailed PCB PDF and official schematics
 - Freelancing and hiring services integration
 - IMEI & Server Services
 - Advanced video courses for technical learning
 - Product marketplace for buying and selling
- **Target Users:** Professional phone repair technicians and engineers
- **Rating:** 4.3/5 stars with 70+ reviews
- **Downloads:** 10K+ downloads

[Grameen School - E-Learning Platform](#)

- **Platform:** Android (Google Play Store)
- **Category:** Education
- **Description:** A comprehensive e-learning platform offering academic courses (Class 01-12) and job preparation materials
- **Key Features:**
 - Academic course bundles for different grade levels
 - Job preparation materials and resources
 - PDF resources including job circulars and e-newspapers
 - E-books and live class updates
 - Integrated contact system for support
- **Target Users:** Students from Class 1 to 12 and job seekers
- **Rating:** 4.6/5 stars with excellent user feedback
- **Downloads:** 1K+ downloads
- **User Feedback:** "Find it best edtech app so far. Easy to use and ready to delivery"
- Md. Jahid Hassan Bhuiyan

Banglar Train - Live Train Tracking

- **Platform:** Android (Google Play Store)
- **Category:** Travel & Local
- **Description:** Real-time train location tracking app for Bangladeshi railways
- **Key Features:**
 - Live train location updates with map integration
 - Train search and selection functionality
 - Chat support system
 - Lost and found item reporting
 - User account management with profile editing
- **Target Users:** Train passengers and railway enthusiasts in Bangladesh
- **Downloads:** 5K+ downloads
- **Developer:** AlgoStack Technology

Web Applications & Websites

PD Entry - Personal Diary Management System

- **URL:** <https://pdentry.com/>
- **Category:** Law Enforcement & Professional Management
- **Description:** A specialized web application for law enforcement diary management and professional reporting
- **Key Features:**
 - Quick report generation for daily activities
 - One-click easy reporting system
 - Automatic monthly file updates
 - PDF report downloads
 - Secure and private reporting
 - Verification-based registration system
- **Target Users:** Law enforcement officers and professionals requiring structured reporting
- **Benefits:** Time-saving, organized documentation, secure data management

Bonanza Jute Composite - Corporate Website

- **URL:** <https://bonanzajutecomposite.com/>
- **Category:** Manufacturing & Export Business
- **Description:** Professional corporate website for a 100% export-oriented jute goods manufacturing company
- **Key Features:**
 - Comprehensive product catalog (Jute Yarn/Twine, Jute Bags, Diversified Products)
 - Company profile and mission presentation
 - Contact and inquiry management system
 - Responsive design for global accessibility
 - Professional business presentation
- **Target Users:** International buyers and jute industry stakeholders
- **Business Impact:** Enhanced global presence for export business

1.10. Conclusion:

Tech Rajshahi Ltd. epitomizes technological innovation and excellence in Northern Bangladesh. This chapter has provided a comprehensive overview of the company's mission, vision, services, leadership structure, work showcase, and client successes, setting the foundation for a deeper exploration of their impact on digital transformation across various industries. The subsequent chapters will delve into the initial feasibility analysis, information gathering, detailed feasibility study, and design processes. These stages will illustrate how Tech Rajshahi meticulously plans, analyzes, and implements cutting-edge solutions to meet and exceed client expectations in the ever-evolving digital landscape.

2

Chapter 2: Initial Feasibility Analysis

2.1. Introduction

The term *initial feasibility study* refers to the investigation of problems that are identified from the outset. The survey may be enlarged based on the findings of the initial investigation. An initial feasibility study evaluates a system proposal's workability, impact on the organization, ability to meet user needs, and resource efficiency. This study summarizes existing knowledge and planned actions, telling us which problems are taken as initial considerations for Tech Rajshahi Ltd.

2.2. Problem Analysis

All technology companies understand that software development introduces difficulties and no software is perfect. Tech Rajshahi, being a technology company, is no exception in this regard. The business and its developer team encounter numerous issues while developing the platform. It is difficult to create an app that is nearly perfect. As a result, the Tech Rajshahi developers are also facing some issues. We contacted their team to learn more about the problems they encounter.

2.3. Problem Statements

2.3.1. Talent Retention

Summary of Findings: Tech Rajshahi faces challenges in retaining talent due to various factors such as salary competitiveness, benefits packages, career growth opportunities, company culture, and management effectiveness.

- **Salary:** Offering competitive salaries is crucial for attracting and retaining top talent. Conducting market research to understand typical salaries for similar positions in the industry is necessary.
- **Benefits:** Beyond salary, benefits packages play a significant role in employee retention. Offering healthcare, retirement plans, and vacation time is essential.
- **Career Growth Opportunities:** Employees seek opportunities for career growth and development. Providing learning and development opportunities such as training programs and mentorship is important.
- **Company Culture:** Company culture significantly impacts employee retention. Promoting work-life balance, improving communication, and recognizing employee achievements can enhance the culture.
- **Management:** Effective management is key to retaining top talent. Providing leadership training and conducting regular employee feedback surveys can improve management effectiveness.

Recommendations:

- Offer competitive salaries and benefits packages to attract and retain top talent.
- Provide opportunities for career growth and development through training programs and mentorship.
- Foster a positive company culture by promoting work-life balance, improving communication, and recognizing employee achievements.
- Enhance management effectiveness through leadership training and regular feedback mechanisms.

2.3.2. Lack of E-commerce Knowledge in Interested People

Summary of Findings: Many individuals interested in joining Tech Rajshahi lack sufficient knowledge in e-commerce, hindering the company's growth in that sector.

- **Lack of Knowledge Base:** Many candidates lack a fundamental understanding of e-commerce principles and practices, including online marketplaces, digital marketing strategies, payment gateways, and customer relationship management systems.
- **Limited Exposure:** The majority of potential candidates have limited exposure to the e-commerce industry, either through academic coursework or professional experience, hampering their ability to contribute effectively to e-commerce projects.
- **Skills Gap:** There exists a significant gap between the skills required for successful e-commerce implementation and the skills possessed by interested individuals. This gap encompasses areas such as website development, online merchandising, data analytics, and e-commerce platforms.
- **Technological Challenges:** Many candidates struggle with understanding the technological aspects of e-commerce, such as integrating e-commerce platforms with existing systems, optimizing website performance, and ensuring cybersecurity in online transactions.
- **Market Dynamics:** A substantial portion of interested individuals lacks knowledge about current market trends, consumer behaviour in e-commerce, and competitive analysis, limiting their ability to devise innovative strategies that align with market demands.

Recommendations:

- Provide training programs and workshops to educate interested individuals about e-commerce.
- Collaborate with educational institutions to offer courses or seminars on e-commerce.
- Create online resources such as blogs, webinars, and tutorials to share knowledge about e-commerce.

2.3.3. Challenges in Achieving Profitability

Summary of Findings: Tech Rajshahi faces challenges in achieving profitability due to factors such as an undefined target market, lack of sales and marketing strategy, and inadequate understanding of production costs.

- **Undefined Target Market:** Tech Rajshahi struggles with identifying its target market, resulting in difficulties in tailoring products and services to meet specific customer needs. Without a clearly defined target market, the company's marketing efforts are less effective, leading to wasted resources and missed opportunities for revenue generation.
- **Lack of Sales and Marketing Strategy:** The company lacks a comprehensive sales and marketing strategy to promote its products and services effectively, including strategies for customer acquisition, lead generation, conversion optimization, and customer retention.
- **Inadequate Understanding of Production Costs:** Tech Rajshahi faces challenges in accurately determining its production costs, including both fixed and variable expenses. Without a clear understanding of production costs, the company struggles to price its products and services competitively, leading to either underpricing or overpricing, both of which can negatively impact profitability.

Recommendations:

- Conduct market research to identify the target market and tailor products and services accordingly.
- Develop a comprehensive sales and marketing strategy to reach and convince customers.
- Gain a clear understanding of production and delivery costs to ensure accurate pricing.

2.3.4. Facing Challenges to Attain Client's Satisfaction

Summary of Findings: Tech Rajshahi encounters challenges in satisfying clients due to poor communication, lack of understanding of client goals, negative product experiences, and unrealistic client demands.

- **Poor Communication:** Tech Rajshahi faces difficulties in maintaining effective communication with clients, including delays in responding to inquiries, unclear project briefs, and insufficient updates on project progress. Poor communication can lead to misunderstandings, frustration, and ultimately dissatisfaction among clients.
- **Lack of Understanding of Client Goals:** The company struggles to fully grasp the goals and objectives of its clients. Without a clear understanding of what clients hope to achieve with their projects, Tech Rajshahi may fail to deliver solutions that meet their expectations.

- **Negative Product Experiences:** Clients may encounter issues or challenges with the products or services delivered by Tech Rajshahi, including bugs, glitches, or usability issues that affect the overall user experience.
- **Unrealistic Client Demands:** Tech Rajshahi may face challenges when clients have unrealistic expectations or demands, such as tight deadlines, scope creep, or requests for features that are not feasible within the project constraints.

Recommendations:

- Improve communication with clients through regular updates and feedback sessions.
- Conduct thorough research to understand client goals and expectations.
- Enhance product quality and customer service to address negative experiences.
- Manage client expectations by providing realistic timelines and deliverables.

2.4. Conclusion

The initial feasibility analysis reveals significant challenges for Tech Rajshahi Ltd., spanning talent retention, e-commerce knowledge gaps, profitability, and client satisfaction. Addressing these issues requires strategies such as offering competitive salaries and benefits, providing e-commerce training programs, developing robust sales and marketing strategies, understanding production costs, enhancing communication with clients, and managing expectations effectively. By implementing these recommendations, Tech Rajshahi can strengthen its workforce, capitalize on e-commerce opportunities, optimize profitability, and foster long-term client relationships, positioning itself for success in the technology market.

3 Chapter 3: Information Gathering

3.1. Introduction

An essential first step in any analysis of Tech Rajshahi Ltd., a leading technology company specializing in software development, e-commerce management, digital marketing, mobile app development, and website development, is information collection. This chapter examines a variety of data collection tools specifically designed for analyzing Tech Rajshahi. We'll utilize resources such as questionnaires, interviews, on-site observations, and literature reviews. Each tool provides distinct insights and data sets, enabling a comprehensive understanding of Tech Rajshahi's operations. The literature review includes examining pertinent Tech Rajshahi-specific documentation, protocols, and forms. Observing Tech Rajshahi in action offers direct knowledge of its working conditions and procedures. Interviews provide direct feedback from key stakeholders, while questionnaires gather information from a broader audience. By effectively using these resources, we can gain valuable insights into Tech Rajshahi's history, market trends, workflows, challenges, and objectives. This data will be used in subsequent analysis to offer recommendations for Tech Rajshahi's future advancements. In the context of examining Tech Rajshahi, this chapter will discuss the advantages and considerations of each information gathering tool, supported by real-world examples. The intention is to equip readers with the skills needed to use these tools effectively, ensuring a thorough examination of Tech Rajshahi and providing valuable information for decision-making. We will explore each information gathering tool in detail in the sections that follow, discussing its significance and practical applications in Tech Rajshahi analysis.

3.2. Information Gathering

One of the most important steps in evaluating and analyzing the potential system for Tech Rajshahi Ltd. is gathering information about the current system. For an analysis to be successful, information collection instruments must be used effectively. Conventional methods of information collection include surveys, on-site observations, and interviews. With the use of these tools, analysts can assess the current system's efficacy and gain knowledge for creating a proposed candidate system.

Information is gathered via a variety of sources and techniques over multiple stages. These include interviewing user staff members, conducting on-site observations, and reviewing the existing documentation, such as procedure manuals, documents, and data flows. To perform a thorough study of Tech Rajshahi, the analyst must gather data in three primary areas: the organization's goals, objectives, and structures; the people who use the current system; and the workflow within the system.

The first area of information collection involves understanding Tech Rajshahi's policies, aims, objectives, and organizational structure. Examining policies helps determine how the system operates as policies are converted into rules and procedures that facilitate goal achievement. The organization's statement of goals acts as benchmarks for fulfilling the broader mission, demonstrating its commitment to its aims. Furthermore, understanding the organizational structure of Tech Rajshahi provides insights into the goals and priorities of management.

The second area of information collection focuses on the people who are essential to the operation of the current system. The analyst should prioritize understanding personnel roles, authority dynamics, work statuses and responsibilities, information needs, and interpersonal interactions. Acquiring this information enables the analyst to identify relevant parties and establish efficient communication pathways.

The third and final area of information collection addresses the workflow of the system. The goal of workflow analysis is to comprehend the various points in the system where data flows. A Data Flow Diagram (DFD), which depicts the flow of data and the interactions between various system components, can be used to visualize this.

By tailoring the information collection procedure to Tech Rajshahi's unique setting, the analyst can gain a comprehensive understanding of the company, its personnel, and its workflow. This information serves as the foundation for further analysis and provides valuable insights for suggesting improvements and creating a potential system tailored to Tech Rajshahi's requirements.

3.3. Information Gathering Tools

For Tech Rajshahi Ltd., the evaluation of existing research, practices, and documentation; on-site observation; interviews; and surveys are examples of information gathering tools. With the distinct views and perspectives that each tool provides, analysts are able to gather a variety of datasets and gain a thorough understanding of the topic they are studying.

3.4. Review of Literature, Procedures, and Forms

Reviewing literature, procedures, and forms is a fundamental aspect of information gathering. These methods involve scrutinizing existing knowledge, documented processes, and structured data collection to glean insights and support decision-making. In the case of Tech Rajshahi Ltd., we conducted a review of literature, procedures, and the company's website to gather pertinent information. This analysis aims to delve deeper into the company's projects, elucidating their objectives, and identifying key elements crucial for their development and implementation. By examining available documentation, our goal is to provide valuable insights into the scope, features, and potential impact of Tech Rajshahi's projects. This approach ensures a comprehensive understanding of the company's operational framework and strategic initiatives, laying the groundwork for informed analysis and recommendations.

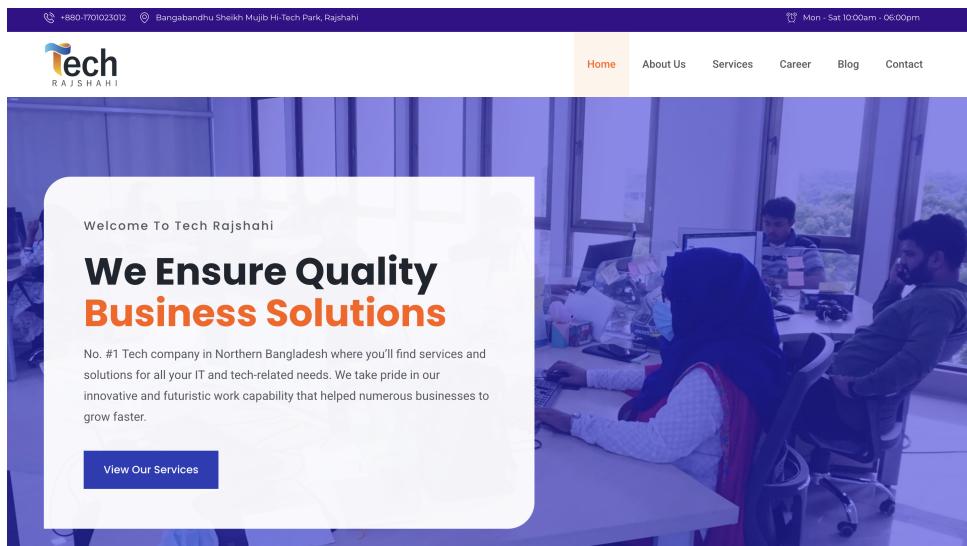


Figure 3. Tech Rajshahi Website

Website: Tech Rajshahi's website is a shining example of user-friendly design. Navigating through their pages feels like a breeze, making it effortless for clients to learn about their services and get in touch. The clear layout, intuitive menus, and accessible contact information ensure that visitors can quickly find what they need. Whether you're exploring their offerings or reaching out for business inquiries, Tech Rajshahi's website streamlines the process, leaving a positive impression.

The website's seamless experience reflects their commitment to excellence and customer satisfaction. It's like finding a well-marked path in a digital forest—inviting, straightforward, and efficient.

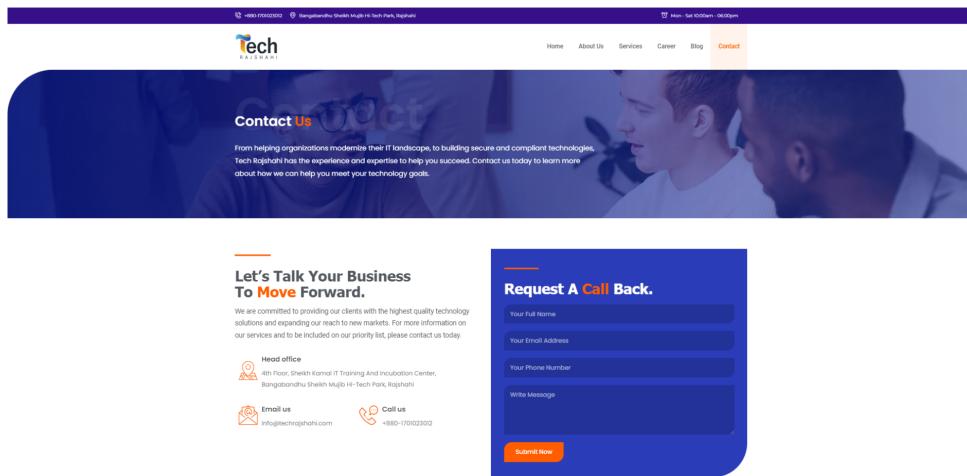


Figure 4. Tech Rajshahi Contact Information

Tech Rajshahi Ltd. has streamlined the process for clients to get in touch. Upon visiting the company's website, clients will find a dedicated "Contact" section, typically located in the top menu or at the bottom of the page. This section provides comprehensive contact details, including the company's email address, phone number, and office address. Whether clients prefer to send an email, make a phone call, or visit the office directly, Tech Rajshahi ensures a seamless and accessible communication process. This

user-friendly approach facilitates inquiries and exploration of collaboration opportunities, making reaching out to Tech Rajshahi a straightforward experience.

3.5. On-site Observation

By conducting on-site observations at Tech Rajshahi Ltd., we gathered detailed and practical information on several aspects of the company's operations and environment. The key findings are summarized below:



Hi Tech Park

Tech Rajshahi

Tech Rajshahi Workplace

Figure 5. On-site Observation

- **Location:** Tech Rajshahi is situated in a modern office space in Bangabandhu Hi-Tech Park, Rajshahi. The office exudes a welcoming atmosphere, with well-maintained facilities.
- **Work Environment and Culture:** The physical workspace at Tech Rajshahi is well organized and conducive to productivity. The office layout is designed to facilitate collaboration, with open spaces and comfortable workstations. The overall ambiance is positive, reflecting a strong company culture that promotes teamwork and innovation.
- **Employee Interactions:** We observed a high level of interaction and cooperation among employees. Team members communicate effectively and work collaboratively on projects. The atmosphere is supportive, with employees frequently engaging in knowledge sharing and collective problem solving.
- **Operational Processes:** The daily operations at Tech Rajshahi are streamlined and efficient. Tasks are clearly assigned, and project management practices are robust. The workflow is well structured, with defined processes for each stage of project development, ensuring timely and quality outputs.
- **Use of Technology and Tools:** Tech Rajshahi employs advanced technological infrastructure and tools. The employees use state-of-the-art hardware and software that support their work efficiently. These tools are integral to their daily tasks, enhancing productivity and facilitating high-quality service delivery.

- **Productivity Levels:** The productivity of the workforce is impressive, with employees demonstrating effective time management and high engagement levels. The workflow is efficient, and any bottlenecks or inefficiencies are quickly identified and resolved to maintain optimal performance.
- **Training and Development:** We observed ongoing training sessions and development programs, reflecting Tech Rajshahi's commitment to employee growth. These programs are well structured and focus on enhancing the skills and knowledge of employees, contributing to their professional development and the overall success of the company.

These observations provide a comprehensive understanding of the operational effectiveness, employee satisfaction, and overall organizational health of Tech Rajshahi Ltd. The insights gained from this on-site observation will inform our analysis and recommendations for future improvements.

3.6. Interviews

During our analysis of **Tech Rajshahi Ltd.**, we interviewed **Mr. Md. Shahinur Rahman**, the Business Development Manager. Interviews are direct interactions aimed at obtaining insights, viewpoints, and ideas on specific subjects. Through targeted questions in structured or unstructured formats, analysts can delve deeper into the interviewees' experiences, perceptions, and expertise.



Figure 6. Md. Shahinur Rahman – Business Development Manager

While our prior on-site observation provided valuable insights into the company's operations and processes, it was limited to summarizing visible aspects. However, we needed insights into people's attitudes, desires, and motivations to gain a comprehensive understanding of the system. To achieve this, we employed additional information-gathering methods, including surveys and interviews.

The interview with Mr. Md. Shahinur Rahman aimed to gather insights into Tech Rajshahi's vision, goals, working environment, financial performance, recruitment procedures, benefits, and achievements. As a leading technology company specializing in digital solutions such as software development, e-commerce management, digital marketing, and mobile app development, Tech Rajshahi has been at the forefront of innovation in the

industry, garnering recognition for its cutting-edge approaches and successful projects. The interview with the manager went as follows:

- **Question:** Brief history and key milestones of Tech Rajshahi over the past 5 years.
Answer: The journey started in 2016 with 3 employees. The office location was Shalbagan at that time. Initially, it was an e-commerce-based firm focused on supporting global e-commerce sellers. The company has since grown to 45 employees and has over 100 clients.
- **Question:** Founding vision and its evolution over time.
Answer: The founding vision was to create a footprint in the global e-commerce marketplace as well as in the Bangladeshi marketplace. Initially, the goal was to work with sellers in various international markets such as Amazon, Walmart, eBay, and Home Depot, mainly in western countries. Over time, the company has succeeded in creating a global client base in countries such as Canada, Australia, and Saudi Arabia.
- **Question:** Ensuring quality and performance through development and post-deployment phases.
Answer: Quality and competitiveness are ensured via analyzing competitors and maintaining a combined effort from all departments.
- **Question:** Key attributes of the team and fostering a collaborative work environment.
Answer: All departments work in a combined manner. The company emphasizes a positive work culture through motivating programs such as employee of the month, project bonuses, sports programs, and learning subsidizing programs.
- **Question:** Opportunities for professional growth and development for employees.
Answer: The company offers subsidized programs for health and fitness and learning courses, as well as annual tours to ensure proper internal communications and a positive working environment.
- **Question:** Biggest challenges faced and how they were overcome.
Answer: Employee acquisition was a major challenge due to the difficulty in finding trained employees specialized in e-commerce in Rajshahi. This was addressed by initiating an internship program focusing on strong communication skills and e-commerce knowledge.
- **Question:** Future plans or upcoming projects for Tech Rajshahi.
Answer: The company aims to launch in-house products primarily in the USA and Canada marketplace by 2026. They are also working on creating marketplace tools and AI tools that automate internal advertising.
- **Additional Information:**
 - **Employee Training Programs:** Training programs include enrolling in courses from reputed e-commerce trainers and providing training materials. Workshops are arranged virtually.
 - **Internship Programs:** Launched when workload increases and advertised on platforms such as BDJobs.com and Tech Rajshahi's Facebook page.

- **Collaboration with Foreign Companies:** Details of collaborations with foreign companies are confidential.
- **Question:** Current vision and mission of Tech Rajshahi.
Answer: The current vision and mission are to scale up work capacity, increase the current client base, and focus on more client acquisition.
- **Question:** How the vision and mission are reflected in day-to-day operations.
Answer: The firm ensures its vision and mission by closely observing current e-commerce trends, new products, and strategies. They routinely arrange employee training programs, internship programs, and internal training programs to keep up in the global competitive space.
- **Question:** Core services offered by Tech Rajshahi and unique selling propositions.
Answer: The main business is e-commerce, with newer business segments including software development, game development, and graphics projects. The unique selling proposition is service-based currently.
- **Question:** How Tech Rajshahi stays ahead in providing innovative digital solutions.
Answer: They source clients from the marketplace and have an informal client referral system where new clients are referred by old clients. The company also works on AI tools that automate internal advertising.
- **Question:** Approach to recognition of need and feasibility studies for new projects.
Answer: When a new project is taken on board, an assessment is made to determine whether it is possible to complete the project and what obstacles will be faced.
- **Question:** Detailed analysis and design phases for system development.
Answer: For a new seller, new tasks include sourcing products, creating relevant content for selling products online, and involving management and marketing departments. This workflow is repeated several times with active client involvement until the end product is attained.
- **Question:** Handling of implementation and post-implementation maintenance.
Answer: Maintenance is not usually required in e-commerce service-based work. For software products, maintenance will be relevant in the future as the company plans to launch its own products.
- **Question:** Success stories or case studies of client achievements.
Answer: In 2020, Tech Rajshahi collaborated with Apex Footwear to help sell their products in the USA marketplace. Despite several challenges, including dealing with Bangladesh customs and political considerations, they succeeded. After 1.5 years of struggle, they started generating decent revenue, and the collaboration has continued successfully.
- **Question:** Largest organizations worked with and services provided.
Answer: Apex Footwear is one of the largest organizations Tech Rajshahi has worked with, focusing on selling their products in the USA marketplace.
- **Question:** Typical process from initial client contact to project completion.
Answer: The process includes setting up a meeting with the client, recognizing their current and future needs, assessing available resources, and submitting a comprehensive proposal. Once the client agrees, work starts formally.

3.7. Questionnaire

We surveyed about twenty-three employees of Tech Rajshahi Ltd. The responses to the questionnaires are summarized below:

- 1. How satisfied are you with your current role at Tech Rajshahi?** Responses ranged from very dissatisfied (1) to very satisfied (5).

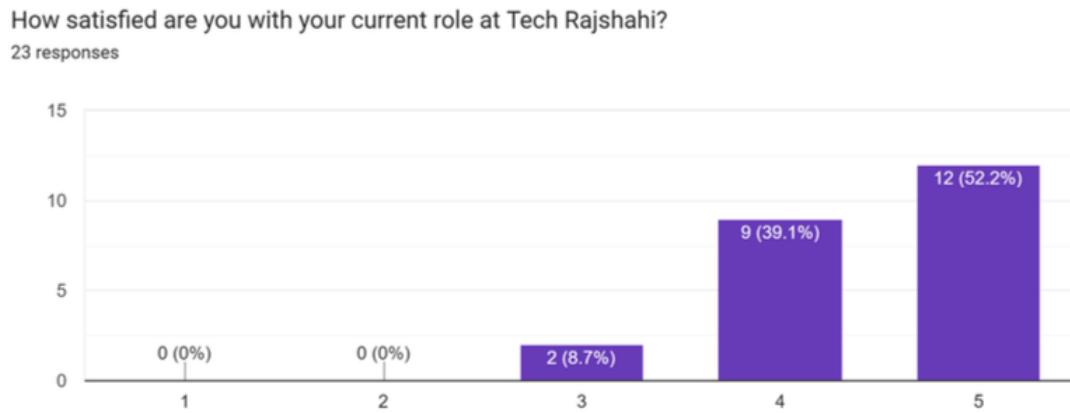


Figure 7. Employee satisfaction levels with current roles at Tech Rajshahi

- 2. How would you rate the work environment at Tech Rajshahi?** Responses ranged from poor (1) to excellent (5).

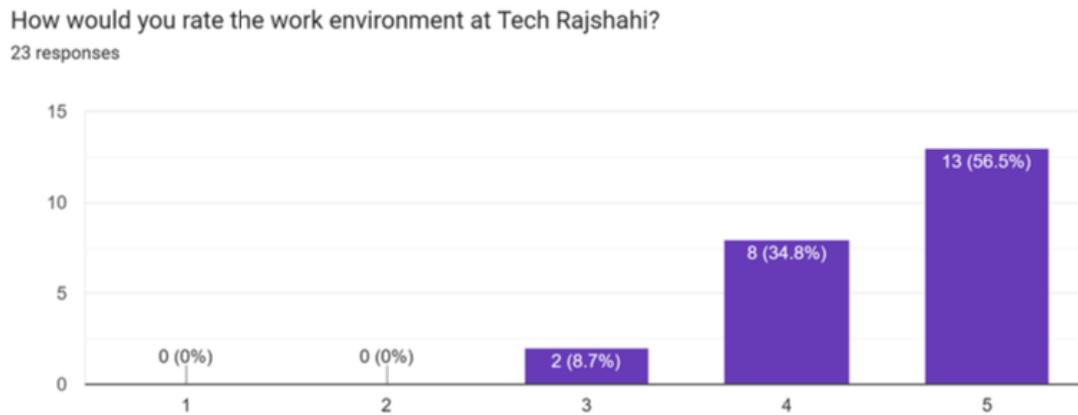


Figure 8. Employee ratings of the overall work environment

3. How satisfied are you with the opportunities for professional growth at Tech Rajshahi? Responses ranged from very dissatisfied (1) to very satisfied (5).

How satisfied are you with the opportunities for professional growth at Tech Rajshahi?

23 responses

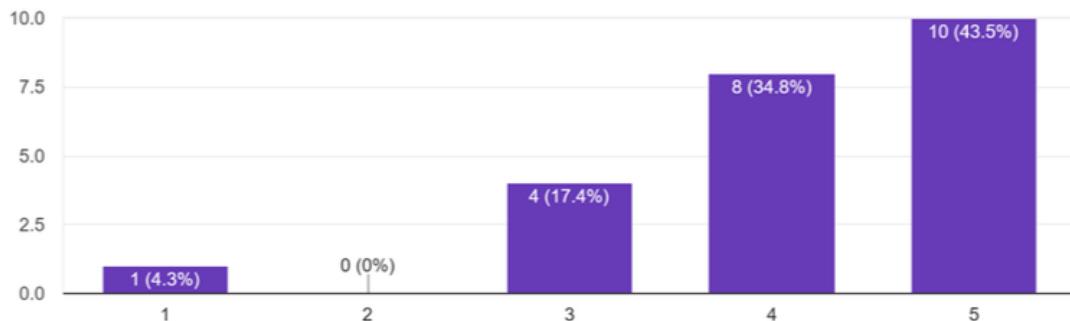


Figure 9. Employee perceptions of professional growth opportunities

4. How do you find the work-life balance at Tech Rajshahi? Responses ranged from poor (1) to excellent (5).

How do you find the work-life balance at Tech Rajshahi?

23 responses

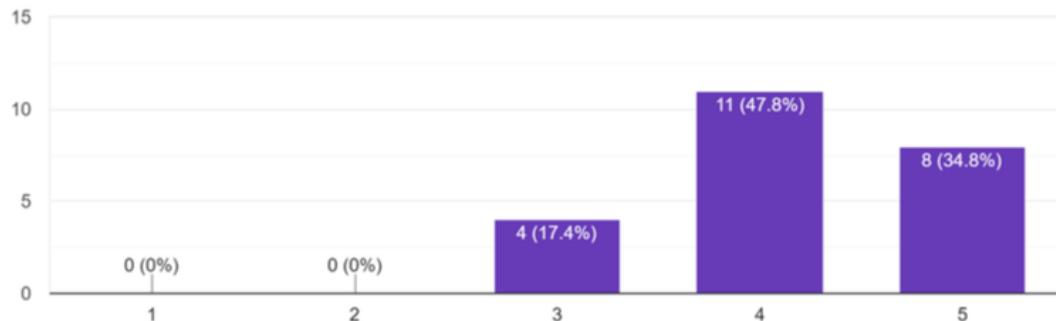


Figure 10. Employee assessment of work-life balance

5. How supportive is the management in helping you achieve your professional goals?

How supportive is the management in helping you achieve your professional goals?
23 responses

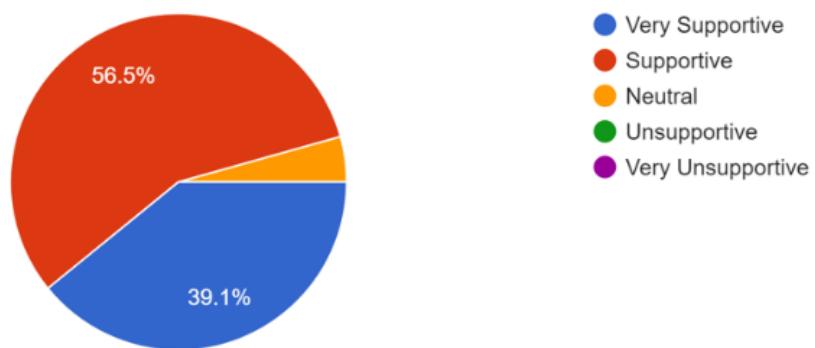


Figure 11. Perceived level of management support for professional goals

6. Do you feel aligned with the company's vision and mission?

Do you feel aligned with the company's vision and mission?
23 responses

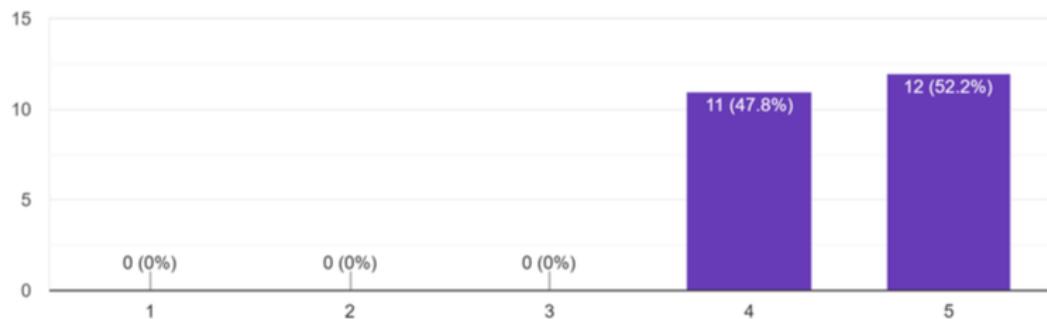


Figure 12. Employee alignment with Tech Rajshahi's vision and mission

7. How effective is the collaboration within your team and across departments?

How effective is the collaboration within your team and across departments?

23 responses

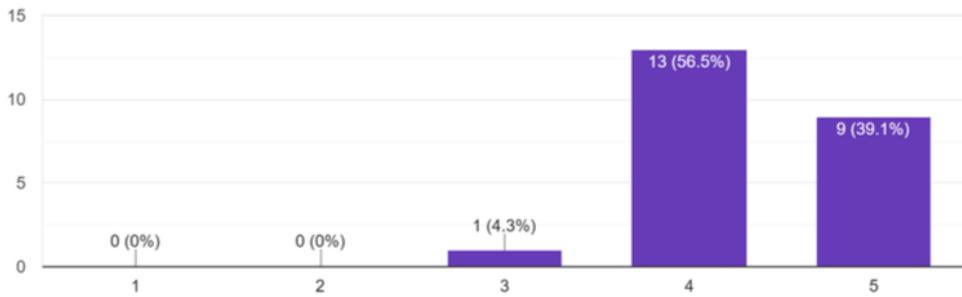


Figure 13. Employee feedback on inter-departmental collaboration

8. How would you rate the tools and resources provided to you for performing your job?

How would you rate the tools and resources provided to you for performing your job?

23 responses

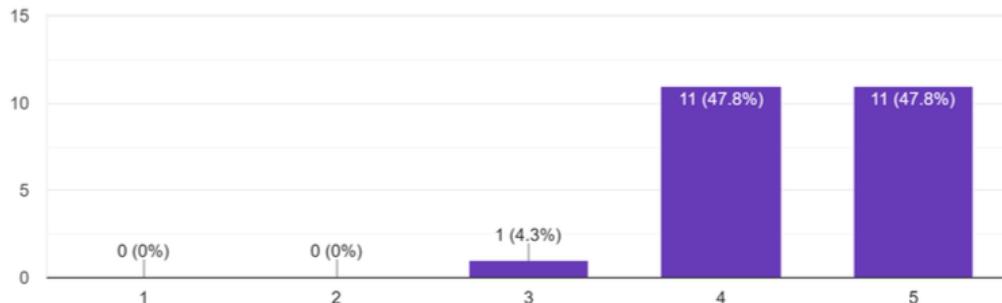


Figure 14. Employee evaluation of workplace tools and resources

9. How satisfied are you with the recognition and rewards system at Tech Rajshahi?

How satisfied are you with the recognition and rewards system at Tech Rajshahi?

23 responses

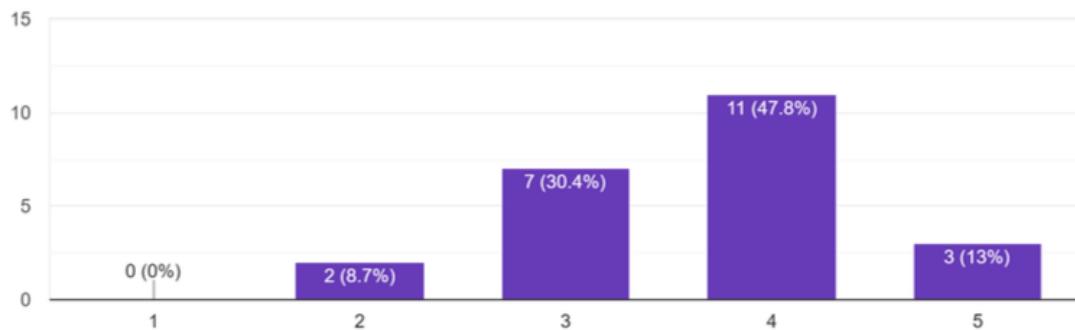


Figure 15. Employee satisfaction with recognition and rewards system

10. Are you involved in any stages of the system development life cycle at Tech Rajshahi?

Are you involved in any stages of the system development life cycle at Tech Rajshahi?

23 responses

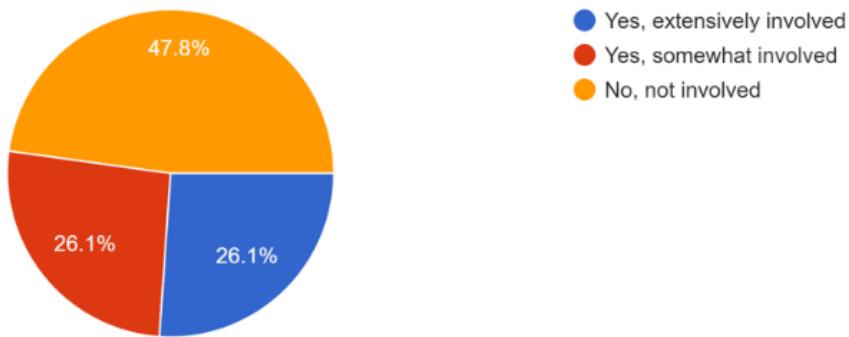
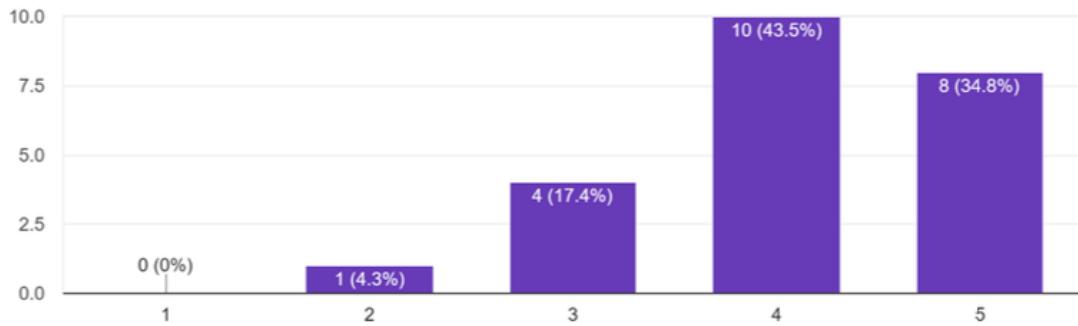


Figure 16. Employee involvement in stages of the system development life cycle

11. How would you rate the training programs provided by Tech Rajshahi for skill enhancement?

How would you rate the training programs provided by Tech Rajshahi for skill enhancement?

23 responses



- Investing in employee training and development programs
- Improving communication channels within the company
- Strengthening employee recognition and reward systems
- Enhancing technology infrastructure and tools
- Other

Figure 17. Effectiveness of training programs for employee skill enhancement

12. What areas do you believe could be improved in yourself and the company?

What areas do you believe could be improved in yourself and the company?

23 responses



Figure 18. Suggested areas for personal and organizational improvement

13. How likely are you to recommend the company as a great workplace to a friend or colleague?

How likely are you to recommend the company as a great workplace to a friend or colleague?
23 responses

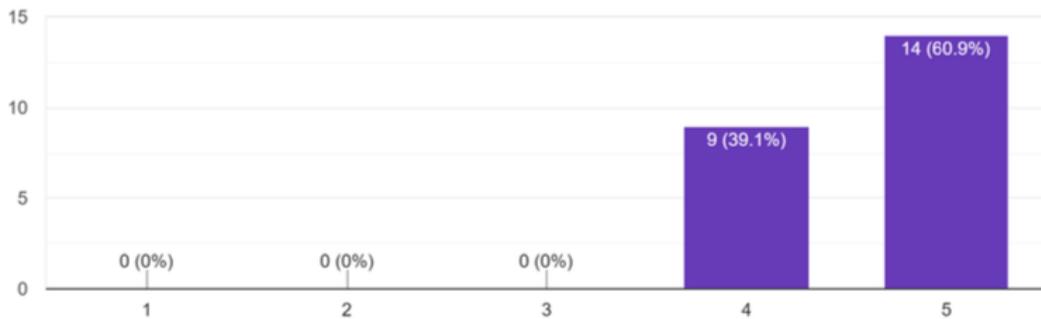


Figure 19. Employee willingness to recommend Tech Rajshahi as a workplace

Conclusion of Questionnaire: Overall, the questionnaire responses indicate a generally positive sentiment among employees regarding their roles, work environment, and alignment with the company's vision and mission. However, employees highlighted areas for improvement such as enhanced training and development, better project planning, improved collaboration and communication channels, and a more robust recognition and rewards system. Some respondents noted that they were not involved in the system development life cycle, suggesting a potential need for increased engagement or better utilization of employee skills in this area. These insights will help Tech Rajshahi identify strengths and areas for improvement, allowing the company to address employee concerns and foster a more positive and productive work environment.

3.8. Conclusion

This chapter showcased various methodologies employed to analyze Tech Rajshahi Ltd. comprehensively. Beginning with an introduction to the importance of information collection, it delved into the significance of tools like questionnaires, interviews, on-site observations, and literature reviews. Each tool offers insights into Tech Rajshahi's operations, informing subsequent analysis and recommendations. The chapter discussed the relevance of reviewing literature, procedures, and forms, exemplified by examining Tech Rajshahi's projects and initiatives. On-site observations provided practical insights into the company's work environment, culture, operational processes, and technology utilization. Interviews with key stakeholders further enriched the understanding of Tech Rajshahi's vision, services, achievements, challenges, and plans. The chapter also presented findings from employee questionnaires, indicating overall satisfaction while identifying areas for improvement, such as training programs, project planning, and communication channels. Through diverse information gathering tools, analysts gain valuable insights into Tech Rajshahi's operations, paving the way for informed decision making and strategic recommendations.

4

Chapter 4: Structured Analysis

4.1. Introduction

Structured analysis tools are crucial for understanding and designing systems. Data Flow Diagrams (DFDs) depict how data moves through processes and data stores, providing a clear view of system functionality. Entity–Relationship Diagrams (ERDs) model the data structure, showing relationships between data elements. Data Dictionaries offer detailed descriptions of data elements and their usage, ensuring consistency. Process specifications document each process's inputs, outputs, and transformations. Flowcharts visualize the sequence of operations, aiding in understanding workflows and logic. These tools collectively facilitate systematic and effective system analysis and design.

4.2. Data Flow Diagram (DFD)

4.2.1. Introduction

A Data Flow Diagram (DFD) visually represents the flow of data within a system, showcasing how inputs are processed into outputs through various functions and interactions. In this report, the DFD illustrates the movement of data between different components of Tech Rajshahi's operations, including project management, employee assignment, and client service. By detailing data sources, processes, and destinations, the DFD provides a clear map of how data is handled and transformed, facilitating a comprehensive understanding of system operations and aiding in the identification of potential improvements or inefficiencies.

4.2.2. Overview of the Present System

DFDs provide a graphical representation of the system, making it easier to understand and communicate the flow of data and processes involved. They serve as documentation for the system, capturing the essential processes, data stores and flows, which can be useful for future reference, maintenance, and enhancements. By analysing the DFD, it becomes easier to identify the system's requirements, including the processes, data sources, and data destinations.

To present the project management workflow of Tech Rajshahi Ltd. in a structured manner, the DFD is presented in multiple levels. At the highest level (Context Diagram), the system is treated as a single process interacting with external entities. The Level 1 diagram decomposes the system into its major functional components, while Level 2 diagrams expand each major process into its constituent sub-processes. Each figure below is accompanied by a brief description to aid interpretation.

4.2.3. Context Diagram

The context diagram provides a high-level view of the Project Management System. Here the system is represented by a single process that accepts project requirements from the Client and produces a completed project. The system also interfaces with a WORK RECORD data store for tracking resources and project status.

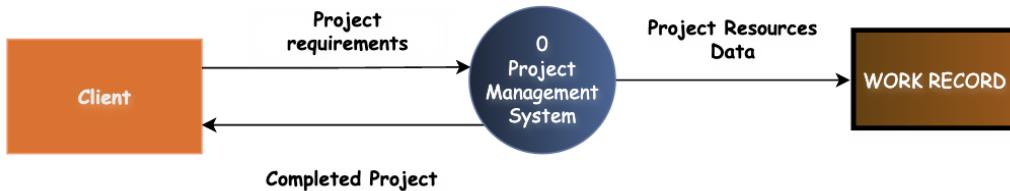


Figure 20. Context Diagram of Tech Rajshahi's Project Management System

4.2.4. Level 1 DFD

The Level 1 DFD decomposes the Project Management System into six major processes. Sequentially, these processes take a project from conception to completion:

- **Process of Sourcing (1.0):** Collects project requirements from the client, checks the availability of resources and, if feasible, stores the project information for further processing.
- **Skill Matching to the Project (2.0):** Retrieves employee information and matches their skills with the requirements of the project.
- **Training Employee for the Project (3.0):** Initiates training when an employee's skills do not meet the project requirements.
- **Assigning and Scheduling Tasks (4.0):** Assigns tasks to appropriate employees and schedules work based on project needs.
- **Checking for Completion of Project (5.0):** Verifies task completion, reviews project deliverables, and prepares the project for handover.
- **Handing Over the Project (6.0):** Compiles final deliverables, obtains client acknowledgement and updates the work records to mark the project as complete.

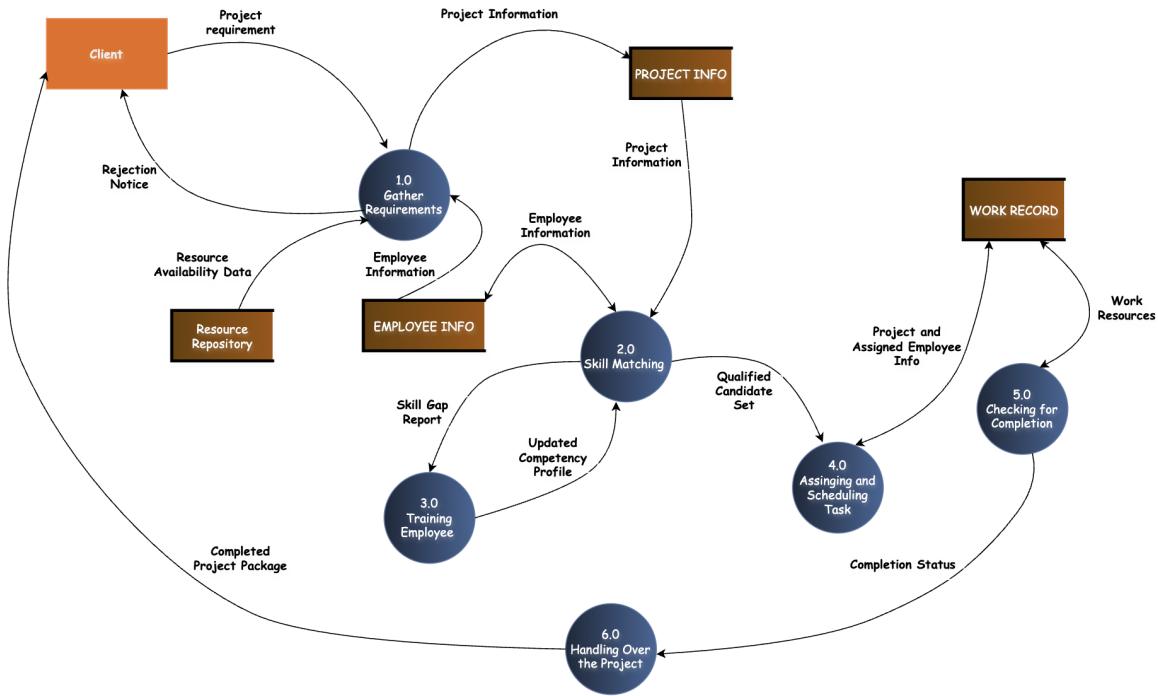


Figure 21. Level 1 DFD – Project Management Workflow for Tech Rajshahi

Process 1.0 – Process of Sourcing-

This diagram explains how projects are sourced. The system begins by gathering project requirements from the client (Process 1.1). It then checks the availability of resources (Process 1.2). If resources are not available, the project is rejected (Process 1.3). Otherwise, the system stores the project information (Process 1.4) for subsequent phases.

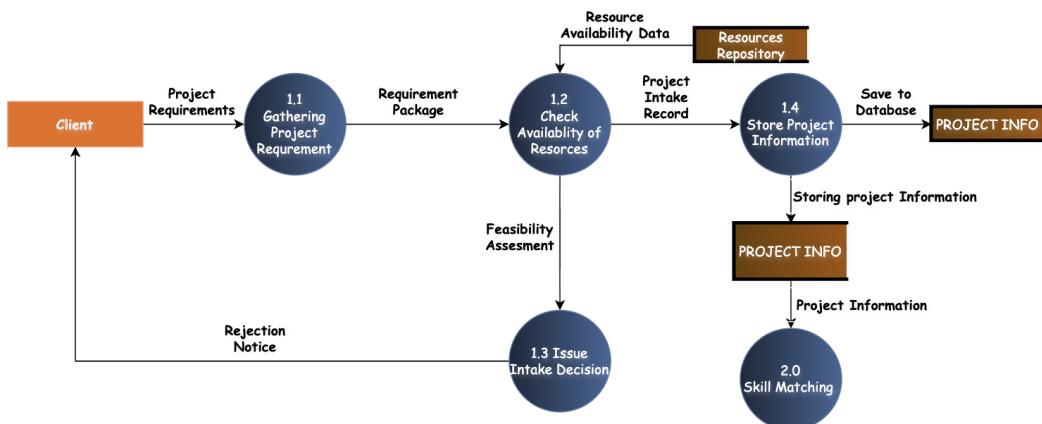


Figure 22. Level 2 DFD – Process 1.0: Process of Sourcing

Process 2.0 – Skill Matching to the Project-

In this stage, the system extracts employee information (Process 2.1) and compares employee skills with project requirements (Process 2.2). A mismatch directs the flow to training; otherwise, it proceeds to task assignment.

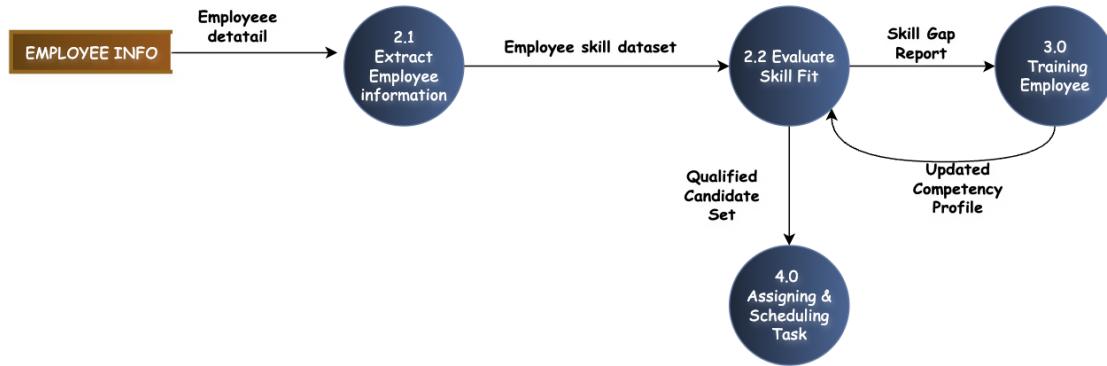


Figure 23. Level 2 DFD – Process 2.0: Skill Matching to the Project

Process 3.0 – Training Employee for the Project-

If a skill gap is identified, employees undergo training. The sub-processes include training employees (Process 3.1), updating employee information (Process 3.2), and returning the skilled employee back to the matching stage (Process 3.3).

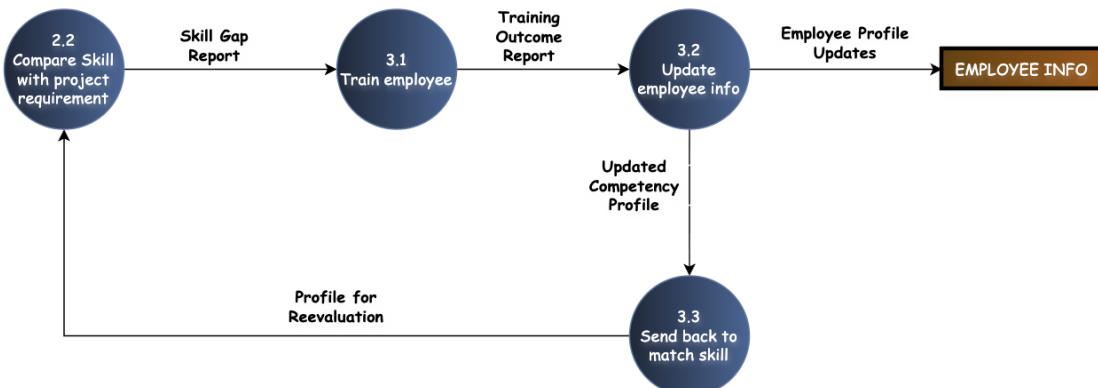


Figure 24. Level 2 DFD – Process 3.0: Training Employee for the Project

Process 4.0 – Assigning and Scheduling Tasks-

After matching and training, the system selects skilled employees (Process 4.1), assigns tasks and schedules work (Process 4.2), and stores project and employee information (Process 4.3) in the work record.

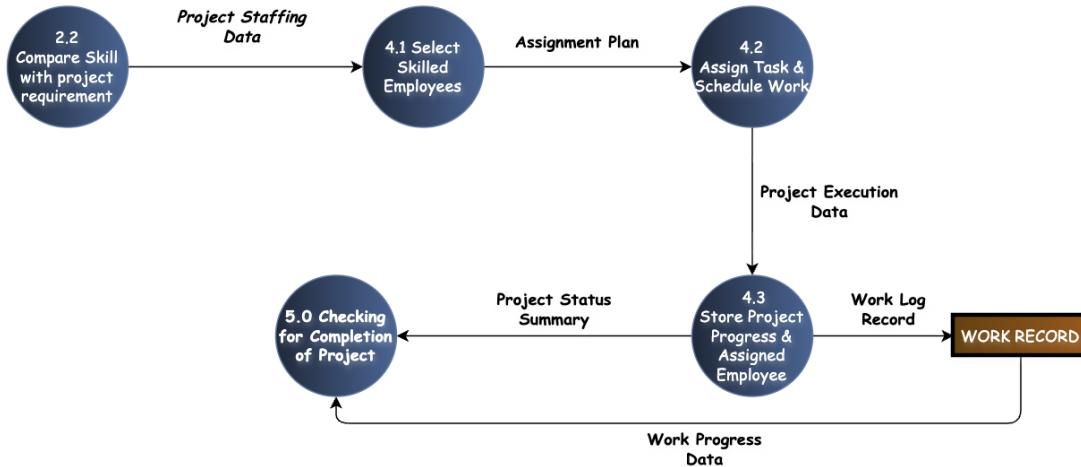


Figure 25. Level 2 DFD – Process 4.0: Assigning and Scheduling Tasks

Process 5.0 – Checking for Completion of Project-

Here the system extracts work records (Process 5.1), verifies project completion and proofing (Process 5.2), and sends the completed project to the handover process (Process 5.3) if it meets quality standards.

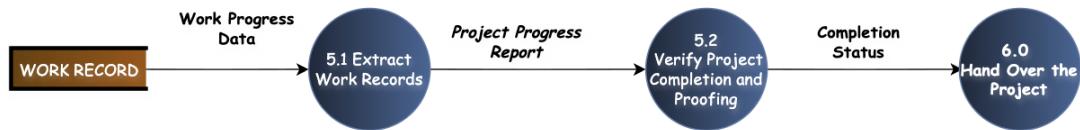


Figure 26. Level 2 DFD – Process 5.0: Checking for Completion of Project

Process 6.0 – Handing Over the Project-

The final stage prepares the deliverable (Process 6.1), sends the final project to the client (Process 6.2), and updates the work record (Process 6.3) to mark the project as closed.

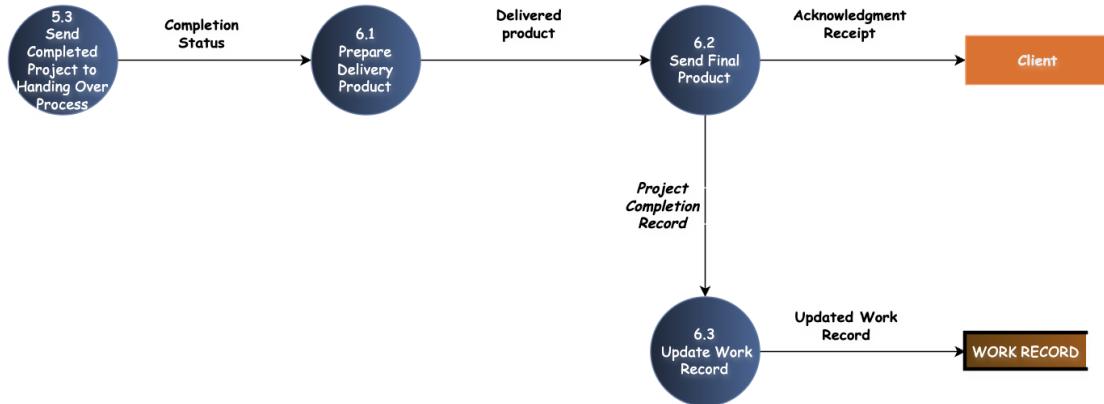


Figure 27. Level 2 DFD – Process 6.0: Handing Over the Project

4.3. Data Dictionary

A **Data Dictionary** is a structured repository of detailed information about the data used within a system. It defines all the data elements, their structures, and their relationships as described in data flow diagrams (DFDs). The primary purpose of a data dictionary is to ensure consistency and clarity in data usage across the organization. It acts as a reference point for system analysts, developers, and users, facilitating improved communication and understanding. The Data Dictionary for **Tech Rajshahi Ltd.** outlines the critical data elements, structures, flows, and processes involved in the organization's operations, especially in areas like project management, employee assignment, and client service.

4.3.1. Data Elements

Element Name	Description	Element Type	Source	Location	Control Information
Client-Name	The full name of the client.	String	Client input during on-boarding	Client database	Access restricted to client management.
Project-ID	Unique identifier for each client project.	Integer	System-generated upon project initiation	Project database	Tracked by project managers and finance.
Project-Requirements	Detailed client requirements for the project.	Text	Process 1.1 (Gathering Requirements)	Project database	Used in Process 1.2 (Resource Check).
Service-Type	Type of service (E-commerce, Software Development, etc.).	String	Selected during project setup	Project database	Accessed by all departments.
Resource-Availability	Status of resource availability for project.	Boolean	Process 1.2 (Resource Check)	Work record	Determines project feasibility.
Task-Description	Detailed description of project tasks.	Text	Process 4.2 (Task Assignment)	Work record	Used in task allocation and monitoring.
Task-Schedule	Timeline and deadlines for project tasks.	Date/Time	Process 4.2 (Scheduling)	Work record	Tracks project progress.
Employee-ID	Unique identifier for each employee.	Integer	System-generated at registration	Employee database	Access restricted to HR and PM.
Employee-Name	Full name of the employee.	String	HR input during registration	Employee database	Used in assignments and records.
Employee-Skills	Skills and competencies of employee.	Text	Process 2.1 (Extract Info)	Employee database	Used in Process 2.2 (Skill Matching).
Skill-Match-Status	Result of skill matching with project needs.	Boolean	Process 2.2 (Skill Comparison)	Work record	Determines if training is needed.

Table 1. Data Elements – page 1 of 2

Element Name	Description	Element Type	Source	Location	Control Information
Training-Status	Completion status of required training.	Boolean	Process 3.2 (Up-date Info)	Employee database	Assessed in Process 3.3.
Training-Records	Details of training completed by employee.	Text	Process 3.1 (Training)	Employee database	Tracks employee development.
Completion-Status	Status of project completion.	Boolean	Process 5.2 (Verification)	Work record	Used in Process 5.3.
Quality-Proof	Quality verification results.	Text	Process 5.2 (Proofing)	Work record	Ensures standards are met.
Final-Deliverable	Completed project ready for handover.	Binary/File	Process 6.1 (Preparation)	Work record	Sent to client in Process 6.2.
Client-Acknowledgment	Client confirmation of project receipt.	Boolean	Process 6.2 (Handover)	Project database	Used in Process 6.3 (Update).
Client-Feedback	Post-project feedback from client.	Text	Client survey	Project database	Quality assurance analysis.

Table 2. Data Elements – page 2 of 2

4.3.2. Data Stores

Data Store	Contents
Projects-Database	Project-Details Employee-Assignment
Client-Database	Client-Details
Employee-Database	Employee-Details Employee-Assignment Training-Status

Table 3. Data Stores

4.3.3. Data Flows

Data Flow	Description	Data Structures	Source	Destination
Project-Initiation	Flow of information required to start a new project.	Client-Details, Project-Details	Client (via meeting or online form)	Project management system
Task-Assignment	Flow of tasks assigned to employees for a project.	Employee-Assignment	Project management system	Relevant department (e.g., development, sourcing, marketing)
Client-Feedback-Flow	Collection of feedback from clients after project completion.	Project-Details	Client (via survey or interview)	Project management system
Employee-Training	Flow of training data to prepare employees for specific tasks.	Employee-Details, Training-Status	HR and Training Departments	Employee records database
Project-Rejection	Flow of information where a project is rejected due to unfulfilled requirements.	Project-Details	Project management system	Client
Project-Completion	Flow of information confirming project completion and handover to the client.	Project-Details	Project management system	Client

Table 4. Data Flows

4.3.4. Data Structures

Structure Name	Description	Data Elements
Client-Details	Contains all relevant information regarding a client.	Client-Name (Mandatory) Client-Contact (Mandatory) Client-Address (Optional) Client-Email (Mandatory)
Project-Details	Contains details about a client's project.	Project-ID (Mandatory) Service-Type (Mandatory) Project-Start-Date (Mandatory) Project-End-Date (Optional) Task-Description (Mandatory) Client-Feedback (Optional)
Employee-Assignment	Information about employees assigned to a specific project.	Employee-ID (Mandatory) Project-ID (Mandatory) Role (Mandatory) Task-Description (Mandatory)
Employee-Details	All relevant information about employees.	Employee-ID (Mandatory) Employee-Name (Mandatory) Employee-Role (Mandatory) Employee-Contact (Mandatory) Training-Status (Mandatory)

Table 5. Data Structures

4.4. Decision Tree

A decision tree is a visual tool used in decision-making and predictive modelling. It represents decisions and their possible consequences, including chance event outcomes, resource costs, and utility. Structured like a tree, it starts with a root node representing the initial decision, splits into branches representing different choices or outcomes, and ends with leaf nodes showing the final decisions or results. Decision trees are valuable for evaluating different strategies and predicting outcomes by quantifying risks and benefits. They simplify complex decision-making processes by breaking them down into manageable, sequential steps, enhancing clarity and strategic planning.

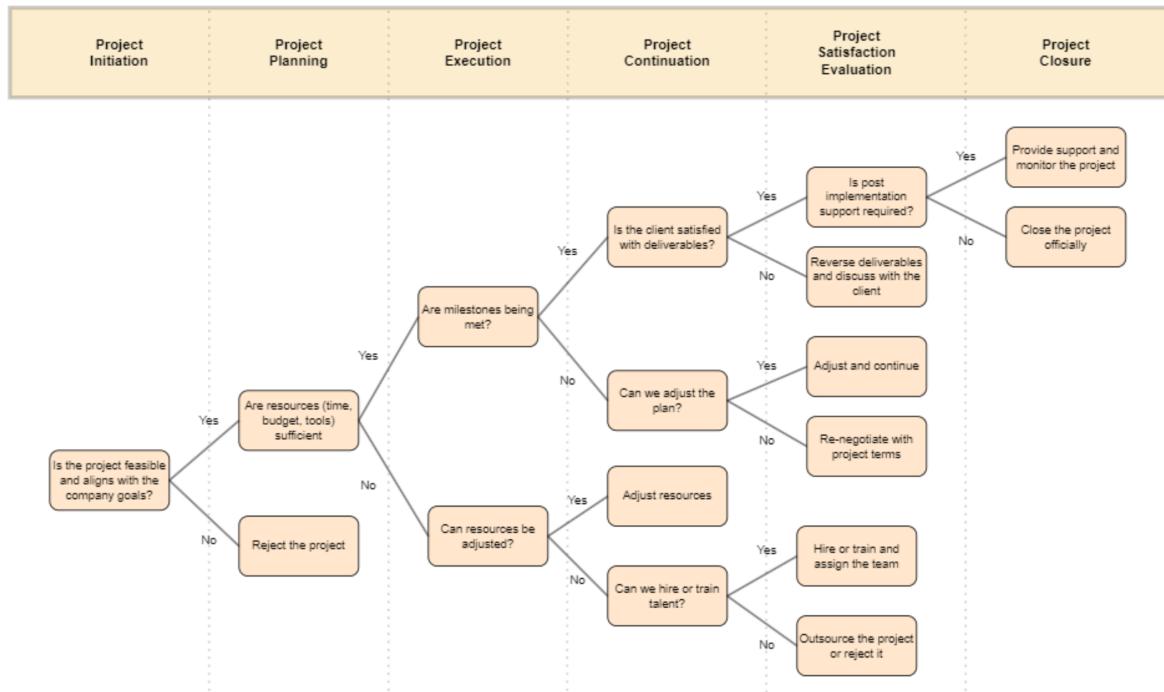
**Figure 28.** Decision Tree for Tech Rajshahi

Figure 29 illustrates a comprehensive project management lifecycle, guiding decisions from project initiation through closure. It begins by evaluating project feasibility and alignment with company goals, then assesses resource sufficiency. The tree branches based on whether milestones are met, client satisfaction with deliverables, and the need for post-implementation support. It offers alternative paths for various scenarios, including adjusting plans, renegotiating terms, or even rejecting the project if necessary. The process emphasizes adaptability, allowing for resource adjustments, hiring or training new talent, or outsourcing when needed. Throughout, it focuses on client satisfaction and effective resource management. The tree concludes with either providing ongoing project support or officially closing the project, ensuring a thorough approach to project management that addresses potential challenges and outcomes at each stage.

4.5. Decision Table

A decision table is a crucial tool in system analysis that helps systematically evaluate complex decision-making scenarios. By presenting conditions and corresponding actions in a structured tabular format, decision tables enable analysts to clearly visualize and assess the impact of different inputs on system outputs. This organized approach not only simplifies the analysis of various scenarios but also aids in identifying inconsistencies, redundancies, and gaps in decision logic. The importance of decision tables lies in their ability to ensure comprehensive coverage of possible conditions, improve decision accuracy, and enhance communication among stakeholders, ultimately leading to more effective and reliable system design and implementation. This decision table provides a systematic framework for making decisions at various stages of a project, from feasibility assessment to closure. This tool allows Tech Rajshahi Ltd. to quickly evaluate different scenarios and determine the appropriate actions, ensuring consistent and efficient project management.

across the organization.

Condition Stub	Condition Entry								
	1	2	3	4	5	6	7	8	9
IF									
Is the project feasible?	N	Y	Y	Y	Y	Y	Y	Y	Y
Are Resources enough?		Y	Y	Y	Y	Y	N	N	N
Are Milestones met?		Y	Y	Y	N	N			
Is the client satisfied?		Y	Y	N					
Is post-implementation support required?		Y	N						
Can Resources be adjusted?							Y	N	N
Can we adjust the plan?					Y	N			
Can we hire or train								Y	N
Then									
Reject the project	X								
Adjust Resources							X		
Reverse deliverables and discuss with client				X					
Adjust and Continue					X				
Renegotiate with project team						X			
Hire or train and assign team								X	
Outsource the project/reject									X
Provide Support		X							
Close the project			X						
Action Stub	Action Entry								

Figure 29. Decision Table for Tech Rajshahi

4.6. Conclusion

The structured analysis tools discussed in this chapter—Data Flow Diagrams (DFDs), Data Dictionaries, Decision Trees, and Decision Tables—are essential for systematically analyzing and designing systems. DFDs provide a visual representation of data movement through processes, helping to clarify system functionality and identify inefficiencies in Tech Rajshahi Ltd.'s operations. Data Dictionaries ensure consistency and clear communication about data elements, supporting effective system development and maintenance. Decision Trees facilitate complex decision-making by mapping out possible outcomes, allowing for strategic planning and resource optimization. Decision Tables help ensure comprehensive decision-making by visualizing conditions and their actions.

5

Chapter 5: Feasibility Study

5.1. Introduction

A feasibility study evaluates the practicality and sustainability of a proposed project, ensuring that the company has adequate resources and the potential to generate profit. The study also identifies potential risks and the benefits of taking those risks for Tech Rajshahi Ltd., a technology company based in Northern Bangladesh.

5.2. Feasibility Considerations

There are multiple factors to consider during a feasibility study. For Tech Rajshahi, the following are critical:

5.2.1. Economic Feasibility

Economic feasibility examines the cost–benefit analysis, ensuring that the project will yield sufficient returns. This includes evaluating expenses related to new initiatives like software development, e-commerce platforms, and mobile app development, and determining whether they are financially viable in the long term.

5.2.2. Technical Feasibility

Technical feasibility checks whether Tech Rajshahi has the required technological infrastructure and expertise to carry out its digital transformation projects. This includes assessing existing systems, potential integrations with e-commerce platforms, and the capacity of the team to handle complex software solutions.

5.2.3. Operational Feasibility

Operational feasibility evaluates whether Tech Rajshahi's everyday operations, infrastructure, and support processes can sustain the proposed system. Key considerations include:

5.3. Steps of Feasibility Analysis

The steps of feasibility analysis are as follows:

- **Form Project Team:** Start by appointing a project leader and assembling a team of experts or stakeholders who will be responsible for conducting the feasibility analysis. This team will handle all aspects of evaluation and decision-making during the process.
- **Prepare System Flowchart:** Develop a system flowchart to visualize the workflow and processes of the proposed system. This helps in understanding how the system functions and identifies potential bottlenecks or inefficiencies.

- **Enumerate Candidate Systems:** Identify and list all potential systems that could meet the project's objectives. These systems should align with the goals and constraints of the project and be technically feasible.
- **Describe Candidate Systems:** Provide detailed descriptions of each candidate system, including their features, specifications, and functionalities. This step ensures that all options are thoroughly understood before comparison.
- **Evaluate Performance and Cost:** Assess each system's performance in terms of efficiency, reliability, and scalability, as well as its cost-effectiveness. This comparison helps in determining which system offers the best value for the project.
- **Weight Criteria:** Assign relative importance or weights to the performance and cost criteria based on the project's priorities. Some projects may prioritize cost savings, while others may focus on performance.
- **Select Best System:** Based on the evaluation and weighted criteria, choose the system that offers the most favourable balance between performance and cost, ensuring it meets the project's objectives.
- **Report to Management:** Compile the findings, including the analysis and the selected system, and present the report to management for approval. The report should provide sufficient evidence for the decision-making process.

5.4. Initial Feasibility Study

Based on an initial review of Tech Rajshahi's challenges and goals, several constraints and proposed improvements were identified:

5.4.1. Existing System Constraints

- Difficulty in retaining skilled talent.
- Lack of e-commerce knowledge among potential recruits.
- Challenges in achieving profitability.
- Limited customer satisfaction due to communication and product issues.

5.4.2. Proposed System Goals

- Offering competitive salaries and career development opportunities to retain talent.
- Providing training programs to bridge the e-commerce knowledge gap.
- Creating a clear marketing and sales strategy to boost profitability.
- Improving client communication and satisfaction by enhancing service quality.

5.5. Feasibility Analysis Steps

Candidate System 1

Enhanced E-commerce Platform Integration

The Enhanced E-commerce Platform Integration system focuses on improving Tech Rajshahi's customer-facing operations by implementing a robust e-commerce platform. This system aims to streamline processes such as customer relationship management (CRM), sales, and marketing, providing a seamless experience for both the company and its clients. Key features include advanced CRM tools, automated marketing systems, and comprehensive payment gateway integration, allowing Tech Rajshahi to track customer interactions, analyze sales data, and personalize marketing efforts effectively. By improving the user experience and enhancing scalability, the system will empower the company to expand its online business operations, increase customer engagement, and boost overall sales performance. Although it requires a significant upfront investment and integration with existing systems, the long-term benefits in terms of increased market reach and customer satisfaction make this system a valuable option for Tech Rajshahi's growth strategy.

Key points:

- Introduce more training programs for employees.
- Develop clearer sales and marketing strategies.
- Focus on improving communication with clients.

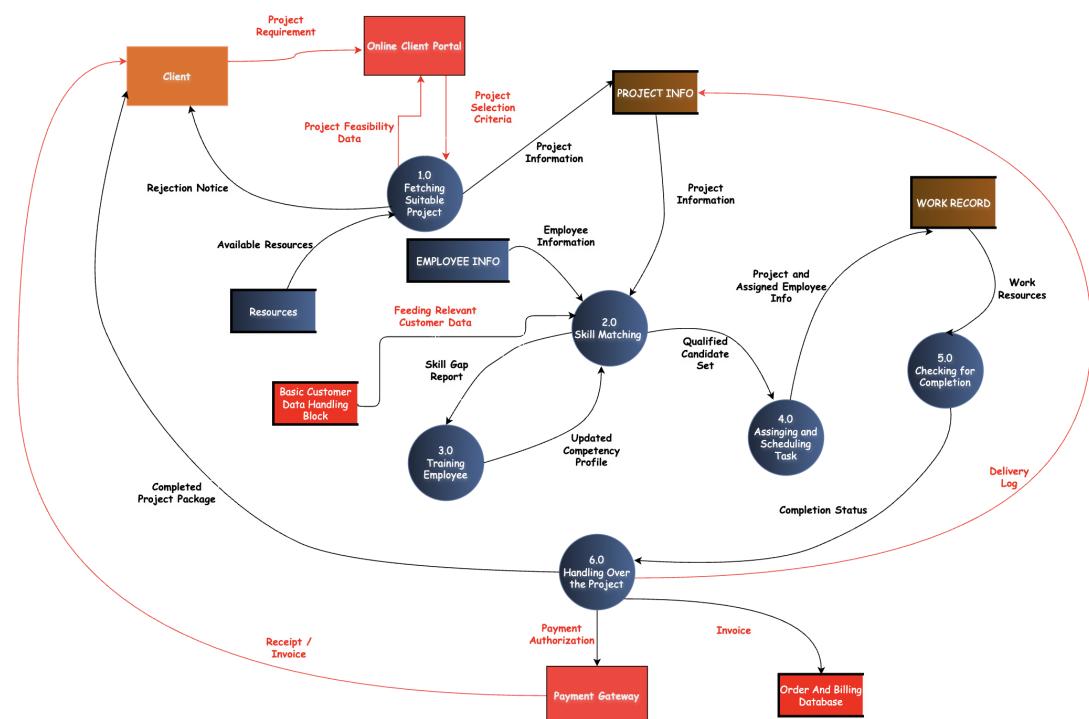


Figure 30. DFD for Candidate System 1

Candidate System 2

AI-Powered Project Management and Automation

The AI-Powered Project Management and Automation system is designed to improve Tech Rajshahi's internal operations by automating key project management tasks. This system leverages artificial intelligence to assign tasks, track progress, optimize resource allocation, and provide predictive analytics for project risks and timelines. By reducing manual workload and streamlining project workflows, the system allows the company to manage multiple projects more efficiently, enhancing productivity and minimizing delays. The AI-powered tool will also provide real-time insights into potential bottlenecks and suggest preventive actions, improving overall project completion rates. While the implementation costs and training requirements are higher, this system will significantly enhance operational efficiency, making it easier for Tech Rajshahi to scale up its project management capabilities and handle more complex projects with minimal resource strain. The automation features make this system highly cost-effective in the long run, offering a strong return on investment through improved internal processes.

Key points:

- Introduce AI-based tools for internal advertising.
- Digitize the workflow, especially for project management and client relations.
- Improve employee satisfaction with better training and career growth options.

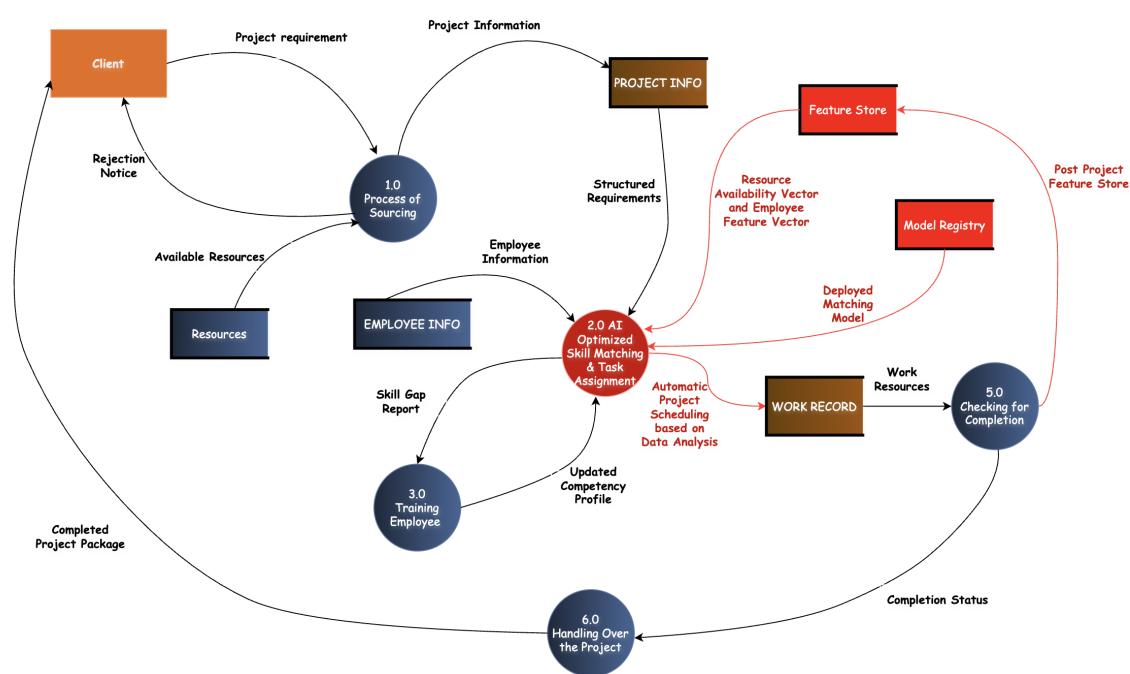


Figure 31. DFD for Candidate System 2

5.5.1. Characteristics of Candidate Systems

Table 6 compares key characteristics of the two candidate systems.

Characteristics	Candidate System 1	Candidate System 2
Employee Training	In-house training programs	AI-assisted training tools
Marketing Strategy	Manual client acquisition	Automated client acquisition
Workflow Management	Semi-manual process	Fully digital and automated
Cost	Tk 8,00,000	Tk 12,00,000

Table 6. Characteristics of Candidate Systems

5.5.2. Candidate Qualitative Evaluation Matrix

Table 7 presents a qualitative evaluation of the two candidate systems across several criteria.

Evaluation Criteria	Candidate System 1	Candidate System 2
Performance	Good	Excellent
Employee Satisfaction	Very Good	Excellent
Client Satisfaction	Good	Excellent
Costs	Moderate	High
Payback Time	6 months	3 months

Table 7. Qualitative Evaluation Matrix

5.5.3. Performance/Cost Evaluation Matrix

Table 8 compares the two systems in terms of performance and cost metrics.

Evaluation Criteria	Candidate System 1	Candidate System 2
Performance	85%	90%
Employee Satisfaction	Yes	Highly positive
Client Satisfaction	Yes	Highly positive
Costs	Tk 8,00,000	Tk 12,00,000
Payback Time	6 months	3 months

Table 8. Performance/Cost Evaluation Matrix

5.5.4. Project Cost Estimates

Table 9 lists the cost estimates for each phase of the two candidate systems.

Phase	Candidate System 1	Candidate System 2
Study Phase	Tk 40,000	Tk 50,000
Design Phase	Tk 1,00,000	Tk 1,20,000
Development Phase	Tk 6,60,000	Tk 10,30,000
Total Cost	Tk 8,00,000	Tk 12,00,000

Table 9. Project Cost Estimates

5.5.5. Weighted Candidate Evaluation Matrix

Table 10 presents a weighted evaluation of the candidate systems based on various criteria. Scores are calculated by multiplying each criterion's weighting factor by the system's rating.

Evaluation Criteria	Weighting Factor	Candidate System 1	Candidate System 2
Client Satisfaction	5	20	25
Employee Satisfaction	4	16	20
Performance	4	16	20
System Flexibility	3	12	9
Technology Integration	3	12	15
Costs	3	9	6
Scalability	2	6	8
Payback Period	2	8	10
Implementation Time	1	4	3
Maintenance Needs	1	4	3
Total Score	—	107	119

Table 10. Weighted Candidate Evaluation Matrix

5.6. Feasibility Report

The two proposed systems for Tech Rajshahi Ltd. differ significantly. Candidate System 1 focuses on gradual improvements such as employee training, clearer marketing strategies, and enhanced communication with clients. This system is cost-effective but slower in achieving significant transformation. Candidate System 2 emphasizes digitization, introducing AI tools, and automated workflows to streamline operations. This system offers faster payback and higher client and employee satisfaction despite a higher initial cost. The weighted evaluation matrix indicates that Candidate System 2 scores higher overall, reflecting its potential to deliver significant improvements in efficiency, scalability, and profitability. Although the initial costs are higher, the long-term benefits, including reduced manual workload and enhanced project management capabilities, justify the investment. Thus, Candidate System 2 is the recommended choice due to its ability to deliver quicker and more substantial operational benefits, aligning well with Tech Rajshahi's strategic goals for growth and competitive advantage.

5.7. Conclusion

The feasibility study conducted for Tech Rajshahi Ltd. evaluates two proposed systems designed to address the company's operational and strategic needs. Candidate System 1 emphasizes incremental improvements with a focus on enhancing employee training, refining marketing strategies, and improving client communication. This system is relatively cost-effective, with a moderate initial investment, and provides moderate enhancements in performance and satisfaction. However, its slower implementation and more gradual transformation could delay the realization of substantial benefits. In contrast, Candidate System 2 offers a more ambitious approach by integrating AI-powered project management and automation tools. This system aims to streamline workflows, optimize resource allocation, and enhance overall operational efficiency. With a higher upfront cost, it promises quicker returns and superior performance metrics, resulting in higher client and employee satisfaction. The analysis indicates that Candidate System 2 delivers more significant improvements, making it the preferred option for Tech Rajshahi Ltd. By adopting this system, the company can achieve substantial operational improvements, supporting its long-term growth and competitive positioning.

6

Chapter 6: Cost–Benefit Analysis

6.1. Introduction

A cost–benefit analysis (CBA) evaluates whether the anticipated benefits of a proposed system outweigh its associated costs. It provides a quantitative and qualitative assessment of all financial, operational, and strategic factors that influence the decision to implement a system. For Tech Rajshahi Ltd., this analysis aims to determine which of the two proposed systems—Candidate System 1 (Enhanced E-Commerce Platform Integration) or Candidate System 2 (AI-Powered Project Management and Automation)—offers a superior return on investment and long-term value.

The cost–benefit analysis complements the feasibility study by assigning numerical and qualitative values to each option, ensuring management decisions are both rational and economically justified.

6.2. Objectives of Cost–Benefit Analysis

- To estimate the overall costs (development, operation, and maintenance) for each candidate system.
- To identify and quantify tangible and intangible benefits.
- To evaluate the financial performance using payback period, ROI, and cost–benefit ratio.
- To select the system that provides the most favorable balance between cost and benefit.

6.3. Types of Costs and Benefits

Costs and benefits can be categorized as follows:

6.3.1. Costs

- **Tangible Costs:** Quantifiable costs such as hardware, software, development, and training expenses.
- **Intangible Costs:** Non-quantifiable costs including productivity loss during transition or user resistance.

6.3.2. Benefits

- **Tangible Benefits:** Measurable gains like increased sales revenue, reduced operating expenses, and improved efficiency.
- **Intangible Benefits:** Qualitative improvements such as better decision-making, higher employee morale, and enhanced brand image.

6.4. Cost Estimation (in BDT)

Enhanced E-Commerce Platform Integration

Cost Category	Description	Estimated Cost (BDT)
Hardware Acquisition Cost	Workstations, networking, and storage servers	1,20,000
Software and Licensing Cost	CRM, payment gateway, e-commerce suite licenses	90,000
System Development and Customization	Website redesign, database integration, testing	3,20,000
Training and Workshops	Training sessions for employees and management	70,000
Data Migration and Setup	Transfer of client/project data to the new platform	50,000
Operational and Maintenance Cost (Annual)	System monitoring, updates, technical support	1,50,000
Miscellaneous Costs	Communication, documentation, contingency	50,000
Total Cost		8,00,000

Table 11. Cost Breakdown for Candidate System 1

AI-Powered Project Management and Automation

Cost Category	Description	Estimated Cost (BDT)
Hardware Infrastructure Upgrade	High-performance servers and cloud integration	2,00,000
AI Software Licensing and APIs	Machine-learning tools, analytics APIs	1,50,000
System Development and Integration	Automation modules, workflow engine, dashboards	5,80,000
Employee Training Programs	AI-based skill development sessions	1,00,000
Maintenance and Support (Annual)	Regular AI model updates, bug fixes	1,20,000
Contingency and Miscellaneous	Unforeseen costs, documentation	50,000
Total Cost		12,00,000

Table 12. Cost Breakdown for Candidate System 2

6.5. Benefit Estimation (in BDT)

Enhanced E-Commerce Platform Integration

Tangible Benefits:

- Reduction in manual order-processing costs: BDT 1,50,000 per year.
- Increase in customer acquisition through improved CRM: BDT 2,00,000 per year.
- Improved sales revenue via smoother e-commerce operations: BDT 3,00,000 per year.
- Reduction in communication delays and rework: BDT 50,000 per year.

Total Tangible Benefits: BDT 7,00,000 per year.

Intangible Benefits:

- Improved brand image and client confidence.
- Enhanced staff coordination and workflow clarity.
- Faster service delivery and client satisfaction.

AI-Powered Project Management and Automation

- Reduction in manual workload and errors: BDT 2,50,000 per year.
- Time savings due to task automation: BDT 3,00,000 per year.
- Increase in project throughput and completion rate: BDT 3,50,000 per year.
- Improved decision-making via analytics and insights: BDT 2,00,000 per year.
- Reduced project delays and client complaints: BDT 1,00,000 per year.

Total Tangible Benefits: BDT 12,00,000 per year.

Intangible Benefits:

- Real-time data visibility and smarter resource allocation.
- Enhanced employee morale and innovation culture.
- Stronger client trust and market reputation.

6.6. Financial Metrics Formulas

To evaluate the financial viability of each candidate system, we use the following formulas:

1. Payback Period (PP):

The payback period measures how long it takes to recover the initial investment from annual benefits.

$$\text{Payback Period (Years)} = \frac{\text{Initial Cost}}{\text{Net Annual Benefit}}$$

2. Return on Investment (ROI):

ROI indicates the profitability of the investment as a percentage of the initial cost.

$$\text{ROI (\%)} = \left(\frac{\text{Net Annual Benefit} - \text{Initial Cost}}{\text{Initial Cost}} \right) \times 100$$

3. Cost-Benefit Ratio (CBR):

The cost-benefit ratio compares total benefits to total costs. A ratio greater than 1.0 indicates benefits exceed costs.

$$\text{CBR} = \frac{\text{Total Benefits}}{\text{Total Costs}}$$

Calculation for Candidate System 1:

$$\text{Payback Period} = \frac{8,00,000}{8,00,000} = 1.0 \text{ year}$$

$$\text{ROI} = \left(\frac{8,00,000 - 8,00,000}{8,00,000} \right) \times 100 = 0\% \text{ (first year)}$$

$$\text{After second year: } \left(\frac{7,00,000}{8,00,000} \right) \times 100 = 87.5\%$$

$$\text{CBR} = \frac{8,00,000}{8,00,000} = 1.0 : 1.0 \text{ (first year)}$$

$$\text{Over 2 years: } \frac{14,00,000}{8,00,000} = 1.0 : 1.75$$

Calculation for Candidate System 2:

$$\text{Payback Period} = \frac{12,00,000}{14,50,000} = 0.83 \text{ years (approx. 10 months)}$$

$$\text{ROI} = \left(\frac{14,50,000 - 12,00,000}{12,00,000} \right) \times 100 = 20.8\% \text{ (first year)}$$

$$\text{After second year: } \left(\frac{14,50,000}{12,00,000} \right) \times 100 = 120.8\%$$

$$\text{CBR} = \frac{14,50,000}{12,00,000} = 1.0 : 1.21 \text{ (first year)}$$

$$\text{Over 2 years: } \frac{26,50,000}{12,00,000} = 1.0 : 2.20$$

6.7. Comparative Cost–Benefit Summary

Category	Candidate System 1	Candidate System 2
Initial Cost (BDT)	8,00,000	12,00,000
Annual Tangible Benefits (BDT)	7,00,000	12,00,000
Annual Intangible Benefits (Approx. Value)	1,00,000	2,50,000
Net Annual Benefit (BDT)	8,00,000	14,50,000
Payback Period (Years)	1.0	0.83
Return on Investment (ROI)	87.5%	120.8%
Cost–Benefit Ratio (CBR)	1.0 : 1.75	1.0 : 2.20

Table 13. Comparative Cost–Benefit Summary of Candidate Systems

6.8. Interpretation and Analysis

The comparative analysis clearly demonstrates that although **Candidate System 2** requires a higher initial investment, it offers significantly greater tangible and intangible benefits. Its higher ROI (120.8%) and more favorable cost–benefit ratio (1:2.20) indicate faster payback and higher profitability. The automation and AI integration also deliver intangible advantages, such as improved employee performance and stronger market competitiveness, which compound long-term benefits beyond the measurable financial scope.

6.9. Recommendation

Based on both quantitative and qualitative evaluations:

- **Candidate System 2** is the superior choice for implementation at Tech Rajshahi Ltd..
- It provides higher productivity, shorter project delivery cycles, and greater scalability.
- Although the initial investment is higher, its quicker payback and greater overall value make it the most sustainable option.

6.10. Conclusion

The cost–benefit analysis reinforces the feasibility study and supports the selection of **AI-Powered Project Management and Automation (Candidate System 2)** as the preferred solution for Tech Rajshahi Ltd..

Key quantitative outcomes include a net annual benefit of BDT 14,50,000, a payback period of approximately 0.83 years, an ROI of about 120.8% in the first year, and a favourable cost–benefit ratio of 1:2.20.

Expected benefits:

- Significant reduction in manual effort and human error.
- Faster project delivery and improved on-time completion rates.
- Better resource utilisation through predictive analytics.
- Enhanced client satisfaction and employee experience.
- Greater scalability without proportional increases in headcount.

Implementation recommendations:

- Adopt a phased rollout starting with a pilot department.
- Allocate budget for integration, training, and 12-month support.
- Establish governance with a steering group to manage change.
- Track KPIs such as project completion rates, turnaround time, and client satisfaction.

With its strong financial return and operational advantages, Candidate System 2 is the recommended investment for Tech Rajshahi's digital transformation goals.

7

Chapter 7: System Design

7.1. Introduction

System design translates analytical insights into a structured and actionable blueprint for implementation. For Tech Rajshahi Ltd., this phase represents the transformation of the requirements gathered and validated in earlier chapters into well-defined technical and functional components of the proposed AI-Powered Project Management and Automation system. The design process ensures that the system is **reliable, scalable, secure, and user-centric**, meeting the diverse needs of employees, clients, and administrators. It acts as the crucial bridge between conceptual analysis—such as DFDs, process models, and requirement specifications—and the real-world construction of a robust system that aligns with Tech Rajshahi's operational and strategic goals.

7.2. Objectives of System Design

The primary objectives of the system design phase are:

- To define the logical and physical architecture of the proposed system.
- To specify hardware, software, and network requirements for implementation.
- To design database structures and data flow mechanisms.
- To create user interfaces that are intuitive and accessible.
- To establish security protocols and data protection measures.
- To ensure scalability and maintainability for future enhancements.

7.3. Types of System Design

System design can be broadly categorized into two types:

7.3.1. Logical Design

Logical design focuses on *what* the system will accomplish—defining major modules, data flows, functional interactions, user roles, and system security policies. It is independent of hardware and software platforms and concentrates on the functional requirements and business logic.

7.3.2. Physical Design

Physical design concentrates on *how* the system will be constructed—specifying hardware configurations, network infrastructure, database schema, user interface layout, and platform dependencies. It translates the logical design into technical specifications for actual implementation.

7.4. Stages of System Design

The system design process follows a systematic approach divided into several key stages:

7.4.1. Stage 1: Requirement Review

Before beginning the design, all requirements gathered during analysis are reviewed and validated with stakeholders to ensure completeness and accuracy.

7.4.2. Stage 2: Architectural Design

The overall system architecture is defined, including the selection of client-server or cloud-based models, selection of programming languages, frameworks, and identification of major system components.

7.4.3. Stage 3: Database Design

Database structures, relationships, and schemas are designed following normalization principles to ensure data integrity and efficiency.

7.4.4. Stage 4: Interface Design

User interfaces, navigation flows, and screen layouts are designed with emphasis on usability and accessibility.

7.4.5. Stage 5: Security and Control Design

Security measures, access controls, authentication mechanisms, and data protection protocols are defined.

7.4.6. Stage 6: Design Verification

The completed design is reviewed and validated through prototyping, user feedback, and technical evaluation before proceeding to implementation.

7.5. Design Methodology

Tech Rajshahi adopts a **hybrid design methodology** that combines the structured discipline of traditional design principles with the flexibility of modern agile practices. This dual approach enables continuous refinement of modules while maintaining a high level of documentation, consistency, and traceability.

7.6. Logical Design for Tech Rajshahi

7.6.1. Process Design

The logical process design of the proposed AI-Powered Project Management and Automation system focuses on integrating multiple interdependent modules into a unified platform that enhances collaboration, transparency, and operational efficiency. Each module has been carefully designed to address specific organizational needs while maintaining seamless interaction with others through shared databases and APIs.

Key modules include:

- **Project Management Module:** Manages projects from initiation to completion, tracking deliverables, milestones, and assigned personnel. Features automated progress dashboards, task dependency visualization, and real-time reporting to improve project visibility. Integration with time-tracking systems ensures precise resource allocation and performance evaluation.
- **AI-Based Task Assignment Module:** Uses machine learning algorithms to match employee skills with project requirements, optimizing resource allocation and reducing manual assignment overhead. The module learns from historical project data to improve assignment accuracy over time.
- **Communication Module:** Facilitates internal team collaboration through centralized messaging, file sharing, and discussion threads. For external communication, the module synchronizes with client-preferred channels such as email, Slack, or video conferencing platforms. This multi-platform integration enhances flexibility while maintaining message consistency.
- **Billing and Payment Module:** Automates invoice generation based on project progress and logged hours, minimizing human error and administrative delays. Tracks both outgoing and incoming payments, ensuring accuracy and transparency. Supports multiple currencies and payment gateways to accommodate diverse clients.
- **Feedback and Quality Assurance Module:** Collects structured responses from both clients and employees. Integrates directly with quality testing tools to correlate test outcomes with user satisfaction metrics, enabling data-driven quality improvement. Automated feedback summaries help management identify recurring issues and areas for process optimization.
- **Predictive Analytics Module:** Provides real-time insights into project risks, resource bottlenecks, and timeline predictions using AI algorithms. Generates alerts and recommendations to prevent delays and cost overruns.

7.6.2. Data Design

The system employs a well-structured relational database schema (based on MySQL or PostgreSQL) to manage interconnected data across various modules. Core entities include **Client**, **Project**, **Invoice**, **Employee**, **Task**, **Assignment**, **Feedback**, and **QAResult**. Referential integrity is maintained using primary and foreign key constraints, ensuring consistency and eliminating redundancy.

The database follows normalization principles (up to 3NF) to maintain efficiency and scalability. Relationships such as "one-to-many" between clients and projects or "many-to-many" between employees and tasks are implemented using junction tables. An Entity–Relationship (ER) diagram visually represents these associations, simplifying database maintenance and future system upgrades.

Furthermore, indexing and query optimization techniques are used to enhance system performance, especially under heavy workloads. The data model also incorporates version control for audit trails and ensures compliance with international data protection standards.

7.6.3. Interface Design

The user interface (UI) and user experience (UX) are designed with an emphasis on simplicity, responsiveness, and accessibility. The front end is developed using modern web technologies such as *React* or *Vue.js* with *Bootstrap* or *Tailwind CSS*, ensuring a clean, modern layout that adapts seamlessly to desktop, tablet, and mobile devices.

Key features include:

- **Unified Authentication:** A single sign-on (SSO) system integrates all modules, supported by OAuth 2.0 for secure access.
- **Dynamic Dashboards:** Personalized dashboards display project timelines, team activities, billing summaries, and client feedback in graphical form using charts and visual indicators.
- **Role-Based Navigation:** Each user—admin, project manager, team lead, or developer—has access only to relevant modules and data based on their role and permissions.
- **Interactive Forms and Reports:** Data entry and reporting interfaces are interactive, allowing quick filtering, searching, and exporting to CSV, Excel, or PDF formats.
- **Notification System:** Real-time notifications alert users about task assignments, project updates, deadline reminders, and system alerts through both in-app and email channels.

The overall design philosophy ensures that employees can focus on productivity while management gains visibility into organizational performance through visual analytics and comprehensive reports.

7.6.4. Security Design

Security is a top priority in the system design, ensuring that sensitive organizational and client data are safeguarded against unauthorized access and breaches. The system adopts a multi-layered security framework covering authentication, encryption, and continuous monitoring.

- **Authentication and Authorization:** Multi-factor authentication (MFA) is enforced for all users, while role-based access control (RBAC) restricts permissions to minimize insider threats. Password policies enforce strong passwords with regular expiration and complexity requirements.

- **Data Encryption:** All data exchanges occur over HTTPS with TLS encryption. Sensitive fields such as passwords, financial details, and personal information are hashed using secure algorithms like bcrypt or Argon2.
- **Monitoring and Backup:** Regular automated backups are maintained in secure cloud storage with automated restoration checks. Continuous system monitoring identifies anomalies, intrusion attempts, and performance issues in real-time.
- **Audit and Compliance:** Comprehensive audit logs track all user actions, data modifications, and system access. Periodic security audits are conducted to ensure compliance with relevant data protection regulations. Security logs are preserved for traceability and accountability.
- **Vulnerability Management:** Regular security patches and updates are applied to all system components. Penetration testing and vulnerability assessments are conducted periodically to identify and address potential security weaknesses.

Through this design, Tech Rajshahi's system achieves a balance between usability, performance, and robust protection, ensuring long-term reliability and trust for both clients and employees.

7.7. Physical Design for Tech Rajshahi

7.7.1. Hardware and Network Setup

The physical infrastructure of Tech Rajshahi's AI-Powered Project Management and Automation system has been designed to ensure high availability, scalability, and secure access across all locations. The company will adopt a **hybrid infrastructure**—combining on-premise servers at the Rajshahi headquarters with cloud-based resources to support remote teams and clients. This setup provides both reliability and flexibility while minimizing infrastructure costs.

- **Workstations:** Each workstation is equipped with a minimum of 8 GB RAM, SSD storage, and high-speed internet connectivity to ensure smooth operation of development tools and system dashboards.
- **Local Servers:** A dedicated on-premise server hosts the backend of the system, managing authentication, transaction processing, AI model execution, and report generation. RAID-enabled drives are used for redundancy and fault tolerance.
- **Cloud Integration:** Cloud storage services such as *AWS*, *Google Cloud*, or *Microsoft Azure* are used for real-time backups, ensuring data durability and remote access for distributed teams and clients.
- **Network Configuration:** The internal LAN connects through a managed switch and firewall router, providing secure communication channels. VPN access is granted to remote employees to maintain confidentiality and integrity.
- **Backup and Recovery:** Daily automated data backups are stored both locally and on the cloud, with a recovery mechanism tested weekly to ensure minimal data loss in case of hardware failure or cyber incidents.

This infrastructure design guarantees that Tech Rajshahi's system can support both on-site and remote work environments, aligning with the company's flexible work policy and future scalability plans.

7.7.2. Database Implementation

The system uses a **MySQL** or **PostgreSQL** database optimized for concurrent operations and heavy query loads. The database schema follows normalization principles (up to 3NF) to eliminate redundancy and improve efficiency.

Key technical features include:

- **Optimized Indexing:** Composite indexing on frequently queried fields and query caching improve performance for analytical queries and report generation.
- **Encryption:** Sensitive data, including employee details, financial transactions, and client credentials, are encrypted both *at rest* and *in transit* using AES-256 encryption.
- **Replication:** A master-slave replication setup ensures real-time data synchronization and disaster recovery readiness. The slave server can immediately take over in case of primary server failure.
- **Backup Automation:** Automated scripts schedule daily incremental backups and weekly full backups, with checksum validation to detect corruption.
- **Monitoring Tools:** Performance monitoring tools such as *phpMyAdmin*, *pgAdmin*, or *Prometheus* are integrated for real-time analytics and database health checks.

The database design supports multi-user access while maintaining strict role-based permissions to prevent unauthorized data exposure. The use of cloud-based replication also ensures zero downtime during scaling or maintenance operations.

7.7.3. Software and Technology Stack

The technology stack for the AI-Powered Project Management and Automation system has been carefully selected to ensure performance, maintainability, and scalability:

Component	Technology
Backend Framework	Node.js with Express or Python with Django/Flask
Frontend Framework	React.js or Vue.js with Tailwind CSS
Database	MySQL or PostgreSQL
AI/ML Libraries	TensorFlow, PyTorch, or Scikit-learn
Authentication	OAuth 2.0, JWT (JSON Web Tokens)
Cloud Services	AWS, Google Cloud, or Microsoft Azure
Version Control	Git with GitHub or GitLab
Containerization	Docker
CI/CD Pipeline	GitHub Actions or Jenkins
Monitoring	Prometheus, Grafana, or New Relic

Table 14. Technology Stack for Tech Rajshahi's System

7.7.4. Deployment Environment

Tech Rajshahi's system will be deployed within a secure, containerized environment for better resource management and faster deployment cycles. The deployment architecture ensures portability, automation, and fault tolerance through the following technologies and practices:

- **Operating Environment:** A Linux-based system (preferably Ubuntu Server or CentOS) serves as the host operating system for stability and performance.
- **Containerization:** *Docker* containers encapsulate application components, allowing consistent deployment across testing, staging, and production environments.
- **Orchestration:** *Docker Compose* or *Kubernetes* is used to manage container clusters, handle load balancing, and automate scaling based on traffic and workload.
- **CI/CD Pipelines:** Continuous Integration and Continuous Deployment pipelines are implemented using *Github Actions* or *Jenkins*. These pipelines automate code testing, building, and deployment, significantly reducing downtime and manual errors.
- **Version Control and Rollback:** The system supports versioned deployments with rollback capabilities, ensuring operational continuity in case of system errors or bugs introduced in new releases.

This deployment strategy ensures that updates, patches, and new features can be rolled out rapidly and securely without disrupting ongoing operations.

7.8. System Architecture Diagram

Figure 32 illustrates the overall architecture of the proposed system, showing the interaction between different components, modules, and external systems.



System Architecture (Placeholder)

Figure 32. System Architecture for AI-Powered Project Management and Automation

The architecture follows a three-tier model:

- **Presentation Layer:** Web-based user interface accessible via browsers on desktop and mobile devices.
- **Application Layer:** Backend server containing business logic, AI algorithms, and API endpoints.
- **Data Layer:** Database server storing all organizational data with backup and replication mechanisms.

7.9. Database Schema Design

Figure 33 presents the Entity-Relationship diagram showing the database structure and relationships between different entities in the system.

Database Design (Placeholder)

Figure 33. Database Schema Design for Tech Rajshahi's System

The database schema includes the following key entities and relationships:

- **Client (1:M) Project:** One client can have multiple projects.
- **Project (1:M) Task:** One project consists of multiple tasks.
- **Employee (M:N) Task:** Employees can be assigned to multiple tasks, and tasks can have multiple employees (many-to-many relationship implemented via **Assignment** junction table).
- **Project (1:M) Invoice:** One project can generate multiple invoices over time.
- **Task (1:M) Feedback:** Each task can receive feedback from clients or team members.

7.10. Input/Output Design

7.10.1. Input Design

Input design focuses on creating efficient and user-friendly data entry mechanisms. The system provides various input methods including:

- **Web Forms:** Structured forms with validation for creating projects, tasks, employees, and clients. Forms include field validation, required field indicators, and helpful tooltips.

- **Bulk Import:** CSV or Excel file upload functionality for bulk data entry of employees, tasks, or historical project data.
- **API Integration:** RESTful APIs allow integration with external systems such as accounting software, time-tracking tools, or client management systems.
- **Voice Input:** For mobile users, voice-to-text capabilities can be integrated for task updates and notes.

Input validation ensures data integrity by checking for:

- Required fields are not left empty.
- Data formats are correct (e.g., email addresses, phone numbers, dates).
- Numerical values fall within acceptable ranges.
- Duplicate entries are prevented where appropriate.

7.10.2. Output Design

Output design focuses on presenting information in clear, actionable formats. The system generates various types of outputs:

- **Dashboards:** Interactive visual dashboards displaying key performance indicators (KPIs), project status, resource allocation, and financial metrics using charts and graphs.
- **Reports:** Comprehensive reports in PDF format including:
 - Project progress reports
 - Financial reports (invoices, payment tracking)
 - Employee performance reports
 - Client satisfaction reports
 - System usage analytics
- **Notifications:** Email and in-app notifications for task assignments, deadline reminders, project updates, and system alerts.
- **Exports:** Data export functionality in multiple formats (CSV, Excel, PDF) for further analysis or record-keeping.
- **Predictive Insights:** AI-generated predictions and recommendations displayed as visual alerts and detailed reports, helping management make proactive decisions.

7.11. Structure Chart

Figure 34 presents the hierarchical structure of the system showing the modular decomposition and relationships between different system components.

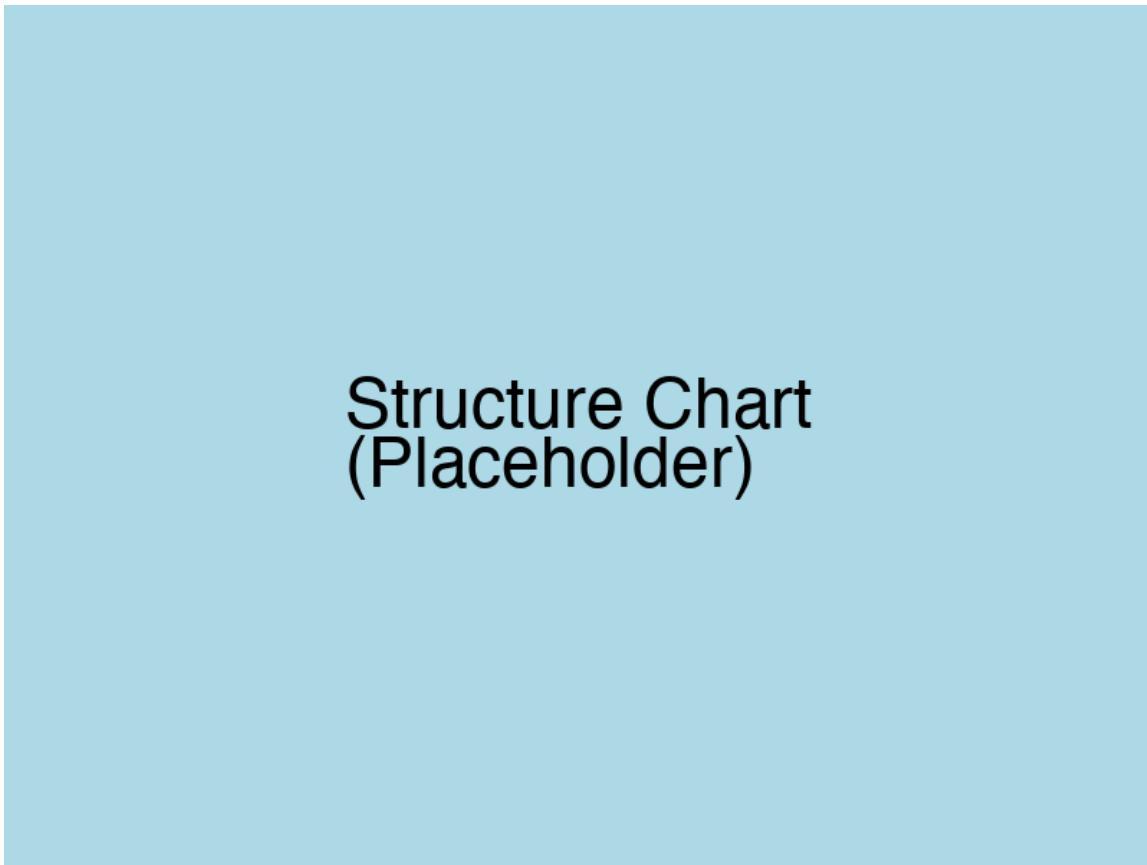


Figure 34. Structure Chart of the Proposed System

The structure chart illustrates how the main system controller coordinates between different modules, ensuring proper data flow and functional integration while maintaining modularity and maintainability.

7.12. Coupling and Cohesion

In software design, **coupling** and **cohesion** are essential principles that determine the quality and maintainability of the system.

7.12.1. Coupling

Coupling refers to the degree of interdependence between software modules. **Loose coupling** is desirable as it allows modules to be modified independently without affecting others. Tech Rajshahi's system design achieves loose coupling through:

- Well-defined APIs between modules.
- Use of message queues for asynchronous communication.

- Dependency injection patterns.
- Standardized data formats (JSON) for inter-module communication.

7.12.2. Cohesion

Cohesion refers to how closely the responsibilities of a single module are related. **High cohesion** is desirable as it ensures that each module has a clear, focused purpose. The system design achieves high cohesion by:

- Organizing modules around specific business functions (e.g., Project Management, Billing, AI Analytics).
- Ensuring each module handles only related tasks and data.
- Following the single responsibility principle.
- Minimizing module size and complexity.

By maintaining loose coupling and high cohesion, the system becomes more maintainable, testable, and scalable.

7.13. Design Verification and User Review

Before final implementation, extensive verification and user evaluation are conducted to ensure the design meets both technical and business requirements. The review process involves a collaborative feedback loop among developers, management, and end-users.

- **Prototyping:** Low-fidelity prototypes and wireframes of dashboards and interfaces are shared with department heads and selected employees for initial validation.
- **Usability Testing:** Interactive mock-ups are tested by selected employees from different departments to evaluate intuitiveness, workflow alignment, and visual clarity. User feedback is systematically collected and analyzed.
- **Performance Validation:** Load and stress testing are conducted to ensure system responsiveness under peak usage conditions. Performance benchmarks are established and verified.
- **Security Review:** The IT department conducts penetration testing and code audits to identify vulnerabilities before launch. Security assessments follow industry standards and best practices.
- **Iterative Refinement:** Based on user feedback and test results, iterative design adjustments are made to improve usability, accessibility, and efficiency. Multiple review cycles ensure the final design meets all requirements.

These validation steps ensure that the system design aligns perfectly with Tech Rajshahi's operational goals and employee workflows. Ultimately, this review-driven approach helps reduce post-deployment issues, ensures higher adoption rates, and delivers a robust, user-friendly system ready for organizational integration.

7.14. Design Deliverables

The system design phase produces several key deliverables that guide the implementation phase:

- **System Architecture Document:** Comprehensive documentation of the system architecture, including diagrams, technology stack, and infrastructure specifications.
- **Database Design Document:** Detailed database schema with ER diagrams, table structures, relationships, and data dictionary.
- **Interface Specifications:** Wireframes, mockups, and detailed specifications for all user interfaces and navigation flows.
- **Security Specifications:** Detailed documentation of security requirements, authentication mechanisms, encryption standards, and access control policies.
- **Technical Specifications:** Detailed technical documentation including API specifications, module interfaces, data formats, and integration protocols.
- **Test Plans:** Comprehensive test plans covering unit testing, integration testing, performance testing, and user acceptance testing criteria.

7.15. Conclusion

The system design phase translates the analytical framework established in previous chapters into a practical and well-structured blueprint for Tech Rajshahi's AI-Powered Project Management and Automation system. The logical design ensures modular functionality, data consistency, and smooth integration across departments, while the physical design focuses on performance, scalability, and secure infrastructure.

Together, these design elements create a foundation that supports efficient project coordination, automated task assignment, intelligent resource allocation, streamlined billing, unified communication, and continuous feedback management. The multi-layered security framework ensures data protection and regulatory compliance, while the hybrid infrastructure provides flexibility and reliability.

By adopting a structured yet adaptable design approach, Tech Rajshahi Ltd. is well-positioned to deploy a future-ready system that promotes operational excellence, enhances decision-making capabilities, reduces manual workload, and drives long-term strategic growth. The comprehensive design verification process ensures that the system will meet user expectations and business objectives, setting the stage for successful implementation and adoption across the organization.