

POS System: Final Project Paper and Presentation

CIS 330

**Marvin De La Cruz Serrano, Taeseung Kang, Victor
Love, Griffin Shewbart**

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Table of Contents

- I. [Problem Statement and Feasibility Study](#)
- II. [Brief Review of Requirements Analysis and Specification](#)
- III. [Preliminary Design](#)
- IV. [Detailed Design](#)
- V. [Project Management](#)
- VI. [Working Prototype or Mockup of Prototype](#)

I. Problem Statement and Feasibility Study

Problem Statement:

Jack's Family Restaurant currently relies on an outdated Point of Sale (POS) system that hinders its operations' efficiency and negatively impacts employees and customers. The software is obsolete, causing delays and reliability issues. At the same time, the complex and confusing user interface increases the time required to train employees and raises the risk of errors during transactions. The manager's card swipe functionality is also unreliable, often failing to perform essential elevated tasks such as applying discounts, managing large bills, or overriding orders.

Additionally, the system's order display for kitchen staff is unclear and difficult to interpret, leading to mistakes and inefficiencies in food preparation. These challenges have reduced operational efficiency, frustrated employees, and created negative customer experiences. To address these issues, a modernized POS system is urgently needed to streamline operations, improve usability, and align with the demands of a fast-paced restaurant environment.

Feasibility Study:

1. Economic Feasibility

The total estimated cost of the project is \$5,000 for each restaurant location, based on current industry standards. This is feasible for a business of this size.

2. Technical Feasibility

The project requires the use of Windows 11 OS and an Intel i7 core processor, which are readily available. The team possesses the technical expertise needed, making this project technically feasible.

3. Operational Feasibility

The proposed solution integrates smoothly with existing systems. Staff will require minimal training and training should be quicker since the layout will be simplified and updated.

4. Legal Feasibility

The project will deal with Jack's brand, since the system is a creative concept, there will be no foreseeable legal barriers, making it legally feasible.

5. Time Feasibility

The project will be able to be implemented and designed within the constraints of the semester. The research for the system will be able to be done quickly making this system easier to design.

II. Brief Review of Requirements Analysis and Specification

Functional Requirements

Payment Processing:

- Accept payments through NFC-enabled credit/debit cards and mobile payment systems like Apple Pay and Google Pay.
- Process payment transactions securely using encryption for sensitive data.

Managerial Functions:

- Allow managers to perform overrides (e.g., discounts, voiding orders) through NFC cards or secure login systems.
- Provide secure NFC-based login for managers to access elevated privileges.

Compatibility and Operations:

- Be compatible with existing POS hardware like receipt printers and kitchen monitors.
- Process orders within 2 seconds and payment transactions within 5 seconds.

Non-Functional Requirements

Performance:

- Ensure order processing is completed in 2 seconds and payment transactions within 5 seconds.

Security:

- Use encryption to secure sensitive data during transactions.
- Implement secure login mechanisms for managerial access.

Usability:

- Offer seamless NFC integration for customer and manager interactions.
- Include diagnostic tools for hardware and software issue reporting.

Maintenance:

- Enable daily automatic checks for software updates.
- Support remote updates to minimize maintenance downtime.
- Provide a support portal for issue tracking and resolution.

Reliability:

- Replace failed components within two business days.

Stakeholders:

- Front-of-house staff (servers, cashiers) who interact with the Order Items subsystem.
- Kitchen staff who rely on the Kitchen Display subsystem for efficient workflows
- Managers who override the system to perform secure, high-level actions.
- Customers who utilize NFC-enabled payment systems for transactions.

Scope:**- Include**

- Integration of intuitive interfaces and payment methods.
- Send real-time order data.
- Visualize orders and simplify real-time updates.
- Protect NFC-based authentication and override history.
- A tool to track sales, inventory, and employee performance.
- Compatibility with existing third-party services such as loyalty programs.

- Excluded

- Only standardized system configurations are implemented.
- This project recommends hardware but does not handle arguments.
- Maintenance and updates are handled by external or internal IT teams.
- Basic training materials are provided, but detailed training is excluded.

III. Preliminary Design

Here's how our improved Point of Sale (POS) system will work

1. **Simplified Layout for Employees:**

The system will have a new, easy-to-understand design. Buttons and options will be clearly labeled and organized, allowing employees to quickly learn how to use them and take orders without confusion.

2. **Modernized Graphics and Design:**

The screens will have updated visuals, with a cleaner and more modern look. This will make the system more visually appealing and intuitive for employees to navigate.

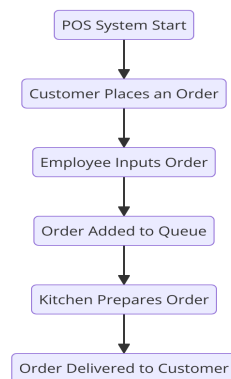
3. Upgraded Manager Access with NFC Readers:

Instead of relying on a card swipe system that often fails, managers will use Near Field Communication (NFC) readers. This means managers can simply tap an NFC-enabled card or device to approve overrides, discounts, or other special tasks quickly and reliably.

4. Improved Kitchen Order Queue:

When an order is placed, it will be sent to the kitchen in a clearer format that's easy for staff to understand.

Below is a flowchart that displays the basic overview of how the proposed system will work:



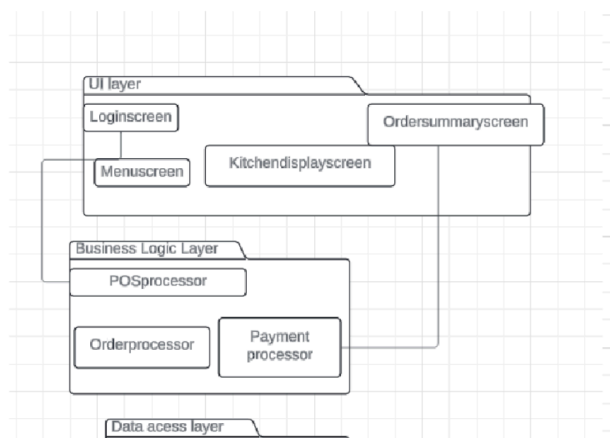
IV. Detailed Design

The proposed Point of Sale (POS) system is built to make the ordering and payment process smoother for employees, managers, and kitchen staff. Below is a detailed, step-by-step explanation of how each part of the system will work, presented in a way that's easy for anyone to understand.

System Components

The system is divided into three main parts:

- User Interface (UI) – This is what employees and managers see and use on the screen.
- Business Logic – This is the "brain" of the system that makes everything work behind the scenes.
- Database – This is where all the information is stored securely, like menus, orders, and employee data.



1. User Interface (UI)

The UI is the part of the system employees and managers interact with, designed to be simple and user-friendly.

Login Screen:

- Employees log in by entering their Employee ID and password on the screen.
- For quicker access, they can scan an NFC card (a card they just tap on a reader).
- Managers have the same process but will be given access to extra features like applying discounts or overriding orders.

Menu Browsing and Order Taking:

- The screen displays all menu items clearly, organized into categories like "Burgers," "Drinks," and "Sides."
- Employees tap the items the customer orders, and they appear in an "Order Summary" section on the screen.
- Options like "Make it a Combo" or "Customize" (e.g., no pickles or extra cheese) are easy to select.

Order Summary and Payment:

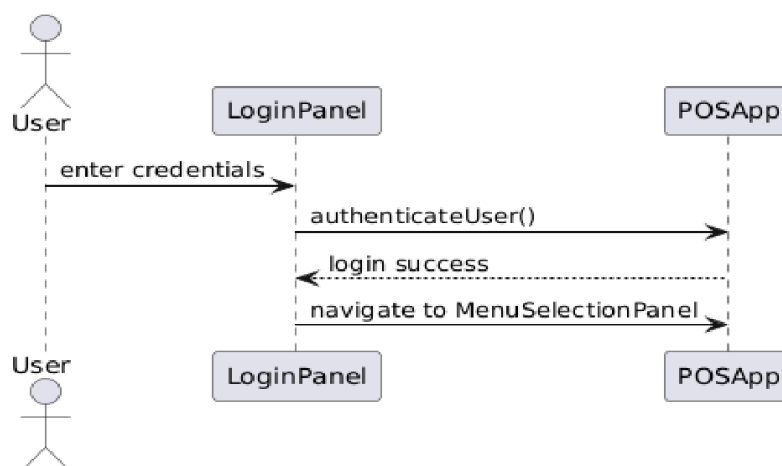
- After the order is finalized, the summary screen shows everything ordered, including the total price.
- Payment options include cash, card, or NFC payments like Apple Pay or Google Pay.
- If cash is chosen, the system will calculate how much change to give back and display it on the screen.

2. Business Logic

This part of the system makes sure everything runs smoothly behind the scenes.

Authentication (Logging In):

- The system checks the Employee ID, password, or NFC card to confirm if the person is allowed to use the system.
- It also decides what features they can access (e.g., employees can take orders, while managers can apply discounts).



Order Processing:

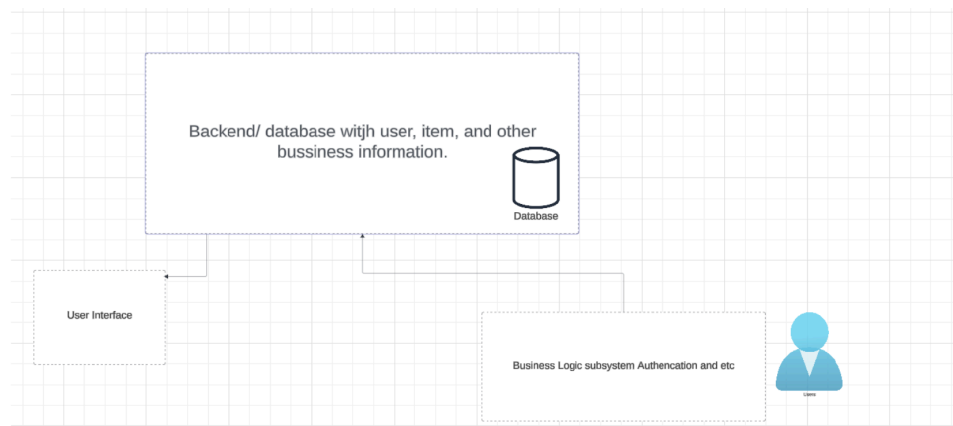
- Once an employee selects items for an order, the system adds up the prices, applies any discounts, and shows the final total.
- If a combo meal or customization is chosen, the system automatically adjusts the price.

Payment Handling:

- For card or NFC payments, the system connects to a secure payment service to process the transaction.
- For cash payments, it calculates how much change is needed and helps the employee confirm the payment.

Kitchen Order Queue:

- After an order is confirmed, it is sent to the kitchen staff.
- The kitchen screen will show the order in a clear, easy-to-read format so that cooks know exactly what to prepare.



3. Database

The database securely stores critical information for the Point-of-Sale system, organized into several key areas:

Employee Information:

- Fields: Username, user ID, password (hashed for security), role (employee or manager), and account creation date.

Menu Details:

- Fields: Menu item ID, name, type (main meal, side, or drink), and price.

Orders:

- Fields: Order ID, user ID (to link to the employee who took the order), order date, and status (in-progress, completed, or canceled).

Order Items:

- Fields: Order item ID, order ID (to link to the specific order), menu item ID, quantity, and item price.

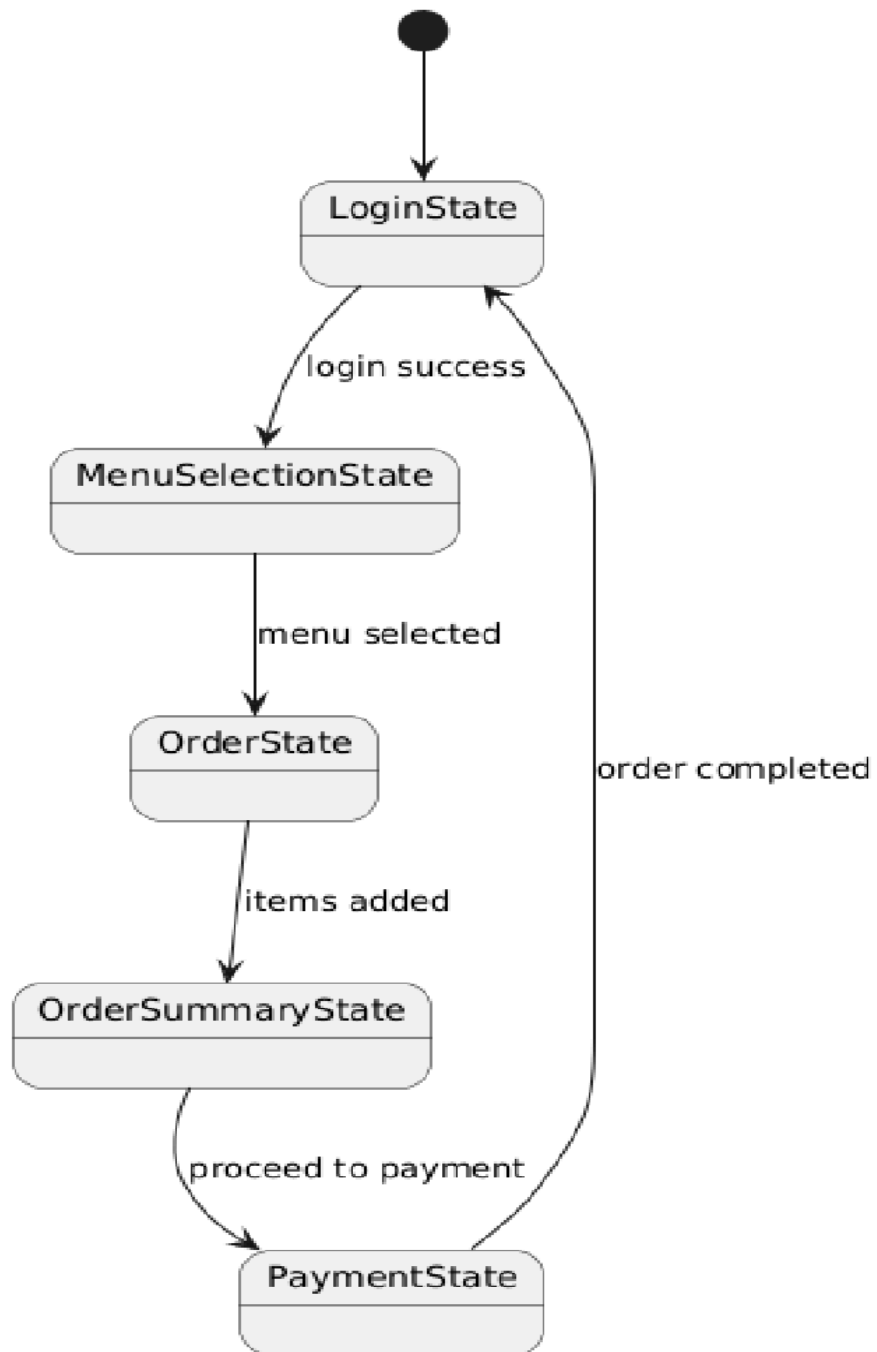
Payments:

- Fields: Payment ID, associated order ID, payment amount, payment method (cash or card), and payment date.

**How It All Works Together**

Here's an example of how the system functions in a real scenario and a diagram:

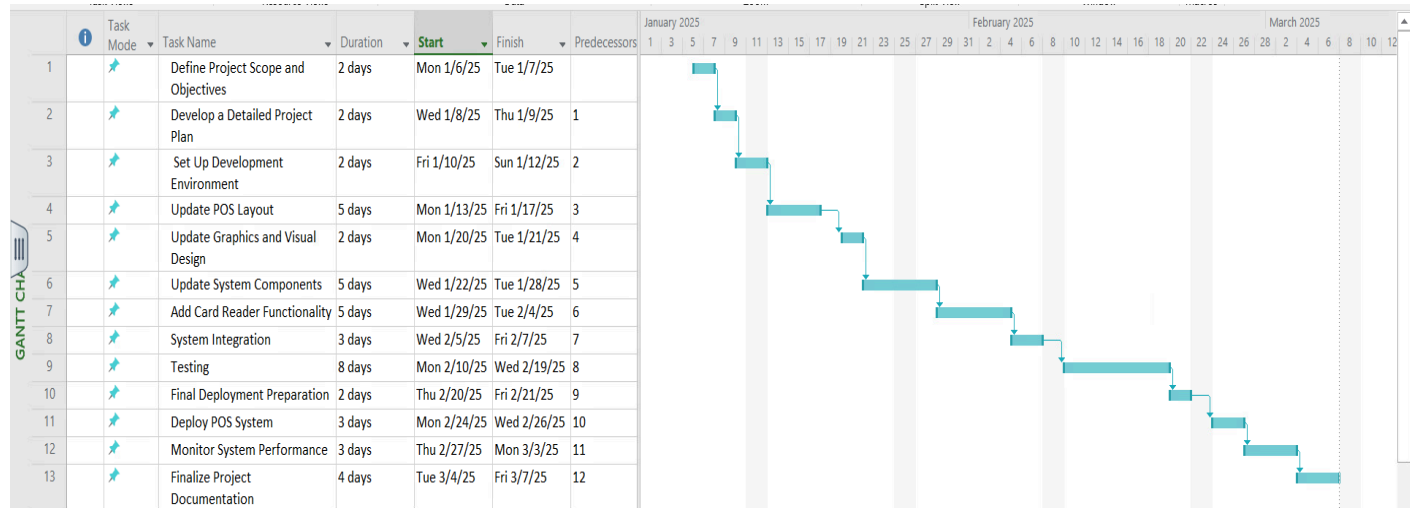
1. An employee logs into the system using their NFC card.
2. A customer places an order for a cheeseburger combo with a large drink.
3. The employee selects "Cheeseburger," "Make it a Combo," and "Large Drink" on the menu screen. The system calculates the total price and shows it on the screen.
4. The customer pays with a credit card. The system securely processes the payment and prints a receipt.
5. The order is sent to the kitchen, where it appears on a screen, showing "1 Cheeseburger Combo – Large Drink."
6. The cooks prepare the meal, and the system updates to mark the order as completed.



V. Project Management

Timeline:

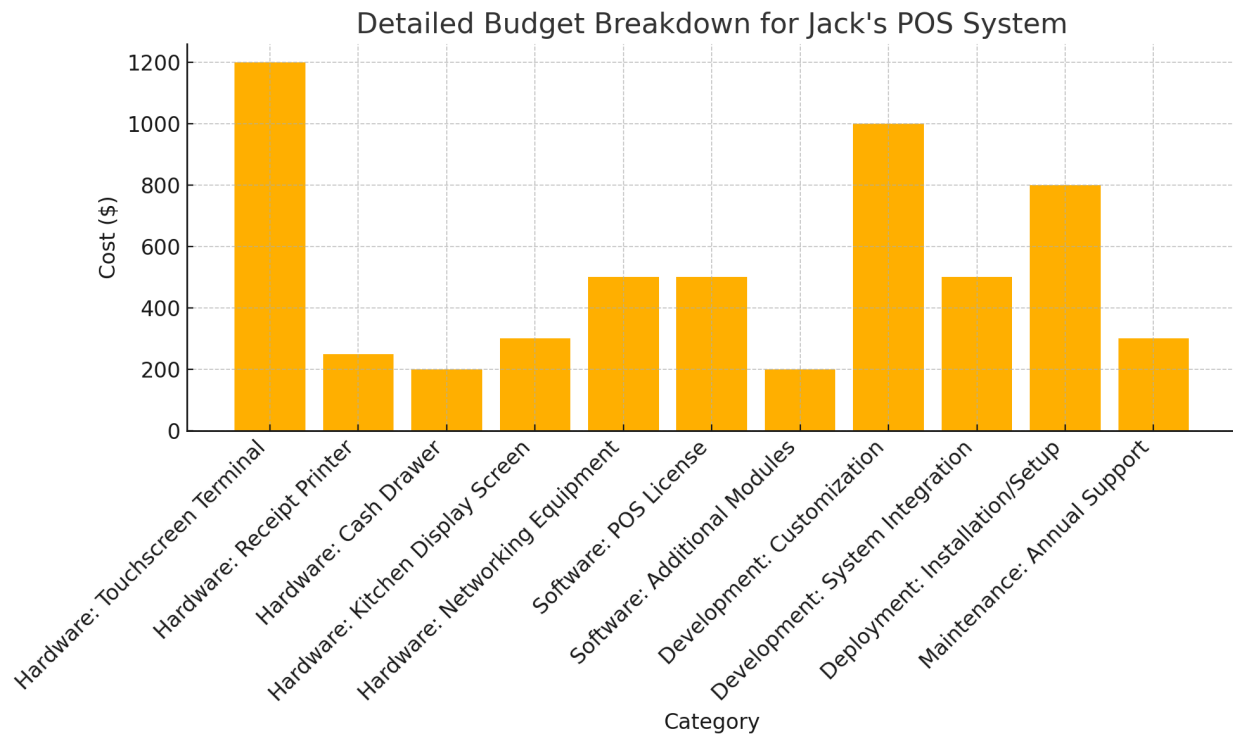
Below is the proposed timeline for the design and integration of the POS system. Using a Gantt Chart we are able to display the timeline process.



Budget:

Here is our budget for our POS system implementation.

Expense details	Category	Cost
Touchscreen Terminal	Hardware Costs	\$1200 x 1 = \$1,200
Receipt Printer	Hardware Costs	\$250 x 1 = \$250
Cash Drawer	Hardware Costs	\$200 x 1 = \$200
Kitchen Display Screen	Hardware Costs	\$300 x 1 = \$300
Networking Equipment	Hardware Costs	Estimate: \$500
Total Hardware Cost	Hardware Costs	\$2,450.00
POS Software License	Software Costs	\$500/year = \$500
Additional modules	Software Costs	\$200/year = \$200
Total Software Cost	Software Costs	\$700.00
Software Customization	Development and...	Estimate: \$1,000
Integration with existing systems	Development and...	Estimate: \$500
Total Development and Customization	Development and...	\$1,500.00
Installation/Setup	Deployment	\$800 x 1 location = \$800
Total Deployment Cost	Deployment	\$800.00
Annual Maintenance/Support	Maintenance and...	\$300/year = \$300
Total Maintenance and Support Costs	Maintenance and...	\$300.00
Total Budget	Total Budget	\$5,000.00



The total estimated budget for Jack's POS system at one location is \$5,000

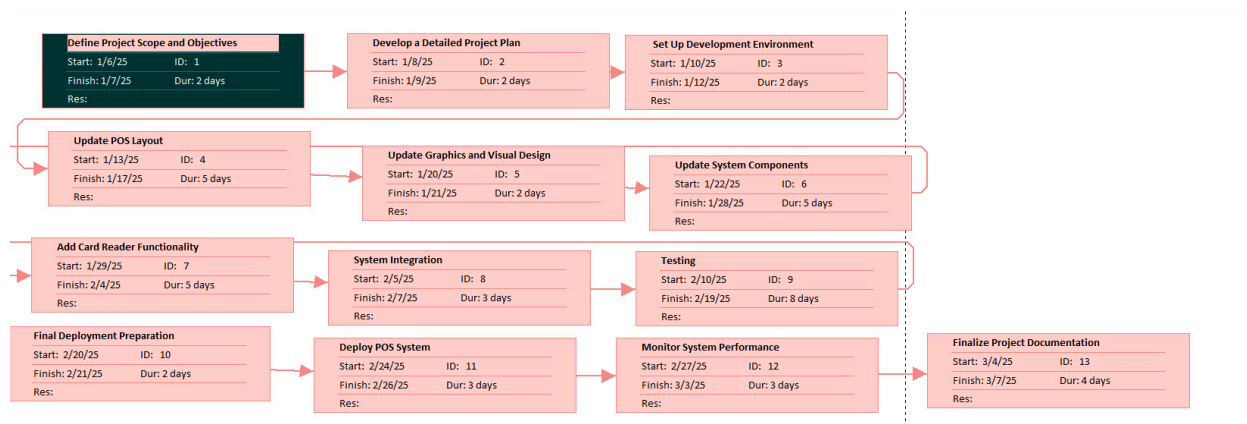
NPV, Payback Period, ROI Calculations:

- Net Present Value:
 - Cash inflow: \$2,000 per year per location
 - Discount rate: 10%
 - Lifespan: 5 years
 - Initial investment: \$5,000
 - Year 1: $2000/(1+0.10)^1 = 2,000/1.1 = 1,818.18$
 - Year 2: $2000/(1+0.10)^2 = 2,000/1.21 = 1,652.89$
 - Year 3: $2000/(1+0.10)^3 = 2,000/1.331 = 1,502.63$
 - Year 4: $2000/(1+0.10)^4 = 2,000/1.4641 = 1,365.92$
 - Year 5: $2000/(1+0.10)^5 = 2,000/1.61051 = 1,241.84$
 - Total Discounted Cash Flows:
 $1,818.18 + 1,652.89 + 1,502.63 + 1,365.92 + 1,241.84 = \underline{7,581.46}$
 - $NPV = 7,581.46 - 5,000 = 2,581.57$

- The project generates \$2,581.57 in value beyond the initial investment when discounted at 10%
- Payback Period:
 - Year 1: Cumulative inflow = \$2,000
 - Remaining investment = \$5,000 - \$2,000 = \$3,000
 - Year 2: Cumulative inflow = \$4,000
 - Remaining investment = \$3,000 - \$2,000 = \$1,000
 - Year 3: Cumulative inflow = \$6,000
 - Remaining investment = \$1,000 - \$2,000 = -\$1,000
 - At the end of Year 3, the cumulative inflow (\$6,000) exceeds the initial investment (\$5,000).
- ROI:
 - Total Cash Inflows = \$2,000/year × 5 years = \$10,000
 - Net Profit = \$10,000 - \$5,000 = \$5,000
 - $ROI = 5000/5000 * 100 = 100\%$
 - The ROI for the project is 100%, meaning the investment doubles its initial value over the 5-year lifespan.

Network Diagram:

Here is the network diagram for the project.



VI. Working Prototype or Mockup of Prototype

