AMA COMPUTER LEARNING CENTER
COLLEGE OF MANILA
BS INFORMATION SYSTEMS

ReamJob POS: An Innovative and Efficient POS System for Printhaus 1019 Sales Management and Inventory System

A Special Project

Presented to the System Analysis and Design

AMA Computer Learning Center College of Manila

BSIS21 - A

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CHAPTER I
INTRODUCTION

1.1 Background of the Study

Printhaus 1019 needs a point-of-sale and inventory system that actually fits how a modern print shop works. Customers expect fast checkouts, jobs need to be tracked properly, and the staff has to see inventory in real time so there's no delays during production. With this POS and inventory system, sales become easier to handle, stock for paper, ink, and other materials gets updated automatically, and every transaction connects to the job orders and production steps. This helps the owners, managers, and front desk all stay on the same page.

The system will be made mainly for printing businesses, so it has a simple tablet-friendly interface but still has strong back-office tools. Things like adjustable pricing for different print sizes, materials, and finishes, job quoting that can turn into invoices, supplier ordering, low-stock alerts, and tracking how much materials are used for each job. This removes a lot of manual work, makes reporting faster, and gives managers useful data like best-selling products, which services make more profit, turnaround time, and waste levels. With this, they can make better decisions and give faster service to customers.

Aside from everyday tasks, the system will also be designed to be more secure and ready for growth. It offers cloud syncing with an offline option in case the internet goes down, role-based access for staff, secure payment processing, and integrations with tools like accounting or e-commerce platforms. For Printhaus 1019, this means fewer missed deadlines, lesser times they run out of materials, better control of expenses, and overall a smoother customer experience from getting a quote up to picking up the finished product.

Printhaus 1019 is a store that is focused on Printing Documents, Tarpaulin, Sintra Board. The owner of the store is Mr. Noel Diaz Cesar and he established the store in December 2012, wanting to cater to the needs of the students, and others. The store is located on 1019 Tayuman St. Tondo, Manila near Novo Tayuman Branch. The store is open from 7 a.m. to 6 p.m from Monday to Saturday. The owner has one person managing the store, they have only one other employee due to the business being small in nature. The main goal of the study is to create a POS System for Printhaus 1019 to help them track records, grow their business and make its transactions faster.

1.2 Statement of the Problem

The study aims to discuss the following problems which were observed from the initial interview with the beneficiary entity, Printhaus 1019. One of the main problems is the inefficient current business process. These range from transaction speed, inventory monitoring, and accurate sales tracking for analytics. The following are the specific problems which the business currently face:

1. Does the system successfully minimize human errors and implement automation in data inventory?
2. Does the system help increase the overall efficiency and productivity of Printhaus in daily operations?
3. Does the system's stock-level update automatically in real-time after a successful transaction?

1.3 Objective of the Study

To improve Printhaus 1019's business process, the developers propose to create a Point-of-Sale System to aid in day-to-day transactions and tracking of inventory, sales and expenses.

This study aims to solve the following problems:

1. Human error in transactions and other business processes: To minimize human error in recording sales and inventory data through automation.
2. Faster processing per transaction: To enhance the overall efficiency and productivity of Printhaus 1019's daily operations.
3. Easier tracking of inventory and other business items: To develop an automated inventory system that updates stock levels in real-time after each transaction.

1.4 Significance of the Study

The study and system will benefit the following group of people:

The Business Owner – This study can provide valuable insights for the business owner of Printhaus 1019. The business owner can optimize their POS system by identifying the key features essential for developing an effective POS that improves operational efficiency, simplifies record-tracking, and enhances overall management processes within the printing shop.

Other Printing Business Owners - This study will be significant as it provides printing services shop owners with relevant insights into the impact and benefits of implementing a Point-of-Sale (POS) system.

Customers - This study would also benefit customers and other patrons of printing businesses as the proposed POS System will help in making transactions faster.

Researchers – Through conducting this study, the researchers will be able to acquire important insights and hands-on practice in web design and development.

1.5 Scope and Delimitations of the Study

This section lists the current scope and possible delimitations of the study.

Scope

The scope of the system or its functionalities would be:

- Point-of-sale: A way for the user to process transactions using the system
- Inventory management: The system allows for tracking, adding, and removing inventory items.
- Sales tracking: Analytics and KPI tracking for sales will be tracked by the system.

Delimitations

The proposed system is seen to have the following limitations:

- The system will not be able to accurately track ink usage.
- Larger or custom projects will not be tracked and added to the system's tracking.

1.6 Definition Of Terms

Automated – A process performed by a computer system with minimal human intervention.

Point of Sale (POS) – A system where sales transactions are processed and recorded.

Printing – The process of reproducing text or images using machines such as printers.

Inventory – A list or record of goods, materials, or supplies available in a business.

Database – An organized collection of data stored and accessed electronically.

Real-time Update – Instant modification of data the moment a transaction occurs.

Web-Based System – A software application that runs through a web browser.

Cloud Syncing – Automatically updating system data across devices through internet-based servers.

Offline Mode – A feature allowing the system to function without internet access.

Role-Based Access – A security method where users receive permissions based on their assigned roles.

Chapter II
REVIEW OF RELATED LITERATURE

2.1 Review of Related Literature

This chapter represents the related literature and studies which contains important information that the researchers can use to help their study. It also includes the comparative analysis to understand the similarities and differences of this study to other recent studies and synthesis for overall outcomes of recent studies that will help improve this study.

2.1.1 Local Studies

According to Wacas (2023) in his research "Efficacy, Reliability, and Accuracy of Inventory System and Point-of-Sale Service for Small-Medium Enterprises in Tabuk City", the implementation of an integrated POS and inventory system enhances business efficiency and customer satisfaction among SMEs. The study highlights the importance of accurate data tracking for both sales and stock management in local enterprises.

Meanwhile, according to Liwanag Jr., et.al, (2021) in "Order Management with Point of Sale", integrating POS systems in order management processes minimizes human error and streamlines transactions. Their study, conducted in the Philippines, demonstrates that the automation of sales operations significantly improves overall business performance. While in the study "Inventory Management Practices of Small-Scale Pharmacies in the Selected Towns in Cavite: A Marketing Perspective" by Soliveres, Herrera, and Cedillo (2023) , effective inventory management is crucial in maintaining product availability and reducing wastage. Although focused on pharmacies, their findings apply to similar local businesses that rely on accurate tracking of products and supplies.

Also, in the study "A Research Proposal of Inventory and POS System for Bida Mart in the City of San Jose Del Monte, Bulacan" (2023/2024), the proposed inventory + POS system for a local Mart in Bulacan offered real-time data

visibility, alerts for low stock, and sales reports to forecast seasonal demands — thereby reducing overstock and understock.

According to An Assessment of the Usability of the Centralized Point-of-Sale (POS) System for Inventory Management of Bounty Agro Ventures, Inc. Rotisserie Operation (2023), the adoption of a centralized POS system in a retail/food service operation at BAVI in the Philippines improved inventory tracking and revealed usability issues among front-end staff, which the study measured via the System Usability Scale (SUS).

2.1.2 Foreign Studies

According to Ramadhani, Nindyasari, and Murti (2021), the "Design and Development of a Web-Based Point of Sale System for Small-Scale Retail Management" aimed to enhance retail operations through a web-based POS that integrates sales and inventory processes, improving accuracy and efficiency.

According to the Preprints Research Team (2024), "Innovative Data Management Strategies in Point of Sale Application Development: Increasing Business Productivity" presents a modern POS model integrating sales and inventory modules using PHP and MySQL, improving usability and operational efficiency.

According to Aguirregabiria and Guiton (2023), in "Decentralized Decision-Making in Retail Chains: Evidence from Inventory Management," effective inventory management decisions depend on system design and data accuracy, which can be supported by integrated POS systems.

According to Choudhury T. M. (2022), in "Web-based POS and inventory management system for SMEs, retail stores, and restaurants", the development of a web-based system helps SMEs record everyday sales and manage inventory, aiming for safer, customizable, and efficient solutions.

According to Uriawan W., Faroj R.Z., Hadid R.A., et al. (2024), in "Innovative Data Management Strategies in Point of Sale Application Development: Increasing Business Productivity", a POS application was designed using modern web technologies (PHP, JavaScript, MySQL) to integrate sales and inventory modules, provide real-time stock tracking and analytics for SMEs.

TECHNICAL BACKGROUND

2.2 Technical Background

This section lays out the technological framework to be used in the development and design of the system. It includes the hardware requirements, languages, frameworks, libraries, tools, and other software requirements needed for development.

2.3 Languages and Frameworks

The following are the technologies to be used in the development of the proposed system:

2.3.1 Languages

These are the languages that will be used in the development of the POS System which include but may not be limited to:

- **Typescript:** TypeScript is a strongly typed programming language that builds on JavaScript, adding syntax for types to enhance tooling and support for large-scale applications. It compiles to clean, standards-based JavaScript, making it compatible with any browser, host, or operating system.
- **Python:** Python is a high-level, general-purpose programming language known for its readability and simplicity. It is used to create and run simple scripts for the back-end.
- **PostgreSQL:** PostgreSQL also known as Postgres, is a free and open-source relational database management system (RDBMS) emphasizing extensibility and SQL compliance.

2.3.2 Frameworks

In conjunction with the aforementioned languages, the following frameworks will be used in the development of the POS system:

- **NestJS:** Nest is a framework for building efficient, scalable Node.js server-side applications. It uses progressive JavaScript, is built with and fully supports TypeScript
- **React+Vite**: React + Vite refers to using Vite, a modern and extremely fast frontend build tool, to set up and power a React application. This combination is a popular and recommended approach for building modern React projects
- **Tailwind CSS:** TailwindCSS is a utility-first CSS framework for the rapid development of user interfaces.

2.4 Software Specifications

For the development of the system, the following software, libraries, platforms,development tools, and development environment will be utilized:

- **Visual Studio Code:** Visual Studio Code is a source code editor used for developing software. It allows users to properly manage their code through operations like version control and debugging.
- **Postman:** Postman is a leading platform for API development that simplifies the process of designing, testing, and managing APIs. It provides a comprehensive toolkit for developers, enabling collaboration and streamlining workflows throughout the API lifecycle.
- **pgAdmin4:** pgAdmin 4 is written as a web application with Python(Flask) on the server side and ReactJS, HTML5 with CSS for the client side processing and UI. Although developed using web technologies, pgAdmin 4 can be deployed either on a web server using a browser, or standalone on a workstation.
- **Python 3:** Runtime environment for scripts.

- **Git:** Git is a free and open-source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.
- **Github:** GitHub is a platform used for software development. Users can peer review and co-edit blocks of code, manage projects, document their code, and be able to Methodology 58 have their codes hosted.
- **Prisma:** Prisma is a next-generation ORM (Object-Relational Mapping) tool designed for Node.js and TypeScript. It simplifies database management by providing type-safe queries, automated migrations, and intuitive schema modeling, allowing developers to interact with databases like PostgreSQL, MySQL, and MongoDB more efficiently.
- **NodeJS:** NodeJS is a runtime environment for executing JavaScript outside the browser, built on the V8 JavaScript engine. It enables server-side development, supports asynchronous, event-driven programming, and efficiently handles scalable network applications.
- **ClerkJS:** ClerkJS is a JavaScript SDK designed for building user management and authentication in web applications.
- **Multer:** Multer is a Node.js middleware designed for handling multipart/form-data, primarily used for uploading files. It simplifies the process of file uploads in Node.js applications, especially those built with Express.js.
- **PDF to Printer:** A powerful Node.js and Electron utility for printing PDFs and images to Windows printers.
- **Unix-print:** Similar to PDF to Printer but for unix-like systems.
- **npm/pnpm:** Node Package Manager was created as a package manager for Node.js. Alongside PNPM, which has the same functionalities, is used as a way to download and manage packages for development

Upon deployment, the system would need to be deployed on the following environment, alongside specific software:

Operating Systems: The system will be developed on a Windows 11 computer. However, deployment and use can be used on any operating system which can run web apps or sites. These OS include: Windows, Linux, and OS X.

Web Browsers: Since the system is a web app, it needs to run on web browsers which can support the system: Chromium-based browsers, such as Chrome or Brave will be used to develop the system but it can be compatible with non-chromium ones like Firefox or Safari.

Deployment Environment: To deploy the system for usage, it will be hosted on two cloud-hosting services: Railway for the back-end and Vercel for the front-end.

Other Software: Due to the nature of the system, it will need support from Office-type software to utilize the printing conversion function. These apps include, but are not limited to, Microsoft Office, LibreOffice, Apache Office.

2.5 Hardware Specifications

The system will be developed on an Acer 7 Laptop running an AMD Ryzen 5 5500U CPU with an NVIDIA GeForce RTX 3050 Laptop GPU on 16 GBs of RAM. However, upon deployment, the hardware to be used will not necessarily need to match the development specs. Any functioning desktop PC or Laptop, with at least 4 GBs of RAM, which is the minimum needed to access and run modern web browser functions, is needed. Also it must be able to connect to other devices/paraphernalia, such as a printer, for the system to function in its entirety.

An important hardware for the complete function of the system however, are printers with plug and play capabilities in order to automatically be detected by the system without the need for further set-up.

CHAPTER III
METHODOLOGY

3.1 Development Methodology

The study used Feature-Driven Development (FDD) to develop the proposed website for this study. A feature-driven development is a customer-centric development methodology known for short iterations and frequent releases. Feature-Driven has even more official activities as well as roles than Scrum, from a development point of view. FDD has detailed design methods that focus on features that are different from Scrum which is focused on generating small products that can be quickly delivered to a customer. Both FDD and Scrum are collaborative and focused on teamwork, and interactions, and both are appraised as Agile Methodologies.

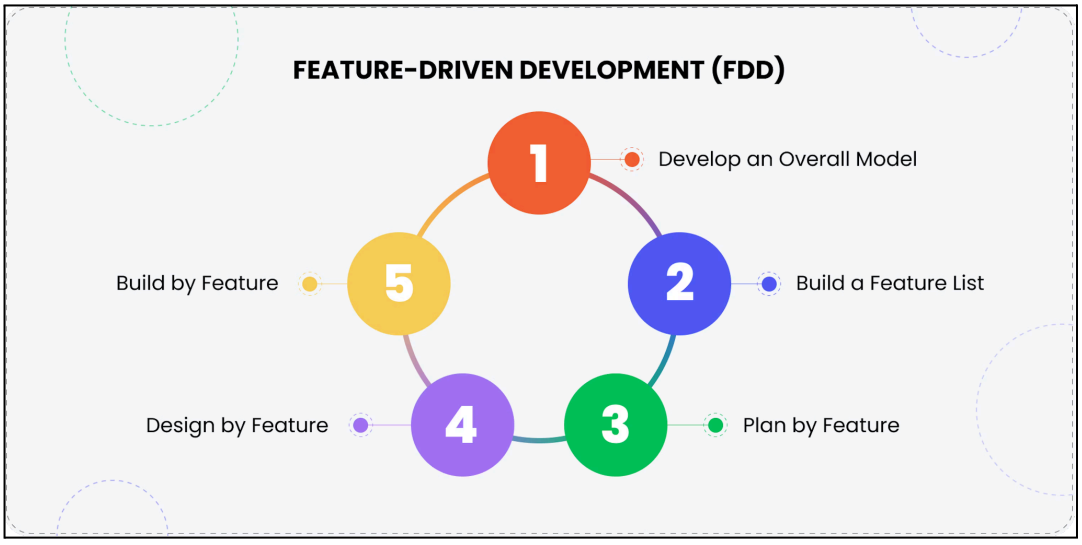

Figure 2.1 *Feature Driven Development*

Feature-Driven Development has five phases. The first one is to develop an overall model, the next is building the list of features, the next is planning out each feature, then designing each feature, and finally building each feature.

3.1.1 Requirements

The FDD methodology begins with the planning stage, where the proponents will collect the needed information for the proposed project that will be crucial for the development of the software to meet the requirements and develop an overall model.

3.1.2 Design

The second stage of agile methodology is to design or plan each feature, in this stage the developers use a bunch of data requirements to design the proposed POS System. Based on the requirements of the beneficiary, the developers will use a plan to identify the features and functions that are needed in this system. This study will use different diagrams to show the plan, design and flow of this system.

3.1.2.1 Context Diagram of the Proposed System

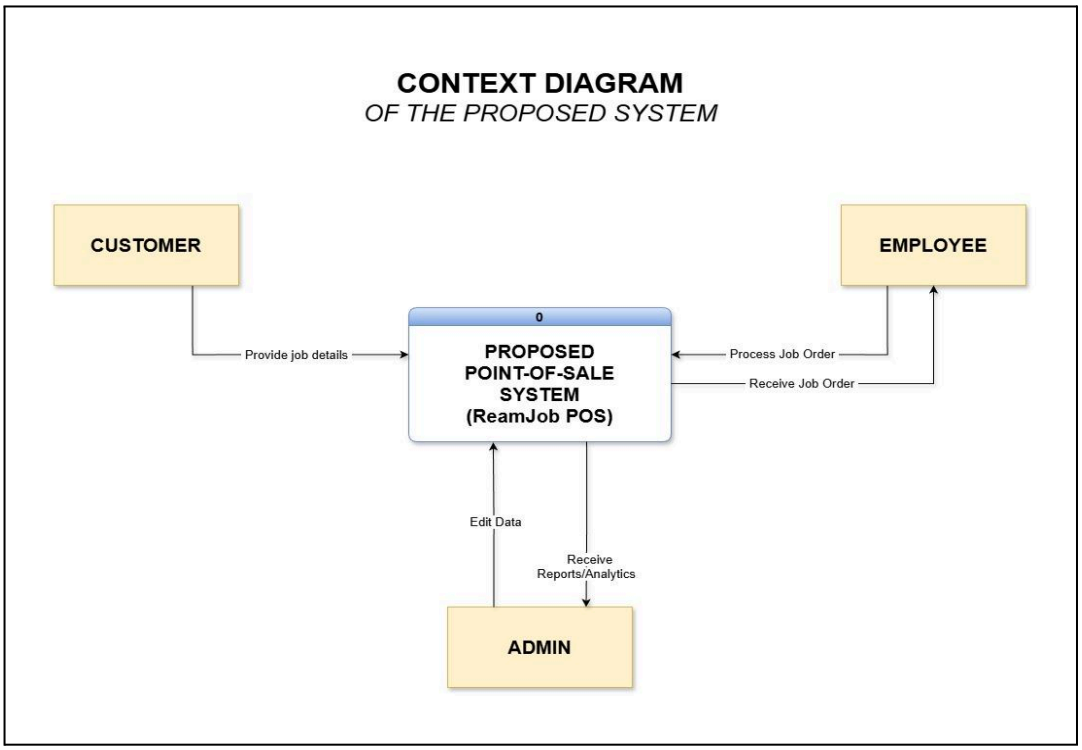

Figure 2.2 *Context Diagram of the Proposed System*

Figure 2.2 shows the context diagram of the proposed system. Otherwise known as the Level 0 Data Flow Diagram, this is the all encompassing generalized view of the system and its interactions with entities. Here, the customer is seen to provide data to the system, the employee processes the data received. The admin then receives processed data from the system and is also able to edit specific data within.

3.1.2.2 Data Flow Diagrams of the Proposed System

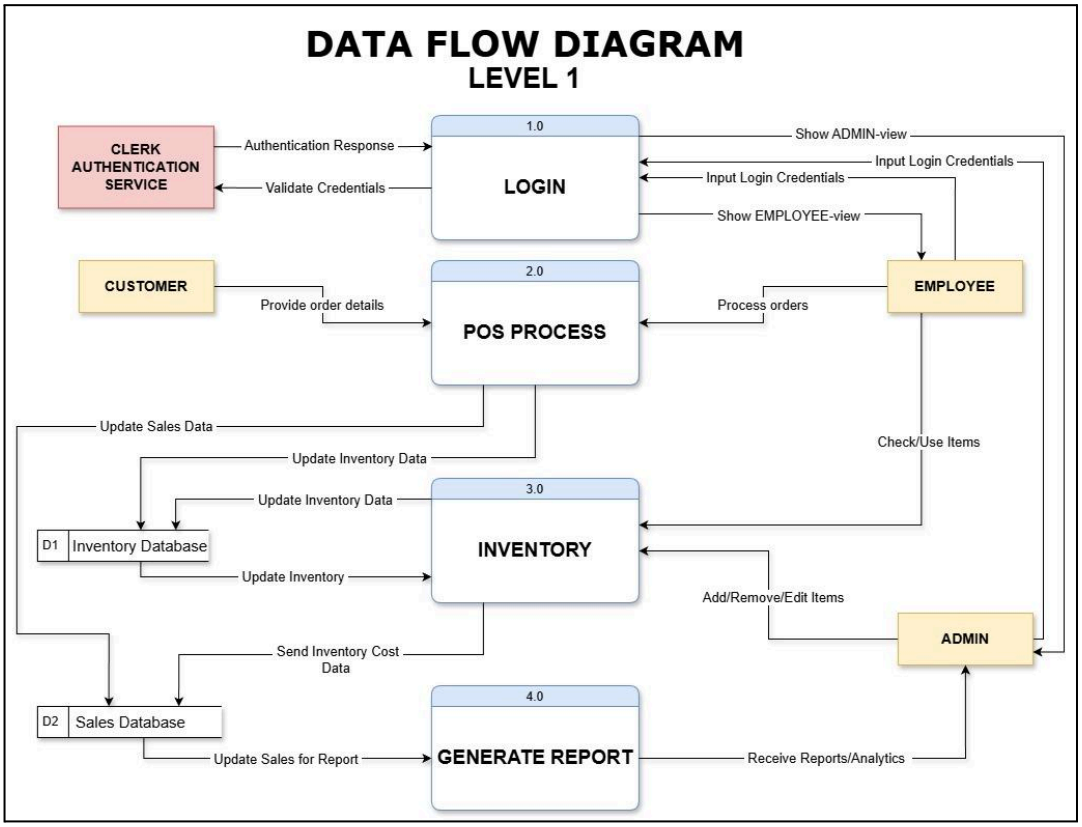

Figure 2.3 *Level 1 Data Flow Diagram of Proposed System*

Figure 2.3 demonstrates the first level of the system's data flow diagram. It shows how the data generally moves within the system. Specifically, it shows the interaction of all entities in the system's three main processes where in A.) The POS Process, where the customer provides the details or data needed for the transaction, and the employee processes the given data to be turned into the final output data to be saved in respective data stores. B.) The inventory process where

the employee has some actions while the admin has more activity such as data manipulation of the process.

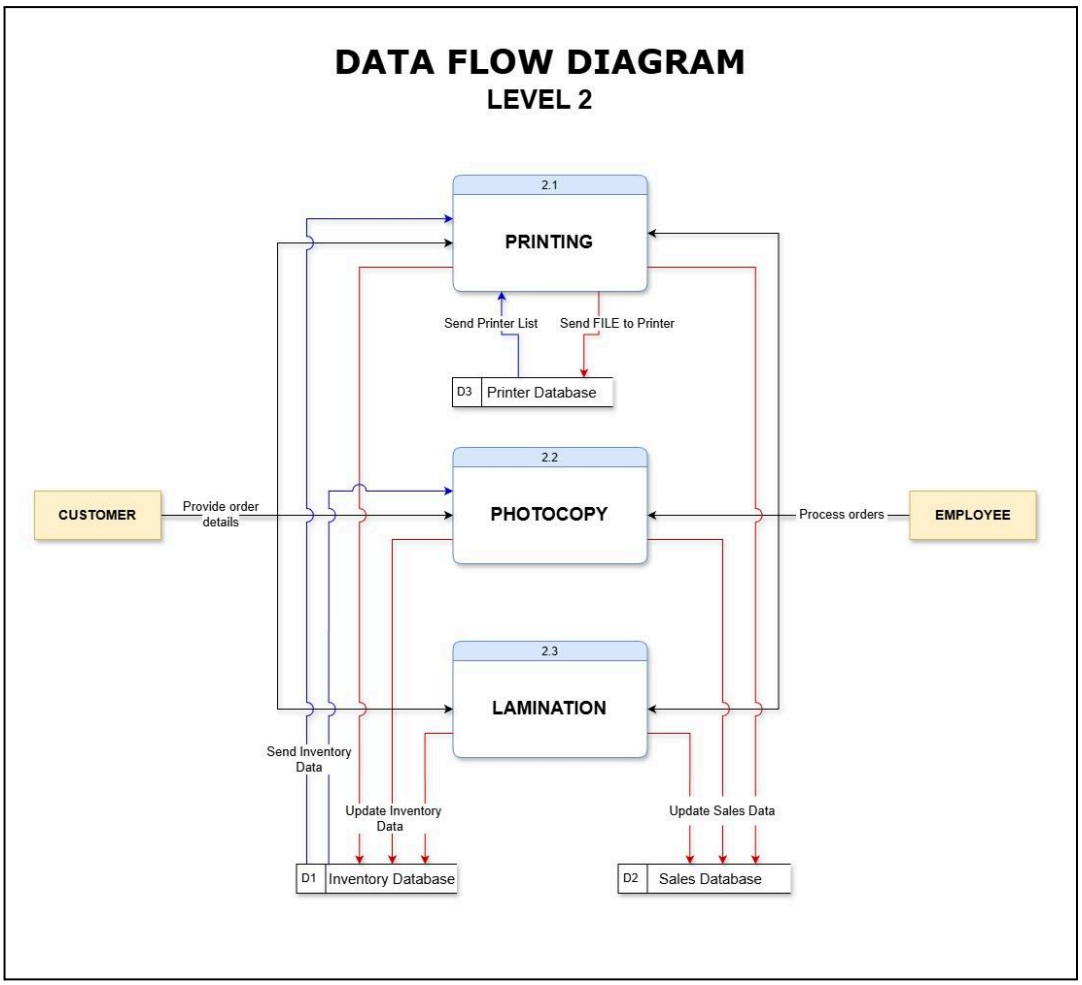

Figure 2.4 *Level 2 DFD on Process 1*

Figure 2.4 shows the subprocesses inside the main POS Process. Here, the interactions of the customer and the employee are laid out. The customer would provide details of the job order which include data for paper size, color, payment method, and other things related to the job. The employee in turn processes this transaction to complete it. Once completed, the data would be sent to subsequent data stores. Mainly in printing, but also on photocopying, the amount of paper used in a transaction would be sent to the inventory data store to update it. The sales data would also be updated from the transactions done.

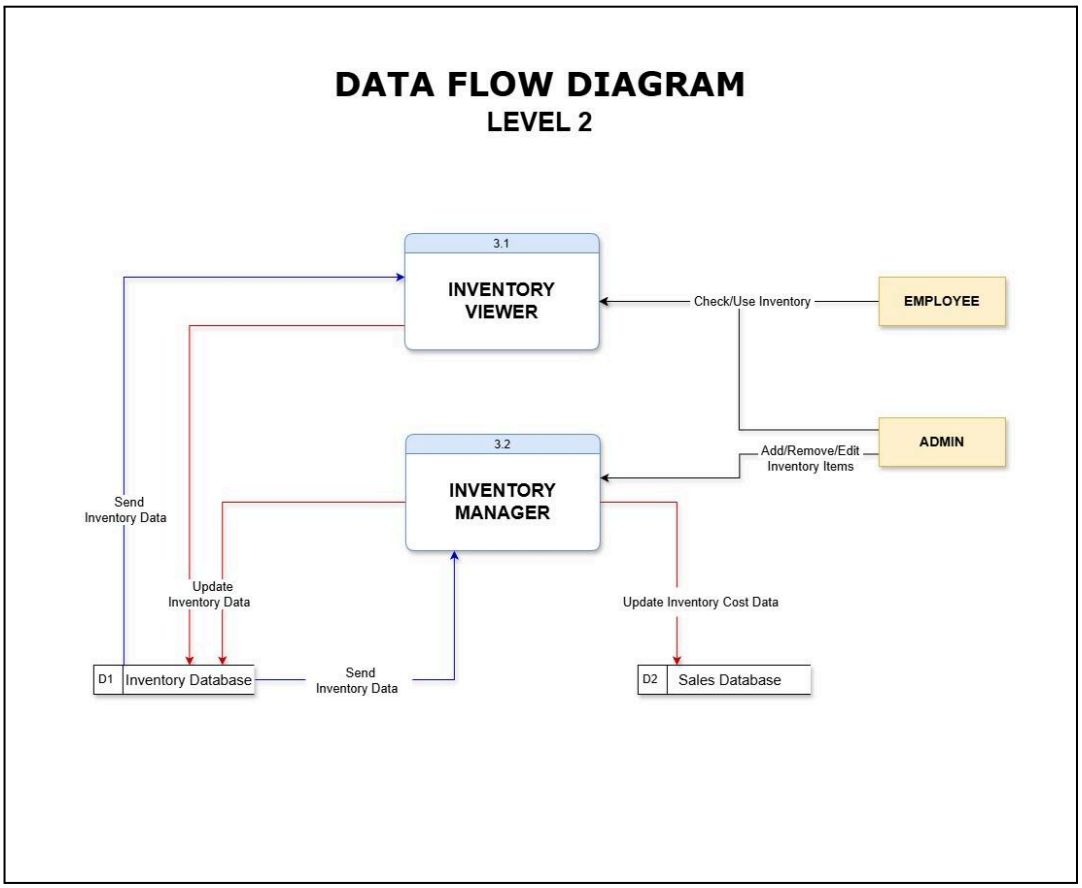

Figure 2.5 *Level 2 DFD on Process 2*

Like the former diagram, Figure 2.5 shows the subprocesses inside the Inventory process. The employee checks or uses the inventory while the admin can manage the inventory and also edit data. All of these interactions will inevitably update the Inventory database, and adding or editing items will update the Sales database.

3.1.2.3 Use Case Diagram of the Proposed System

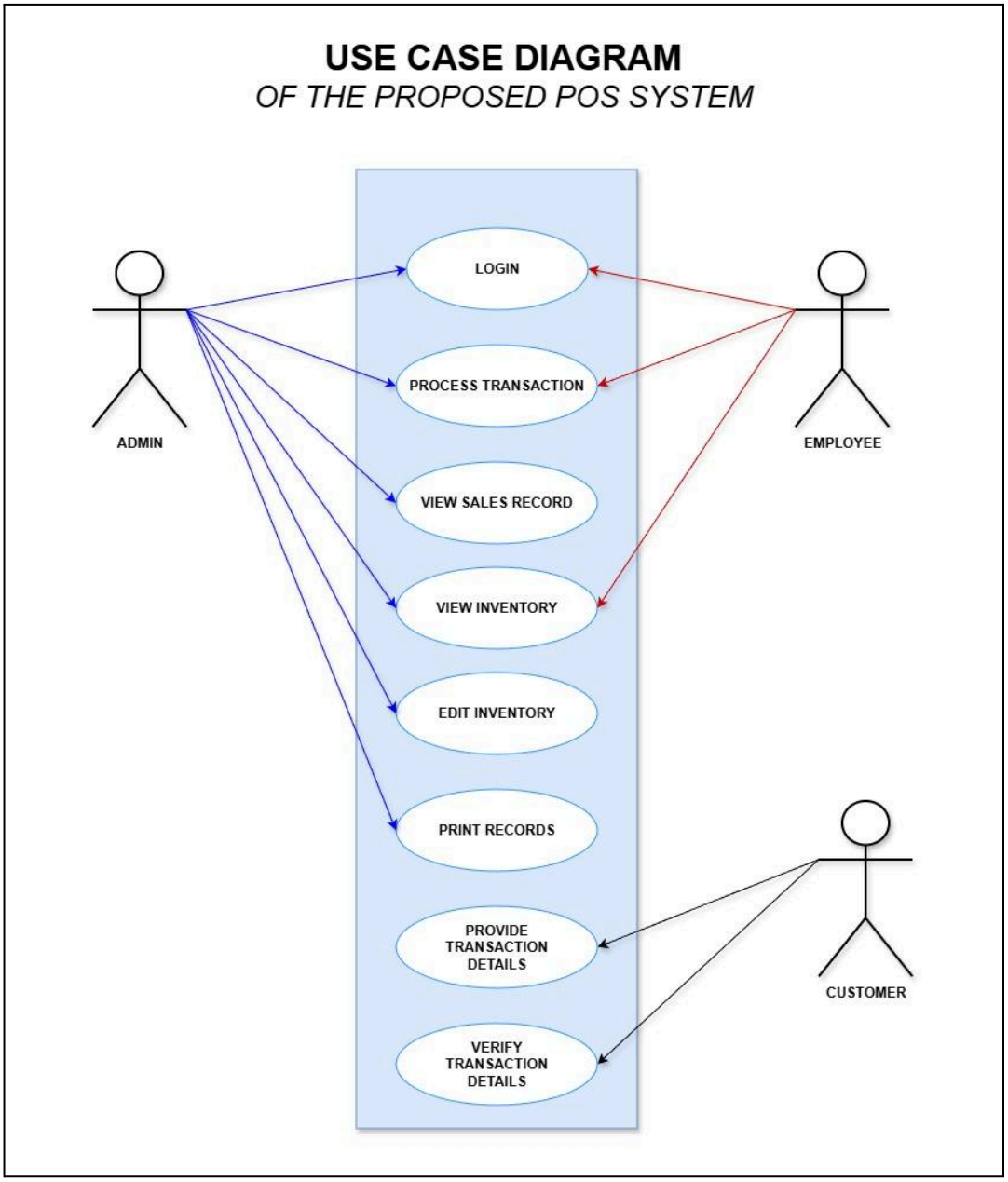

Figure 2.6 *Use Case Diagram of the Proposed System*

As seen on Figure 2.6, the use case diagram exhibits the Actors of the system (seen on the sides) and the system functions (in the middle.) This diagram show which functions each actor can perform on the system indicated by arrows.

3.1.2.4 Flowchart of the Proposed System

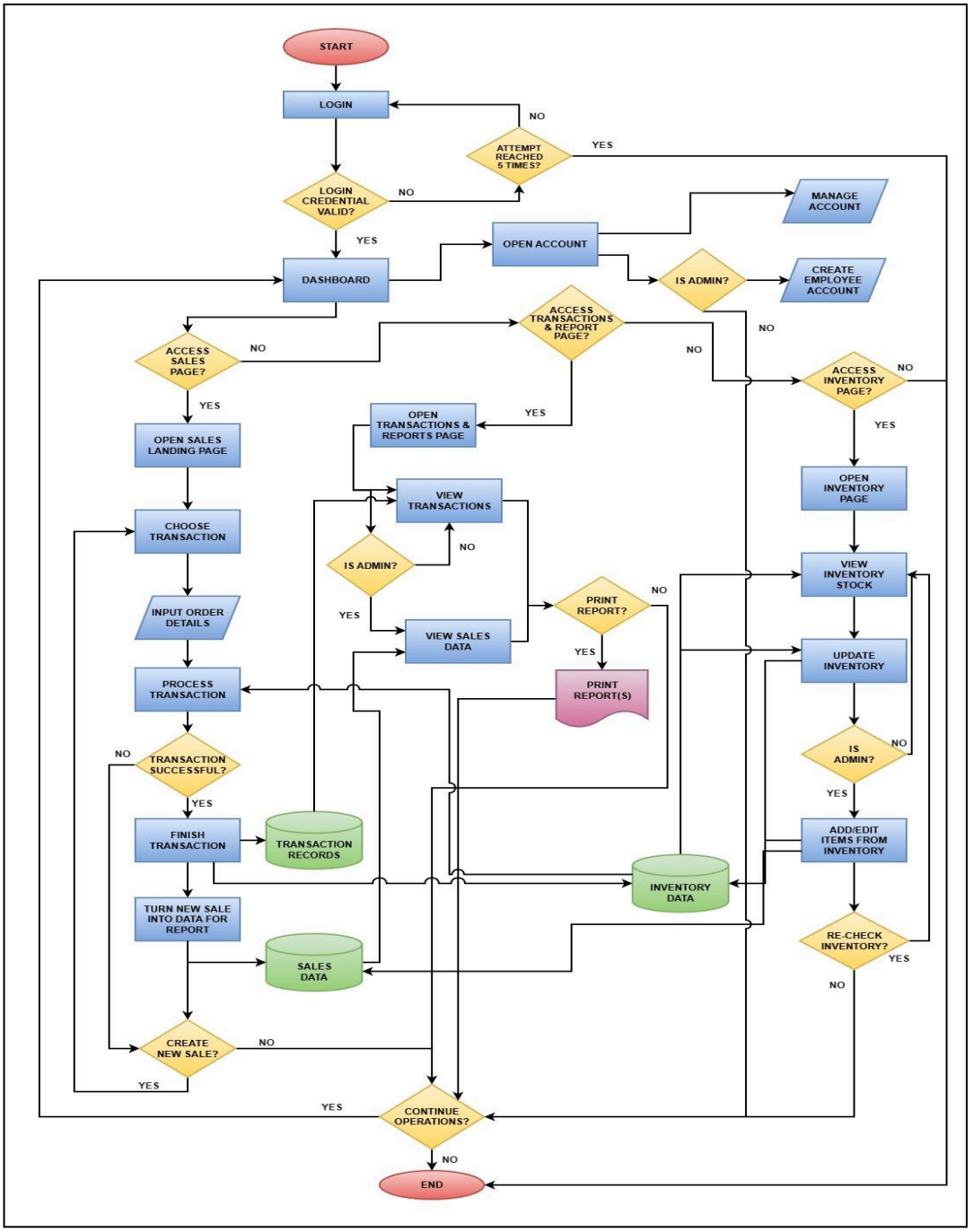

Figure 2.7 *System Diagram/Flowchart of the Proposed System*

The System Flowchart can be seen here in Figure 2.7, it shows the flow of the system's function. It starts by logging in the system, then choosing which system function to act on. Each process has its own function which ultimately loops or ends the system.

3.1.2.5 Entity Relationship Diagram

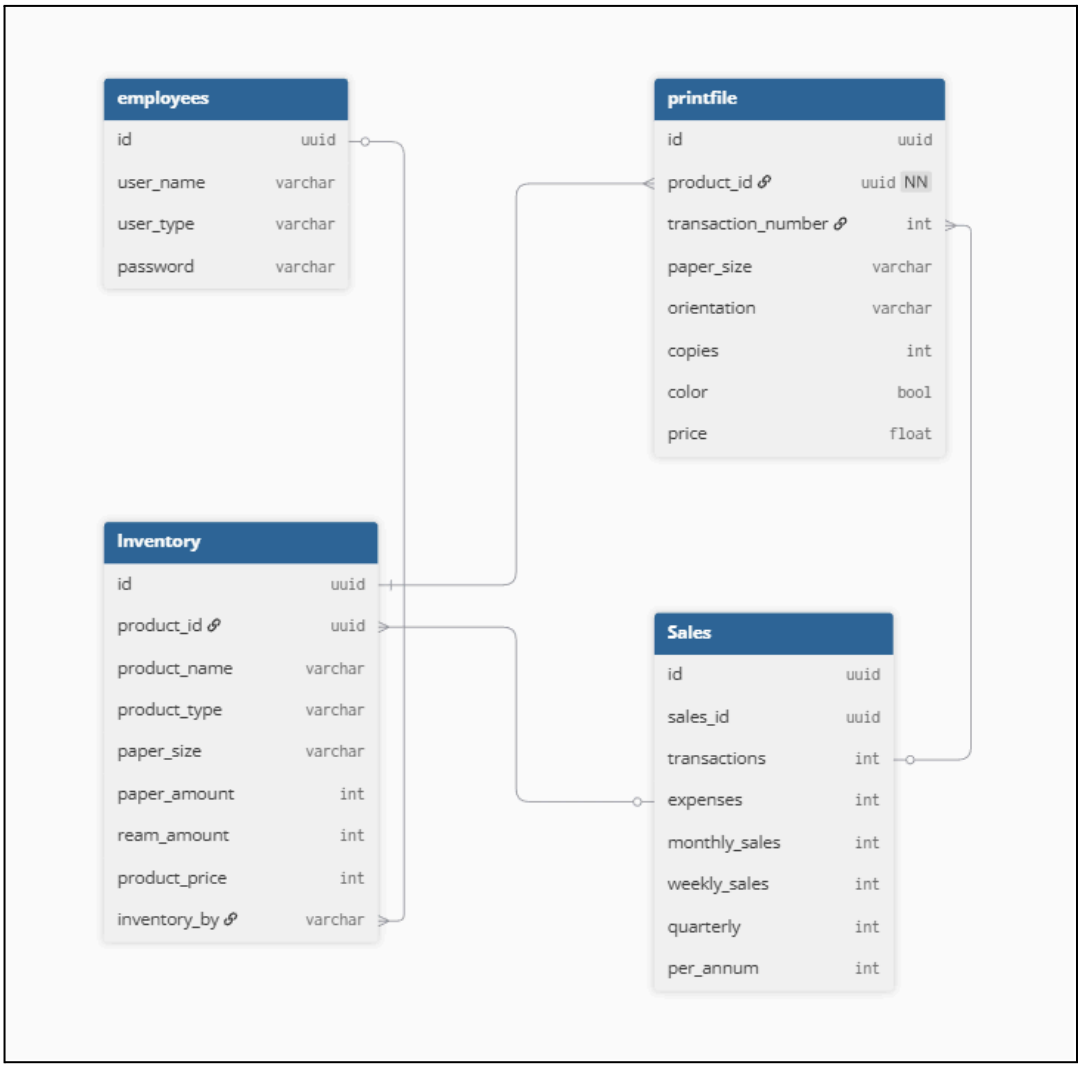

Figure 2.9 *Entity Relationship Diagram of the Proposed System*

The above diagram shows the entities and their relationships within the system. The entities share minimal relationships except for referencing various attributes for use. As an example, *printfile* references the *Inventory*'s ID to know which inventory item to be used for specific system functions.

3.1.3 Development

The development stage is the part where the developers do the actual implementation, coding, and creation of the system and its features in accordance

with the model and design specifications. The developers will use the specified technologies and platforms mentioned in the previous chapter for development.

3.1.4 Testing

The testing phase of the software development lifecycle (SDLC) is where you focus on investigation and discovery. During the testing phase, the developers will do multiple trials of the system and check for errors and see if there are things that need to be changed or improved.

3.1.5 Deployment

After a series of trials, it is now time to deploy the application. In this phase the application is completely tested and is now ready to be used by the target users. The beneficiary, Printhaus 1019, will be the main target of the system while secondary targets would be the customers of the business.

3.1.6 Review and Maintenance

After deploying the automated application, the developers will now wait for the users' reviews. In this phase the developers analyze the reviews of the system and use those reviews to further improve on certain features of the application. The features in the system should always be constantly improved and maintained in order to make the application run without any concerns.

3.2 Research Environment

This research environment provides complete information about who, what, when and where which includes both the academic background of developers and the operational environment of the beneficiary. The students from ACLC College Manila will conduct this research to gain practical experience in web development and design. The research focuses on building a Point-of-Sale (POS) and Inventory System which addresses the current business process inefficiencies at the beneficiary location. The research beneficiary is Printhaus 1019 which operates as a small printing business that started its operations in December 2012. The system

deployment location exists at the store address of 1019 Tayuman St. in Tondo Manila near Novo Tayuman Branch. The system users consist of the business owner who runs the business and his two staff members including a manager and an employee. The system needs to demonstrate its performance and impact during the store operating hours from 7:00 a.m. to 6:00 p.m. on weekdays. The research environment enables the development of a system which uses real-time stock updates to automate inventory tracking and reduce human mistakes for faster transaction processing.

3.3 Research Respondents

The data collection in this research will involve three categories of respondents. The Primary Beneficiary, or System End-Users, consists of the three internal personnel: Business Owner, Manager, and Employee. Their input is necessary to validate that the system has achieved its core objectives, such as error reduction and instant inventory updates. Since the business scope is limited, a Total Enumeration or Census will be used for this category. The second category, Beneficiary-Adjacent Entities, comprises Printing Business Owners/Managers, from which a Convenience/Purposive Sampling will be obtained to determine the common problems within the industry and to validate the market value of the system. Last but not least, Customers of the Shop, who will usually be students and patrons, will be utilized to determine the perceived impact of the system on service quality and speed of transaction, ascertained through indirect observation methods and short exit surveys.

3.4 Data Gathering Procedure

The process of data gathering will make use of different methods for each of the groups targeted. For the Primary Beneficiary, which is the Business Owner, Manager, and Employee in other words, the System End-Users, the data will mainly be gathered through a Structured Questionnaire and the System Evaluation Form. This is because this approach will allow for the systematic collection both before and after the implementation of quantitative and qualitative data to measure changes in efficiency, error reduction, and the successful operation of real-time inventory updates, hence proving that the core objectives of the project have been

achieved. For the customers at the shop, however, data will be collected through a short exit interview with a Short Feedback Form.

3.5 Data Gathering Instruments

The research will use two primary data collection instruments which match the requirements of each participant group. The research will use a Structured Questionnaire and System Evaluation Form to collect data from the Primary Beneficiary group which consists of the Printhaus 1019 shop owner and staff. The quantitative tool uses Likert Scale measurements to evaluate system effectiveness and usability through core performance indicators that assess human error reduction and operational efficiency improvement and real-time inventory update validation success. The research design uses a simplified method to obtain customer feedback about service speed and overall service quality which helps validate technical performance data from staff members.

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