An Undergraduate Internship Report

Inventory Management System

At

Tech VaultBD Ltd.

By

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Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the award of any other degree or diploma at IUB or any other educational institution, except where due acknowledgement is made in the report. Any contribution made to the research by others, with whom I have worked at IUB or elsewhere, is explicitly acknowledged in the report. I also declare that the intellectual content of this report is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

20-01-2021

_____ _____

Signature Date

Md. Saiduzzaman

_____

Name

Acknowledgement

In the completion of this internship report I would like to thank a few people for their support and guidance. First, I would like to express my gratitude to Mr. Rayhan Uddin, Founder & CEO, Tech VaultBD Ltd, for his assistance and encouragement during the path of my internship. Then I want to offer my utmost gratitude to Mr. Ashfaq Ahmmed, Director, HR, Tech VaultBD Ltd and Mr. Sajibul Alom Sajib, who were my on-site supervisor, for his guidance, monitoring, extraordinary effort and constant encouragement throughout the course of this internship. The blessing, help and guidance given, time to time shall carry me a long way in the journey of life on which I am about to embark.

I am also thankful to my Team members, for the valuable information provided by them in their respective fields and their cooperation, help and valuable suggestions given to me during the period of my internship.

I would like to thank my honorable faculty Md. Abu Sayed, my university supervisor, for his constant supervision, and directing me throughout the planning and writing of the report. After providing me proper guidance from the very beginning, I am greatly thankful to him for assisting me regardless of the enormity of my troubles by providing step-by- step procedures on upcoming activities.

I might as well thank Independent University, Bangladesh for having such a brilliant course which gave me a chance to work in the real world and gain the necessary experiences I will be need for my career. I am also grateful to Tech VaultBD Ltd for recruiting me as an intern.

Letter of Transmittal

20th January 2021

To

MD.Abu Sayed
Lecturer,
Department of Computer Science and Engineering
Independent University Bangladesh
Bashundhara RA, Dhaka

Subject: Submission of Internship Final Report

Dear Sir,

With great pleasure I am submitting the internship report performed at Tech Vault BD Ltd. I have found the study to be quite interesting, beneficial and knowledgeable. It is my immense pleasure in presenting you this report based on my experience during my internship. In this report, I have discussed my internship period Tech Vault BD Ltd, an overview of the company and its activities, my experiences working for a reputed Tech VaultBD Ltd's IT section.

I also hope that you would kindly accept my report into consideration of any mistakes in preparing this report.

Best Regards and thank you

Sincerely Yours

MD. Saiduzzaman

ID-1531062

Project Title

Inventory Management System

Organization

Tech Vault BD Ltd.

Prepared By

Md. Saiduzzaman (1531062)

Evaluation Committee

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Signature

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Name

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Supervisor

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Internal Examiner

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External Examiner

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Convener

Abstract

This internship course requires me to join a company in a department of my field of line which is Computer Science and Engineering. This internship gave me the chance to work for real world clients by joining a software company. I joined as an intern in a software company called Tech Vault BD Ltd. It allowed me to gain first-hand experience of working in a company, attend business meetings, talking to clients, planning, gathering requirement analysis, designing and development, for them and not for some project of my own. Hence, this experience was challenging but crucial as well, to help me elevate my skills and confidence for me to be ready to pursue my career in this line. The internship was of 3 months period and the report has been mainly made about my overall learning and experiences from this course of time.

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Introduction

1.1 Overview

Overview of This Report

This report is made only for academic purpose and to fulfil the requirement for industrial attachment. This report has covered the direct and indirect aspects of software industry and their challenges. This report gives an insight into the experience that I achieved from my workplace. A brief description of Tech VaultBD Ltd is included so that other students can get to know about the company and may decide whether it is suitable for them or not. If internships are about gathering skills, then projects are the main way of gathering them. Till writing this report I have worked on two projects and helped in developing the web applications for Tech VaultBD Ltd. The tasks, timeline and results of those specific projects are included for a better visualization of industry standard projects. An internship may not run as smoothly as it is expected. There may be a lot of challenges but there is a lot to learn from them. The challenges that I have faced over this period are discussed in this document. The skills which include both technical and non-technical ones are also a vital part of this report. And last but not the least, some recommendations are proposed which if worked out may provide some benefits to the future interns.

Overview of Company

Tech VaultBD Ltd. is a certified and experienced IT and digital solution provider. They provide primarily web application, android application, and enterprise solutions according to the needs of customer customized requirements. Their services and products are designed with a focus on stable and reliable business systems. They also have special expertise in providing specialized products, and custom end to end solutions to enterprise customers. They are highly capable to implement and manage complex IT systems according to customer desired requirements in changing times

with greater effectiveness than many competitors. In the last 3 years, The Tech VaultBD Ltd. worked on more than 42 individual projects and has a large customer base of more than 25 customers all over the world.

As a software development team, Tech VaultBD Ltd generally follows the agile software developing methodology Scrum but according to the project need development methodology also can be changed. From the project management point of view, scrum is the most efficient and flexible system development method.

In each phase of software development, Tech VaultBD Ltd strictly follows the planned and fixed system. All the analytical and technical terms which are important for the system are documented so that anybody can easily truck the software development process.

1.2 Objectives

The main objectives of inventory management are operational and financial. The operational objectives mean that the materials and spares should be available in sufficient quantity so that work is not disrupted for want of inventory. The financial objective mean that investments in inventories should not remain idle and minimum working capital should be locked in it. The followings are the objectives of inventory management:

1. To ensure continuous supply of materials spares and finished goods so that production should not suffer at any time and the customer's demand should also be met.

2. To avoid both overstocking and under-stocking of inventory

3. To maintain investment in inventories at the optimum level as required by the operational and sales activities.
4. To keep materials cost under control so that they contribute in reducing cost of production and overall cost.
5. To eliminate duplication in ordering or replenishing stocks. This is possible with the help of centralizing purchases.

6. To minimize losses through deterioration, pilferage, wastages and damages.

7. To design proper organization for inventory management. Clear cut accountability should be fixed at various levels of the organization.

8. To ensure perpetual inventory control so that materials shown in stock ledgers should be actually lying in the stores.

9. To ensure right quality goods at reasonable prices. Suitable quality standards will ensure proper quality stocks. The price analysis, the cost analysis and value analysis will ensure payment of proper prices.

10. To facilitate furnishing of data for short term and long term planning and control of inventory.

1.3 Scopes

1. Problem Statement
2. Vision statement- Purpose of these management systems
3. List of features- A list of finalized features.
4. Stakeholders- Bullet list of stakeholders.
5. Users- Users identification.
6. Risks- Potential risks to the project.
7. Assumptions- If you have any.
8. The scope of phased release
9. Features that will not be developed

Literature Review

2.1 Relationship with Undergraduate Studies

- **CSE-213 Object-Oriented Programming:** This course introduces the concepts of object-oriented programming to students with a background in the procedural paradigm. Design principles and patterns of modularity and abstraction in object-oriented programming are discussed in detail. Basic concepts covered: objects, classes, constructors, destructors, abstract data types, composition, inheritance, polymorphism, overloading, function chaining. More advanced topics include: friend and virtual functions, template functions and classes, using standard library classes as building blocks for an application. This course introduced me to Java which helped me throughout the project.

- **CSE-307 System Analysis and Design:** This course examines the tools and techniques used for the design and analysis of information systems. Topics covered include: Systems and models; Project management; Tools for determining system requirements; data flow diagrams; decision table and decision trees; Systems analysis: systems development life cycle models. Object oriented analysis: use-case modeling, Unified Modeling Language. Feasibility analysis, structured analysis; systems prototyping; system design and implementation: application architecture, user interface design. Front-end and backend design; database design; software management and hardware selection. Case studies of Information Systems. Not only for the project but also the report, this course was of great help. This course has helped in planning the whole project from the beginning to the end.

- **CSE-203 Data Structure:** Data representation and storage in elementary data structures like arrays and linked lists (both singly linked lists and doubly linked lists). Abstract Data Types (ADT): Stack, Queue, Priority Queue. Comparative analysis of different implementations of ADTs (Array based and linked list based). Binary Search Tree (including red/black trees), Heap, Efficient Priority Queue (Heap based). Complexity analysis of dictionary operations (insertion/deletion/search) on ADTs. Use of data structures in the design and implementation of smart searching and sorting algorithms (Binary search, Heap sort). Graphs (Connectivity graph, Directed and Undirected graph).This course taught me to analyze the efficiency of implementation choices.

- **CSE-303 Database Management:** An introduction to database design and the use of database management systems. The course includes detailed coverage of the development process, database architectural principles, relational algebra and SQL using Oracle or SQL Server. Other key database topics covered are data modelling (E-R model, relational data model, integrity constraints, data model operations, normalization, object oriented data modelling), database security, administration and distributed systems. A huge part of the project is related to backend. This course has given the overall knowledge to backend, which is related a huge part of project.

- **CSE-309 Web Application and Internet:** This course serves as a comprehensive overview of web technologies and their usage. Essential topics such as OSI & TCP/IP architecture, Internet Routing, IP addressing & Domain Name System will be covered. Discussions will be held on popular browsers, HTML and Cascading Style Sheet, HTTP, HTTPS, FTP, Client and Server side scripts, Scripting (JavaScript, AJAX, XML) with jQuery libraries, Web Servers (IIS, Apache). Students will learn to design dynamic websites using ASP.NET with SQL server and PHP with My SQL. A brief overview of topics in web security such as cryptography, digital signatures, digital certificates, authentication & firewall will be provided. While working with the frontend design, this course was in help. From this course, I have learned basic frontend designing.

2.2 Related works

Already there have some good software for inventory management system.

These are:-

- **ZHENHUB Inventory Management**: ZhenHub is a cloud-based logistics and inventory management solution for small and midsize businesses (SMBs). Its free version offers inventory tracking, shipment tracking, and warehouse management. ZhenHub's USP is its shipping management functionality that integrates with multiple shipping solutions such as DHL and FedEx. It lets you schedule, manage, and track orders from these providers.

- **inFlow Inventory Management**: inFlow Inventory suits businesses of all sizes. Its free version is deployed on-premise and lets you manage up to 100 products and customers. This version includes barcoding, cost management, sales orders, purchase orders, and count sheet functionalities. inFlow's unique selling point (USP) is its payments tracking

functionality, which provides real-time details of all the completed and pending payment transactions.

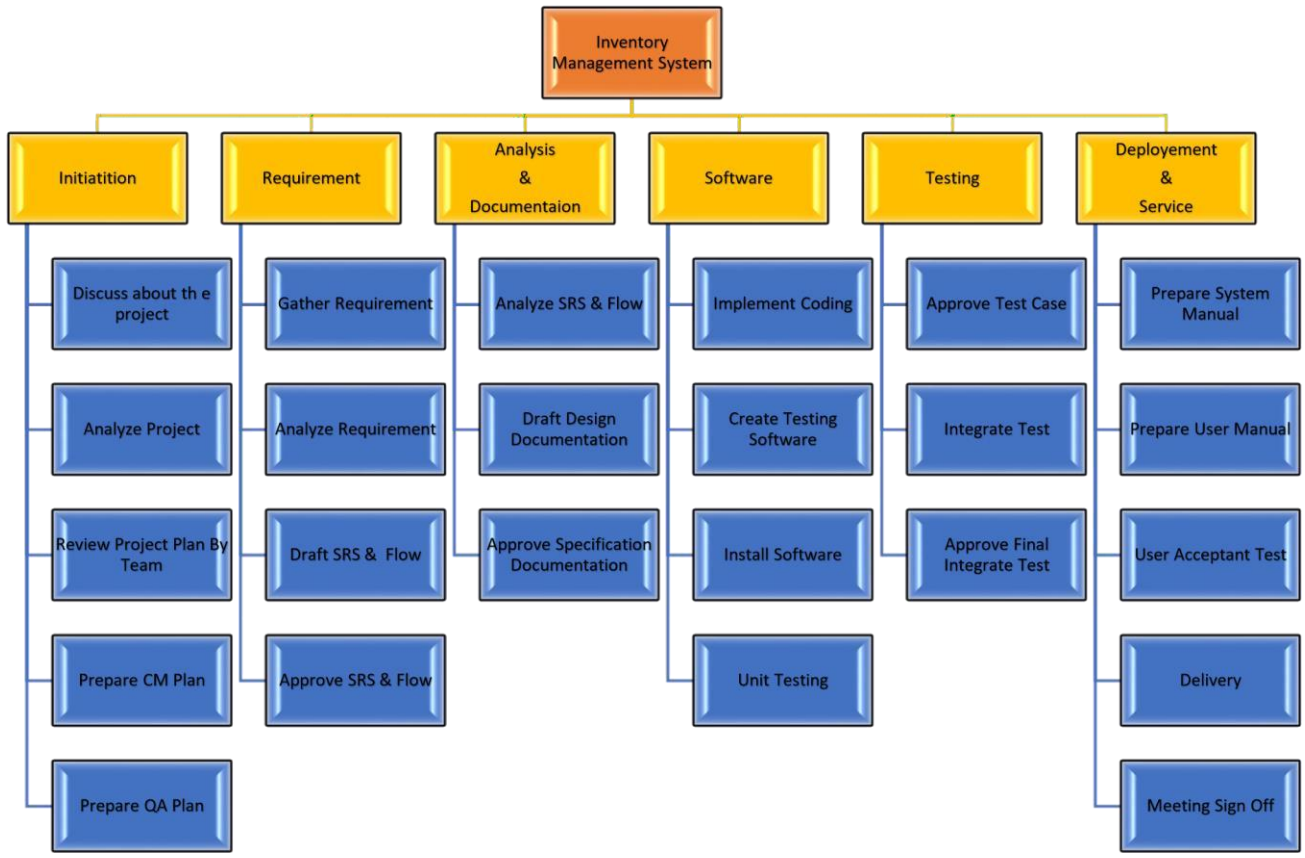
- **Sortly Pro Inventory Management:** Sortly Pro is a cloud-based inventory management solution for businesses of all sizes. Its free plan supports one user and lets you manage up to 100 transaction entries per month. Sortly Pro's USP is its product tagging and cataloging functionality that lets users create product catalogs with up to eight photos for each item. If you want to manage more than 100 entries per month, upgrade to the **Advanced** or **Ultra** plans. In addition to the features offered in the free version, these plans offer QR code tagging and scanning, user activity tracking, document management, and customized branding.
- **ODOO Inventory Management:** Despite Odoo being an ERP tool, users can download and access its inventory module, using it as a standalone inventory management solution. Odoo's USP is that it is a full suite ERP, making the product suitable for your CRM, project management, and business management needs. Odoo is available for free if you implement only the inventory management module. Users need to pay for other apps such as CRM and project management.
- **ZOHO Inventory Management**: Zoho Inventory is a cloud-based inventory and warehouse management solution for SMBs. Its free version lets you manage 20 online orders, 20 offline orders, 12 shipments, and 1 warehouse per month. This version also lets you select and manage shipping providers for your orders. Workflow management functionality is the free version's USP. It triggers an alert as soon as the stock dips below the critical level and lets you re-order the stock.

I browse their sites and software. And took lots of idea about features and functions for implement my project.

Project Management & Financing

3.1 Work Breakdown Structure

WBS is a hierarchical structure that shows the breakdown of a project into smaller parts. It organizes the work of the team members into manageable sections. We have created a WBS for our project so that our work is organized. WBS provides a visual of all the scopes, risks, communication points, responsibilities, cost and ensures that important deliverable are not missed. It is the perfect tool for the team for brainstorming and cooperation. We have used the top-down approach in WBS.



3.2 Process/Activity wise Time Distribution

This table shows the time allocation of the work. I mention all these by Work Breakdown Structure.

Process/Activity	Time Distribution(week)	Work Percentage (%)
Initiation	1 week	5
Requirements	1 week	10
Analysis & Documentations	4 week	10
Software	6 week	45
Testing	1 week	15
Deployment & Service	1 week	10

3.3 Gantt Chart

	Week													
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Discuss about topic														
2. Analysis Project														
3. Review Project Plan by team														
4. Gather Requirement														
5.Design Diagram														
6.Design Application Interface														
7.Build Interface														
8.Build Database														
9.Insart Coding														
10.Testing														
11.Deployment														

3.4 Process/Activity wise Resource Allocation

1. Analysis: One senior and one assistant business analyst assigned for the overall analysis. They were involved several meetings with client, gather all the documents and deliver them to my project manager and the team.
2. Design: One database administrator was assigned to database design related work. Me with another one UX designer was involved with interface design.
3. Development: There was 1 software engineers along with me were involved to software development area.
4. Unit test: 2 QC engineer were tested the software along with load testing.
5. One operation Engineer was going through the system and hand over the project to user end.

3.5 Estimated Costing

Economic cost also important concern when developing a new system. There have to make a few costs to implement the system. The cost was calculated on the basis of the features the client demands.

- As this is a web application so first of all buy a domain name and for storage buy a host service.
- Development cost like pay for web service or some other services.

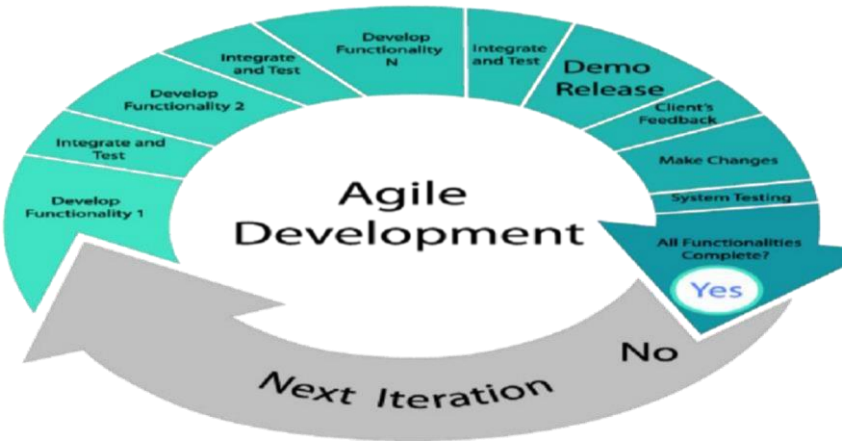
It depends on the size, requirements, functionalities and design of the software. Pre-designed themes, logo design cost, the cost for home page sliders, search engine optimization, chat option, social media connection, SSL certificates and many other tools are includes in this estimate costing. The overall costing based on full system implementation is 2.5 Lakh. The cost of developer and resources used were also in here. If client required it after 1 year, then for hosting and domain additional charge will be taken. And maintenance and support cost per month is 25 thousand.

Methodology

Most organizations are deploying one of the world's most popular open source database software MySQL for developing systems. This is because it is consistent, fast in performance, platform independent, reliable, easy to use, considered to be more stable, takes little storage space on disk, and is highly secure. The system was designed using UML a modelling language technique and programming languages such as PHP an HTML embedded script language which easily integrate with MySQL. These are further explained below.

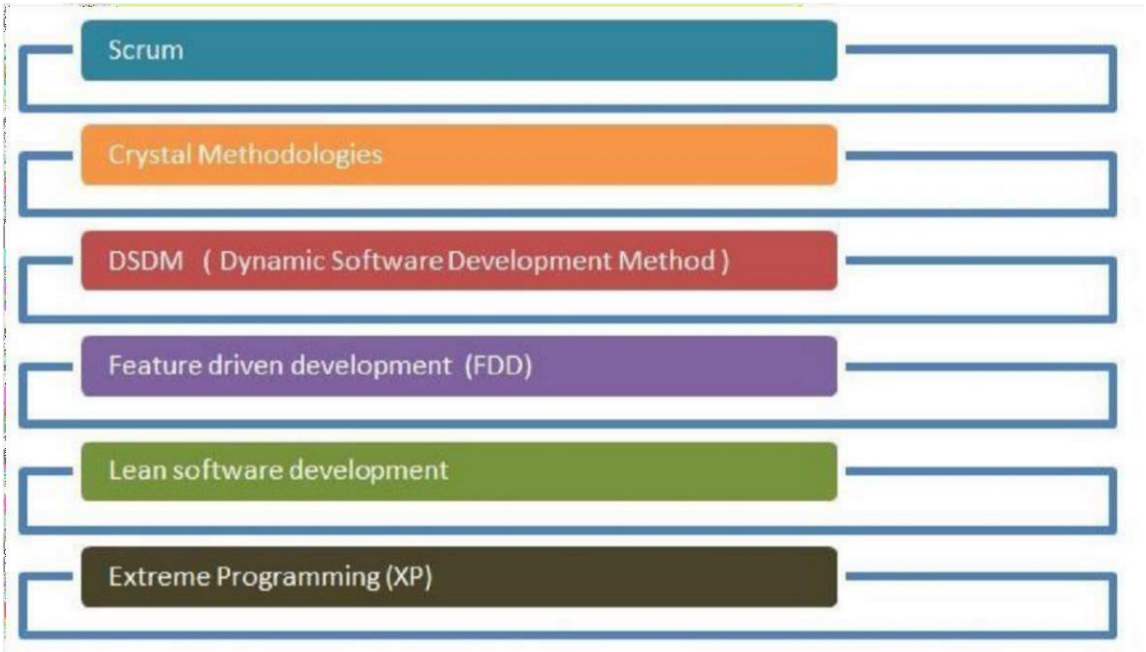
Software Development Methodology:

Agile development consists of iterations. This means, the software owner receives a viable piece of software at the end of each iteration. First, it's the design of the future product; then is launched the development, where the product receives new features and gets tested, iteration by iteration. Besides, the software owner can track the progress of development by receiving timely reports. Furthermore, this allows the owner to shape the picture of the app by giving feedback and altering requirements. Requirements to develop a software tend to change. Vision and strategy change. Users may demand new features or pay less attention to other "useless" features. These unexpected changes may cause certain delays and overpays to be realistic. Experience shows that initial requirements do change. These requirements may vary from insignificant ones to those which require rewriting quite a bulk of code. Agile method adds more room for change/improvements. As agile developer, we keep track of the altering/improving the software.



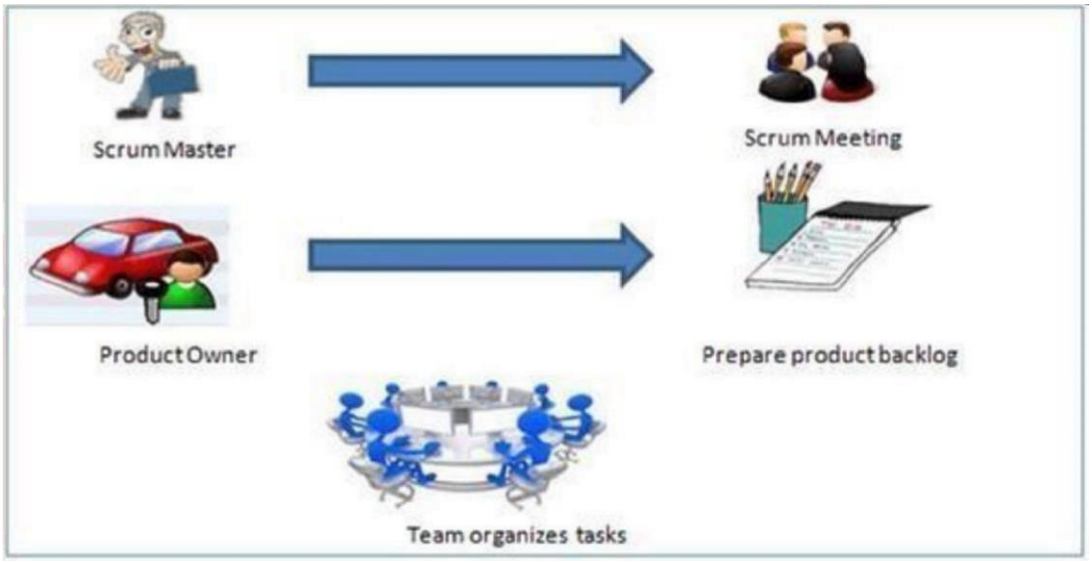
AGILE TESTING METHODOLOGY

There are Six Agile methodology for developing software. We use Scrum method for our inventory Software development. The further details are given below



SCRUM:

SCRUM is an agile development method which concentrates specifically on how to manage tasks within a team-based development environment. Basically, Scrum is derived from activity that occurs during a rugby match. It consists of three roles, and their responsibilities are explained as follows:



Scrum Master

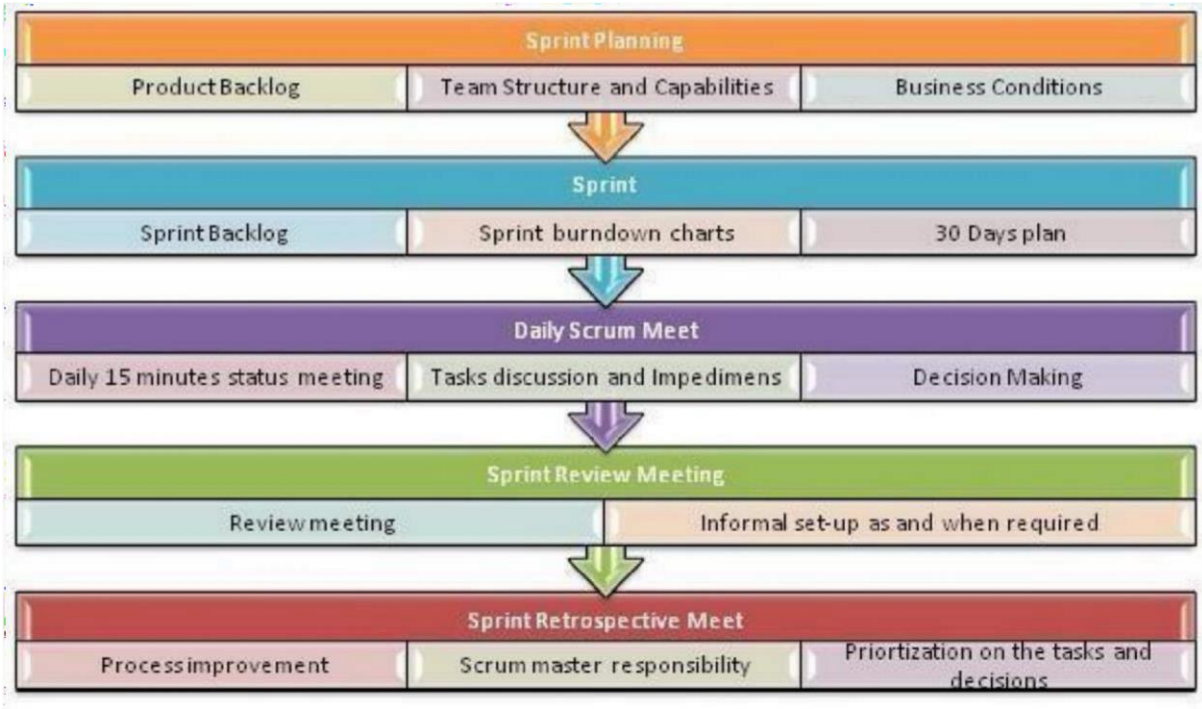
Master is responsible for setting up the team, sprint meeting and removes obstacles to progress

➢ Product owner

The Product Owner creates product backlog, prioritizes the backlog and is responsible for the delivery of the functionality at each iteration **Scrum Team**

Team manages its own work and organizes the work to complete the sprint or cycle.

SCRUM PRACTICES



Why We Use Scrum [Agile process]?

1. Helps save time and money

With a traditional method and a responsible team, you can achieve wonders through SCRUM. The ability to manage tasks in an organized way and have the planning necessary to reach them, make it a crucial tool to save time and money. 15-minute daily meetings ensure that the process is at the correct stage, as established at the beginning of the project.

2. Encourages teamwork

With the division and assignment of roles and tasks efficiently, this methodology helps us to work successfully on a project. The “product owner” and the “team” are complemented by the SCRUM Master, a resource that helps and supports the mission. The possibility of appreciating the progress of the work offers a guarantee that the process will be transparent and by the established.

3. It adapts to the company

The SCRUM methodology also provides the possibility of adjusting to the companies that use it. In this way, not only the idea of an organized production of tasks is conceived, but also a plan that goes hand in hand with the company in charge of the project and its characteristics.

4. It is easy to use

Through a methodology like SCRUM, the integration of all the parties involved in a project is successfully achieved. The participation and management of SCRUM are simple and easy to handle for all stages. In the same way, it has a record of work done and is monitored to achieve it efficiently.

Body of the Project

5.1 Work Description

Inventory refers to the assets of the company which consists of raw materials, work in progress and finished goods that are ready for the sale or will be ready for the sale. It is the goods and material company hold for the ultimate purpose, resale. It is held by the organization to support production, repairs, maintenance or for sale. It is the major part of the assets of the business because inventory turnover represents one of the primary sources of the revenue generation. Inventory can also be on consignment, which is an arrangement when a company has its goods at third-party locations with ownership interest retained until goods are sold. When the inventory is sold, the carrying cost goes to the cost of goods sold on the income statement.

These are my work description shortly mentioned in below:-

- Discuss about the Project with team.
- Analysis Project
- Review Project plan by team
- Prepare CM & QA plan
- Gather and Analyze requirement
- Draft and Approve SRS & Flow
- Analyze SRS & Flow
- Draft Design Document and approve specification documentation
- Implement coding
- Create test software and install software.
- Unit testing
- Approve test case
- Integrate test and approve it.
- Prepare system manual and user manual
- User acceptant test
- Delivery
- Meeting sign off

5.2 System Analysis

At the systems analysis phase, requirements were gathered, analyzed, and used to build the models which models would be used at the design phase and these included the business transaction lists, the coordination model, Business Process Model (BPM), the process flows at Companies, sequence diagrams that, in turn, were used to produce collaboration diagrams and class diagrams, activity diagrams, conceptual data model, and functional and non-functional requirements.

The study used the System Development Life Cycle (SDLC) for the development of the new system. This methodology helped improve the management and control of the system development process, simplifying, and structuring the process, standardizing the development process by specifying activities to be done and techniques to be used. This method involved major activities such as Planning, Analysis, Design, testing, and Implementation. Within these activities were specific activities under each and all these were fully followed in the development process as will be seen in the project schedule attached. However, the System Development Life Cycle (SDLC) model was used together with the prototyping approach and this was because SDLC follows a sequential flow of activities and so may not be practical to be used alone as some requirements would not be completely specified. Prototyping is always necessary when some requirements cannot easily be specified, or when some functionality is not known or fully understood.

5.2.1 Six Element Analysis

- **Processor:** The processor is that element of system which involves the actual transformation of input and output.

  In this project we have done lots of process to transform input to output. Such as input order details to output sell invoice

- **Control:** The control element guides the system. It is the decision subsystem that control the pattern of activities.

- **Environment:** Environment is the “suprasystem” which operates within an organization. It is the source of external elements that impinge on the system. In fact, it often determines how a system must function.

- **Outputs and Inputs:**
    1. Output: A major objective of a system is to produce an output that have value to its user. Whatever the nature of the output.
    2. Input: Inputs are the elements (materials, human resources, information) that enter the system for processing.

- **Feedback:** Control in dynamic is archived by Feedback. Output is measured against a standard, in some form of cybernetics procedure that includes communication and control. Output information is fed back to the input and/or to management (controller) for deliberation. Feedback may be positive or negative, routine or informational.

- **Boundaries & Interface:** The concept of boundary of a system makes it possible to focus on a particular system within a hierarchy of systems. The boundary of a system may exist either physically or conceptually. The operational definition of a system in terms of its boundary is:

1. List all components that are to make up the system and circumscribe them. Everything within the circumscribed space is called the system, and everything outside is called the environment.

2. List all flows across the boundary Flows from the environment into the system are inputs; flows from inside the boundary to outside are called outputs.

3. Identify all elements that contribute to the specific goals of the system and include these within the boundary if they are not already included.

5.2.2 Feasibility Analysis

1. Operational Feasibility

1. Reduce the cost of paper Reports.
2. Reduction of overhead staff time.
3. The acceleration of information flows 4. Change the corporate culture.
5. Higher productivity can be gained.
6. Prevent lost records.
7. Save storage space.
8. Fast response to changes.

9. Functional tests are frequent in the process.
10. Direct collaboration with the client.
11. Motivation and responsibility of teams.

2. Technical Feasibility

The Inventory Management System is technically feasible because of the rapidly maturing and improving technology, it is even more feasible. XAMPP server, PHP , MySQL, HTML, CSS, jQuery and JavaScript the basic required components they are open source too. So, it is feasible to developer side.

3. Economic Feasibility

The Inventory Management System is economically feasible since the savings and benefits of the system are more when compared to the cost. The WSCL will save a considerable amount of labor in managing paper files, any study of financial feasibility also must consider non quantitative costs and benefits of a project. Sometimes a particular system may not appear to be feasible from a purely quantitative perspective, but the nonquantitative benefits are so significant that they overcome a cost-benefit ratio that is not optimal.

4. Legal Feasibility

All the legal constraints have been considered before proceeding with this project which includes data protection acts, social media laws, or zoning laws so that it does not face any legal constraints in the future.

5. Scheduling Feasibility

To make a project successful, it is very important to complete a project at the given time. The project to date has been completed on time that has been designated for each task.

5.2.3 Problem Solution Analysis

Basically, Inventory management system is a very difficult process, to operate it manually. Because, for manually operating we need more manpower, have to keep lots of paper documents, maintaining supply chain system, difficult to maintain contact with customer &

supplier & manufacturer, checking item availability etc. Besides those, every process needs so many time in manually. But in automation system we can reduce huge number of manpower, we doesn't have to use paper, can easily maintain the supply chain. And also in automation system have list of customer, supplier, manufacturer, so that we can contact with them anytime easily. In this automation system we also can search and gather information about products, item availability etc.

5.2.4 Effect and Constraints Analysis

Limitations are very simple. Almost most of the company don't use any software based automation system. So that initially we face problem for gathering the requirements.

Inventories that are counted weekly or monthly and then compared with counts from the previous period can only generate data at or after the point of counting. This results in a lack of detail in the information about how inventory moves over the short term.

Businesses moving large amounts of inventory may want to have a finer level of detail than periodic inventory allows. On the other hand, the nature of a small business may not require such detail, especially when ordering multiple quantities (to take advantage of bulk discounts) minimizes short term variability.

5.3 System Design

This phase involved the actual designing of the system using inputs from the analysis phase. This included selecting the preferred database software and building the design using the software. This provided inputs for the implementation phase of the system and included; functional design, logical design of the database, Entity Relationship Diagram, physical 28 design of the database, User interface designs, report templates, systems architecture, network model and the program design.

This phase provided an overview of the intended SAIMS, evaluated the feasibility study and risks that would be associated with the project. At this phase, the study identified the need and determined the scope of the entire project. Also, a detailed work plan was drawn and time schedule, and system justification and scope specification determined.

5.3.1 Rich Picture

A Rich Picture is a way to explore, acknowledge and define a situation and express it through diagrams to create a preliminary mental model. A rich picture helps to open discussion and come to a broad, shared understanding of a situation

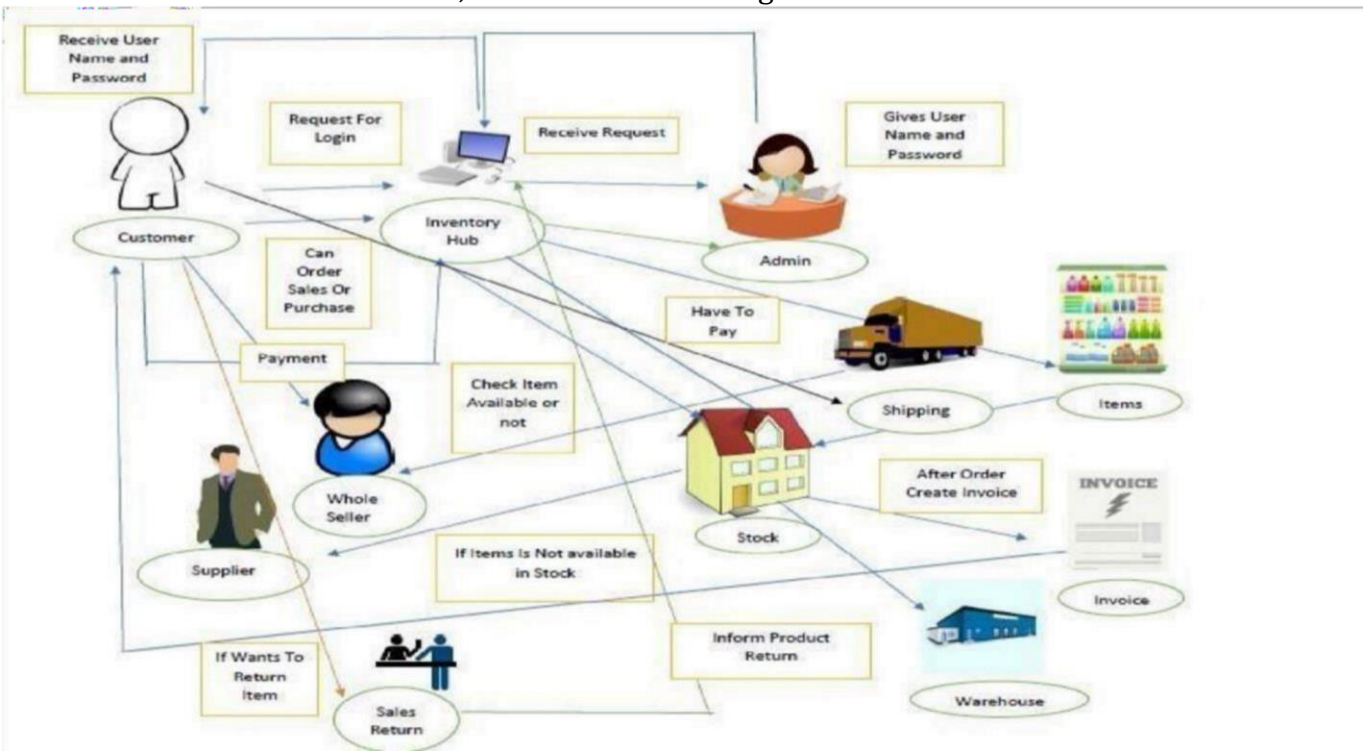


Fig: Rich picture of "Inventory Management"

5.3.2 UML Diagrams

User Case Diagram:

Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors and their goals.

The main purpose of a use case diagram is to show what system functions are performed for which actors.

Diagram Building Block

Use cases: A use case describes a sequence of actions that provide something of measurable value to an actor and is drawn as a horizontal ellipse. **Actor** An actor is a person, organization or external system that plays a role in one or more interactions with the system like Customer, Employee, Supplier, Admin, Vendor. **System boundary boxes (optional)**

A rectangle is drawn around the use case called the system boundary box to indicate scope of the system

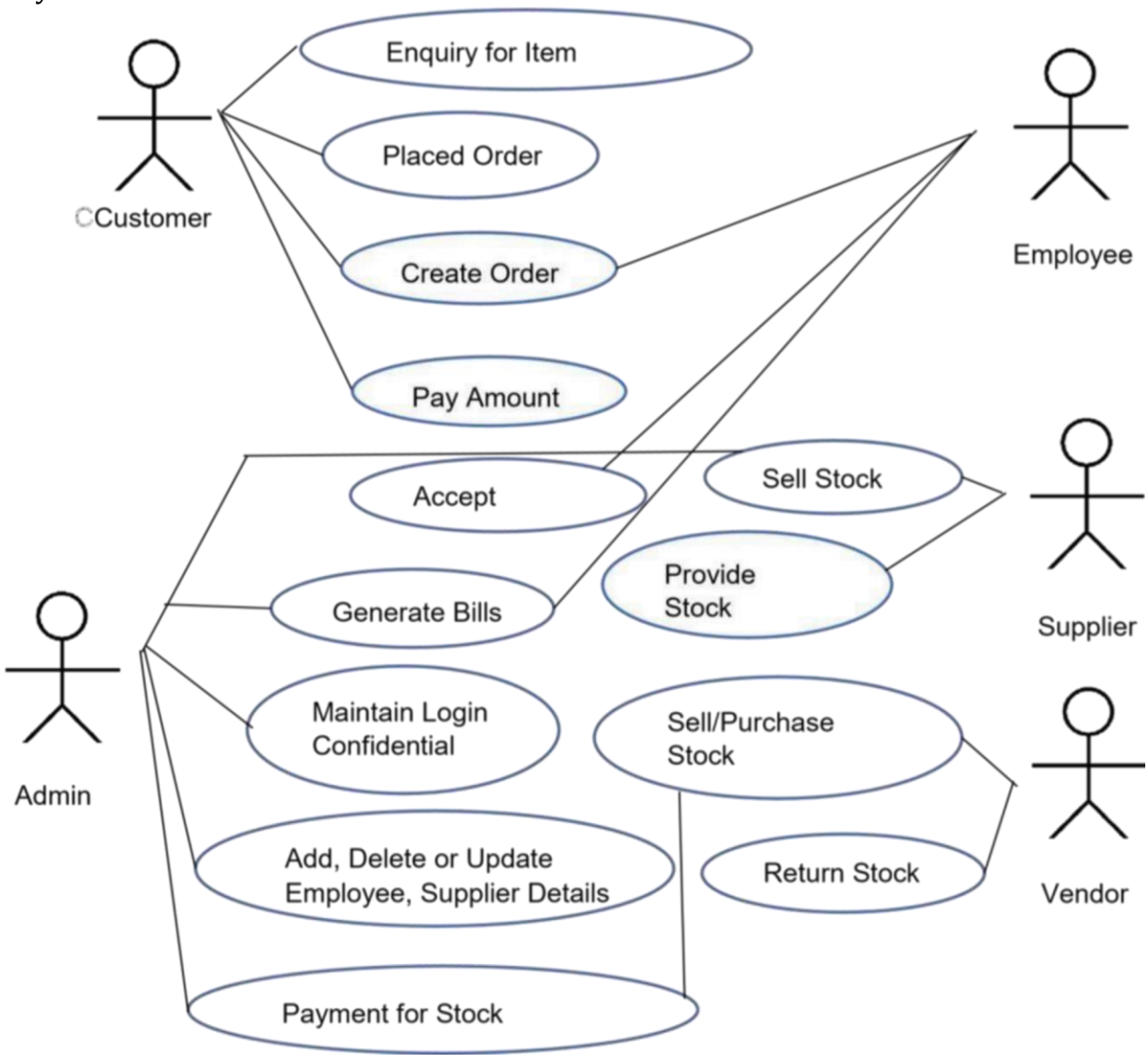


Fig : Use case Diagram Of "Inventory Management"

ERD Diagram:

An entity relationship diagram (ERD) is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within that system.

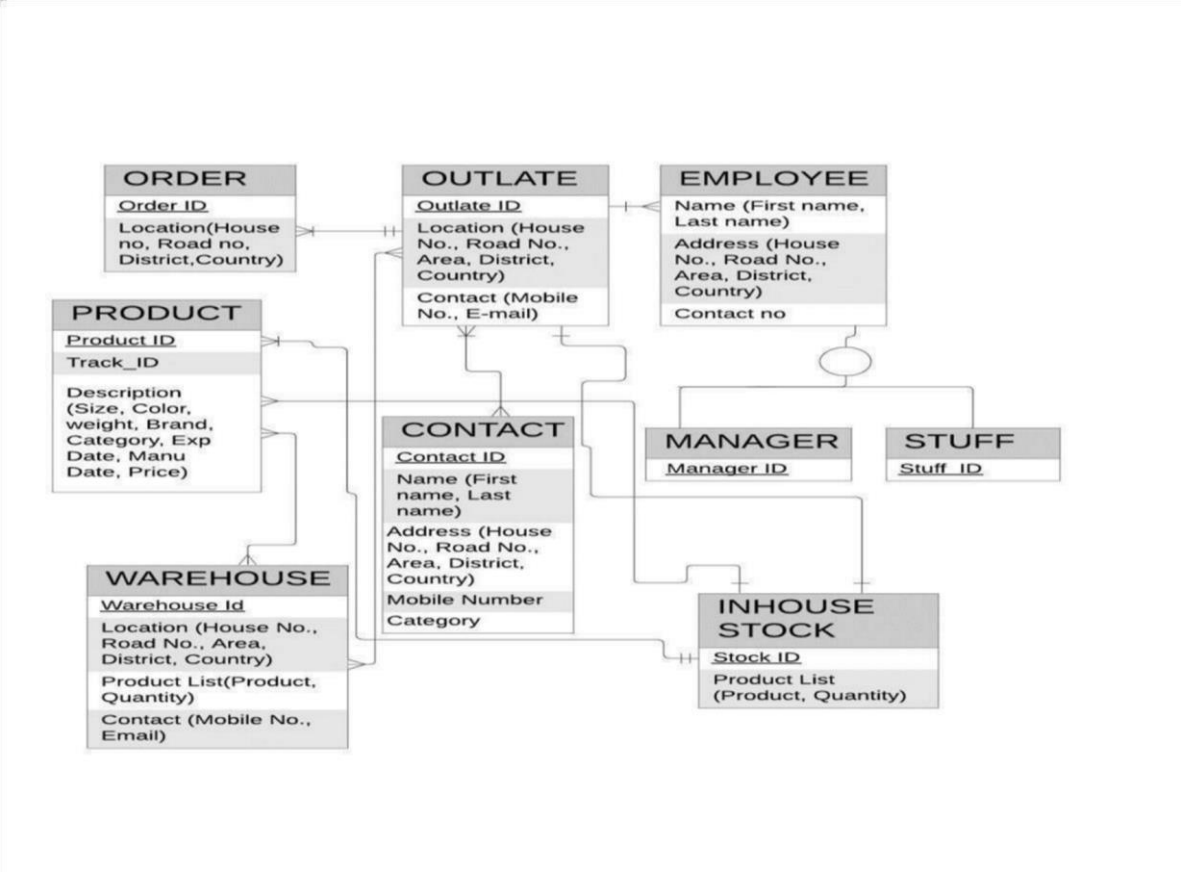


Fig : ERD-Diagram of Inventory Management

Process Flow Diagram:

Process Flow Diagram or Flowchart is a diagram which uses geometric symbols and arrows to define the relationships. It is a diagrammatic representation of the algorithm.

The Process flow Diagram of our application is shown below:

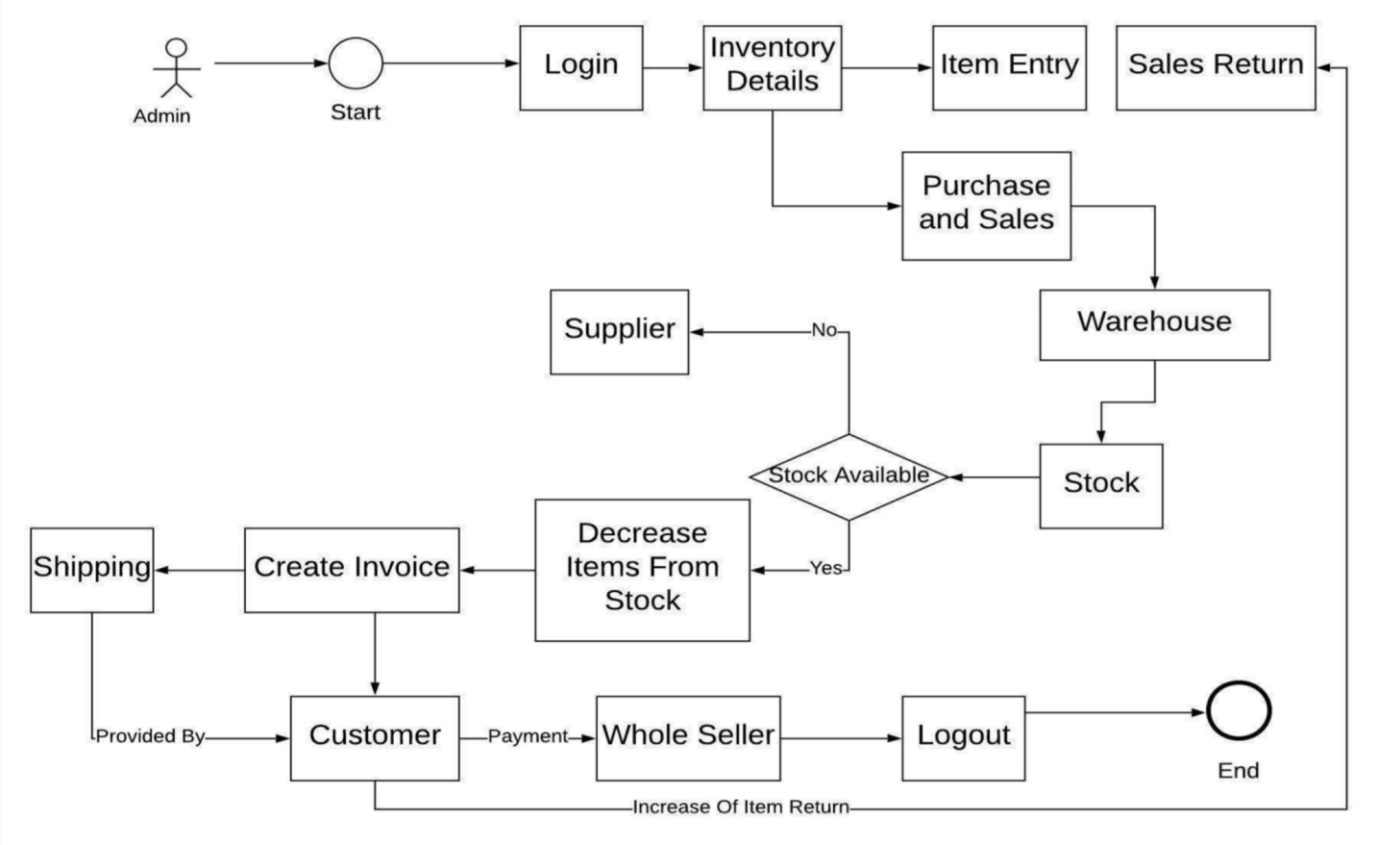


Fig : Inventory Management Process Flow Diagram

5.3.3 Functional and Non-Functional Requirements

Functional Requirements: The System aims at providing an efficient interface to the user for managing of inventory, it shall also provide the user varied options for managing the inventory through various functions at hand. The ingredient levels are continuously monitored based on their usage and are checked for the threshold levels in the inventory and accordingly the user is alerted about low levels of certain ingredients. The design is such that the user does not have to manually update the inventory every time, the System does if for the user.

The System calculates and predicts the amount of usage for specific set days that are pre-set by the user(admin), it also alerts the user of an impending action to order ingredients before the specific day set by the user. Therefore, the user never has to worry about manually calculating the estimated usage of the ingredients as the System does it for the user.

The simple interface of the System has functions like adding a recipe, removing or updating the recipe. It also extends to functions such as adding a vendor for an ingredient, removing the vendor, checking threshold levels, processing orders, altering processed orders etc.

Some Functional Requirements are:

Inventory Management

- Product Categorization
- Product Measurement
- Product History
- Stock Inquiries
- Cycle Counting
- Collaborative Inventory
- Automatic Stock-out Reports
- Vendor-Managed Inventory
- e-Commerce

Transfer Management

- Multi-Location Tracking
- Stock Transfer
- Order Picking
- Kitting and Product Bundling
- Voice Picking
- Pick-to-Light (PTL)

Purchasing

- Purchase Order
- Bulk Pos

- Partial Receiving
- Supplier Management
- Backordering

Shipping

- Labelling
- Multi-Carrier Shipping
- Multiple Shipment Orders

Order Management

- Order Tracking
- Sales Order
- Quotations
- Order Editing
- Customer Pricing
- Multichannel Sales
- Returns

Reporting and Analytics

- Dashboards
- Customized Reports
- Report Integration

Deployment

- On-premise
- Cloud-based

Integration

- Integration and Synchronization
- API/Web Service

Non-functional Requirements:

Reliability:

- The System must give accurate inventory status to the user continuously. Any inaccuracies are taken care by the regular confirming of the actual levels with the levels displayed in the system.
- The System must successfully add any recipe, ingredients, vendors or special occasions given by the user and provide estimations and inventory status in relevance with the newly updated entities.
- The system must provide a password enabled login to the user to avoid any foreign entity changing the data in the system.
- The system should provide the user updates on completion of requested processes and if the requested processes fail, it should provide the user the reason for the failure.
- The system should not update the data in any database for any failed processes.

Performance:

- The system must not lag, because the workers using it don't have downtime to wait for it to complete an action.
- The system must complete updating the databases, adding of recipe, ingredient, vendor and occasions successfully every time the user requests such a process.
- All the functions of the system must be available to the user every time the system is turned on.
- The calculations performed by the system must comply according to the norms set by the user and should not vary unless explicitly changed by the user.

Supportability:

- The software is designed such that it works even on systems having the minimum configuration.
- The system is adaptable even if additional plugins or modules are added at a later point.
- The data can be exported to the manager so as to make the system more portable.

Packaging:

- The system must be able to run on the Windows operating systems beginning with Windows XP and must be able to run on future releases such as Windows 8, 10.
- The software must incorporate a license key authentication process.
- The packaging must come with a manual that details the use of the system, and the instructions on how to use the program. This manual may be included either in a booklet that comes with the software, or on the disc that the software itself is on.

Implementation:

- The System User Interface is built by Bootstrap 4.
- The Programming is done in IntelliJ IDEA.
- The Database is implemented on the Microsoft Access.

Interfacing:

- The system must offer an easy and simple way of viewing the current inventory.
- The system must be able to display the relationships between vendors, ingredients, and recipes in an intuitive manner.

Legal:

- The software must be licensed on an individual basis for smaller companies, as well as through a multi-license deal for larger corporations.

- The client should agree to EULA before using our software.

Stakeholders:

Executives:

- Customer Service Manager
- Sales Manager
- Account Manager
- Branch Manager
- Sales Executive **IT Executive:**
- Software Developer
- Software Designer
- Software Operator **Others:**
- Warehouse Manager
- Vendor
- Supplier
- Customer

5.4 Product Features

We are working with Tech VaultBD Ltd to develop a constructive inventory management system. Our main motive is to track inventory levels, orders, sales, and shipments so that business can be easily and effectively managed. According to our market analysis, we have set some features to meet up the growing needs of our clients and ensuring the quality of customer services. The features list is given below-

❖ **User:**

- ✦ Add User
- ✦ Manage user

- User profile
- Admin profile

❖ **Product:**

- Product list
- Product availability
- Product brand
- Product category
- Product attributes
- Add Product
- Manage Product

❖ **Contact:**

- Client list
- Supplier list
- Manufacturer list
- Stores list
- Company list

❖ **Order:**

- Add order
- Manage order
- Sales order
- Sales order workflow
- Purchase order
- Purchase order workflow
- Track shipments
- Invoicing
- Bill generate

❖ **Reports:**

- Sales report
- Product report

- ✦ Order report
- ✦ Total data report

❖ **Setting:**

- ✦ Update admin information
- ✦ Update user information
- ✦ Change password

❖ **Login & Logout:**

- ✦ User entry and out function
- ✦ Admin entry and out function

5.4.1 Input

- Customer information
- Product information
- Order details
- Supplier information
- Manufacturer information
- Manufacturing cost

5.4.2 Output

- User information
- Total paid order
- Product list
- Sales report
- Invoice / bill
- Stock list

5.4.3 Architecture

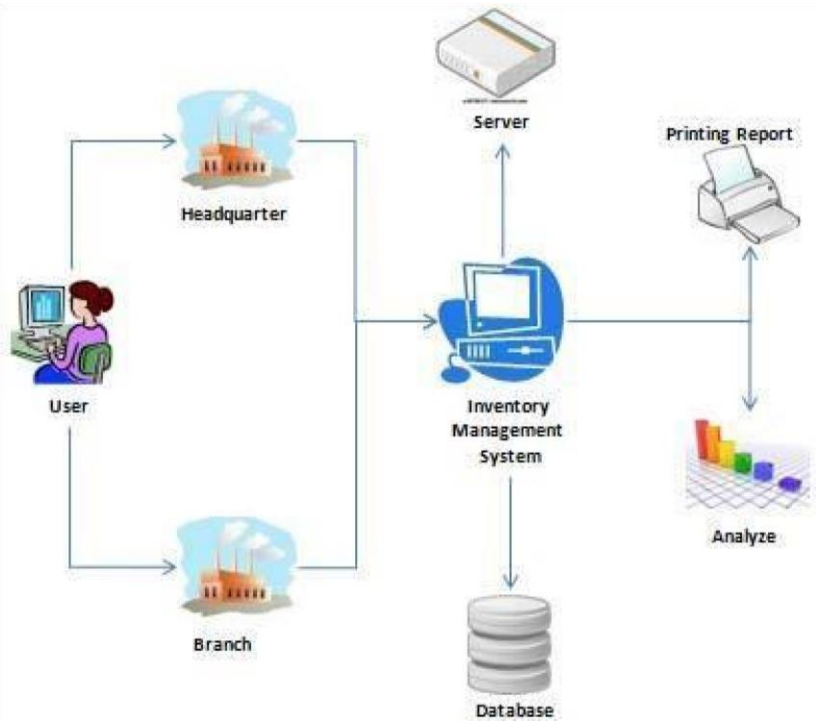


Fig: Software architecture of "Inventory Management"

5.4.4 Implementation

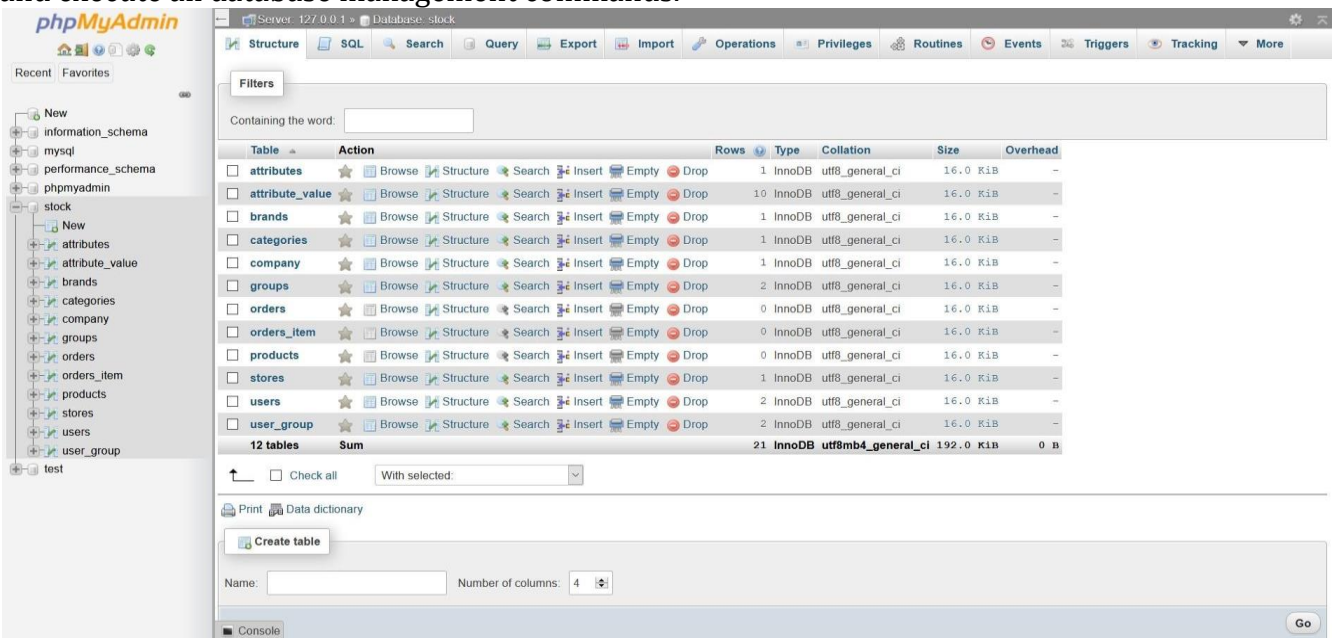
The implementation plan involved a plan of the major activities required to install both the hardware and software of the system. It should however be noted that the training, deployment, support and maintenance of the Inventory was beyond the scope of this project. So, the above have not been included in this project.

User Interface: PHP was the main programming language used in developing the user interfaces and connecting to the interfaces to the database. The PHP was embedded in HTML to enhance desirable interfaces. Macromedia Dreamweaver version 8.0 was the web page program editor used for coding and de-bugging the PHP functions. The front end was built using PHP and also

used to connect the interfaces 57 to the backend. Java script was used for validating all data to be fed into the different forms.

Database Implementation: The database management system was designed using MySQL and a script was run to build the database, the necessary tables, the relationships between those tables, and their constraints as depicted in the systems' design phase. The primary keys were identified in all tables, the relationship between the primary keys and foreign keys of the different tables which were useful in linking the related tables. The database system was built basing on the Entity Relationship Diagram created in the system design phase. In order to test the database integrity, the database was populated with data by the developer to ensure that whenever certain queries were run, the results produced matched those expected. Attempts were also made to enter erroneous data into the database to ensure that the correct data types were recognized.

phpMyAdmin: phpMyAdmin is a free tool that is used to control the administration of MySQL database. It was used to perform operations like creating databases, tables, fields, relationships and execute all database management commands.



Results & Analysis

Development of System Application Model and its Approval

In this phase the final application model will be designed and submitted for approval from the concerned authority. To accomplish the job following steps will be followed:

Initially, some of these tasks had some bugs but these were fixed after several tests. All these tasks are tested on local hosting. Some of these tasks have some shortcomings which are not implemented. Back End development is completed and changes are being made in Front End. Apart from the development team, the client has also tested some of the tasks that were implemented before. After the project is completed and before going live, it will be tested again and changes will be made if needs.

Testing

Purpose of Testing:

The purpose of software testing is to access or evaluate the capabilities or attributes of a software program's ability to adequately meet the applicable standards and application need. Testing does not ensure quality and the purpose of testing is not to find bugs. Testing can be verification and validation or reliability estimation. The primary objective if testing includes:

- To identifying defects in the application.
- The most important role of testing is simply to provide information.
- To check the proper working of the application while inserting updating and deleting the entry of the products.

For Testing the Inventory Management Software, we use both Black-box and White-box testing. Firstly, we test the whole software by the black-box testing with the local host xampp. Then we inspect the code from Chrome for white-box testing alongside with IntelliJ IDEA.

Black-Box Testing

It is a way of software testing in which the internal structure or the program or the code is hidden, and nothing is known about it.

White-box Testing

It is a way of testing the software in which the tester has knowledge about the internal structure the code or the program of the software.

We use Black Box Testing for:

- Non-functional testing
- Functional Testing
- Regression Testing

Then we use White Box Testing for:

- Path Testing
- Loop Testing
- Condition testing.

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

The Inventory Manage System software has been made sustainable by making these small yet significant changes.

- 360 degree program view :

  By this inventory management project we can view all the processes of the system easily. Manufacturing details, warehouse stock, outlet stock, order management, sales management, contact management, product details etc. all processes can use at a time by this system.

- Manage it all in one place:

  We can create, collect & store all the information of the management system. If it needs, these data can be collect and shared with anyone in the organization. Specially, Sales report, product list, contact list, order list, stock list, invoice etc. those data can be share and collect.

- Standardize and simplify :

  This software makes it easy for us to standardize the data gathering process with the system. And simplify the data storing process. We have kept the software as simple as possible so that users do not find it difficult to use the software.

7.2 Social and Environmental effects and analysis

✦ **Social Effect:**

Inventory management is critical to business logistics. But if the state includes additional restrictions on its management cause disturbances with great social impact. To study the social impact of these additional restrictions, Logistic Model Based on Positions, that studies the logistics through functions, will be used. In particular there will be used the Inventories

models manager. Hence the objective of this work: Determine the social impact that can cause government restrictions on inventory management, through the Inventories models manager of the Logistic Model Based on Positions.

✦ **Environmental Effects:**

This paper analyzes the impacts of different pollution control policies on a firm's decisions of production planning and inventory control. Based on a stochastic model with both demand and environmental uncertainties, we derive the optimal policies of production planning and inventory control under both regulatory and voluntary pollution control approaches, and investigate their operational and environmental effects. We establish that the conventional wisdom which suggests that reduction of environmental waste at the end of a production process also decreases the stock and throughput levels of a production system is not necessarily true. Rather, a regulatory environmental standard that limits the total amount of waste may induce the firm to raise its planned stock level, which would lead to a higher expected amount of environmental wastes before the standard is enforced as well as environmental risks at other stages of the production process. The additional planned stock level, which is termed "environmental safety stock," can be reversed by using the voluntary control approach that provides the firm with the flexibility to occasionally exceed the environmental standard. We also conduct numerical experiments to analyze the effects of different values of model parameters under different control approaches. The analytical results provide new insights to the impacts of a firm's production and inventory decisions on the natural environment as well as to the choices of pollution control approaches by decision makers in both the private and public sectors.

7.3 Addressing Ethics and Ethical Issues

People around the world have got a different set of ethics. Problems might arise when one's ethics are pointed wrong by others.

- Tax evasion:

  In this system, user can erase the lots of thing about product.so there has a chance to tax evasion, if it use by dishonest people.

- Unemployment :

  The automation system turning labor tasks into machine tasks. It reduce the need of some employee. So that, there having an Unemployment issue.

All these issues will be monitored by authorized Admins so that ethical issues can be avoided.

Future Work & Conclusion

8.1 Future Works

We are trying to build an Inventory, Accounting and HR management Software. Our First Phrase is almost done with the inventory management system. In future we will develop the Accounting and HR part for a complete package for industrial sector. The project has a very vast scope in future. The project can be implemented on intranet in future. Project can be updated in near future as and when requirement for the same arises, as it is very flexible in terms of expansion. With the proposed software of database Space Manager ready and fully functional the client is now able to manage and hence run the entire work in a much better, accurate and error free manner. This project can be extended and in future it can also be includes:

1. Finger print authentication
2. Face Recognition authentication
3. Mobile & IOS application

8.2 Conclusion

It has been a tremendous opportunity for me to work as intern at Tech VaultBD Ltd. The internship program helped me gain important knowledge on how the IT sector shaping in the country. It has enabled me to understand the technologies that are frequently used in the software industry. The program has helped me develop good judgment, proceed on my own in new technological challenges, and develop better analytical skills and learn professional company culture. The internship program has been a great helping the sense that it improved my teamwork capabilities. It is important to function as a unit and respect the teammate's ideas and suggestions. Moreover, team discussions like brain storming sessions helped me identify and solve numerous problem issues which would have been impossible to solve otherwise. During the last few months, I have a clear idea about how the IT industry is shaping out to be a major driving force in the country's economy. It has enabled me to understand the technologies that are frequently used in the software industry. At the same time it helped me learning the software life cycle for a real life system. This inspired me to be harder working, responsible and confident.

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