RESEARCH ARTICLE

Design and implementation of Data Mart Management System Using Java

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ABSTRACT:

The DataMart Management System is a Java-based application developed to improve warehouse and inventory management by automating key business operations. The system integrates essential modules, including Master Maintenance, Receiving, Shipment, Billing, and Report Generation, into a centralized platform. It helps organizations manage inventory efficiently, reduce manual errors, and improve operational productivity. Java technology provides platform independence, security, scalability, and reliable performance for the application. The system enables accurate inventory tracking, faster transaction processing, and effective report generation to support decision-making. Overall, the proposed system offers a practical and cost-effective solution for modern warehouse and inventory management.

Keywords:

DataMart Management System, Warehouse Management, Inventory Management, Java Technology, Warehouse Automation, Billing System, Report Generation, Inventory Tracking, Database Management, Software Development.

INTRODUCTION

Warehouse and inventory management play a vital role in ensuring the smooth functioning of business operations. Traditional manual methods of managing inventory often lead to errors, delays, data redundancy, and inefficient stock control. To overcome these challenges, the DataMart Management System has been developed as a Java-based application that automates warehouse activities and improves operational efficiency. The system integrates essential functions such as Master Maintenance, Receiving, Shipment, Billing, and Report Generation into a single centralized platform. It enables users to maintain supplier, retailer, and product information while ensuring accurate inventory tracking and faster transaction processing. Developed using Java technology, the system offers platform independence, security, scalability, and reliable performance across different

operating environments. By minimizing manual intervention and providing real-time access to inventory data, the DataMart Management System enhances decision-making, reduces operational costs, and improves warehouse productivity. This project demonstrates an effective and practical solution for modern warehouse and inventory management systems.

LITERATURE REVIEW

Kimball and Ross [1] explained that data marts improve business intelligence by organizing subject-specific data for faster reporting and decision-making. Their work highlights the importance of structured databases in organizational performance.

Silberschatz, Korth, and Sudarshan [2] emphasized that efficient database management systems improve data integrity, security, and transaction processing, making them suitable for inventory and warehouse applications.

Elmasri and Navathe [3] discussed relational database design principles that support reliable storage, retrieval, and management of organizational data. Their research forms the foundation of database-driven warehouse systems.

Hwang and Cappel [4] examined data warehouse implementation practices in large organizations and concluded that centralized information systems improve operational efficiency and support better managerial decisions.

Sunarya, Dewanto, and Tiwa [5] developed a sales data mart that improved reporting speed and data accessibility for business users. Their findings demonstrated the usefulness of data marts in business analysis.

RESEARCH GAP

Although numerous studies have examined warehouse management systems, database management, and data mart technologies, several research gaps remain.

First, many existing studies primarily focus on database architecture or inventory management separately rather than integrating supplier management, inventory

control, shipment processing, billing, and report generation into a single application.

Second, previous research mainly emphasizes theoretical concepts or large-scale enterprise systems, whereas limited attention has been given to developing simple, cost-effective Java-based warehouse management applications suitable for small and medium-sized organizations.

Third, many existing warehouse systems require expensive commercial software and complex implementation, making them less accessible for organizations with limited technical resources.

Finally, there is limited research evaluating how a Java-based warehouse management system can improve operational efficiency, reduce manual errors, and simplify inventory management through an integrated platform.

This study addresses these gaps by designing and implementing an integrated Warehouse Management System using Java and MySQL that automates inventory management, shipment processing, billing, and reporting within a single centralized application.

PROBLEM STATEMENT

This DataMart Management Software project mainly deals with automating the tasks of maintaining and transacting

the goods.In the DataMart Management System

Inventory management is the key process. This process includes the activities such as maintenance of stock details, maintenance of receipts and items etc. It is a tedious job to maintain all these details manually. Hence we opted to automate the Warehouse Management System.

This system maintain all the goods at the Administrator, Sub-location Incharge, and Retailer and also maintain parts at suppliers and his data. So it will take lot of time time to retrieving even a single line of data or deleting data

By manually the DataMart Management System will face difficulties while updations and it is time consuming and leads more errors.

Conceptual Framework

Independent Variable

Java-Based Warehouse Management System

↓

System Modules

Master Maintenance

Receiving

Shipment

Billing

Report Generation

↓

Processes

Inventory Management

Stock Tracking

Supplier Management

Retailer Management

Database Management

↓

Dependent Variables (Outcomes)

Improved Operational Efficiency

Reduced Manual Errors

Faster Transaction Processing

Better Inventory Control

Improved Decision-Making

Higher User Productivity

SYSTEM STUDY

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system was also within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirements, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must

not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the users about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

SYSTEM ANALYSIS

EXISTING SYSTEM:-

This DataMart Management System project mainly deals with automating the tasks

of maintaining and transacting the goods.In the DataMart Management

System-inventory management is the key process. This process includes the activities

such as maintenance of stock details, maintenance of receipts and items etc. It is a

tedious job to maintain all these details manually. Hence we opted to automate the

Warehouse Management System.

DataMart Management System-automates the job of warehouse system. It mainly

includes five members.

1. Administrator

2. Sub-Location In-charge

3. Retailer

4. Supplier

5. Customer

Any DataMart Management System mainly deals with the following processes.

1. Registration of members

2. Ordering items

Acquiring items, Receipts

4. Transferring items

5. Selling items and generating bills

6. Generating reports

The Administrator has the privilege to maintain different types of items in the warehouse.He is concerned with the registration of Suppliers, Sub-Location In-charges.

He maintains the reports of suppliers who are eligible to supply the items. He can send the purchase order to above suppliers when items are required. He is responsible for adding receipts when items delivered to the warehouse.He is also responsible to send the items to sub-location in-charges on demand. He deals with adding of new items and generating reports on items, orders, receipts and stock etc.

Sub-location In-charge is registered and verified by the administrator. He is responsible to maintain the items for transferring them to Retailers on demand. He can send purchase order to Administrator forgetting items that are required for retailers. He can ship the items to retailer when he got the purchase order from retailer. He deals with generating reports on items, orders and stock etc.

Retailer is registered and verified by sub-location in-charge. He is responsible to maintain the items for selling to customers. He can send purchase order to Sub-location In-charge for getting items that are required for customers. He deals with generating reports on items, orders, bills and stock etc.

The supplier supplies the items based on the order provided by the administrator.

The customer receives the bills from the retailer based on his purchases.

This project fulfills the desires of users to enhance the communication among different type of people such as administrator and Sub-location Incharge, Retailer.

PROPOSED SYSTEM

Proposed systems are those that are automated, so that it is easy to retrieve the responses from the system fast and updating the details once the response or

services are provided to the end-users upon their request without any difficulty and Saves time.

SYSTEM SPECIFICATION

HARDWARE REQUIREMENTS:

- System : Pentium IV 3.5 GHz or Latest Version.
- Hard Disk : 120 GB.
- Ram : 1GB.

SOFTWARE REQUIREMENTS:

- Operating system : Windows XP or Windows 7, Windows 8.
- Data Base : My Sql Server
- Coding Language : My Sql Server
- Server : Tomcat 6.

SYSTEM DESIGN

DATA FLOW DIAGRAM:

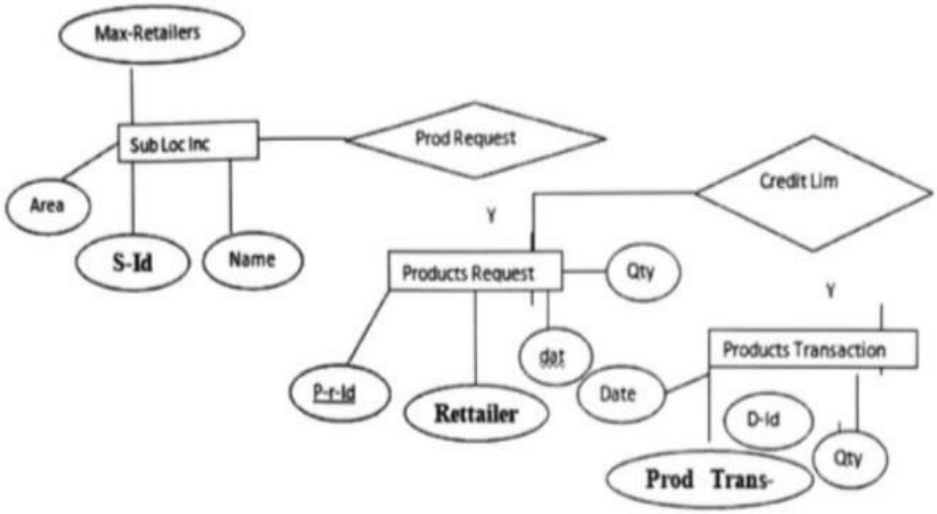
The DFD is also called a bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.

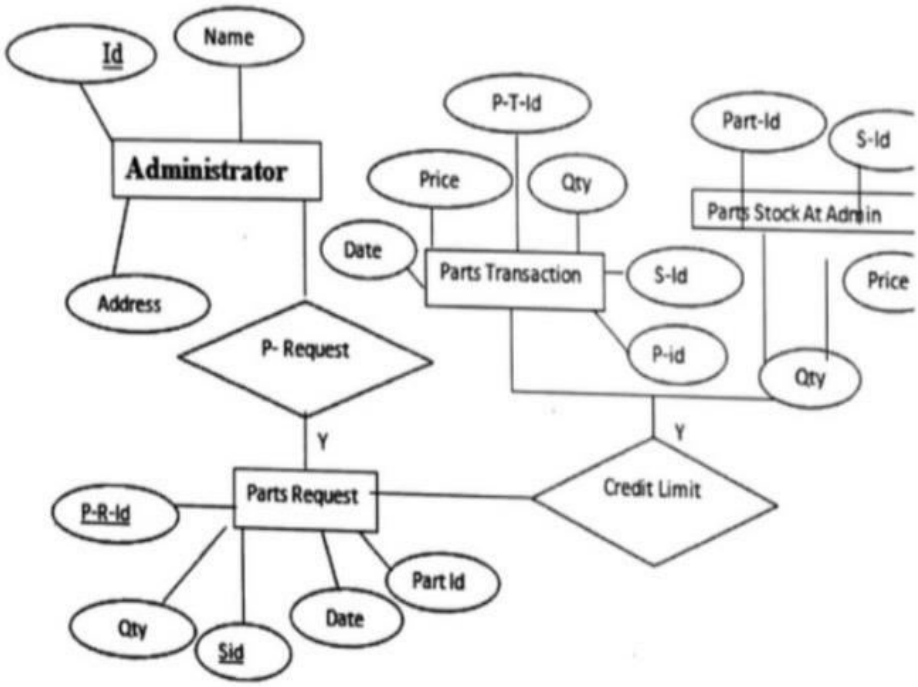
The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output. DFD is also known as a bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD maybe partitioned into levels that represent increasing information flow and functional detail.

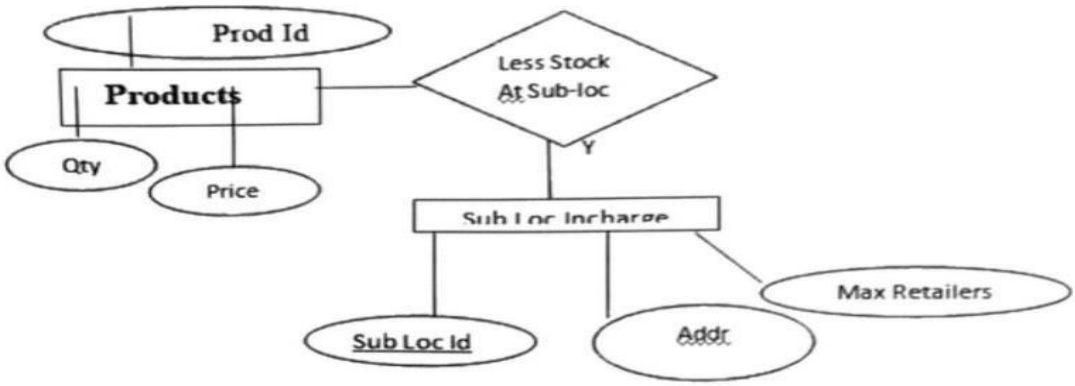
The tools for structured analysis are:

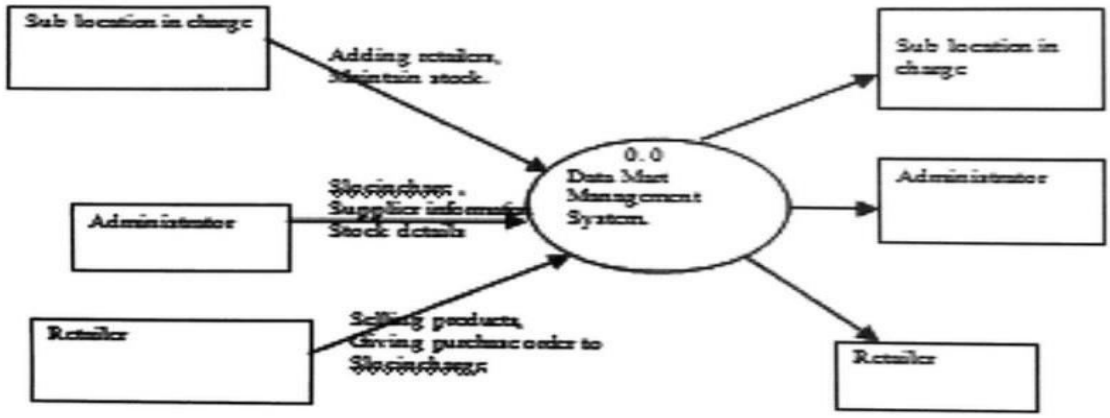
1. Data flow diagrams

2. E-R Diagrams









UML Diagrams

Unified Modeling Language (UML) is a standard visual modeling language used to design, develop, and document object-oriented software systems. It helps developers understand system structure and behavior through diagrams.

Goals of UML:

* Provide a standard visual modeling language.

* Support software design and documentation.

* Be independent of programming languages.

* Allow extension and reuse of models.

* Promote best software development practices.

Input Design

Input design is the process of collecting and entering data into the system accurately and efficiently. It focuses on reducing errors, ensuring security, and making data entry simple and user-friendly.

Objectives:

1. Ensure accurate and valid data entry.
2. Reduce input errors.
3. Provide easy-to-use input screens.
4. Improve data processing efficiency.

Output Design

Output design focuses on presenting processed information in a clear and useful format to users. It helps users make decisions by providing reports, documents, and other outputs effectively.

Objectives:

1. Present information clearly.
2. Support decision-making.
3. Generate reports and documents.
4. Provide alerts, confirmations, and important updates.

IMPLEMENTATION

DataMart Management System mainly consists of five modules ...

1. Master maintenance
2. Receiving
3. Shipment
4. Billing
5. Reports

Master Maintenance:

DataMart Management System maintains the following master details for various purposes.

1) Suppliers Details

ii) Sub-location Incharges Details

iii) Retailers Details

iv) Products Details

Receiving :

DataMart Management System receives the stock in a validated manner against the Purchase Order & Receipt No. The warehouse management receiving process includes all the items necessary to receive, from unloading the trucks to recording the account.

DataMart Management Systemcan perform the following receiving tasks ...

1) Purchase Order

ii) Goods Order

Shipment:

DataMart Management System provides you many functions to maintain the flow of goods in the warehouse.

The following tasks are caused under this module :-

i) Transfer inventory

ii) Put inventory on hold

iii) View inventory balances

iv) View inventory transactions

Billing :

Warehouse billing process allows the retailer to generate new bills and also allows viewing of existing bills.

Reports :

The reports process allows the user to produce the reports necessary for day-to-day warehouse operations. The standard reports are...

i) Inventory Reports

ii) Purchase Order Reports

ili) Administrative Reports

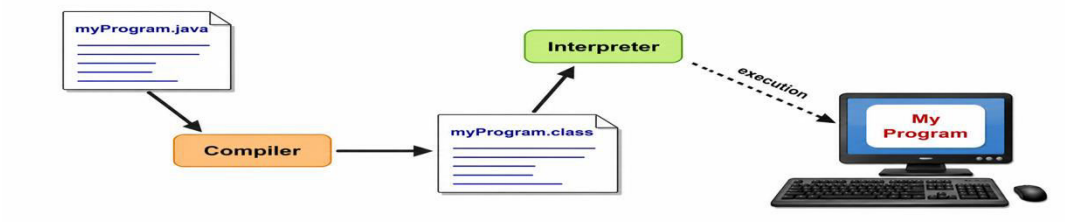
SOFTWARE ENVIRONMENT

Java Technology

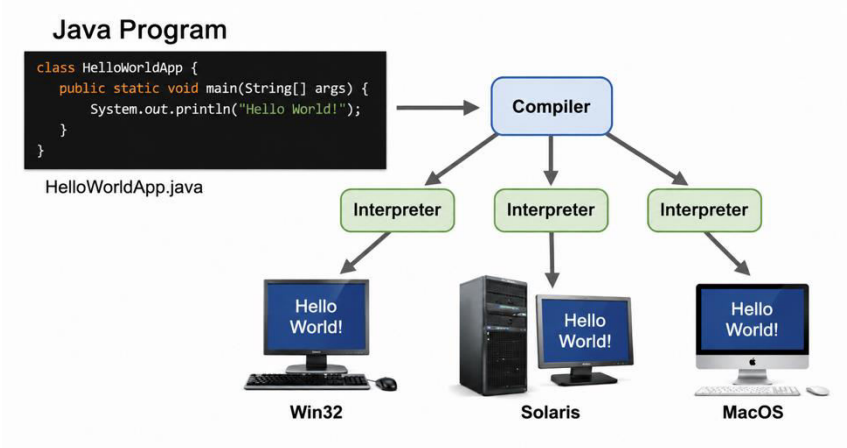
Java technology is both a programming language and a platform. The Java programming language is a high-level language that can be characterized by all of the following buzzwords:

1. Simple
2. Architecture neutral
3. Object-oriented
4. Portable
5. Distributed
6. High performance
7. Interpreted
8. Multithreaded
9. Robust
10. Dynamic

With most programming languages, you either compile or interpret a program so that you can run it on your computer. The Java programming language is unusual in that a program is both compiled and interpreted. With the compiler, first you translate a program into an intermediate language called Java byte codes —the platform-independent codes interpreted by the interpreter on the Java platform. The interpreter parses and runs each Java byte code instruction on the computer. Compilation happens just once; interpretation occurs each time the program is executed. The following figure illustrates how this works.



You can think of Java byte codes as the machine code instructions for the Java Virtual Machine (Java VM). Every Java interpreter, whether it's a development tool or a Web browser that can run applets, is an implementation of the Java VM. Java byte codes help make "write once, run anywhere" possible. You can compile your program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the Java VM. That means that as long as a computer has a Java VM, the same program written in the Java programming language can run on Windows 2000, a Solaris workstation, or on an iMac.



The Java Platform

A platform is the hardware or software environment in which a program runs. We've already mentioned some of the most popular platforms like Windows 2000, Linux, Solaris, and Mac OS. Most platforms can be described as a combination of the operating system and hardware. The Java platform differs from most other platforms in that it's a software-only platform that runs on top of other hardware-based platforms. The Java platform has two components:

1. The Java Virtual Machine (Java VM)

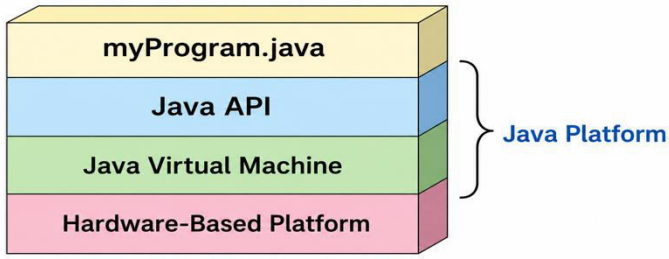
2. The Java Application Programming Interface (Java API)

You've already been introduced to the Java VM. It's the base for the Java platform and is ported onto various hardware-based platforms.

The Java API is a large collection of ready-made software components that provide many useful capabilities, such as graphical user interface (GUI) widgets. The Java

API is grouped into libraries of related classes and interfaces; these libraries are known as packages. The next section, What Can Java Technology Do? Highlights what functionality some of the packages in the Java API provide.

The following figure depicts a program that's running on the Java platform. As the figure shows, the Java API and the virtual machine insulate the program from the hardware.



Native code is code that, after you compile it, the compiled code runs on a specific hardware platform. As a platform-independent environment, the Java platform can be a bit slower than native code. However, smart compilers, well-tuned interpreters, and just-in-time byte code compilers can bring performance close to that of native code without threatening portability.

What Can Java Technology Do?

The most common types of programs written in the Java programming language are applets and applications. If you've surfed the Web, you're probably already familiar with applets. An applet is a program that adheres to certain conventions that allow it to run within a Java-enabled browser.

However, the Java programming language is not just for writing cute, entertaining applets for the Web. The general-purpose, high-level Java programming language is also a powerful software platform. Using the generous API, you can write many types of programs.

An application is a standalone program that runs directly on the Java platform. A special kind of application known as a server serves and supports clients on a network. Examples of servers are Web servers, proxy servers, mail servers, and print servers. Another specialized program is a servlet. A servlet can almost be thought of as an applet that runs on the server side. Java Servlets are a popular choice for building interactive web applications, replacing the use of CGI scripts. Servlets are similar to applets in that they are runtime extensions of applications. Instead of

working in browsers, though, servlets run within Java Web servers, configuring or tailoring the server.

How does the API support all these kinds of programs? It does so with packages of software components that provide a wide range of functionality. Every full implementation of the Java platform gives you the following features:

The essentials: Objects, strings, threads, numbers, input and output, data structures, system properties, date and time, and so on.

Applets: The set of conventions used by applets.

Networking: URLs, TCP (Transmission Control Protocol, UDP (User Data gram Protocol sockets, and IP (Internet Protocol) addresses.

Internationalization: Help for writing programs that can be localized for users worldwide. Programs can automatically adapt to specific locales and be displayed in the appropriate language.

Security: Both low level and high-level, including electronic signatures, public and private key management, access control, and certificates.

Software components: Known as JavaBeans™

, can plug into existing component architectures.

Object serialization: Allows lightweight persistence and communication via Remote Method Invocation (RMI).

Java Database Connectivity (JDBC™): Provides uniform access to a wide range of relational databases.

The Java platform also has APIs for 2D and 3D graphics, accessibility, servers, collaboration, telephony, speech, animation, and more. The following figure depicts what is included in the Java2 SDK.

Research Methodology

This study adopted a system development research methodology to design and implement a Data Mart Management System using Java. The methodology focused on understanding the existing warehouse management process, identifying its limitations, designing an improved system, implementing the application, and evaluating its performance. A structured approach was followed throughout the development process to ensure that the proposed system met the functional requirements of warehouse operations.

Research Design

The research followed a design and development approach. The primary objective was to develop a centralized software application capable of managing warehouse activities, including supplier registration, inventory maintenance, receiving, shipment, billing, and report generation. The system was designed to replace manual processes with a computerized solution that improves efficiency, accuracy, and data management.

Requirement Analysis

The first stage involved analysing the existing warehouse management process to identify operational challenges. Information was obtained from the current workflow and system requirements, including inventory maintenance, product management, supplier information, retailer management, billing, and report generation. The analysis highlighted common issues such as manual record keeping, delays in retrieving information, data redundancy, and increased chances of human error.

Based on these findings, the functional and non-functional requirements of the proposed system were identified.

System Design

After analysing the requirements, the overall architecture of the system was designed. Data Flow Diagrams (DFDs), UML diagrams, and database design were used to represent the interaction between users, system modules, and stored data. The application was divided into five major modules:

Master Maintenance

Receiving

Shipment

Billing

Report Generation

Each module was designed to perform a specific warehouse function while maintaining data consistency throughout the system.

System Development

The application was developed using Java as the programming language because of its platform independence, object-oriented features, security, and reliability. MySQL was used as the back-end database to store warehouse information, while Apache Tomcat was used as the application server.

The implementation process included database creation, user interface development, coding of business logic, database connectivity using JDBC, and integration of all functional modules into a single application.

System Testing

The developed application was tested to verify that all modules functioned according to the specified requirements. Different testing techniques were performed during the development process, including unit testing, integration testing, system testing, black-box testing, and white-box testing.

Testing ensured that inventory transactions, supplier records, shipment processing, billing operations, and report generation were executed accurately without errors. Any issues identified during testing were corrected before the final implementation of the system.

Evaluation of the Proposed System

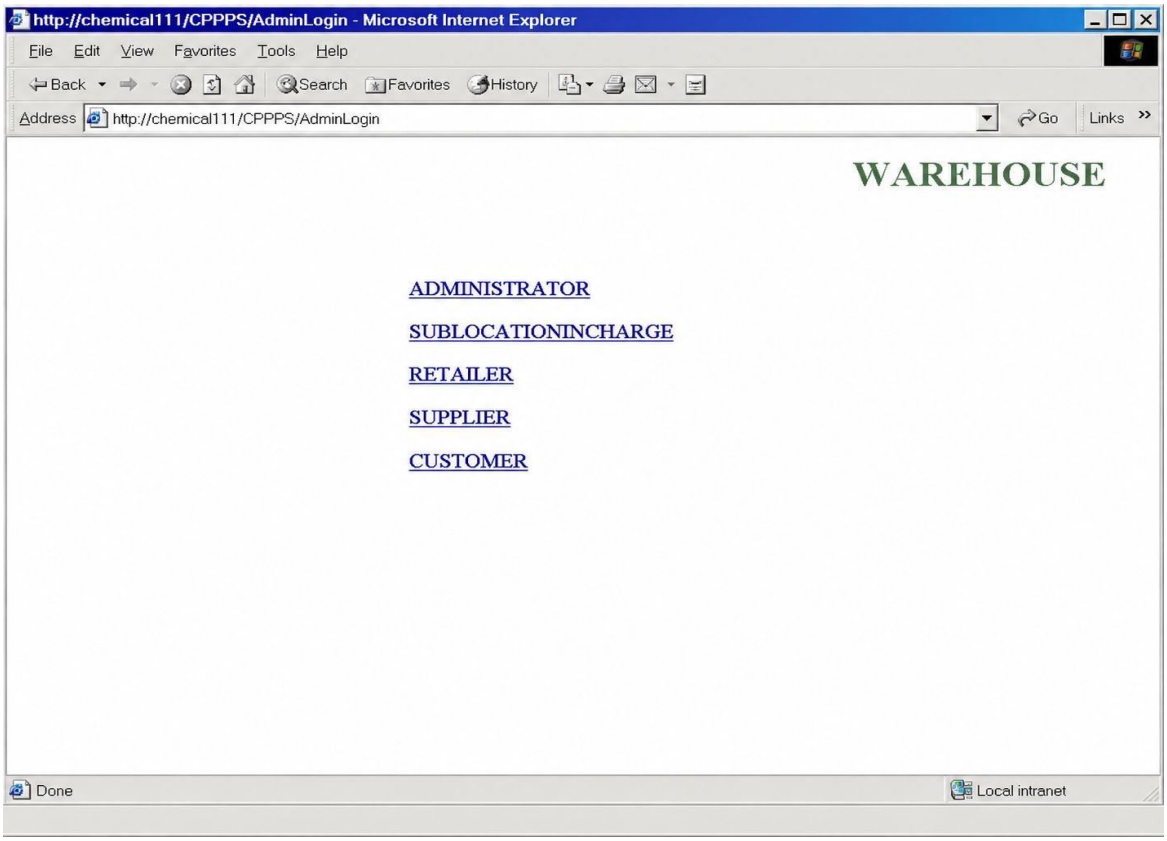
The performance of the proposed system was evaluated by comparing it with the existing manual warehouse management process. The evaluation considered factors such as processing speed, accuracy of inventory records, ease of retrieving information, reduction in manual work, and overall system efficiency.

The developed application demonstrated improved operational performance by reducing manual errors, providing faster access to warehouse information, improving inventory control, and supporting effective decision-making through automated report generation.

Summary

The research methodology provided a systematic framework for analysing the existing warehouse management process, designing the proposed system, developing the application using Java and MySQL, and validating its functionality through comprehensive testing. The methodology ensured that the developed system effectively addressed the limitations of manual warehouse management while providing an efficient and reliable solution for inventory management.

RESULTS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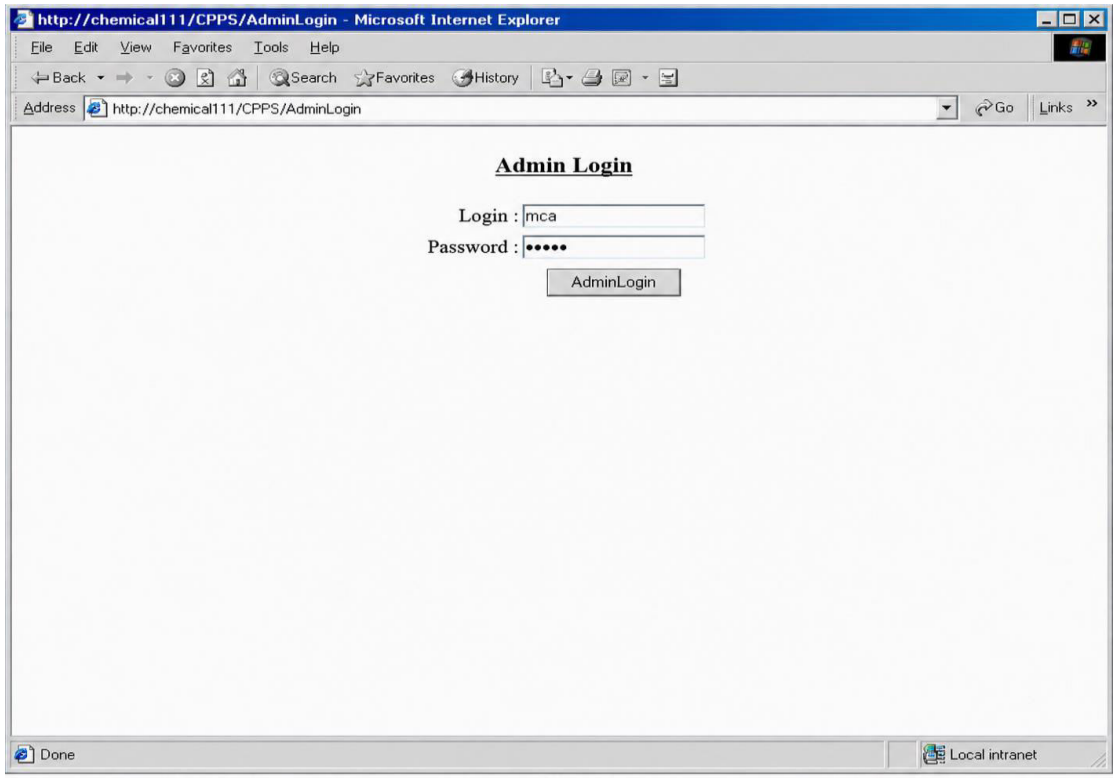
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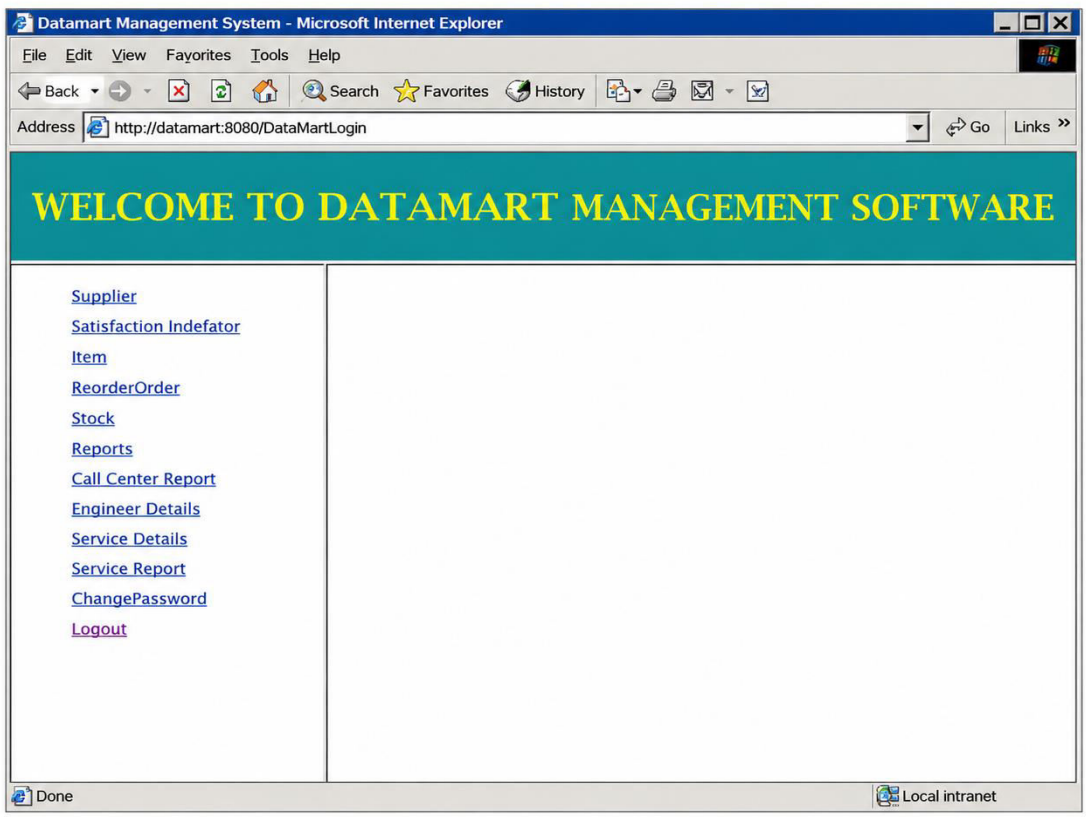
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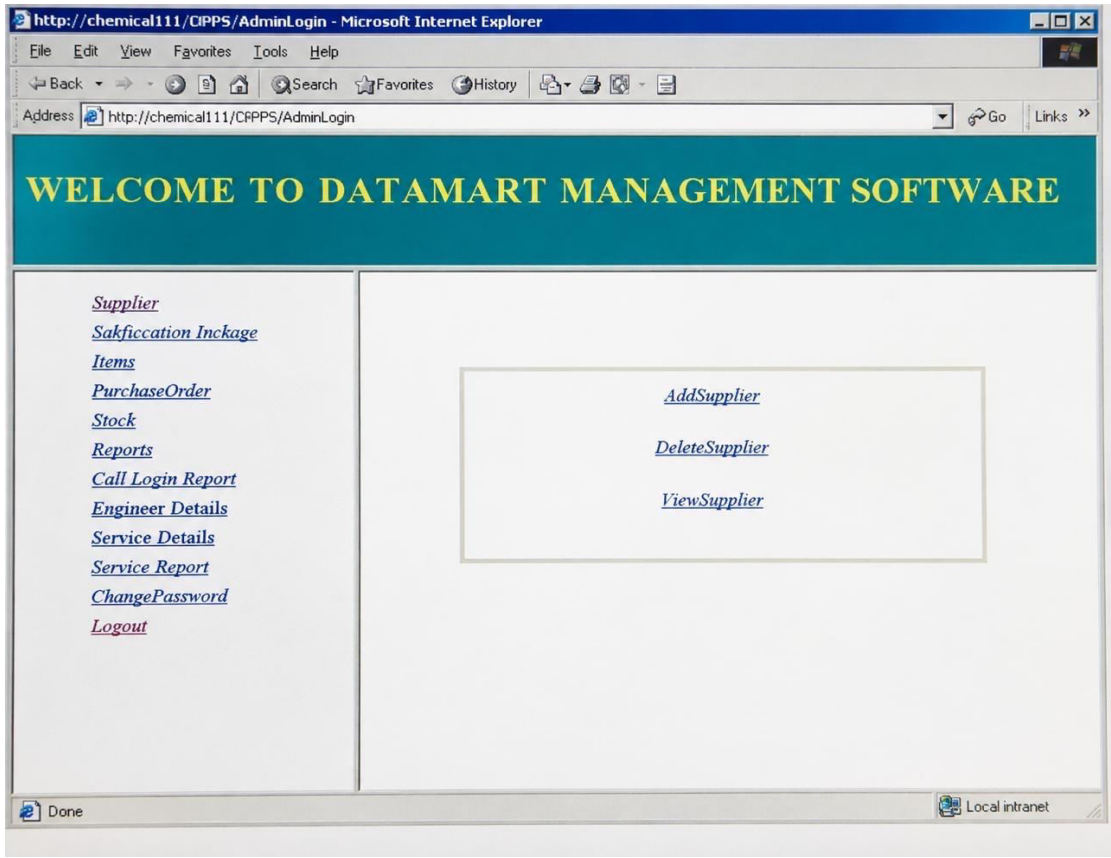
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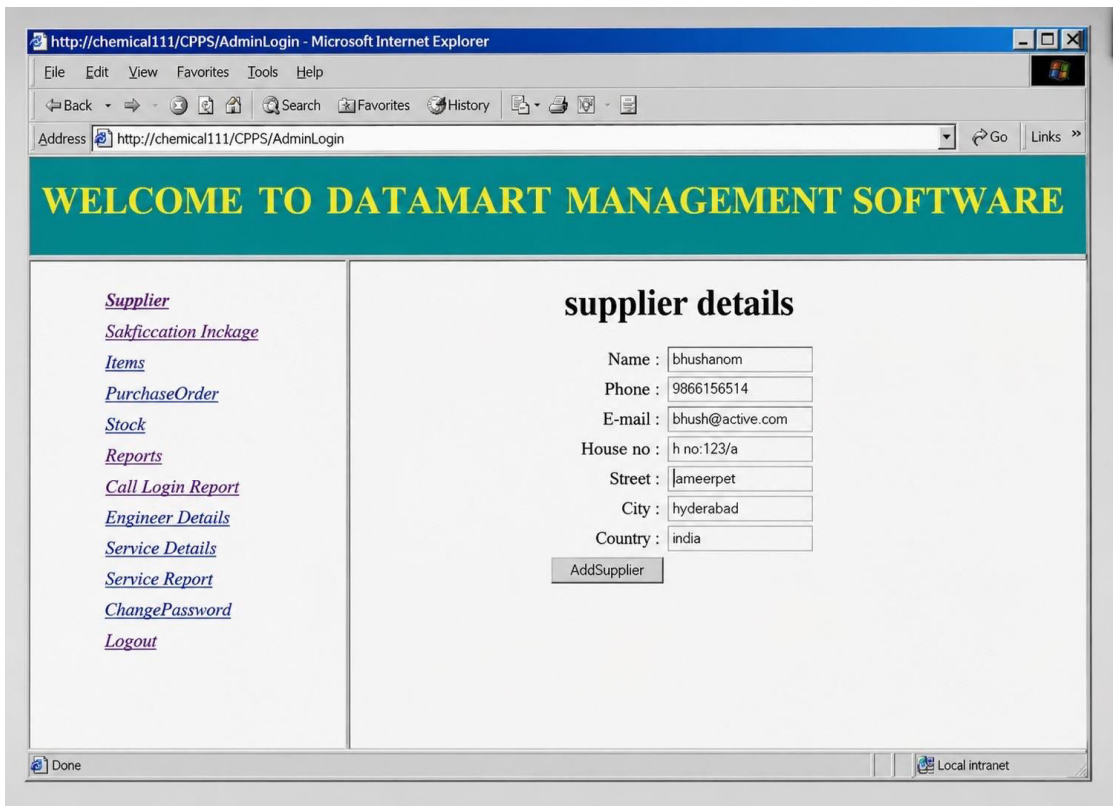
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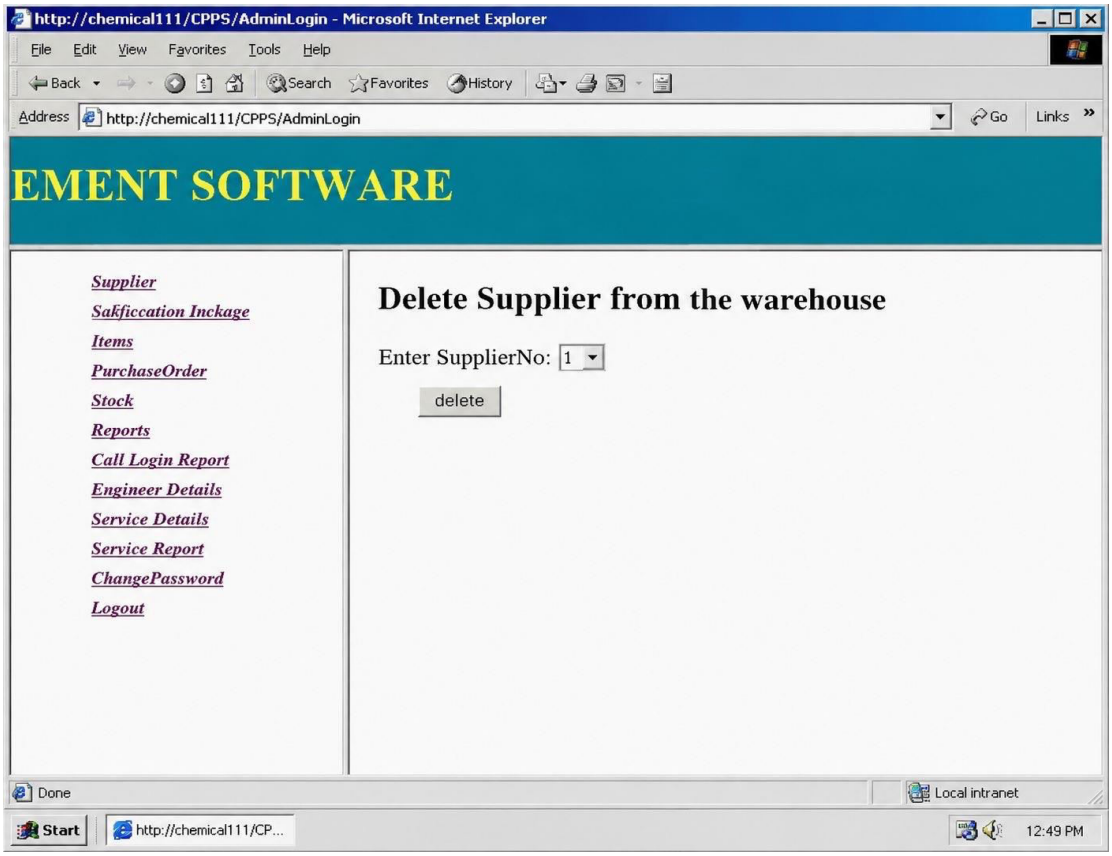
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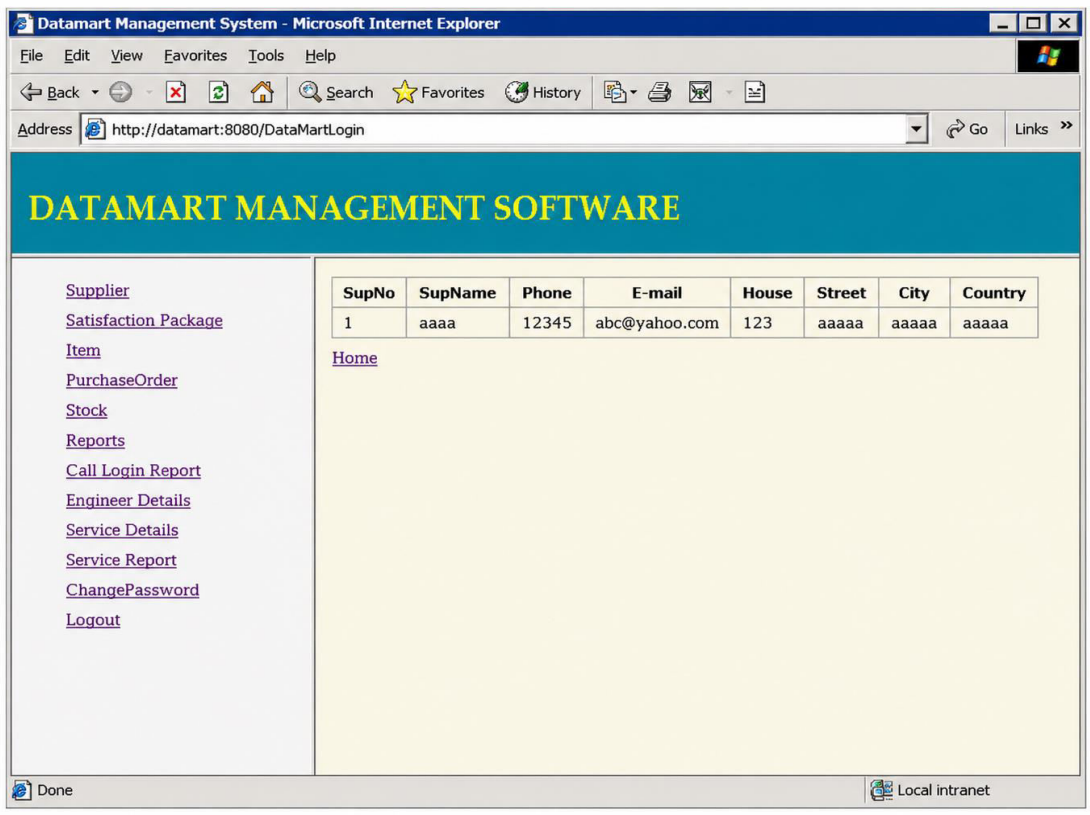
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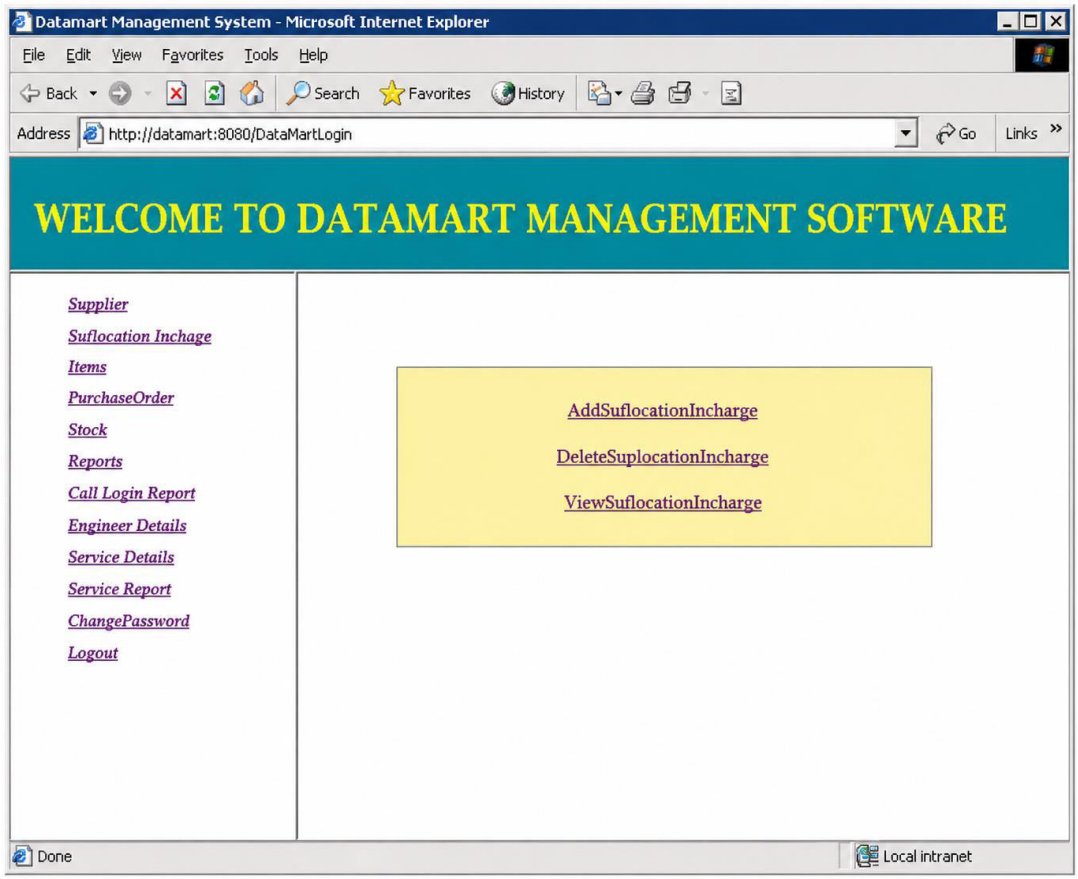
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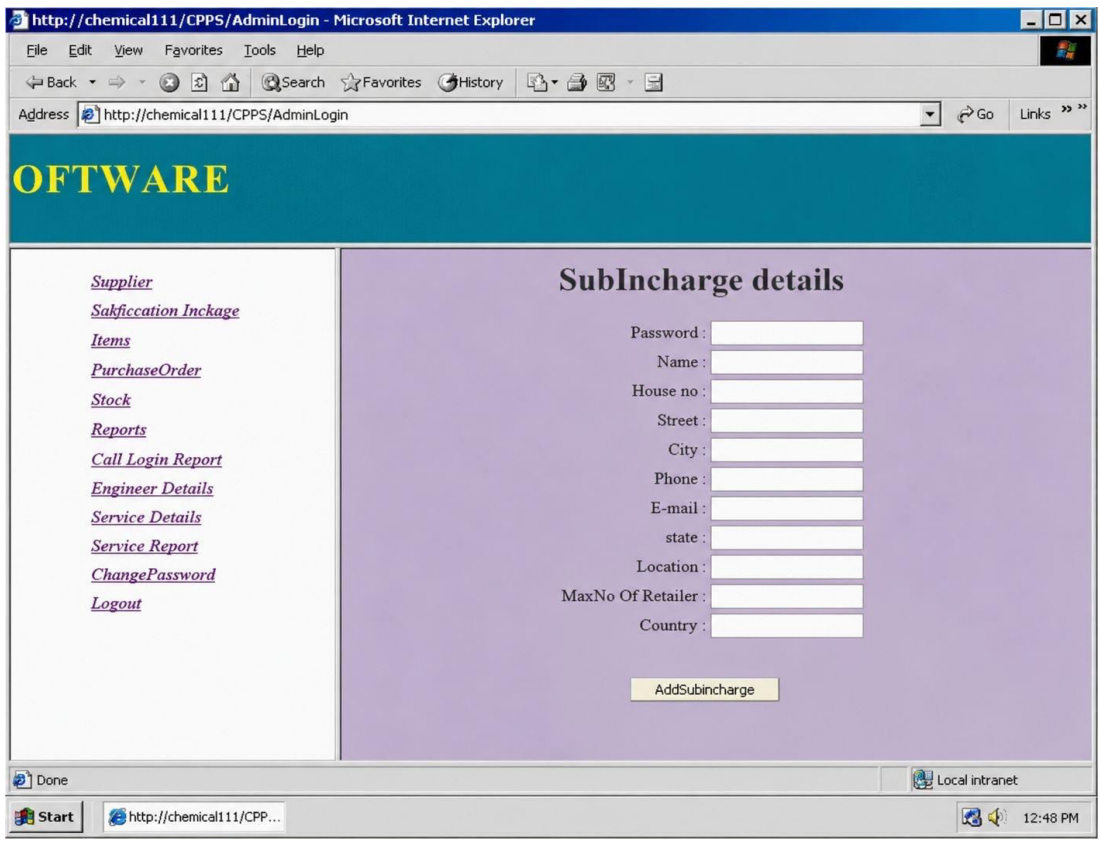
http://chemical111/CPPS/AdminLogin - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://chemical111/CPPS/AdminLogin
Go Links
OFTWARE
Supplier
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PurchaseOrder
Stock
Reports
Call Login Report
Engineer Details
Service Details
Service Report
ChangePassword
Logout
SubIncharge details
Password :
Name :
House no :
Street :
City :
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state :
Location :
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AddSubincharge
Done
Local intranet
Start
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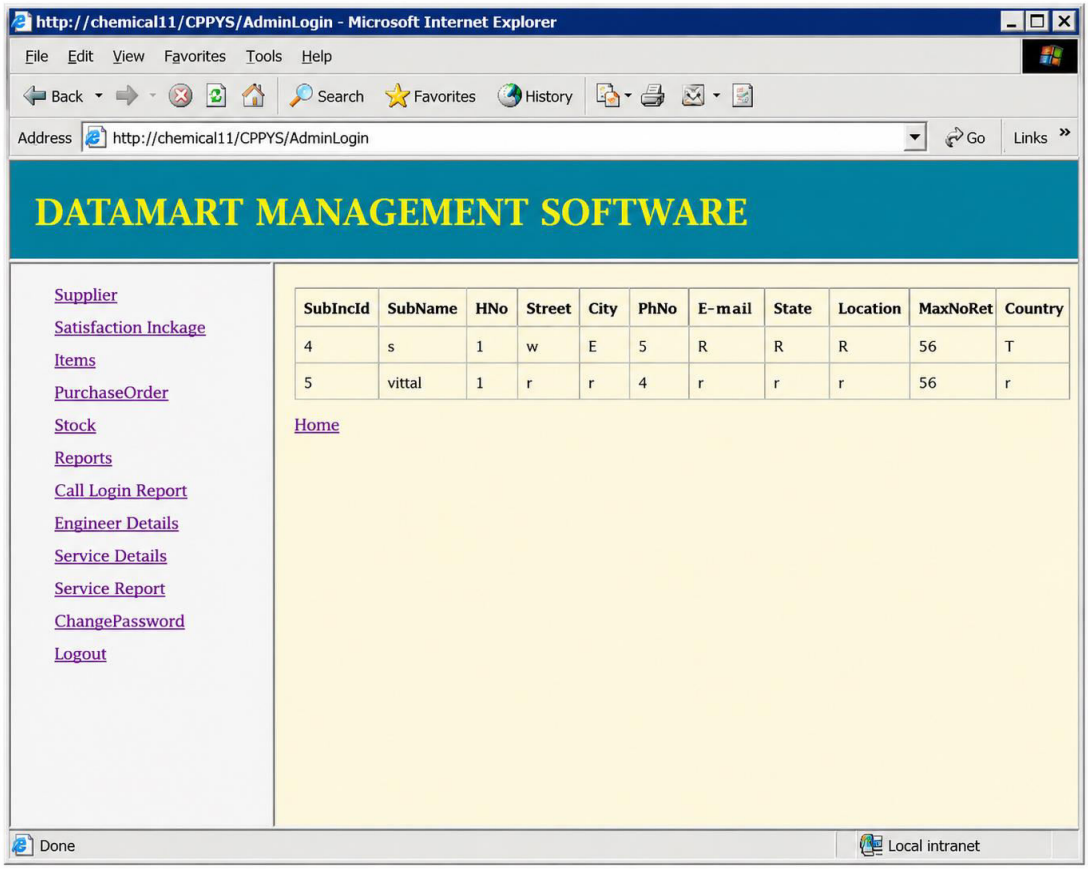

TESTING

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail . There are various types of tests. Each test type addresses a specific testing requirement.

TYPES OF TESTS

Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All

decision branches and internal code flow should be validated. It is the testing of individual software units of the application it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at the component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at of components.

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Systems/Procedures

: identified classes of valid input must be accepted.

: identified classes of invalid input must be rejected.

: identified functions must be exercised.

: identified classes of application outputs must be exercised. interfacing systems or procedures must be invoked.

Organization and preparation of functional tests are focused on requirements, key functions, or special test cases. In addition, systematic coverage on identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

System Test-

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and

integration points.

White Box Testing-

White Box Testing is a testing in which in which the software tester knows the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

Black Box Testing-

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box you cannot "see" into it. The test provides inputs and responds to outputs without considering how the software works.

Conclusion

The main objective of the Warehouse Management System project is to automate warehouse operations and improve the efficiency of inventory management. The system is developed using J2EE as the front-end and MySQL as the back-end on the Windows platform.

The application simplifies warehouse activities by maintaining accurate records of products, stock, administrators, sub-location in-charges, and retailers. It reduces manual work, minimizes errors, and enables faster retrieval and updating of information. The system also improves inventory control, enhances data security, and supports better coordination between different users.

Overall, the Warehouse Management System provides a reliable, user-friendly, and efficient solution for managing warehouse operations, helping organizations save time, improve productivity, and ensure smooth day-to-day functioning.

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