SUPPLY CHAIN MANAGEMENT

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(Affiliated to Anna University)

A PROJECT REPORT

Submitted to the

FACULTY OF INFORMATION AND COMMUNICATION ENGINEERING

In partial fulfillment of the requirements
for the award of the degree

of

MASTER OF COMPUTER APPLICATIONS

June, 2006

Kumaraguru College of Technology

Coimbatore – 641006

Department of Computer Applications

Bonafide Certificate

Certified that this project report titled **SUPPLY CHAIN MANAGEMENT** is the bonafide work of **Ms. P. SWATHI REKHA (Reg No. 71203621055)** who carried out the research under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.
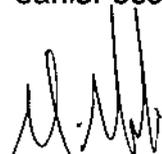
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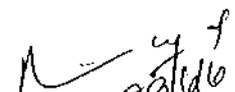
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June 1, 2006

To Whomsoever It May Concern

This is to certify that **Ms.P.Swathi Rekha** (03MCA36), student of Kumaraguru College of Technology, Anna University has executed a project titled **"Supply Chain Management"** at Aspire Systems (India) Private Limited, in partial fulfillment of the requirement for the award of the Degree of Master of Computer Applications (2003 - 2006) conducted by your esteemed University. She worked under the guidance of Mr. Ananthanarayanan Krishnamoorthy, Delivery Manager, Aspire Systems for the period starting from January 2006 – June 2006.

For Aspire Systems (India) Private Limited
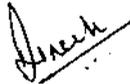
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ACKNOWLEDGEMENT

I wish to express my sincere thanks to former principal **Dr. K.K. PADMANABHAN Ph.D.**, Kumaraguru College of Technology, Coimbatore, for permitting me to undertake this project. I wish to express my sincere thanks to **Dr. V. Joseph Thanikkar Ph.D.**, principal, Kumaraguru College of Technology, Coimbatore, for permitting me to undertake this project.

My deepest acknowledgement to **Dr. Gururajan, Ph.D.**, Head Of The Department, Computer Applications, Kumaraguru College of Technology, Coimbatore, for his timely help and guidance throughout this project.

I am greatly indebted to my guide **Mr. M. Manikantan MCA, M.Phil**, Senior Lecturer, Department of Computer Applications, Kumaraguru College of Technology, for his valuable guidance and encouragement at every stage of this project work.

I express my sincere thanks to **Mr. Ananthanarayanan Krishnamoorthy**, Delivery Manager, Aspire Systems, for his support and assistance at various levels of my project work. I wish to thank all my staff members for their timely help and guidance to complete the project successfully.

ABSTRACT

The project titled **"SUPPLY CHAIN MANAGEMENT"** is codenamed as **SCM**. SCM is web based Application software that integrates dealers network into one process forming a chain relationship among them. The project is developed for **ASPIRE SYSTEMS** situated in Chennai. The project is done with Windows 2000 operating system using Java technologies as front end and Oracle 9i as backend.

The project includes main modules as TOC which is used for simple navigation route and Searching, which is used to find the necessary information needed for the dealers. The process activities involved in Supply Chain Management include Order Export, E-Notes manager, Preferences, History and Bookmark etc.

The major goal of the system is to develop a web based application, which includes supply chain activities that provides an interface to perform most of the operations that are being performed in a company. The main aim of this project is to reduce the workload of the manual existing system by planning, designing, and developing the proposed system that speeds up the processes to meet the requirements added by the end user in an efficient manner. This system is an integration of Client/Server architecture and the web technology such that it makes easier for the company to communicate easily through the system by maintaining all their day-to-day transactions in web.

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LIST OF SYMBOLS, ABBREVATIONS AND NOMANCLATURE

JDBC	-	Java Database Connectivity
HTTP	-	Hyper Text Transfer Protocol
HTML	-	Hyper Text Markup Language
JSP	-	Java Server Pages
DFD	-	Data Flow Diagram
ATCS	-	Aftermarket Technical Communication System
IPC	-	Illustrated Parts Catalog
TSB	-	Technical Service Bulletin
OM	-	Operation & Maintenance Manual
SSO	-	Single Sign On

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

SCM is developed according to the requirements of the concern to maintain and support the products from installation through operation and product life cycle maintenance. Each request arriving is already authenticated by SSO and there is no need for any additional checks to be made. When a user logs in using SSO, he/she is authenticated and gets an SSOID. This id is the SAME ID cross all the systems. The process activities involved in SCM are Table of Content, Search, Order Export, Access Control, History, Bookmark and Preferences.

Table of Content (TOC)

TOC is used for simple navigation route. The user is able to open documents by drilling down the TOC and clicking a document icon. The user is able to collapse and expand any level in the tree by clicking the folder icon.

Search

Search Content includes basic and advanced searching capabilities. The search interfaces are Full-text and fielded search per manual, Full text search according to TOC location, Advanced search (Boolean operators), Proximity search, Wildcards search, Synonyms, MUO Search, S/N Search, Search results page.

Order Export:

Order Export is a Shopping Center includes Order Export toolbar, Order Export Parts table, Crossed parts, DBS (PFW & NDS) Integration & Preference.

Order Export toolbar includes features New, Edit, Add part row, Delete, Print, Save, Open, Send, Export, Check Availability (Sends pick list to DBS and get response for parts availability) and Crossed parts. Order Export parts table contains the information of parts that were inserted.

The DBS Interfacing will allow Dealers access to their inventory and ordering system (PFW or NDS). The interface will enable the dealers to obtain inventory data (Bin, On-Hand, On-Order) directly from their business system. The integration will be done only if it is defined in the Order Export preferences screen.

Access Control:

These capabilities will dictate the way a user can view different types of content and the way he can perform different system functionalities on that content.

History:

Presents a list of links to the last 25 documents that the user viewed. The history links are kept for each user cross sessions.

Preferences:

The button pops-up a window enabling the user to define the GUI preferences.

Enotes manager:

Links to the Enotes Forum screen. There are 2 types of notes. They are Regular notes and Feedback notes

Bookmark:

Allow the user to jump to documents that he saved as bookmarks. The bookmark links are kept for each user cross sessions. Up to 25 documents that the user saved will be stacked.

Objectives

- To maintain and support equipments from initial installation to product lifecycle maintenance.

- To develop a web based application, which includes supply chain activities online among the various dealers that provide an interface to perform most of the operations.

- To plan, design, develop and test the proposed system in a faster and efficient manner.

- To evaluate the hardware and software that is needed to implement the system.

Project Scope

- All the activities that are performed in a Supply Chain Management process have been computerized.
- The project extends up to the searching the needed details regarding the parts of construction machineries.
- Create a technical maintenance and catalog repository
- Generate an on-demand publication
- Initiate part orders in IR ordering systems
- Help reduce parts miss-orders
- Help to optimize maintenance planning and execution
- The application will incorporate a robust and optimized repository, including searching and document presentation
- User friendly and intuitive interface for the user, including special utilities for different types of content (IPC and SI)
- It also extends to shopping cart of the construction machineries.
- The project's scope is to meet the boundaries to implement the operations involved in Supply Chain Management.

Need for the Project

- To meet the requirements which is bounded within the scope of project.
- IR improves service productivity, increase spare parts sales and boost customer satisfaction.
- It also provides a Solution to the safe and effective maintenance of critical service and parts information to engineers and mechanics and even to aftermarket dealers.

- To deliver and dynamically update more than four gigabytes of data, including hundreds of different manuals, parts catalogs, service bulletins and installation updates, to its dealer network via one integrated, Web-based application.

- To reduce the workload of the manual existing system by planning, designing, and developing the proposed system that speeds up the processes to meet the requirements added by the end user.

- The system should provide a generic system Internet web-based system for supply chain management activities of Company.

Features to be met

- The system can work in any operating systems, which has a JAVA run time environment.

- Accept user input data such that the validation checking's made and the details are stored in the back end database Oracle 9i.

- Various information's are analyzed by the customer and vendor in a reported format viewed in the browser window over the Internet.

1.2 ORGANIZATION PROFILE

Aspire Systems is a fast-growing outsourced product development firm focused on helping software companies create innovative products for the next generation. Aspire has hundreds of man-years of experience working as an engineering partner for a number of software companies.

Aspire's mission is to partner with their customers, helping them manage change and drive significant improvement in their business process through the effective use of technology.

Aspire's product development team is spread between its Global Innovation Center in Chennai, India, and offices in the United States. Aspire understands and is committed to meeting the unique and complex needs of software product companies.

Aspire's niche focus has enabled us to record an annualized growth of over 100% for the past three years. Today, Aspire stands as an obvious choice for software product companies who want to harness the dual power of outsourcing and offshoring. Aspire facilitates rapid time-to-market at lower development costs by providing comprehensive services in the areas of product development, advancement, testing, implementation and maintenance.

Aspire Benefits

- Onsite Offshore Model
- Established Quality Standards
- Value Proposition

Aspire combines in depth industry expertise and technology capabilities to offer customers a comprehensive array of services. Our practices and technology offerings are structured as follows:

Practices

Aspire's service area include

- Product Development
- Product Advancement
- Product Testing
- Product Implementation
- Product Maintenance

Technologies

- Java
- . NET
- C/C++
- Testing

Domain Areas

- Real Estate
- Retail
- Pharmaceutical
- Supply Chain Management
- Health Care
- Manufacturing
- Engineering
- High Tech

CHAPTER 2

SYSTEM REQUIREMENTS AND SPECIFICATION

2.1 HARDWARE REQUIREMENTS SPECIFICATION

System Requirements

Processor	:	Intel Pentium III
RAM	:	256 MB RAM
Hard Disk	:	40GB

Server Requirements

Platform	:	Windows 2000/NT
Database	:	Oracle 9i

Client Requirements

Working Environment :		Windows 2000/NT
Runtime Environment :		JAVA, J2EE (JAVA Technologies)
Tool	:	Struts Studio

2.2 SOFTWARE REQUIREMENTS SPECIFICATION

Softwares

Operating System	Windows 2000/NT
Language	J2SDK 1.4, J2EE (JAVA Technologies)
Database Server	Oracle 9i
Web Server	Apache Tomcat Server 4.1
Application Server	Jboss
Browser	Internet Explorer
Configuration Tool	Clear case

Supported Soft wares

Software	Purpose
JSP, EJB, Struts Framework and other java related tools	Helps the software to be loaded on an internet, which could be accessed for managing the Supply Chain process.
Mantis	Help to track the defects

2.3 SOFTWARE OVERVIEW

Java

Java is an Object Oriented Programming language developed at Sun Microsystems in June 1995. Java has built-in support for threads, networking and a vast variety of other tools. The amazing thing about java is that it can be used to create a huge variety of applications and is noted for its 'Write once Run anywhere' characteristic.

Java is simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded and dynamic language.

The Java architecture consists of Java Virtual Machine (JVM), which is an abstract computer that runs compiled java programs. The JVM supports object oriented programming directly by including instructions for object method invocation. The java compiler generates architecture-independent byte codes.

Benefits of java

Java allows the user to:
- Write robust and reliable programs.
- Build an application on almost any platform, and run that application on any other supported platform without having recompiling your code.
- Distribute your applications over a network in a secure fashion.

Java has an extensive use of library of routines for copying with TCP/IP protocols like HTTP and FTP. Java application can open and access objects across net local Universal Resource Locator (URL) with the same ease as accessing the local file system. The Remote Method Invocation method enables communication between distributed objects.

The JDBC (Java Database Connectivity) interface allows Java applets, servlets and applications to access data from popular database management systems.

Java Server Pages

Java Server Pages provides web developers with a framework to create dynamic content on the server. It is the combination of HTML or XML and java code. It extends the Java Servlet API. It separates the java code and design details completely and the coding style is simple and clear.

Benefits of JSP

- JSPs run on all the main web servers.
- JSPs provide better facilities for separation of page code and template data by means of JavaBeans and custom tag libraries.
- JSPs are interpreted only once, to Java byte-code and re-interpreted only when the file is modified.
- JSPs can maintain state on the server between requests.
- It spawns a new thread for each request.
- Runs in a ready-loaded JVM as an extension to the web server.

The Jakarta Struts Project

The Jakarta Struts project, an open-source project sponsored by the Apache Software Foundation, is a server-side Java implementation of the Model View Controller (MVC) design pattern. Craig McClanahan originally created the Struts project in May 2000, but since that time it has been taken over by the open source community. The Struts project was designed with the intention of providing an open-source framework for creating Web applications that easily separate the presentation layer and allow it to be abstracted from the transaction/data layers. Since its inception, Struts has received quite a bit of developer support, and is quickly becoming a dominant factor in the open-source community.

Understanding the MVC Design Pattern

To gain a solid understanding of the Struts Framework, you must have a fundamental understanding of the MVC design pattern, which it is based on. The MVC design pattern, which originated from Smalltalk, consists of three components: a Model, a View, and a Controller component. Three Components of the MVC Component Description Model Represents the data objects. The Model is what is being manipulated and presented to the user. View serves as the screen representation of the Model. It is the object that presents the current state of the data objects. Controller Defines the way the user interface reacts to the users Input. The Controller component is the object that manipulates the Model, or data object.

Some of the major benefits of using the MVC include

Reliability

The presentation and transaction layers have clear separation, which allows you to change the look and feel of an application without recompiling Model or Controller code.

High reuse and adaptability

The MVC lets you use multiple types of views, all accessing the same server-side code. This includes anything from Web browsers (HTTP) to wireless browsers (WAP).

Rapid deployment and Maintainability

Development time can be significantly reduced because Controller programmers (Java developers) focus solely on transactions, and View programmers (HTML and JSP developers) focus solely on presentation. The separation of presentation and business logic also makes it easier to maintain and modify a Struts-based Web application.

The Struts Implementation of the MVC

The Struts Framework models its server-side implementation of the MVC using a combination of JSPs, custom JSP tags, and Java servlets. In this section, we briefly describe how the Struts Framework maps to each component of the MVC.

The Model

The Struts Framework does not provide any specialized Model components.

The View

Each View component in the Struts Framework is mapped to a single JSP that can contain any combination of Struts custom tags. The following code snippet contains a sample Struts View: As you can see, several JSP custom tags are being leveraged in this JSP. These tags are defined by the Struts Framework, and provide a loose coupling to the Controller of a Struts application.

The Controller

The Controller component of the Struts Framework is the backbone of all Struts Web applications. It is implemented using a servlet named org.apache.struts.action.ActionServlet. This servlet receives all requests from clients, and delegates' control of each request to a user-defined org.apache.struts.action.Action class. The ActionServlet delegates control based on the URI of the incoming request. That is then used by the ActionServlet to determine the View that will present the results of the Action's processing. The ActionServlet is similar to a factory that creates Action objects to perform the actual business logic of the application.

DATABASE

ORACLE

Oracle Corporation is the world's leading supplier of software for information management, and the world's second largest software company. Oracle was the first company to release a product that used the English-based structured query language, or SQL. This language allows the end users to extract information themselves, without using a systems group for every little report.

Oracle basically does three things
- Lets you put data into it
- Keeps the data
- Lets you get the data out and work with it

Oracle supports this keep-in-out approach and provides clear tools with considerable sophistication that allows us to find how data is captured, edited, modified and put in; how to keep it securely; and how to get it out to manipulate and how to prepare reports on it.

An object-relational management system (ORDBMS) extends the capabilities of the RDBMS to support object-oriented concepts. We can use oracle as an RDBMS or take the advantage of its object-oriented features. Oracle 8 is the first object-capable database developed by oracle. Oracle 9i, the database for Internet computing, provides advanced tools to manage all types of data in web sites. Oracle 8i is an Object Relational Database Management System (ORDMS).

The Internet File System (IFS) combines the power of oracle 8i with the ease of a file system. It allows users to move all of their data into the oracle 8i database, where it can be stored and managed more efficiently. Oracle 8i intermedia allow users to web-enable their multi-media data-including image, text, audio and video data. Oracle 8i includes a robust, integrated, and scalable Java virtual machine within the server (Jserver), thus supporting java in all tiers of applications. This eliminates of necessity of recompiling or modifying java code when it is to be developed on a different tier.

With the newly introduced resource management, the DBA can choose the best method to fit an application's profile and workload. The extended features of parallel server and networking improve ease of system administration. The extended functionality of advanced replication results in better performance and improves security.

The data types that were defined in this document follow ORACLE Server standard. The following table defines Oracle data types that should be in use when generating the schema.

Description	Oracle Data Type
Standard character data field with max p characters	VARCHAR2 (size)
Unicode character data field with max p characters	NVARCHAR2 (size)
Integer data field	INTEGER
Binary integer value (0 or 1)	NUMBER (1) (0 should be the default number)
Numeric data with 'p' digits total and 's' digits on the right of the decimal point.	NUMBER (p, s)
Date data field	DATETIME

Platform Specification

Operating System

An Operating System is a collection of computer programs that control, how the computer works. It can also be defined as the software, which acts as a traffic cop, directing requests and information to add from the various devices within a single PC. The OS handles disk requests (read and write) keyboard translations, memory accesses, peripheral accesses and many other functions.

Windows 2000/NT

This is a network operating system. This is based on the client-Server architecture. Benefits of this Operating system is as follows

- More intuitive interface.
- Better multitasking and multithreading.
- Clients can be attached to workstations.
- Plug-and-Play technology.
- Higher level of security.
- NTFS-a powerful NT File System.

3.1 EXISTING SYSTEM

- All the activities that are performed in a Supply Chain Management process are done manually.
- The parts catalogs, installation updates and different manuals regarding the product are kept manually.

The existing system is maintained manually. The Supply chain management involves lot of labor where every activity has been recorded manually.

The availability of required material cannot be found easily and this impacts on the inefficiency of service. Since the dealers need the information regarding the different product it is tedious to find from different manuals.

Disadvantages in Existing System

- It is a time consuming job to extract any information from the bulky registers.
- There is more chance for human errors to happen.
- More manpower is required.
- Increases time/cost overheads.
- Increases processing overheads.
- Very low security over data.

3.2 PROPOSED SYSTEM

The proposed system is developed to overcome the common difficulties that are found in the manually maintained existing system. The system is developed in order to meet the demand requirements in the existing system boundaries. Using clients platform to customize the Default application which enables IR to deliver and dynamically update more than four gigabytes of data, including hundreds of different manuals, parts catalogs, service bulletins and installation updates, to its dealer network via one integrated, Web-based application.

Modules

The system contains following modules.

- Table of Content
- Search
- Order Export
- Access Control
- Enotes manager
- History
- Preferences
- Book mark

Features of proposed system

- Chain of operations to be carried out between the dealers and the company.
- The system can work in any operating systems, which has a JAVA run time environment and a Browser with the capability of running JSP Pages.
- Accept user input data such that the validation checking's are made and the details are stored in the back end database Oracle.
- Various information's are analyzed by dealers in a reported format viewed in the browser window over the Internet.

Advantages

- Labor management is reduced
- The impacts of services was made faster
- Analyzing of reports are done easily
- More manpower is reduced
- No need to maintain information in bulky
- Less chance for human errors to happen
- Time consumption is reduced
- Decreases processing overheads
- Very high security over the data

The main goal of the proposed system is to meet those above requirements that support the Supply Chain Management activities.

3.3 MODULE FUNCTIONALITIES

a) Table of Content

The Application TOC (Table Of Contents) is presented in the application left frame. The TOC frame is available throughout the application. The TOC is presented hierarchically (Tree TOC) according to the hierarchical publication levels.

- The user is able to collapse and expand any level in the tree by clicking the folder icon. In order to improve performance the expansion will be done in groups of 30 entries. Where more than 30 entries exist under the same folder a 'Next' link text is presented enabling the user to open the next 30 entries.

- The user is able to open documents by drilling down the TOC and clicking a document icon. The required document is opened and displayed in the application main frame.

- ATCS 3.0 includes automatic TOC Synchronization mechanism. When a document is presented in the application main-frame the document's TOC entry is automatically selected i.e. highlighted and expanded. The user can open the TOC frame to view the document location in the publication structure.

- The user has the option to close the TOC using the   icon to enable larger space of the main frame.

- **Proximity** - a check box in each of the Advanced Search Screens enables the user to decide whether to include default proximity definitions in search or not. The default proximity that is used is NEAR [5] relation between the searched words i.e. the words should appear with up to 5 words between them without relevance of order.

- **Quick Search** - The quick search is a text box that enables a full text search on the application content. The search is context sensitive search i.e. the search will be performed on top of the TOC selected path (Manual, Division, Product, Model, Chapter and Section) and down. In case there's no TOC selection, the search will be performed on the entire application content.

After performing a search the search fields entered values are cleared.

c) Order Export

The Order Export screen is opened from the 'Order Export' button on the main toolbar. The Order Export holds parts that were populated by the user and includes various Shopping List functionalities.

The Order Export consists of the followings:
- The Order Export toolbar
- The Order Export Parts table

The Order Export toolbar consist of Back to Session, Add part row, New, Open, Save, Delete, Print, Export, Send to EC central, Check Availability.

In the Order Export Parts table, the Parts table contains the parts that were sent/inserted including the following information:

- Part number – extracted from the IPC parts list, or manually inserted using 'Add Part Row' functionalities.
- Quantity - extracted from the IPC parts list, or manually inserted/edited.

d) Enotes manager

A Note can be held against the following data components:
- Document – Service (OMs, TSBs etc) documents and IPC figures
- Part

There are 2 types of notes:
- Regular notes
- Feedback notes

Each dealership has its own forum. Users from a specified dealership will be able to read notes added by other users from that dealership and they would not be able to read notes added by users from other dealerships.

e) History

Presents a list of links to the last 25 documents that the user viewed. The history links are kept for each user cross sessions.

f) Preferences

The button pops-up a window enabling the user to define the GUI preferences: Should the user choose to 'Close TOC by Default' – the TOC will be closed when the applications loads.

g) Bookmark

Allow the user to jump to documents that he saved as bookmarks. The bookmark links are kept for each user cross sessions. Up to 25 documents that the user saved will be stacked.

3.4 FEASIBILITY STUDY

The main purpose of feasibility study is to determine whether the problem is worth solving. Feasibility study is high-level capsule version of the extra system analysis and design process. The success of a system also lies in the amount of feasibility study done on it. There are three main feasibility tests performed. They are as follows

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- The user has the option to close the TOC using the   icon to enable larger space of the main frame.

b) Search

The Search Screens area includes an advanced search form for each manual. Each form includes fields that are specific to the manual including the followings:

- **Term fields** – drop-down objects containing all the available values for the selected field. In case of the IPC and OM manuals the Division, Model and Product term fields are filtered interdependently i.e. choosing a Division filters the product field values to include only products applicable to the chosen Division.

- **Accelerator Term field** – the model field in each of the search screen has an acceleration functionality that will filter the values according to types characters.

- **Full text fields** – text boxes that enable a full text search on part of the selected field content. The search can include operators such as 'And', 'Or', '?' and 'Near' (proximity search – adjacent 10 words before and after the word typed in).

- **Wildcards** - as a default, '*' wildcards are used before and after the searched phrase. A check box in each of the Advanced Search Screens enables the user to perform exact search. If the user check that box the '*' wildcards won't be inserted and exact search will be used to find matching phrase.

- **Synonyms** - a check box in each of the Advanced Search Screens enables the user to decide whether to include synonyms in search or not. The synonyms are extracted from a synonyms file provided by IR.

- **Proximity** - a check box in each of the Advanced Search Screens enables the user to decide whether to include default proximity definitions in search or not. The default proximity that is used is NEAR [5] relation between the searched words i.e. the words should appear with up to 5 words between them without relevance of order.

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Operational Feasibility

During feasibility analysis, operational feasibility study is necessary as it ensures that the project developed is successfully implemented in the organization. According to software engineering principles, operational feasibility or in other words usability should be high. A thorough analysis is done and found that the system is operational.

Technical Feasibility

Technical feasibility takes care of the technical issues that are to be tested to see whether the system is feasible. Technical feasibility analysis makes a comparison between the level of technology available and the technology that is needed for the project. The level of technology is determined by factors such as the software tools available, the machine environment, platform etc since, the resource required for the development of the project is already available in the organization, and this project is technically feasible.

Economical Feasibility

This is the most important aspect that has to be critically evaluated. The costs and benefits have to be estimated. Considering the cost factor, since the client is ready to pay a reasonable amount, which will be more than the cost of developing the system, the system will be economically feasible.

CHAPTER 4

SYSTEM DESIGN

INTRODUCTION

The most important and challenging phase of the system life cycle is system design. The design focuses on the detailed implementation of the system. The first step in system design phase is to determine how the outputs are produced and in what format. Secondly, input data and the tables have to be designed to meet the requirements of proposed system.

System Design is the process of developing specifications for a system that meet the criteria established in system analysis. The major step in design is the preparation of input design and design of output reports in a form acceptable by the user. System Design includes input to the system and the speed of retrieval of data.

Design is the first step of the development of the system. Design will be perfect only if the data collection is done properly with out errors. Design is the base of the development of the system. Once the design phase is over then coding for this design can be done. While designing all possibilities of the system is taken into consideration.

4.1 DATA FLOW DIAGRAM

Data flow diagrams are commonly used during problem analysis and design. A DFD shows the flow of data through a system. It views the system as a function that transforms the inputs into desirable outputs. A DFD aims to capture the transformation that takes place within a system into output data so that eventually the output data is produced.

The agent that performs the transformation of data from one state to another is called a process (Bubble). Named circles show the processes and named arrows represent dataflow. A square defines a source or destination of system data. An open rectangle is a data source.

SYNONYM SEARCH Error!

Expression
search

Dealer

Synonym
Search

TN SYNONYMS GROUP

Synonym
words
retrieved

Notify if not possible
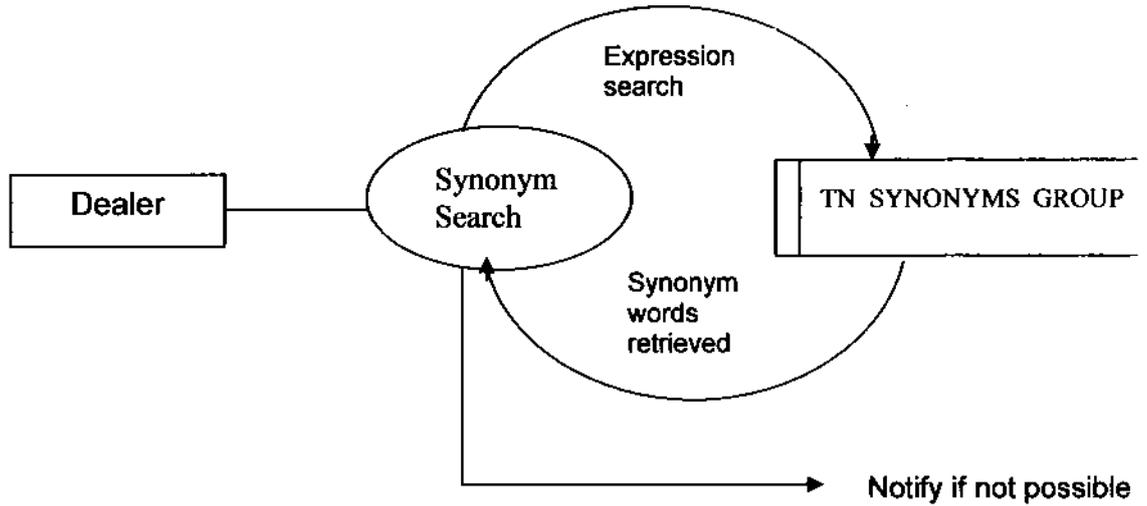
Figure 4.1.1 DFD Synonym Search

BOOKMARK/HISTORY

Add

TN_RT_BOOKMARKS

Dealer

Bookmark/
History

Delete

View

TN_RT_BOOKMARK_ATTRIBUTES

View

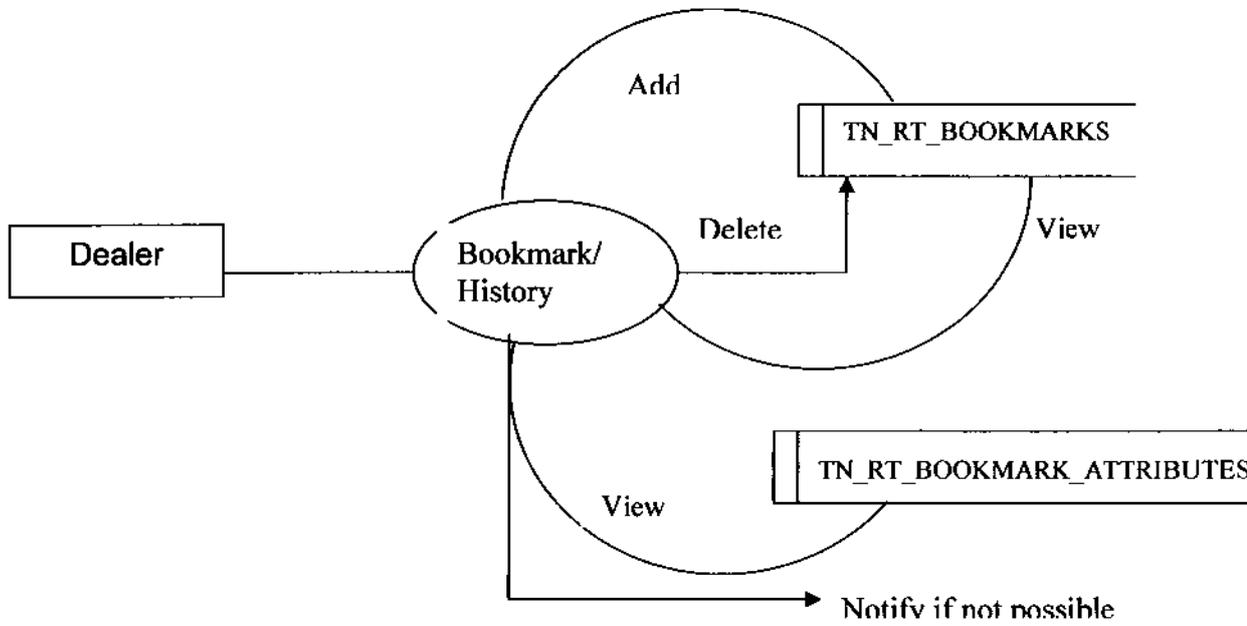Notify if not possible

Figure 4.1.2 DFD Bookmark/History
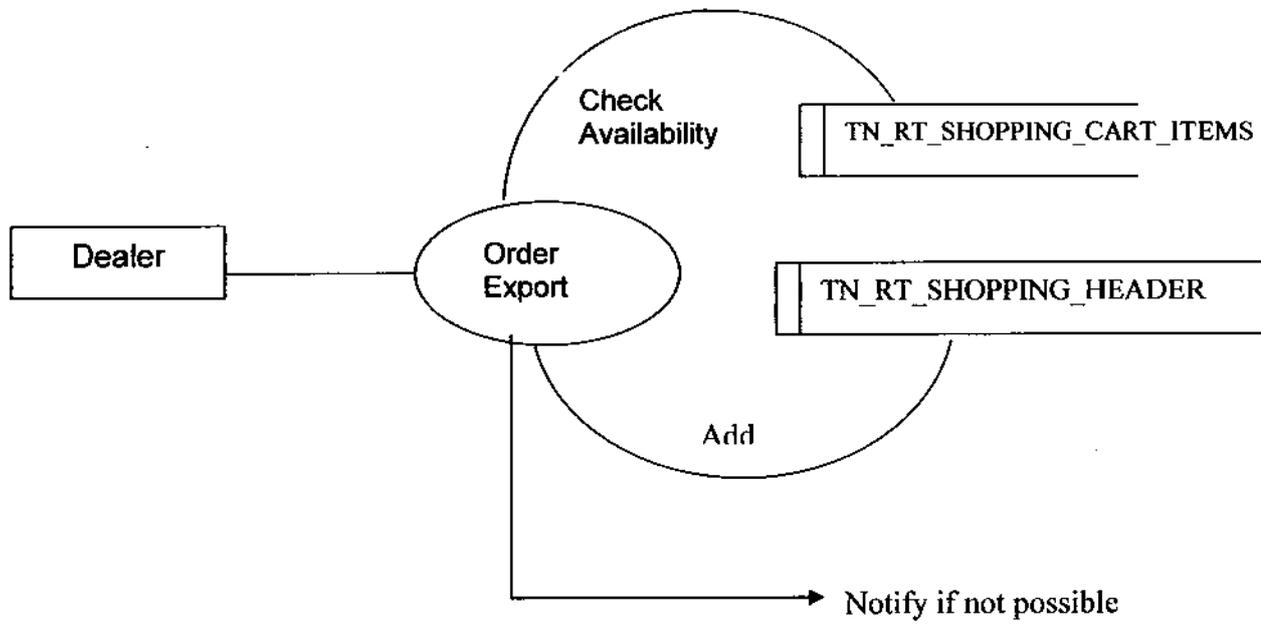
ORDER EXPORT

Figure 4.1.3 DFD Order Export

4.2 DATABASE DESIGN

A database is a collection of interrelated data stored with minimum redundancy to serve many users quickly and efficiently. The general objective of database design is to make the data access easy, inexpensive and flexible to the user. The design of the database is one of the most critical parts of design phase. An elegantly database can play as a strong foundation for the whole system. The details about the data relevant for the system are identified first.

According to their relationship, tables are designed by the following standard database design methods. The data types for each data item in the tables are decided. For the optimum design of the database, to have better response time, to have data integrity, to avoid redundancy and for the security of the database all the tables created are normalized. The database design is done according to the procedure. The database design transforms the information domain model created during the analysis into the data structure that will be required to implement the system software. The database design is made up of two levels,

- Conceptual level
- Normalization

Conceptual Level

The level represents the major data object and relationship between them. Conceptual level describes the essential features of the system data. Just like a DFD for a system, the conceptual level uses symbols for modeling method called Entity Relationship model.

Relationship between entities makes the database structure. Four type of relationship exist among entities. They are, one-to-one, one-to-many, many-to-one, and many-to-many. A one-to-one relationship is an association between two entities.

A one-to-many relationship describes an entity that may have two or more entities related to it. Likewise a many-to-many relationship describes entities that have many relationships.

Normalization

After the conceptual level, the next level to organize the database to a good shape is called normalization. The normalization simplifies the entities, removes the redundancies from the system data and finally builds a data structure, which is both flexible and adaptable to the system. Normalization offers a systematic step-by-step approach towards this goal. The different normal form applied is given below,

- First normal form (NF)
- Second normal form (2NF)
- Third normal form (3NF)

The database is designed sing RDBMS concept there by enabling the sharing of data and was normalized to avoid the redundancy. This will lead to quicker application development with low maintenance cost.

IR Settings

4.2.1 Table Name : Set_DefaultPreferences

This table holds the default preferences that will be used in the application.

Field	Data Type	Index	Null	Description
Preference	VARCHAR2 (50)	Primary Key	No	Preference type.
AttributeName	NVARCHAR 2 (50)		No	The preference attribute name.
AttributeValue	NVARCHAR 2 (50)		Yes	The preference attribute value.
CreatedOn	DATETIME		Yes	The first date the record was created
ModifiedOn	DATETIME		Yes	The last date the record was modified

SYNONYMS

4.2.2 Table Name : TN_SYNONYMS

This table holds the expressions used in the synonym module. Each expression can be constructed from more than one word.

Field	Data Type	Index	Null	Description
SynID	INTEGER	Primary Key	No	Unique identifier of "TN_SYNONYMS" table. A sequential number.
Expression	NVARCHAR 2 (100)	Yes	No	No delimiters, aside from 'space' are allowed

4.2.3 Table Name : TN_SYNONYMS_GROUPS

This table holds the relation between the synonyms and its expressions.

Field	Data Type	Index	Null	Description
ID	INTEGER	Joined Primary Key	No	Represents the term (<HT>) that the synonym is related to.
SynID	INTEGER		No	The synonym that represented by the term (<TERM>).

4.2.4 Table Name : TN_RT_TERMFIELDS

This table contains the application Term Fields names and values.

Field	Data Type	Index	Null
PublicationID	VARCHAR (64)	Joined Primary Key	No
TermFieldName	VARCHAR (64)		No
TermValue	VARCHAR (255)		No

4.2.5 Table Name : TN_RT_SEARCHRESULTS

This table contains the application search results fields and values.

Field	Data Type	Index	Null
PUBLICATION_ID	VARCHAR (64)	Joined	No
TN_KEY	VARCHAR (64)	Primary Key	No
ELEMENT_NAME	VARCHAR (32)		No
ELEMENT_VALUE	VARCHAR (255)		

4.2.6 Table Name : TN_RT_PUBLICATION_TREE

This table holds the publication details.

Field	Data Type	Index	Null
PUBLICATION_ID	VARCHAR (64)	Primary Key	No
PUBLICATION_PAREN T_NAME	VARCHAR (64)		Yes
PUBLICATION_MAIN_ NAME	VARCHAR (64)		No
PUBLICATION_ORDER	NUMBER		No

4.2.7 Table Name : TN_AC_USERPREFS

This table holds the application generic preferences

Field	Data Type	Index	Null
USERID	NVARCHAR (50)	Joined	No
PREFERENCENAME	NVARCHAR (50)	Primary Key	No
PREFERENCEVALUE	NVARCHAR (50)		Yes
PREFERENCETYPE	INTEGER		Yes

4.2.8 Table Name : TN_RT_COLLABORATION_FORUM

This table holds all forum details.

Field	Data Type	Index	Null	Description
forumID	INTEGER	Primary Key	NO	Unique identifier of the table. A sequential number.
name	NVARCHAR (255)		YES	Name of the forum
description	NVARCHAR (255)		YES	Description of forum
modifiedDate	VARCHAR (15)		YES	Modified Date
creationDate	VARCHAR (15)		YES	Creation Date

4.2.9 Table Name : TN_RT_COLLABORATION_THREAD

This table holds all forum threads.

A thread is a tree of messages.

In IR project the tree will combine with one message.

Field	Data Type	Index	Null	Description
threadID	INTEGER	Primary Key	NO	Unique identifier of the table. A sequential number.
forumID	INTEGER	YES	NO	Refers to TN_RT_COLLABORATION_FORUM.forumID
rootMessageID	INTEGER		NO	Refers to TN_RT_COLLABORATION_MESSAGE. MessageID, which is the root message in the thread.
modifiedDate	VARCHAR (15)	YES	NO	Modified Date
creationDate	VARCHAR (15)	YES	NO	Creation Date
DOCUMENTID	VARCHAR (255)		YES	A Persistent reference id that defines which content, the note was attached.
TARGETTYPE	VARCHAR (50)		YES	Target type
DOCUMENTLOCATION	VARCHAR (50)		YES	This field will be populated with data only when attached note to PartNumber and hold the PartNumber itself.

4.2.10 Table Name : TN_RT_COLLABORATION_MESSAGE

This table holds all user messages per each thread.

Field	Data Type	Index	Null	Description
messageID	INTEGER	Primary Key	NO	Unique identifier of TN_RT_COLLABORATION_MESS AGE table. A sequential number.
threadID	INTEGER	YES	NO	Default value is (-1)
subject	NVARCHAR (255)		YES	Subject of the message
userID	INTEGER		NO	User id
body	NVARCHAR		YES	Body of the message
modifiedDate	VARCHAR (15)	YES	NO	Modified Date
creationDate	VARCHAR (15)	YES	NO	Creation Date
approved	INTEGER	YES	NO	Approved

4.2.11 Table Name : TN_RT_COLLABORATION_MSG_PROP

This table holds additional property of message.

In IR feature it will be used for storing **Feedback** indication and **Email** information

Field	Data Type	Index	Null	Description
messageID	INTEGER	Primary Key	NO	Refers to TN_RT_COLLABORATION_MESS AGE.messageID
name	VARCHAR (50)		NO	Message property name
propValue	VARCHAR (255)		YES	Message property value

4.2.12 Table Name : TN_RT_COLLABORATION_GROUP_PERM

This table holds the permission on forums (read/write/reply) per each group

Field	Data Type	Index	Null	Description
forumID	INTEGER	Primary Key + Index on GroupId	NO	Refers to TN_RT_COLLABORATION_FO RUM.forumID
groupID	INTEGER		NO	Group id
permission	INTEGER		NO	Permission given

Shopping list tables

4.2.13 Table Name : TN_RT_SHOPPING_CART_HEADERS

This table holds the saves shopping lists details.

Field	Data Type	Index	Null	Description
SHOPPING_CART_ID	NUMBER	Primary Key	No	Unique identifier of "TN_RT_SHOPPING_LIST_HE ADERS" table. A sequential number.
SHOPPING_CART_NA ME	VARCHAR2 (25)		Yes	Shopping Cart Name
SHOPPING_CART_DES CRIPTION	VARCHAR2 (150)		Yes	Shopping Cart Description
SHOPPING_CART_STA TUS	VARCHAR2 (20)		Yes	Shopping Cart Status
ACTIVE_STATE	VARCHAR2 (10)		Yes	Active State
CREATED_DATE	VARCHAR2 (20)		Yes	Created Date
CREATED_BY	VARCHAR2 (25)		Yes	Created by
STATUS_UPDATE_DA TE	VARCHAR2 (20)		Yes	Update Date Status
STATUS_UPDATE_BY	VARCHAR2 (25)		Yes	Update by Status
SHOPPING_CART_UPD ATE_DATE	VARCHAR2 (20)		Yes	Shopping Cart Update Date
SHOPPING_CART_UPD ATE_BY	VARCHAR2 (25)		Yes	Shopping Cart Update By

4.2.11 Table Name : TN_RT_COLLABORATION_MSG_PROP

This table holds additional property of message.

In IR feature it will be used for storing **Feedback** indication and **Email** information

Field	Data Type	Index	Null	Description
messageID	INTEGER	Primary Key	NO	Refers to TN_RT_COLLABORATION_MESSAGE.messageID
name	VARCHAR (50)		NO	Message property name
propValue	VARCHAR (255)		YES	Message property value

4.2.12 Table Name : TN_RT_COLLABORATION_GROUP_PERM

This table holds the permission on forums (read/write/reply) per each group

Field	Data Type	Index	Null	Description
forumID	INTEGER	Primary Key + Index on GroupId	NO	Refers to TN_RT_COLLABORATION_FORUM.forumID
groupID	INTEGER		NO	Group id
permission	INTEGER		NO	Permission given

Shopping list tables

4.2.13 Table Name : TN_RT_SHOPPING_CART_HEADERS

This table holds the saves shopping lists details.

Field	Data Type	Index	Null	Description
SHOPPING_CART_ID	NUMBER	Primary Key	No	Unique identifier of "TN_RT_SHOPPING_LIST_HE ADERS" table. A sequential number.
SHOPPING_CART_NA ME	VARCHAR2 (25)		Yes	Shopping Cart Name
SHOPPING_CART_DES CRIPTION	VARCHAR2 (150)		Yes	Shopping Cart Description
SHOPPING_CART_STA TUS	VARCHAR2 (20)		Yes	Shopping Cart Status
ACTIVE_STATE	VARCHAR2 (10)		Yes	Active State
CREATED_DATE	VARCHAR2 (20)		Yes	Created Date
CREATED_BY	VARCHAR2 (25)		Yes	Created by
STATUS_UPDATE_DA TE	VARCHAR2 (20)		Yes	Update Date Status
STATUS_UPDATE_BY	VARCHAR2 (25)		Yes	Update by Status
SHOPPING_CART_UPD ATE_DATE	VARCHAR2 (20)		Yes	Shopping Cart Update Date
SHOPPING_CART_UPD ATE_BY	VARCHAR2 (25)		Yes	Shopping Cart Update By

4.2.14 Table Name : TN_RT_SHOPPING_CART_ITEMS

The table holds the saved shopping lists parts' details.

Field	Data Type	Index	Null	Description
SHOPPING_CART_ID	NUMBER	Primary Key	No	Refers to TN_RT_SHOPPING_CART_HEADERS.SHOPPING_CART_ID
ITEM_NUMBER	VARCHAR 2 (25)		No	Item Number
ITEM_DESCRIPTION	VARCHAR 2 (100)		Yes	Item description
ITEM_QUANTITY	INTEGER		Yes	Item Quantity
UNIT_PRICE	NUMBER		Yes	Unit Price
ITEM_SOURCE	VARCHAR 2 (100)		Yes	Item Source

4.2.14 Table Name : TN_GN_SEQUENCES

This table lists the sequences in the application and their last sequence ID.

Field	Data Type	Index	Null	Description
SEQ_NAME	VARCHAR2 (40)	Primary Key	No	Sequences name
SEQ_VALUE	NUMBER (18)		Yes	Last sequence ID.

Preferences

4.2.15 Table Name : DD_Set_DealerPreferences

This table holds the dealership preferences set by the dealership administrator.

Field	Data Type	Index	Null	Description
DealershipAR_Number	NVARCHAR (50)	Primary Key	No	Dealership Number
Preference	VARCHAR (50)		No	Preference type.
AttributeName	NVARCHAR (50)		No	The preference attribute name.
AttributeValue	NVARCHAR (255)		Yes	The preference attribute value.
CreatedOn	DATETIME		Yes	The first date the record was created
ModifiedOn	DATETIME		Yes	The last date the record was modified

4.2.17 Table Name : DD_Set_UserPreferences

This table holds the preferences set by the user.

Field	Data Type	Index	Null	Description
UserName	NVARCHAR (50)	Primary Key	No	User Name
Preference	VARCHAR (50)		No	Preference type.
AttributeName	NVARCHAR (50)		No	The preference attribute name.
AttributeValue	INTEGER		Yes	The preference attribute value.
CreatedOn	DATETIME		Yes	The first date the record was created
ModifiedOn	DATETIME		Yes	The last date the record was modified

Document History (Bookmark)

4.2.18 Table Name : TN_RT_BOOKMARKS

This table contains all user document bookmarks and user documents history.

Field	Data Type	Index	Null	Description
BOOKMARK_ID	NUMBER	Primary Key	No	Unique identifier of "TN_RT_BOOKMARKS" table.
USER_NAME	VARCHAR2 (64)		No	User Name
SAVE_DATE	NUMBER		No	The date the bookmark was created
TYPE	NUMBER		Yes	Bookmark/History
TITLE	VARCHAR2 (255)		Yes	The given name for the bookmark
PUBLICATION_ID	VARCHAR2 (128)		Yes	Publication Id

4.2.19 Table Name : TN_RT_BOOKMARKS_ATTRIBUTES

This table holds all bookmark additional parameters.

Field	Data Type	Index	Null	Description
BOOKMARK_ID	NUMBER	Primary Key	No	Refers to TN_RT_BOOKMARKS.Bookm arkId
ATT_NAME	VARCHAR2 (64)		No	Attribute name
USER_NAME	VARCHAR2 (64)		No	User Name
SAVE_DATE	NUMBER		No	The Date the bookmark was inserted.
TYPE	NUMBER		Yes	Bookmark/History

4.3 INPUT AND OUTPUT DESIGN

INPUT DESIGN

Input design is the process of correcting a user-oriented description of the inputs to a computer based one. Inaccurate data is one of the most common causes of data processing errors. If poor input design, particularly where operators enter data from source documents permit wrong data to enter into a computer system, then it will change the entire process in an unpleasant way consists of

- The field length is well documented. The field length is specified correctly such that the data entered will not exceed the allocated space and or numeric data is right justified.
- The sequence of field matches the sequence of data or type of data, which is going to be entered.
- The data format is well identified for entering or specifying the data's

In this system, the screen includes appropriate labels or prompts for data entry. The system also includes some screen design rules that are important for user satisfaction. They are given below.

1) The same format is used with related screens, users can identify easily where the selections are made while placing orders.

2) The screen is not over crowded. Often too neat, and eye pleasing. It facilitates the user to identify the labels easily and enter the data's.

3) Provides validation instructions if the user enters a numeric field in a character field.

4) The consistent terminology is used which coordinate forms and screen designs.

5) Hence the input design will be easy to follow and does not induce errors. The screen designs are viewed in appendix.

OUTPUT DESIGN

Outputs from a system can be defined as the information being processed and then generated by the system in a specified format. Output design serves the best information source of any system. Once the output is designed it would serve for present and future references. Outputs are carefully designed such that it gives an error free output format.

CHAPTER 5

IMPLEMENTATION

INTRODUCTION

System implementation is considered to be the most crucial stage in objective to find how the successful new system will work and be effective. A crucial phase in any system is the System Implementation, which means that a new system design is converted in to operations. Conversion of manual system in to a new computer based system is known as System implementation.

The implementation is made such that to create accurate information and reports that helps the company to communicate easily through the system without finding any difficulties. The system should be implemented with the technique of planning and Control. A detailed correct plan should be defined over the system and the flow of control is implemented in such a way that meets the requirements.

The following are the different phases involved in system implementation such as verification, validation, system testing, maintenance.

5.1 VERIFICATION

The verification is used to run the system in the stimulated environment using stimulated data. The stimulated test is to primarily looking for error and omission regarding end user and design specification. The verification procedure is to check each record, data item or field against certain criteria. The system should be verified

and validated at each of the software process using documents produced during the previous stage.

Verification is rebuilding the product right. Verification involves the checking program confirms to each specification. Verification starts with requirement review and continuous through design and code review to product testing. To satisfy the objectives static and dynamic techniques of system checking and analysis should be used. The system has been verified using sample data for all the modules.

There are two techniques known as **Static** and **Dynamic** technique.

Static technique is concerned with analysis and checking of system representations such as design diagram, requirements document. **Dynamic technique** or test involves an effective implementation of the system. However static technique was not used in the project and only dynamic technique was used successfully.

5.2 VALIDATION

Validation checking is the quality of software in both simulated and live environments. The may ordered as follows

Completeness check

Completeness check ensures that all fields in a record are present and are read in the proper sequence. In Customer details table, all field of customers must be fulfilled. Suppose any textbox left blank, then immediate relevant message will be showed. If the user enters numeric value in text field, then all data in the form are discarded. When the user click new button, the all text boxes are clear whatever they show.

Consistency check

Consistency check refers to the relevance of one type of data to another. For example when the user enters dealers name, then all relevant information about the dealers will be immediately placed in form.

Reasonableness check

Reasonableness check evaluates a transaction against a standard to determine it meets the test. For example, when a user enters field size that more than the limit, then immediate alert will be shown.

Sequence check

Sequence check verifies that data records are in sequence prior to processing. A check of duplicate records may also be incorporated in the routine.

5.3 SYSTEM TESTING

System testing makes a logical assumption that if all the part of the system is correct and the goal will be successfully achieved. System testing is the stage of implementation, which is aimed at ensuring that the system works accurately and efficiently before live commences.

There should be careful planning how the system will be proved and the test data designed. During system testing, the system is used experimentally to ensure that the software does not fail. In other words, we can say that it will run according to its specifications and in the way users expect.

It is desirable to discover any surprises before the organization implements the system and depends on it. Software testing accounts for the largest percentage of technical effort in the software process. The objective of system testing is to uncover errors. To fulfill the objective the testing is done in the following 3 phases.

Unit Testing

Unit testing focuses verification effort on the smallest unit of the software design the module. The local data structure is examined to ensure that data stored temporarily maintains its integrity. Boundary conditions are tested to uncover the errors of the module within the boundary.

Integration Testing

After the complete testing of all modules, they are put together and integrated. The primary concern is the compatibility of individual modules. The specification for data type, length and name is tested for compatibility.

Stress Testing

Once all the modules are subjected to stress test, to confront programs with abnormal situations. The tests may be based on choosing large tables with large number of fields. Several users were allowed to access the database simultaneously and the system survived this test successfully.

All the modules of this system were successfully tested using test as well as real data collected. All the reports and the screens are tested for their validity and values in the database tables are checked for their correctness and consistency. After successful testing of the system, it was ready for implementation.

5.4 MAINTENANCE

The process of making changes and modifications to the system after it has been delivered implemented and is in use called software maintenance.

Corrective Maintenance

It is concerned with fixing reported errors in software.

Adaptive Maintenance

It is concerned with changing the software to source and to adapt to the new and changing environment.

Defective Maintenance

It involves implementing new functioned or non-functional system requirements to ensure more effective execution of the system.

Perceptive Maintenance

It mainly deals with accommodating new or changed users requirements and increase the system performance or to enhance its user interface. The objective of maintenance should be to prevent failures and optimize the software.

Preventive Maintenance

It concerns activities aimed at increasing the system's maintainability such as updating documentation adding comments, improving modular structure of the system.

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION

An attempt has been made to computerize the Supply Chain Management system and is implemented at Aspire System, Chennai, up to the satisfactions of the company. On-line validation in all areas wherever requires is taken care off. Before the introduction of computer systems the works were done through the manual system. The computerized system automatically enquires and updates all relevant information and it is found that it has successfully overcome the pitfalls in the manual system.

Comparative analysis is carried out and it is viewed that the new system is successfully working for the test data provided by the users and they hope that the software will be extremely helpful to the company. Finally I thank the Department of Computer Science and Engineering for providing me a good opportunity to carry out this project work with the guidance of staff.

FUTURE ENHANCEMENT

The future enhancement will be, encourage the online shopping, Serial number search etc. Since the system is so flexible the future enhancement and changes can easily be made.

APPENDICES

Login (SSO) Page

WELCOME TO IR APPLICATION

HTTP Divisions	UTILITY:PAVING:COMPAC
HTTP Access	IPC:OMH:TSB:OTHER
HTTP ARNumber	S136
HTTP UID	ir100072
HTTP Name	swathi
HTTP Email	swathi@yahoo.co.in
HTTP Dealer Admin	true
HTTP Lookup table	true
HTTP Language	English
HTTP IC Dealer ID	true
OBS ACCOUNT ID	rj196
OBS STORE	
OBS_COMPANYNAME	

Test Mode True

Submit

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  - Utility Equipment
  - Compaction Equipment
  - Material Handling
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  - Paving Equipment
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  - SERVICE
  - Specifications
  - Troubleshooting
  - WARRANTY

System Updates

New documents are available in the IPC manual
New documents are available in the OM manual
New documents are available in the SM manual
New documents are available in the Other manual

Training Tools

IR Training Tool
Hot Keys

Table of Content Page

IR - Microsoft Internet Explorer provided by Aspire Systems

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        - Lubrication
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      - AIR_SOURCE_X
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    - HP1000A/VCU
    - HP1300B/VCU, X
    - HP130/VCU, HP
    - HP300/VCU, P3
    - HP600/VCU, HP
    - HP600A/VCU, HP
    - HP600B/VCU, HP
    - HP825/VCU, XP
    - HP825C/VCU, HP
    - HP1000E/VCU, X
    - S1360/VCU, XP1
    - HP375/XD, XP3
    - HP600/XD, XP1
    - HP675/VCU
    - NHP1600/VCU
    - NHP1300/VCU
    - P130/XD, P130C

SAFETY
General

Ensure that the operator reads and understands the decals and consults the manuals before maintenance or operation. Ensure that the Operation and Maintenance manual, and manual holder if equipped, are not removed permanently from the machine. Ensure that maintenance personnel are adequately trained, competent and have read the manuals. Make sure that all protective covers are in place and that the canopy/doors are closed during operation. The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark arrestors, and intake (shut off) valves may be required, dependent on local regulations or the degree of risk involved. Air discharged from this machine may contain carbon monoxide or other contaminants which will cause serious injury or death. Do not breathe this air. Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally. Ensure that the machine is operating at the rated pressure and that the rated pressure is known to all relevant personnel.

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine safety valve rating. If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurized or over pressurized by another. Compressed air must not be used for a feed to any form of breathing apparatus or mask. The discharged air contains a very small percentage of compressor lubricating oil and care should be taken to ensure that downstream equipment is compatible if the discharged air is to be ultimately released into a confined space, adequate ventilation must be provided. When using compressed air, always use appropriate personal protective equipment. All pressure containing parts, especially flexible hoses and their couplings, must be regularly inspected, be free from defects and be replaced according to the Manual instructions. Avoid bodily contact with compressed air.

The safety valve located in the separator tank must be checked periodically for correct operation. Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine. Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine. Do not alter or modify this machine. A battery contains sulfuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of

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		Part Number	Part Description	Qty
X		59497867	Engine Coolant Temperature Switch	1
X		59239996	Engine	1
X		59623747	Engine Fan	1
X		59075671	Rear Engine Mount	2

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