CMPE 450
SOFTWARE ENGINEERING
REQUIREMENT ANALYSIS DESIGN DOCUMENT

Version 2.0

Project Name: Stock Follow Up System Project

Submitted to Instructor : AYŞE BAŞAR BENER
Asistant: Onur GÜNGÖR

Submitted by: **Requirement Analysis Group**

Cem DİLMEGANİ
Erol KÜRELİ
Ethem ORUC
Mustafa YÜCEL

Boğaziçi University, İstanbul
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Introduction

1.1 Purpose of the System

The stock follow up system has three main purposes that aim to different user groups. One of these purposes is storing the merchandise information in a single database with an organized and easy way, which will lead to a more accessible and more reliable data storage method.

Another purpose of the system is updating the stored information each time a good is being added to/removed from the depot, which will enable the users to follow up the stock status.

The last purpose of the system is providing restricted access to the database to examine the goods information with a filtered listing option. This way, the authorized users will be able to reach to any needed information easily, efficiently and securely.

1.2 Scope of the System

The stock follow up system is going to be used in the administrative departments and the academic departments of Bogazici University. However, the main target user group is the purchasing department; and the other departments can also use this system optionally.

The data insertion to the database will be automatically done based on the information coming from another integrated system, however a depot clerk will confirm the information before it is added to the database.

Removing the goods information from the database will be performed by the departmental depot clerks when the department takes an item from the depot.

The data examination part of the system will have various user groups. First of all, each departmental depot clerk and the managers of these departments will be able to see their stock information. Furthermore, the general depot clerk will be able to see the goods information which is in general depot. Moreover, the rector will have permission to see the whole database. Lastly, since the stock follow up system has an account based access procedure, any user can examine or update the database if authorization is given.

1.3 Objectives and Success Criteria of the Project

The most important criteria in designing the stock follow up system can be defined as accuracy, simplicity and efficiency. Since the database will include a big amount of data with a variety of fields, accuracy has an important role in this project. The system will be used by many users at the same time, and each user can perform different actions. All these situations increase the complexity of the program, so the system should provide a good error handling mechanism and a simple GUI, without losing its efficiency.

Security is also an important criteria for the design of this system and the reliability of the data. Authorization mechanism should be implemented carefully, and the database should be well protected against not permitted access attempts.

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CURRENT SYSTEM

Currently, a system like the stock follow up system is being used to control and organize the storage of the goods. This system is called Ayniyat Takip Sistemi and is being used in the university warehouse. Basically, it is a Microsoft Office Access program with a user interface, which includes various functions such as storing the records of transacting goods and reporting / documenting the stock information.

When a department needs an item, they send a request form to the purchasing department. The only authorized employee stores the information of all requested items in a simple spreadsheet, and then the purchasing of that item is being appointed to an employee. After the item is ordered and purchased, it is being stored in the university warehouse until it is going to be used. When the item is needed, the purchasing department sends an approval form to the property department to get the item from the warehouse. If the request gets approved, the property department adds the information of that item into a database and sends the approval form back to the purchasing department to end the process.

The problem with the current system is that the merchandise information is not being stored in an organized and associated way. The property department has only the list of the approved items, so the spreadsheet which is stored in the purchasing department is the only source to reach to the total list of purchased items. However, this spreadsheet can only be modified by a single user and it is stored in the computer of this user, which makes it insecure, inefficient and time consuming to modify.

Another important function of this system is documenting and reporting the stock information. When required, the system can provide a report about

the current stock status. It can also generate a report about the records of transacting goods. Other than these, the system has a date filtered reporting option, which gives the opportunity to observe the stock information in a specific date interval.

One of the problems with the current system is that it is not accessible through the network, so that the only user of the program is the depot clerk. Since the use of this system is such limited, it is not efficient and useful for the other departments and units. Additionally, there is also a problem with the registration of the purchased goods. In some cases, the goods can be directly sent to the requesting department after the purchase is performed, without entering the warehouse. In such a case, the merchandise information can not be stored in the system, so it gets harder to control and follow up the stock.

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PROPOSED SYSTEM

3.1 Functional Requirements

The stock follow up system is going to be an extention to the SAS project completed last year. To put simply, this extension will be used to add merchandise to stock, remove used goods from stock and to allow stock to be analyzed by clerks and various administrators. As a result, the extension is used for two main purposes which are inserting/updating and observing data.

The system will consist of a single module including various interfaces. First of all, the sign in part of the system is managed by the old SAS project.

Once the users connect to the system, they will encounter different options depending on their user rights. There will be three main functions

Confirming a request form: Once a request form has been confirmed, the merchandise bought by the form will be added to the GD and that addition is recorded for reporting purposes. If the merchandise was requested by an Administrative Department then that merchandise will be added to the stock in GD. If the merchandise was requested by an Academic Department then that merchandise will be added to the stock in GD and it will immediately be decreased from the GD and added to the stock of the depot of the Department which requested that merchandise.

Removing a good from stock: People with the necessary permissions will be able to input the type and quantity of good to be removed from the stock and that removal will be recorded for reporting purposes.

Viewing stock: The data examination part of the system will be more comprehensive compared to the data insertion part. In this part, the users will be able to observe a specific part of the depot with the help of a filtering option. The items in the depot which they are allowed to view will be determined by their authority. They will have the option to create a specific list by filtering the data according to different fields and ranges of values that the fields can take, such as defining a range on the amounts field or adding an interval on the date field. This mechanism will allow the users to filter the data without requiring any database knowledge.

Setting a limit on the stock: A minimum limit can be set on an item. When that limit is reached, a notification will be made to the user

3.2 Nonfunctional Requirements

3.2.1 User Interface and Human Factors

There will basically be four groups of users who will interact with the program. GDCs, DDCs, DMs and Rector. Most users will have intermediate computer knowledge. Therefore, with the help of an intuitive user-interface the end-users can easily start working with our program after reading a short tutorial.

There will be GDCs who confirm the delivery of goods which were requested through request forms. GDCs will also have the permission to view the stock in GD and to remove goods from the stock in GD.

There will also be DDCs. At least one DDC will be assigned to a DD. A DDC may be assigned to more than one DD but that is not required. In short a many to many relationship exists between DDCs and DDs. However, especially for large departments we are expecting that there will be DDCs assigned solely for those DDs. DDCs will have the permission to view the stock in their DD and to remove goods from the stock in DD.

Each department manager has permission to view only the stock that involve his or her department's depot.

The Rector will be allowed to view the stock and the transfers in all DDs and the GD.

3.2.2 Documentation

There will be no need for printed documentation for the user groups. Since the user interface will be designed as simple as possible, an extra printed technical documentation for users is not required. Each user will be able to access a Frequently Asked Questions. There should also be a help section which details every operation accomplished by the system.

The documents that will be prepared during the design phase of the Stock Follow Up System include RAD including System Models, SDD and ODD.

3.2.3 Hardware Consideration

There are two aspects for hardware configuration: clients and server. The server should be capable of handling connections simultaneously of one quarter of all DDCs and GDCs (approximately 15 people) plus at least a few managers. There are approximately 50 departments who have separate budgets and there will be approximately 2 people per department who can be registered as managers and 1 person who will be registered as the DDC. According to our discussions with managers, we have estimated that not more than 10 percent of the managers will be accessing to the system at the same time. So in conclusion the system should at least support 25 connections. In case the number of connections exceeds the maximum number for the system, the system should notify the users of the abnormal condition. In total there will be about 80 users.

The server should have necessary disk space for its related data. The size of primary and secondary storage should be proportional to the size of the transaction data and the number of users. Also an additional server may be preferred to keep the database separately according to the size of the database and number of data processing on the database. This separation would enhance the performance of the overall system by transferring the burden of excessive data processing to the Data Server.

Finally, in terms of their physical location, there are two user groups. The GDCs, and others (including the rector, managers, DDCs) who are located in various places on campus. The intranet connection has to be able to support connections from the GD and the connections from the other places on campus.

3.2.4 Performance Characteristics

The information retrieval should be as fast as possible for user satisfaction and performance. To ensure this, the system must give response to the operations quickly and the users also should be able to access the system easily.

Error Handling:

Any other error that will occur after the test phase of the program may be corrected later on. Connecting to server, scripting, database and server errors will be taken care of separately by the developers of the program and handled properly to ensure system integrity.

Extreme Situations:

It must be ensured that the GDCs can access the system at all times. Priority will be given to their operations in case of extreme conditions.

3.2.5 Quality Issues

The most important dimension of quality that concerns this Stock Follow Up System module is reliability and usability. The program should be kept user-friendly. The program must handle all errors and control the data flow between user inputs and database. The data consistency in the database is an important criterion for the quality of the program.

3.2.6 System Modifications

A Reporting System may be added to the program. The current design includes generic filters on the forms which will be used to sort the data according to chosen fields. The generic filters can be customized to cover the specific needs of the departments. For example, a yearly stock movement report can be created as a predefined filter which is a simple filter choosing purchases over a specific date interval of a specific department.

3.2.7 Physical Environment

The server can be located anywhere that provides normal room tempera-

ture and pressure.

3.2.8 Security Issues

As mentioned at 3.3.1, there are four user groups and each user group has different privileges for accessing the different parts of system and performing different tasks. It must be insured that non-users of the system have no means of accessing or modifying the database or the program.

It must also be ensured that department managers do not have any access to the depots that are not owned by their department.

3.2.9 Resource Issues

The database must be backed up periodically. The backup operation should be handled when last user connected to the system and least query is being executed on the database. For example a job can take the backup of the database every midnight.

3.3 SYSTEM MODELS

3.3.1 Scenarios

The first scenario begins when the purchased goods come to the general depot. After the arrival of the goods, the clerk of the general depot approves the request form. There are two possibilities for the approval process.

Firstly, the purchased goods may be for the administrative departments. In this case, the goods stay in the general depot and are added to the storage list of the administrative departments. The type, shelf no, the amount, unit price, arrival date of the goods and the department for which the goods are purchased are stored. We also should know the total number of a type of good. So, the number of the new goods should be added to the total number of that type of good.

Secondly, the purchased goods may be for the academic departments. These goods are sent directly to the academic department that will use the purchased goods. The same information except the shelf no will be stored

for this second case. Since, these types of goods are sent directly to other departments, their departure dates will be same as the arrival dates. The departure dates will be stored too. These goods will not change the total number of goods.

The second scenario is displaying the stored information about the general depot by the clerk of the general depot. He will be able to see the stored data (the amount of available goods, the amount of used goods) with a filtering option. The filtering can be performed according to different values of type, department name and ranges of arrival date and departure date.

In the third scenario, some goods will be removed from the general depot. The total number of the right type of goods will be decreased. The departure date of the good will be stored. Each type of the good will have a minimum amount of stock number. So, if the total number of a type of good decreases below that minimum number, the system will give an alert. If the goods are for academic departments, they will be taken out right after they are brought to the depot. So, the departure date will be same as the arrival date. These goods should be added automatically to the depot of the academic department.

The fourth scenario is to set the minimum number of a type of the good that must be available in the depot. In the third scenario, we saw that if the total number of a type of good becomes less than this number, the user is alerted. The setting of this limit number is done by the clerk of the general depot.

In the fifth scenario, some goods will be removed from the depot of an academic department. The total number of the right type of goods will be decreased. The departure date of the goods will be stored. If the number of that type of goods decreases below a certain number, the program will alert the user.

The sixth scenario is displaying the stored information about the departmental depot by the clerk of the departmental depot. He will be able to see the stored data (the amount of available goods, the amount of used goods) with a filtering option. The filtering can be performed according to different values of type, department name and ranges of arrival date and departure date.

The seventh scenario is to set the minimum number of a type of the good that must be available in the departmental depot. This minimum number

will be set by the clerk of the departmental depot.

The eighth scenario is about the managers of academic and administrative departments. A manager from each department will be able to see the stored data about only his own department. The display results will be same as the ones for the clerks. They will have the same filtering options. The manager will be also able to see reports including these data. The reports may be according to types of goods, dates and departments.

In the last scenario, the rector will be able to see stored information about all departments. Also, the rector will be able to get reports about the stored data.

3.3.2 Use Case Model

Actors

The actors of the system are the GDCs, DDCs, managers of the departments and the rector. Each of the users has different authorities and use different forms of the program to perform their tasks.

Use Cases

The use cases of the system are approving of request forms, removing goods from depots and viewing the goods in depots.

The use case diagram below shows the relation between the actors and the use cases. In the system, a GDC can approve a request form, remove a good from GD, view goods in GD, set a limit on a type of good; a DDC can remove a good from DD, view goods in DD, set a limit on a type of good; a manager can view goods in a DD; the rector can view the goods in both DDs and GD; it would also be nice if the rector and the managers could access reports which use predefined filters such as movement of certain goods within the last year.

3.3.3 Object Model

Data Dictionary

A The system has different kinds of users. These users are GDCs, DDCs,

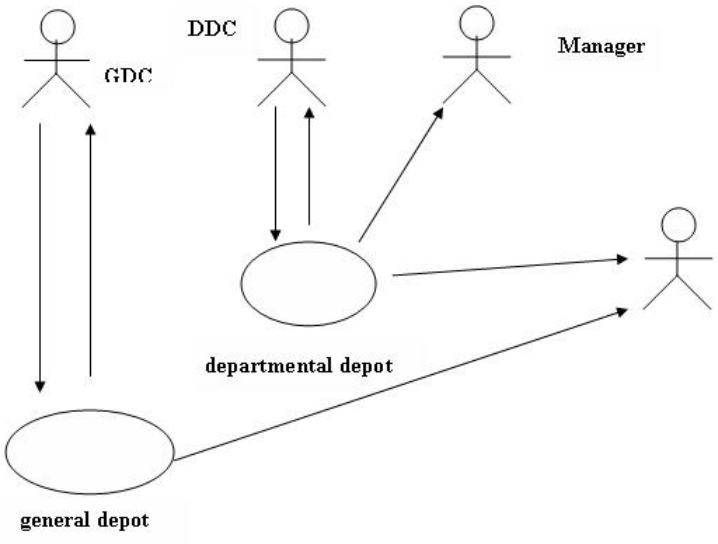

Figure 3.1: use_case_diagram_of_the_system

managers of the departments and the rector. These users are identified by their username and passwords are used for authentication purposes.

B The system holds these specific information about the goods located in the depots. The information about the goods includes what type of good they are, where they are physically located, how many of them exists in the depot and the minimum amount that needs to exist in the db.

3.3.4 Dynamic Models

Sequence Diagrams

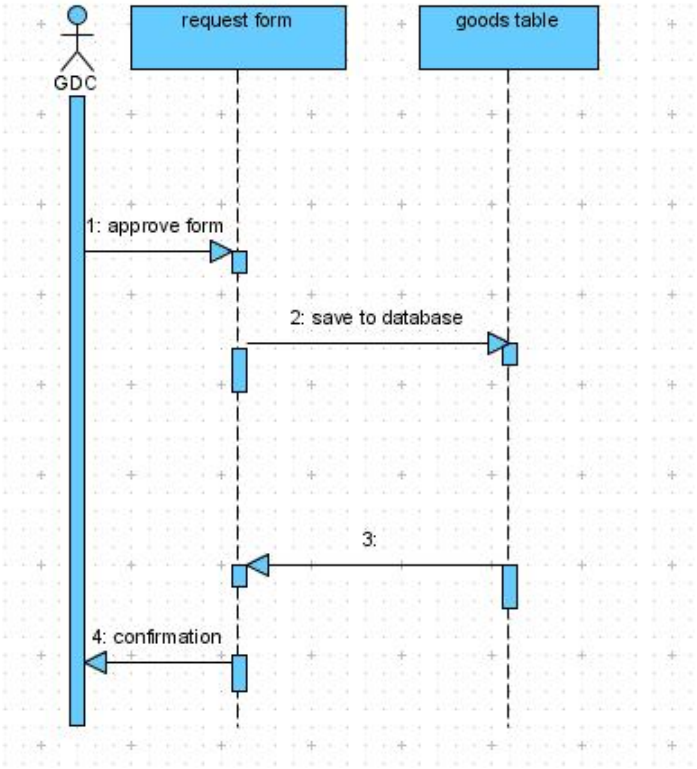

Figure 3.2: Sequence_Diagram_for_Request_Form_Approval_of_Administrative_Departments'_Goods

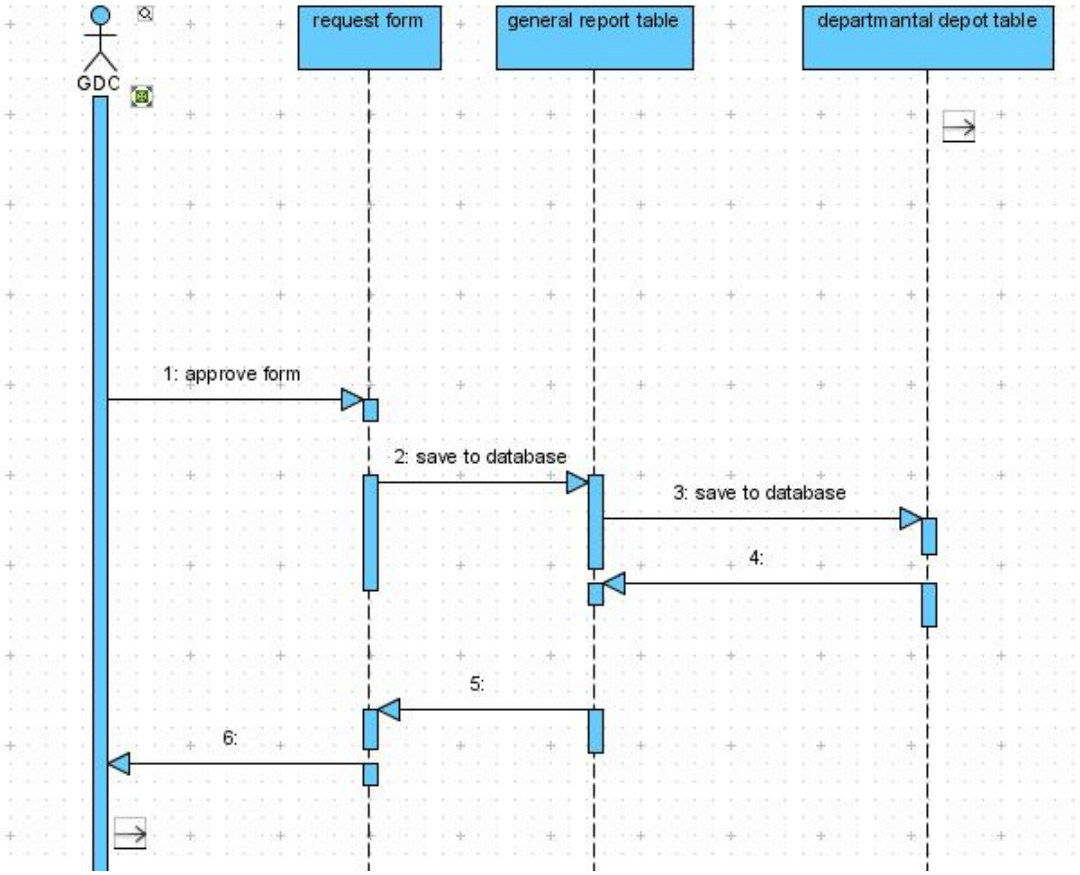

Figure 3.3: Sequence_Diagram_for_Approval_of_Academic_Departments'_Goods

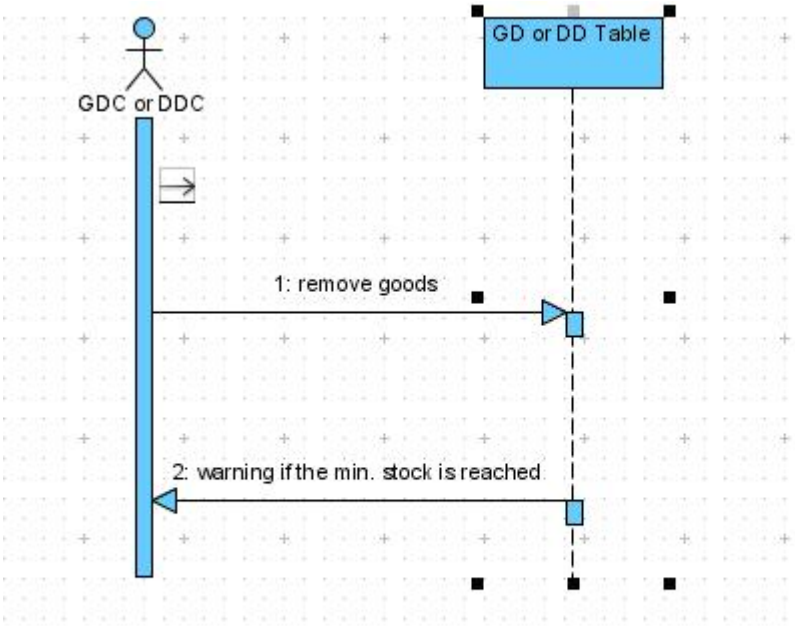

Figure 3.4: Sequence_Diagram_for_Removing_Goods_from_Stocks

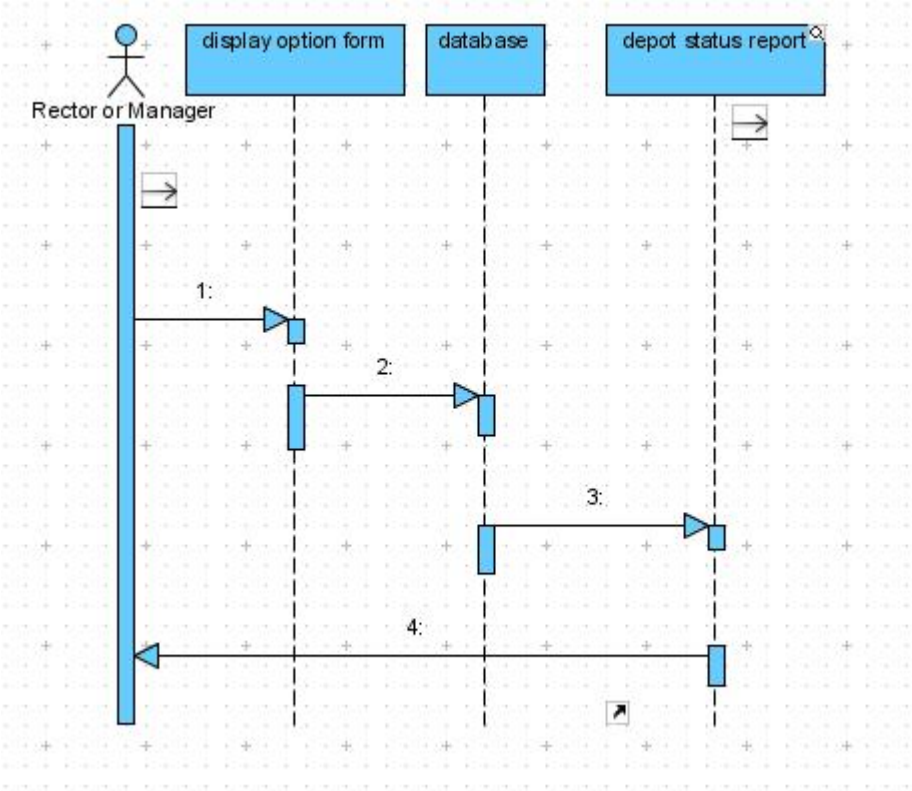

Figure 3.5: Sequence_Diagram_for_Reporting

3.3.5 User Interface - Navigational Paths

Navigational Paths

Different users have different navigational paths in the system. The general depot clerk can approve the request form, display the stored data, remove goods from the depot and set a minimum level for different types of goods. The departmental depot clerks can display the stored data, remove goods from the depot and set a minimum level for different types of goods. The managers of departments can see the stored data about his own department and view reports. The rector can see the stored data about all the departments and view reports.

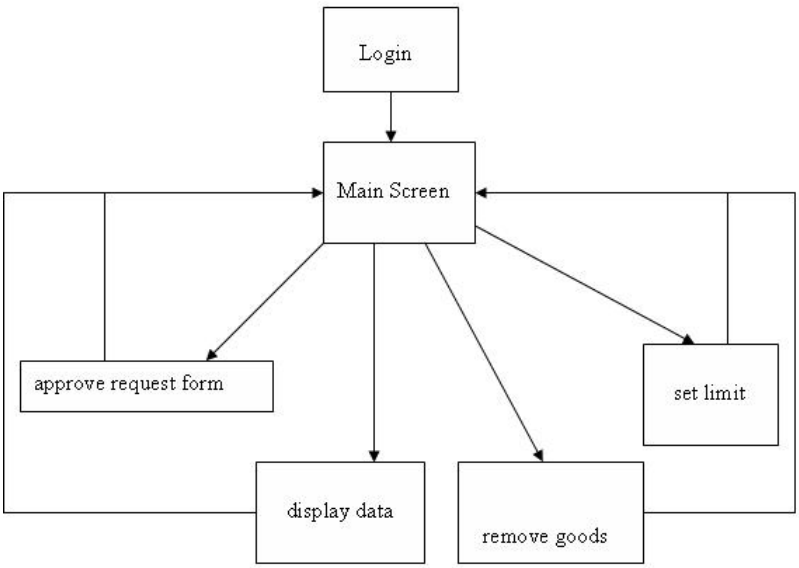

Figure 3.6: Navigational_Path_for_General_Depot_Clerk_Case

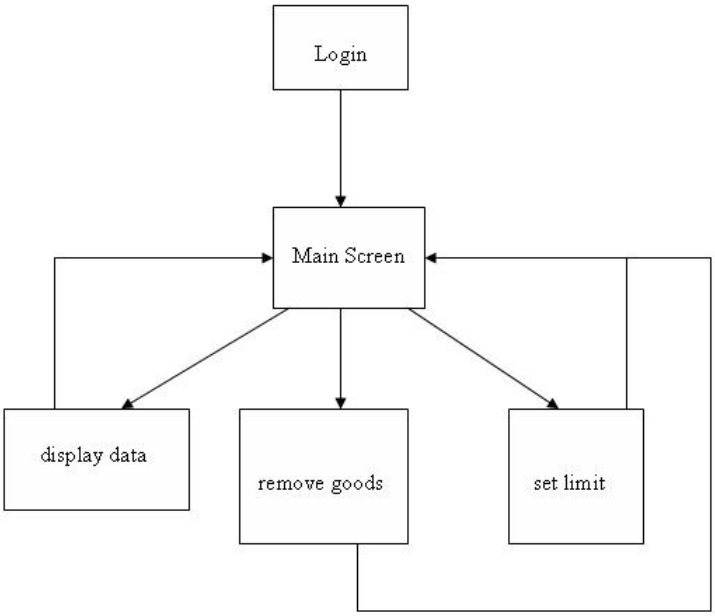

Figure 3.7: Navigational_Path_for_Departmental_Depot_Clerk_Case

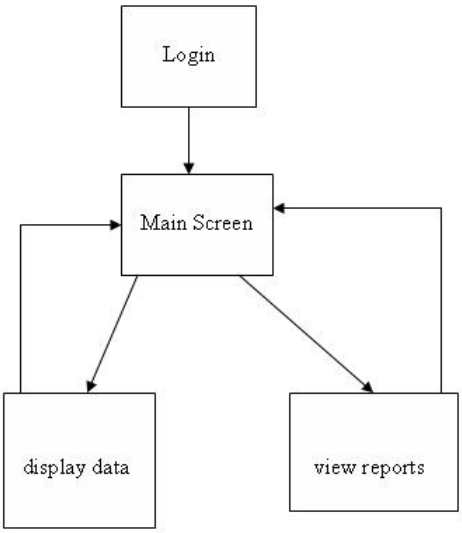

Figure 3.8: Navigational_Path_Rector_Case

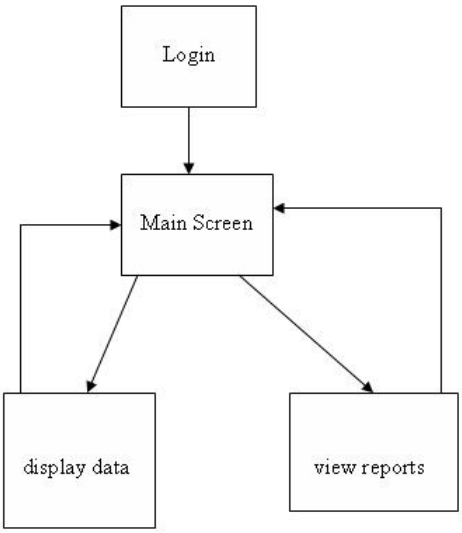

Figure 3.9: Navigational_Path_Manager_Case

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Definitions, Acronyms and Abbreviations

- CmpE: Computer Engineering
- RAD: Requirements Analysis Document
- email: Electronic Mail
- ID: Identification
- SDD : System Design Document
- ODD : Object Design Document
- GUI : Graphical User Interface
- GDC : General Depot Clerk
- DDC: Departmental Depot Clerks
- DM: Department Manager
- GD: General Depot
- DD: Departmental Depot

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Glossary

Academic Department: A department which does not use the General Depot for its storage. It may or may not have its own physical depot. Regardless of the existence of a physical depot, a virtual depot, a departmental depot, will be managed for this department in the software

Actor : External entity that needs to exchange information with the system. An actor can represent either a user role or another system.

Administrative Department: A department which uses the General Depot for its storage.

Authorization : The process of associating a person with access rights.

Class diagram : UML notation representing the structure of the system in terms of objects, classes, attributes, operations, and associations. Class diagrams are used to represent object models during development.

Criterion : A measure of goodness used when evaluating alternatives for an issue.

Department Depot: A storage facility used for storing goods for Academic Departments

Departmental Depot Clerk: Manages the storage in Departmental Depot, details are outlined in the nonfunctional requirements

Functional Requirement : An area of functionality the system must support. The functional requirements describe the interactions between actors and the system independent of the realization of the system.

General Depot: A storage facility used for storing goods for Administrative Departments

General Depot Clerk: Manages the storage in General Depot, details are outlined in the nonfunctional requirements

Goods : An item that exists in the depot

GUI : Graphical User Interface

Login : procedure used to get access to an operating system, or application, usually in a remote computer.

Manager : He is responsible for managing a department.

Merchandise: A good that has been bought from an outside vendor

Nonfunctional requirement : A user visible constraint on the system. Nonfunctional requirements describe user visible aspects of the system that are not directly related with the functionality of the system.

Pseudo requirement : A constraint on the implementation of the system imposed by the client.

Purchase : buying of a good to a department

Purchasing Department : the Bosphorus University Department which manages purchase of goods for all departments.

Object Design Document (ODD) : A document describing the object design model. The object design model is often generated from comments embedded in the source code.

ODD : See Object Design Document.

Scalability : the ability of a computer application or product (hardware or software) to continue to function correctly and efficiently as it (or its context) is changed in size or volume in order to meet a user need.

Scenario : Instance of a use case. A scenario represents a concrete sequence of interactions between one or more actors and the system.

SDD : See System Design Document.

Security : Property of a system indicating its ability to protect the re-

sources against unauthorized use.

Sequence diagram : UML notation representing the behavior of the system as a series of interactions among a group of objects. Each object is depicted as a column in the diagram. Each interaction is depicted as an arrow between two columns. Sequence diagrams are used during analysis to identify missing objects, attributes, or relationships. Sequence diagrams are used during object design to refine the specification of classes.

System Design Document : A document describing the system design model.

Transaction : See purchase

User : A role representing the persons who interact directly with the system when accomplishing their work.

Use case : A general series of interactions between one or more actors and the system. See also scenario.

Use case diagram : UML notation used during requirements elicitation and analysis to represent the functionality of the system. A use case describes a function of the system in terms of a sequence of interactions between an actor and the system. A use case also includes entry conditions that need to be true before executing the use case and the exit conditions that are true at the completion of the use case.