

CHAPTER 5

INTELLIGENT BANK MANAGEMENT SYSTEM (IBMS) DESIGN

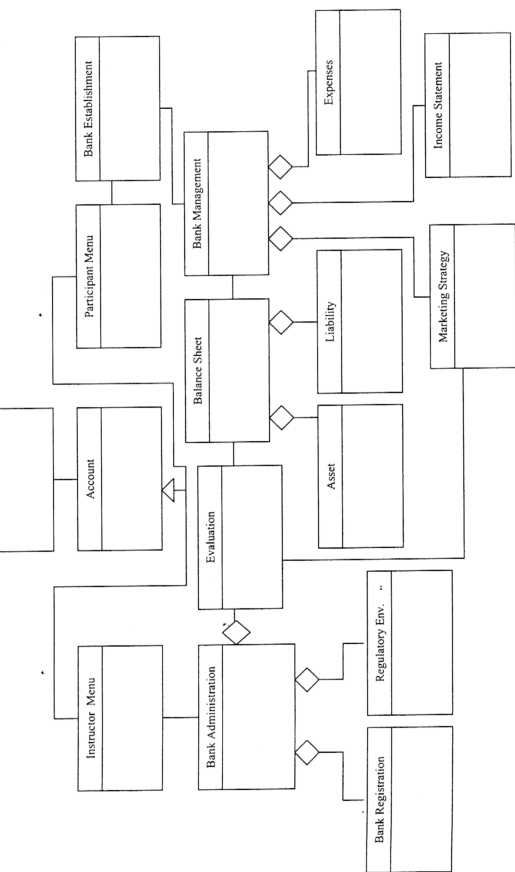
5.1 Introduction

Software architecture design begins after the system analysis phase and before the implementation phase. In Chapter 4, the system requirements for IBMS were produced and these requirements are the key input for the software architecture design.

The design focuses on three important concepts which are business logic of IBMS, the access layer and the user interface layer. UML were used to design the architectural design for each layer. It is essential to know the business logic as it captures the static and dynamic relationship that exists in between the business objects. Then the access layers were designed in accordance to the business class diagram for data storage. The last phase was about user interface design which focuses more towards the front end of the system.

5.2 Business Class Diagram

The business class diagram was used to identify the components of IBMS and the relationship in between components. Figure 5.1 is an IBMS business class diagram. The diagram shows that in order to play the IBMS, the users need to register themselves to create an account. The business class diagram also shows the relationships in between the Instructor and participants.



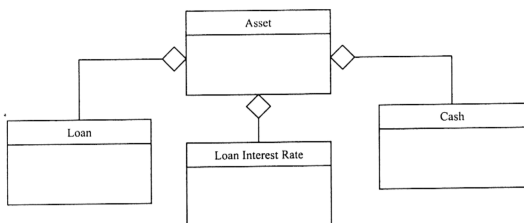


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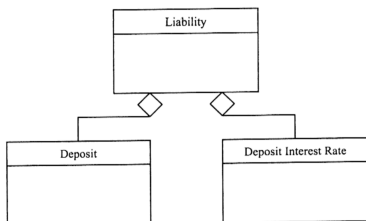


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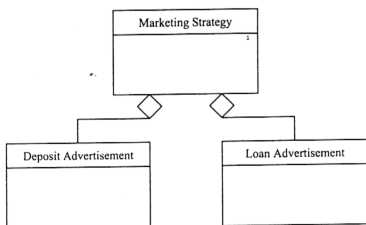


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5.3 Activity Diagram for the Design of IBMS

The Activity Diagram shown below is an abstraction form the use case model shown in the analysis phase. The activity diagram shows the overall workflow of the bank management using the Intelligent Bank Management System (IBMS). The activity diagram explains that the Instructor needs to start the game by registering the banks to compete in the application. Next the Instructor will go to the Regulatory Environment Page to configure the regulatory environment. Then the Instructor will press the complete button to initiate the Quarter 1 with the default configuration of Quarter 0.

Next the participants will log in to the system and if the participants are in Quarter 1, they need to establish the bank. Once the bank has been established the bank will have a default balance sheet and income statement of Quarter 0. The participants need to analyze the report and regulatory environment. Accordingly the strategy needs to be implemented to improve the bank performance. The Bank committee needs to decide on the strategy and start to play the game by configuring the interest rates and expenses.

Once the participant click the complete button, the Quarter will be completed and the Instructor will need to evaluate and rate the strategy to show the results of the bank decision.

Next, the participants will view the results and feedback from the Instructor as well as print the report. Next the Instructor will analyze the quarterly report. This cycle will go on until the last quarter. After the last quarter, the Instructor will . announce the winner or the bank which have performed better than the others.

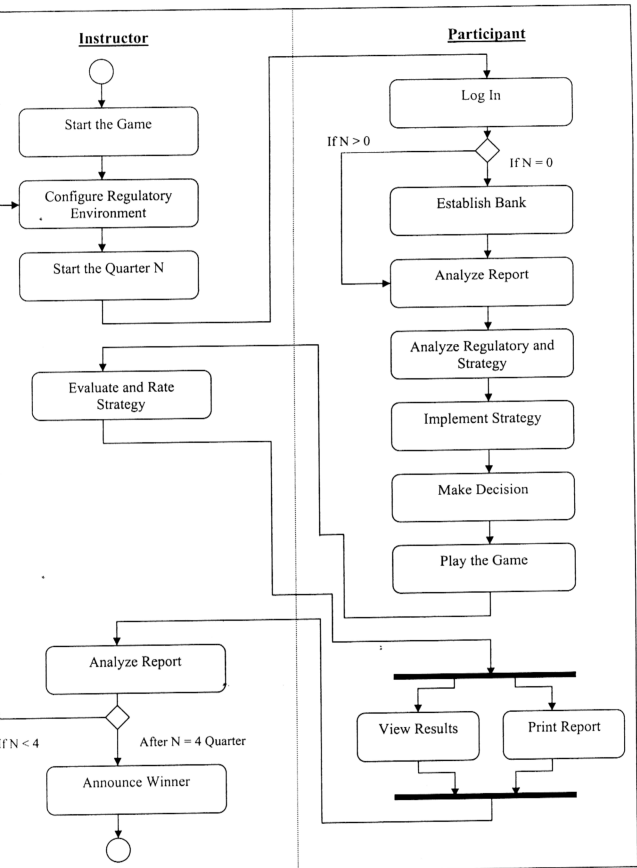


Figure 5.2: IBMS Activity Diagram

5.4 Database Classes

The database design for IBMS was carried out by identifying the access classes through the business class diagram. The storage classes for IBMS are:

1. class Registration – stores the registration information for both Instructor and participants
2. class Bank Establishment – stores the data needed for creating a new game
3. class Regulatory Environment – stores the regulatory environment data
4. class Maximum(Max) Deposit Rates – stores the range of interest rates for the types of deposits
5. class Maximum (Max) Loan Rates – stores the range of interest rates for the types of loan
6. class Maximum(Max) Reserve Requirement(Req) – stores the reserved amount for the bank from deposits
7. class Other Regulatory – stores other regulatory data
8. class Deposit Advertisement – stores data about deposit advertisement that need to be viewed by the Instructor
9. class Loan Advertisement – stores data about loan advertisement that need to be viewed by the Instructor
10. class Bank Profile – stores data needed during the setting up of the bank by the participants
11. class Balance Sheet – stores the data about assets and liability
12. class Asset – stores data about types of assets

13. class Cash – stores data about types of cash
14. class Loan – stores the amount of loan disbursed for all type of loan
15. class Loan Interest Rate – stores the data on loan interest rates
16. class Interest Income – stores the amount of interest income gained for each quarter
17. class Liability – stores data about types of liability
18. class Deposit – stores data about types of deposits
19. class Deposit Interest Rate – stores the data on deposit interest rates
20. class Interest Expenses – stores the amount of interest expenses for each quarter
21. class Expenses – stores the data on types of expenses and the amount
22. class Income Statement – stores the data related to income statement

The access classes for IBMS are shown in Figure 5.3 below:

Registration	Bank Establishment	Regulatory Environment
<ul style="list-style-type: none"> - GroupID - User Level - User Name - Password - e-mail - Department - User ID 	<ul style="list-style-type: none"> - GroupID - Bank Name - Instructor Name - Nu. Of Banks - Bank Chairman - Economic Year 	<ul style="list-style-type: none"> - Max Deposit Rates - Max Loan Rates - Max Reserve Req - Other Regulatory
Max Deposit Rates	Max Loan Rates	Max Reserve Req
<ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Checking Deposit - Savings Deposit - Time Deposit 	<ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Syndicated Loan - Housing Loan - Bridging Loan - Personal Loan 	<ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Checking Deposit - Savings Deposit - Time Deposit

Figure 5.3: Access Classes

Other Regulatory <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Max Capital Note 	Deposit Advertisement <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Strategy 1 - Strategy 2 - Strategy 3 - Strategy 4 - Total cost 	Loan Advertisement <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Strategy 1 - Strategy 2 - Strategy 3 - Strategy 4
Bank Profile <ul style="list-style-type: none"> - GroupID - Bank Name - Objective - Bank Chairman - Executive 1 - Executive 2 - Executive 3 - Executive 4 	Balance Sheet <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Total Asset - Total Liability 	Asset <ul style="list-style-type: none"> - Group ID - Bank Name - Quarter - Cash - Loan - Premises - Securities - Total Asset
Cash <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Vault Cash - Reserves - Float - Total Cash 	Loan <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Syndicated - Housing - Bridging - Personal 	Loan Interest Rate <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Syndicated - Housing - Bridging - Personal

Figure 5.3, continued

Interest Rate Income <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Syndicated - Bridging - Housing - Personal - Total 	Liability <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Deposit - Central Borrowing - Capital Notes - Equity 	Deposit <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Checking - Savings - Time Deposit - Total Deposit
Deposit Interest Rate <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Checking - Savings - Time 	Interest Expenses <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Checking - Savings - Time - Total Interest Expenses 	Expenses <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Salaries - Total Deposit Adv - Total Loan Adv
Income Statement <ul style="list-style-type: none"> - GroupID - Bank Name - Quarter - Total Interest Income - Total Interest Expenses - Net Interest Income - Operating Income - Total Expenses - Total Revenue - Avg Tax - Net Income 		

Figure 5.3, continued

Figure 5.4 shows the relationship in between each access class layer:

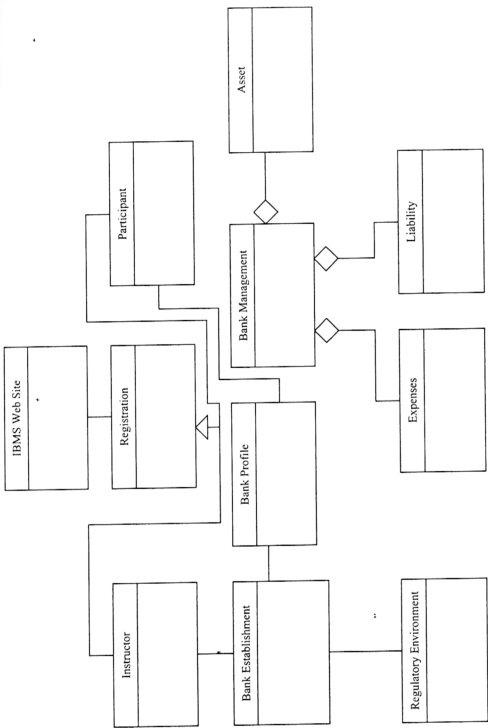


Figure 5.4: Access Classes

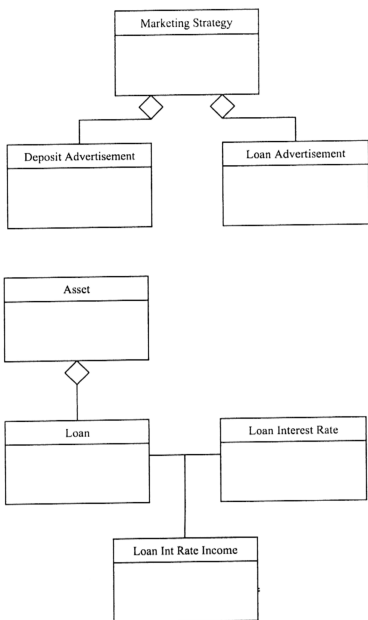


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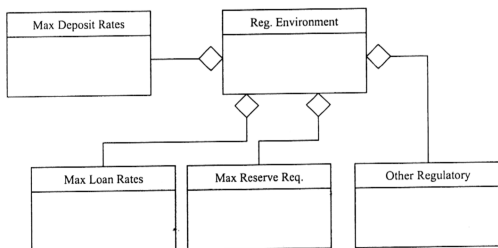
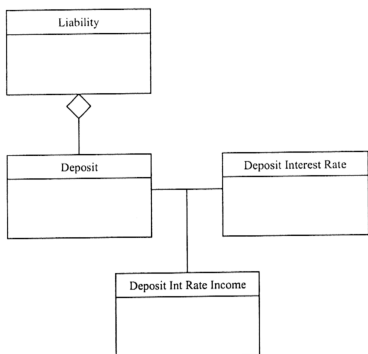


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5.5 Intelligent Bank Management System (IBMS) Architecture

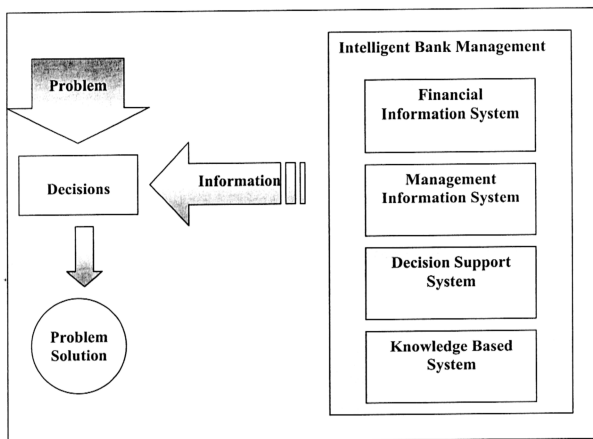


Figure 5.5: The Framework of IBMS

Figure 5.5 shows the IBMS architecture that consists of four important components to assist the participants in making decision. The components are:

1. Financial Information System

IBMS able to provide the financial information of the previous quarter as a reference to further improve in their current quarter.

2. Management Information System

The management information system is a combination of financial information system which provides the necessary information to manage the bank.

3. Decision Support System

IBMS were able to generate necessary information such as income statement and balance sheet from the participants input which were used to make a decision for the next quarter.

4. Knowledge Based System

The system was able to provide necessary information or help if the participants were not able to make a decision through the tutorial module.

The combinations of these four components were used by the participants to provide solution for their problem while managing the bank.

5.6 Sequence Diagram

Sequence diagrams are shown below to show the interaction between the user interfaces in a time sequence. The vertical dimension represents time; the horizontal dimension represents different objects. The sequence diagrams shown below were used as a guideline in designing the user interface.

The sequence diagram consists of:

1. Figure 5.6: Creating a Game
2. Figure 5.7: Game Administration
3. Figure 5.8: Playing the Game
4. Figure 5.9: Manage the Bank
5. Figure 5.10: View Results for Instructor
6. Figure 5.11: View Results for Participant

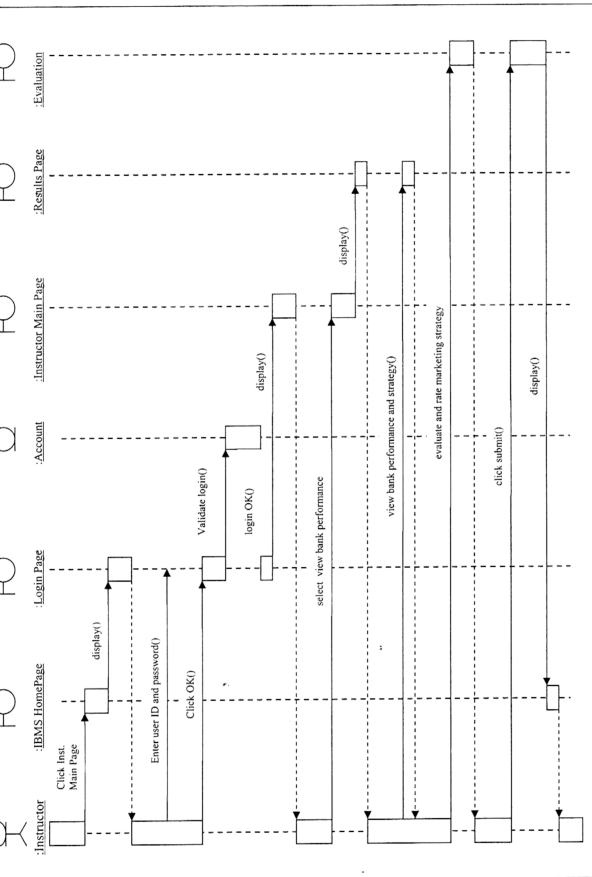


Figure 5.7: Game Administration

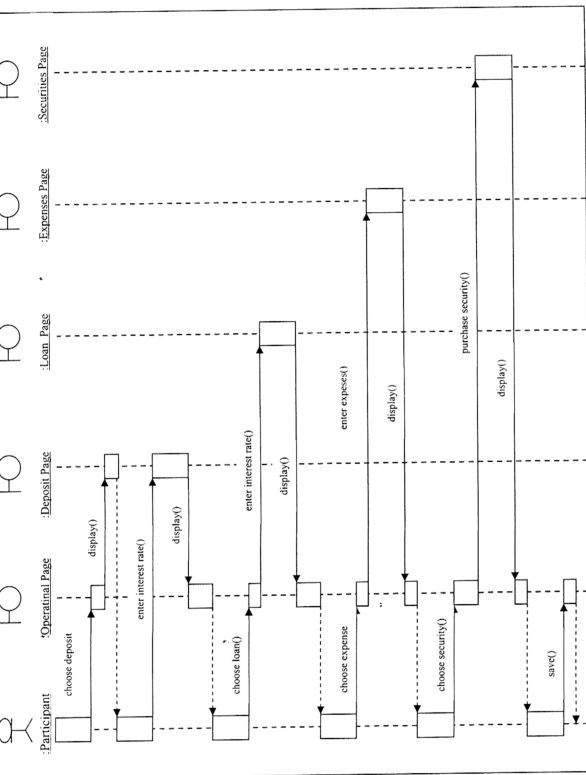


Figure 5.9: Manage the Bank

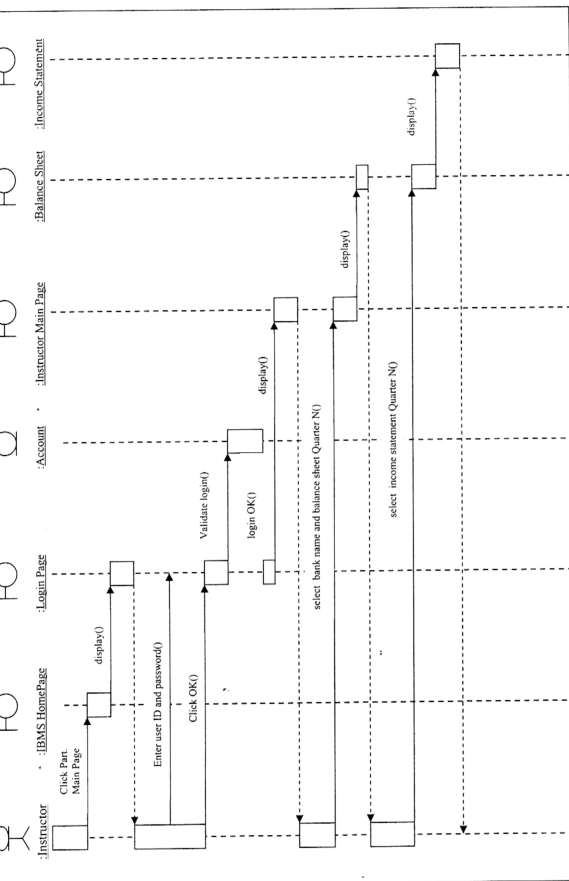


Figure 5.10: View Results for Instructor

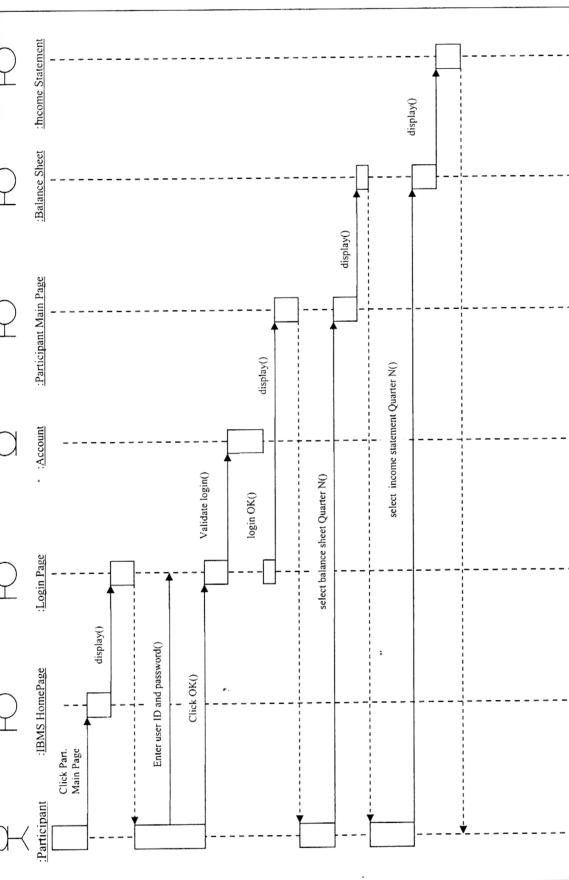


Figure 5.11: View Results for Participant

5.7 User Interface Design

Figure 5.12 shows the various front-ends that allow users to read and manipulate configuration data. Each user interface module is represented as an object in the interface layer diagram shown below.

There are two main interface layers that have been designed for IBMS in accordance to the type of users and their accessibility to the data. The diagram shows the relationship in between each interface module in detail.

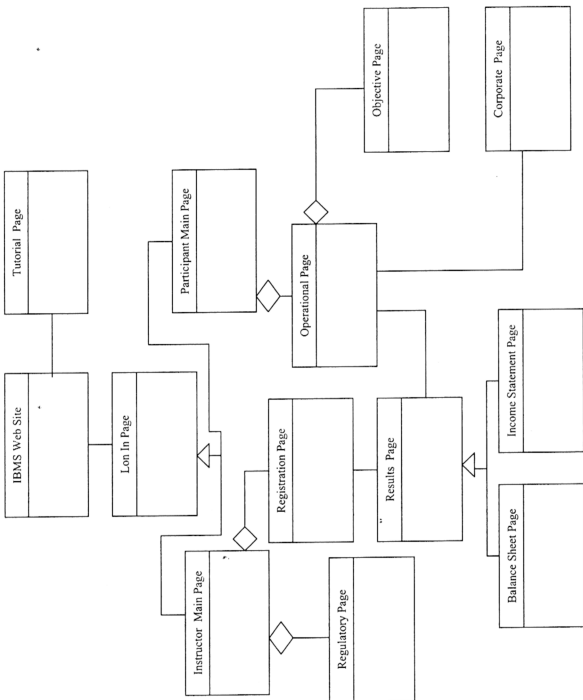


Figure 5.12: Interface Class Diagram

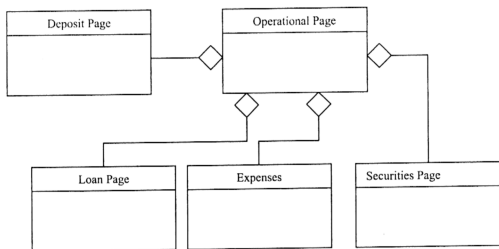


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5.8 Product Factor

The design of the Intelligent Bank Management System (IBMS) is closely related to the factors affecting the product such as:

1. Functional Features
2. User Interface
3. Performance
4. Dependability
5. Failure Rates and testing
6. Service
7. Product Cost

5.8.1 Functional Features:

1. **On line Bank Management**
Users of the system who had registered have their own bank management page
2. **On Line Financial Information Records**
Users of the system who had registered have access to their bank management record
3. **Financial Decision Making**
Users of the system who had registered will be able to change the rates (deposit, loan etc) with comparison to the previous record.
4. **View Results Information**
Users of the system who had registered will be able to view the results for each quarter (balance sheet and Profit report)
5. **On line Tutorial on Bank Management**
The registered users will be able to view the tutorial and will also able to sit for the on line test of Intelli Bank Management.

5.8.2 User Interface

1. **Ease of use and understandable**
The system must accommodate all types of users from novice to experts
2. **User Interface can be customized**

The user interface will be customized for each bank registered under IBMS

5.8.3 Performance

1. Number of Users

Number of users is not set as the expectation is very high

2. Response time

User request will be processed and the result is sent back to the client PC

5.8.4 Dependability

1. Availability Restriction

System will function for 24 hours a day and it could be accessed globally

2. Costly Failures

System can be dependable in any kind of situation and avoid costly failures

3. Security Requirement

There will be a password available for each registered users

5.8.5 Failure Detection, Reporting and Recovery

1. Fault Correction

System should correct the fault once detected

2. Recovery

System should respond to the presence of faults or to loss of data

3. Error Logging

Implement proper error logging

5.8.6 Service

1. Connectivity Needed

Client's PC's connected on dial-up lines or TCP/IP LAN

2. System Upgrade

The system will be upgraded when necessary

3. Maintenance of domain specific hardware

Maintenance of the hardware important to ensure continuous operation

4. System Testing

System Testing is done after upgrading is done

5. System Maintenance

System evolution is monitored by developers

5.8.7 Product Cost

1. Hardware / Software Cost

Hardware/software cost for project must support the allocated budget for the project

2. Project Development Cost

The cost of the whole project is set

5.9 Conclusion

In accordance to the methodology, Unified Modeling Language (UML) was used to design the software architecture for the Intelligent Bank Management Simulation System (IBMS). The result of the software architecture design is a set of documents and artifacts describing Web based Intelligent Bank Management System. The architecture model was chosen to design the software architecture for the Intelligent Bank Management System (IBMS) because it provides a good solution when factoring in all technical, marketing, personnel and cost issues.