

Application Development-CW1

House Hold Management System for E-Shift

GitHub Link for the System:

<https://github.com/sula92/E-Shift.git>

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INTRODUCTION

1.1 Introduction

E-Shift is a House Hold shift company that operates locally throughout Sri Lanka along with many branches in Sri Lanka. He is well known for his devotional performances for over twenty years. They provide the best customer service across the country.

The company uses Microsoft Excel to enter all data. Likewise, some data is entered into the books manually. Data redundancy, less integrity and inaccuracy, delay in decision-making due to unavailability of timely reports are the main problems they are overcoming in the company. The current system does not adequately meet their business requirements. The new system will solve these problems and achieve efficiency and effectiveness.

The solution is to use a standalone application that is developed in C# to cover administrative processes to achieve organizational goals and objectives. The newly developed system helps to perform customer management, employee management, truck management, user management, unit management, job management and product management processes and functions for managerial decision making.

The System can be logged in utilizing a Username and a Password. This can be accessed by Administrator and registered customers. Data can be retrieved easily. The interface is very user friendly. This System has been developed based on Waterfall model. C# is used as the main language. Additionally, XAMPP is selected as the database server to store data of the system.

The developed system is thoroughly tested utilizing a complete procedure and evaluated with user to determine whether the system user requirements are obtained. The system confirms to the specification whilst providing the intended functionality of enhancing efficiency and effectiveness. Main goal of this system is to smooth line the process in E-Shift.

1.2 Motivation for the Project

E-Shift is one of the famous Shifting companies in Sri Lanka. It has been on the market since 2000. However, all management activities and inventory are handled manually.

Customers and management face many difficulties in accomplishing their tasks. Therefore, he is forced to spend more time and more effort to complete such tasks. Therefore, a computer system was requested by the client to overcome these problems.

The motive to develop an window form application. Currently the Company does not have a proper automated system to manage their routine.

Currently the business is done utilizing Excell and mannual methods to handle these activities.

- ❖ Registrations
- ❖ User Management
- ❖ Employee Management
- ❖ Customer Management
- ❖ Product Management
- ❖ Unit Management
- ❖ Job Management
- ❖ Lorry Management
- ❖ Container Management

Many issues are faced by the Employees of the company during the management of the company.

Specially they faced difficulties such as

- All the information is stored in a physical document-based system
- Lack of security
- Difficulty of managing multiple customers
- Higher level of data redundancy
- Management has to handle the jobs over the phone
- Current manual system is error prone.
- Inconsistency in maintaining data.
- Difficult to manage information about customers, employees, jobs.

The objective of this project is to develop an Windows Form Application system for E-Shift and its subordinates to over come the above mentioned issuess in an easy,accurate and efficient way.

1.3 The Scope Of the Project

The primary objective of the system is to provide an effective way of analyzing company processes with minimal cost, time and human effort. The system can accurately and efficiently process the company's daily procedures by reducing the overhead caused by current performance. The administrator can maintain the system by updating, adding and viewing the data of the above entities. This system is user friendly for customers which reduces the burden and helps to manage all the sections related to them like order status view, profile information, job demand.

Scope of the system

Functionalities of Administrator

Below are the basic functionalities that the system is capable of performing.

- User Level & Access Management:
 - Only the administrator has the privilege to manage the customer and grant and revoke the access permission.
- Customer Management
 - Manage all functionalities of Customers.
 - Adding new Customers to the system and provide access to the system.
- Employee Management
 - Employees can only be managed by the administrator.
 - Manage employees and allocate them to units.
- Unit Management
 - Admin can add new units.
 - Administrator can assign employees and a lorry to a unit
 - Admin can edit the unit data
 - View unit data

➤ Lorry management

- Add, update lorries to the system
- View the Lorry Info

➤ Job management

- Admin can manage all the job requests that comes from customers side and approve or decline them.

➤ Product Management

- Upload video sessions that has been conducted before and past papers to the system. Customers who missed the lectures can watch them

Functionalities of Customer

➤ User Registration

- Once Customer/Employee registered in the system, they will get the permission to access their profile after admin gives the access.

➤ Secure Login

- Customer can login the system by providing their username and password.

➤ Request For Jobs

- Customer can request for jobs
- Customer can view requested jobs
- Customer can update product Info and cancel a requested job

➤ Manage Customer Profile

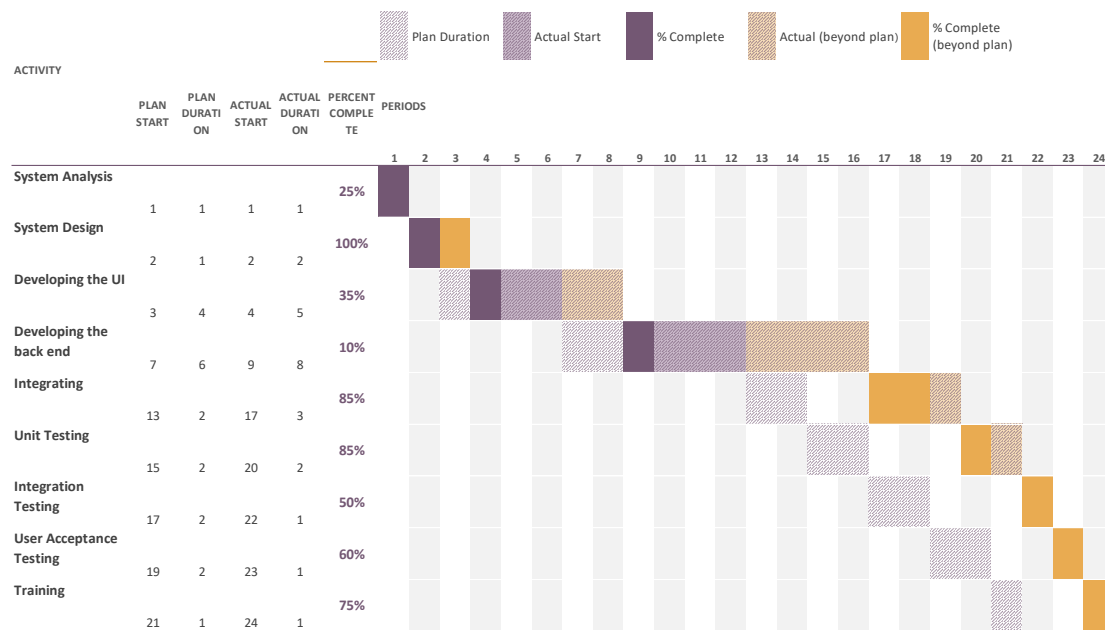
- Customer has to be able to login and manage their own profile.

1.4 Objective of the project.

- In order to Enhance the efficiency and maintainability.
- In order to Minimize the time taken to handle Registrations
- In order to Minimize the perform load of the company along with its employees.

- In order to maintain smooth cus management process by enhancing the reliability and efficiency of the company.
- In order to easily register new customers as and handle jobs

1.5.Project Plan



CHAPTER: 02 – ANALYSIS

2.1.Introduction

This chapter consists description about the functional and nonfunctional requirements. Furthermore, the techniques used In order to gather necessary information is described extendedly. Requirements gathering and analysis is the main part of the project since poor and unclear objectives will definitely lead In order to an unsuccessful results. Domain understanding, requirements gathering, classifying and prioritizing functions are the main activities carried throughout this phase [2] [3].

2.2.Fact Finding Techniques Used

2.2.1. Interviews (Employees)

Interviewed randomly selected employees in-order In order to get a clear view of the current system of company and In order to clarify doubts about the management procedures related In order to managerial level of the SIn order tore. Interviewed two employees of company In order to get an idea about the problems they face with the current running system in their company. Interview has an overall idea about the project as well as the way it has In order to look likes.

2.2.2.Observations

Some more special things could be crept up through this technique which cannot be analyzed through documentation. The process of the company was explored without interrupting their daily routine. By utilizing this fact gathering technique we could understand the difficulties they face without a proper auIn order to mated system In order to handle their tasks as well as time they waste in some situations.

2.2.3.Questionnaires

Questionnaires were used In order to gather some requirements from different employees In order to identify what they think about the current manual system of the company. It could be able In order to identify the requirements of the employees from each branch which has In order to be included in the new system.

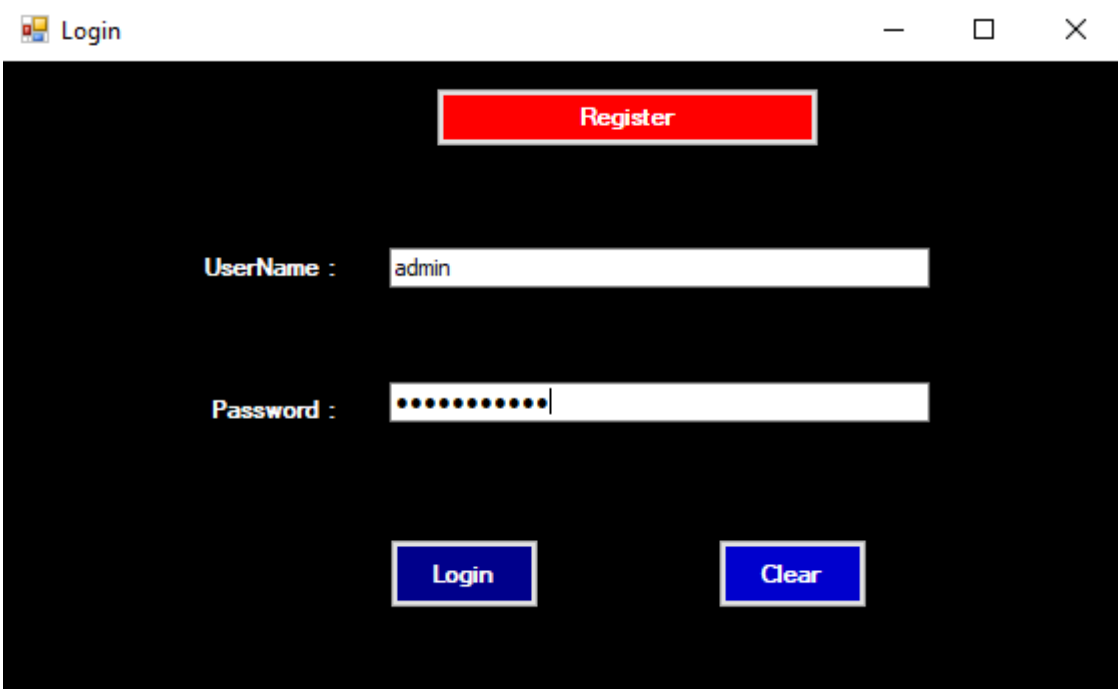
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2.4.Areas Cover through the Proposed System

2.4.1.Functional Requirements

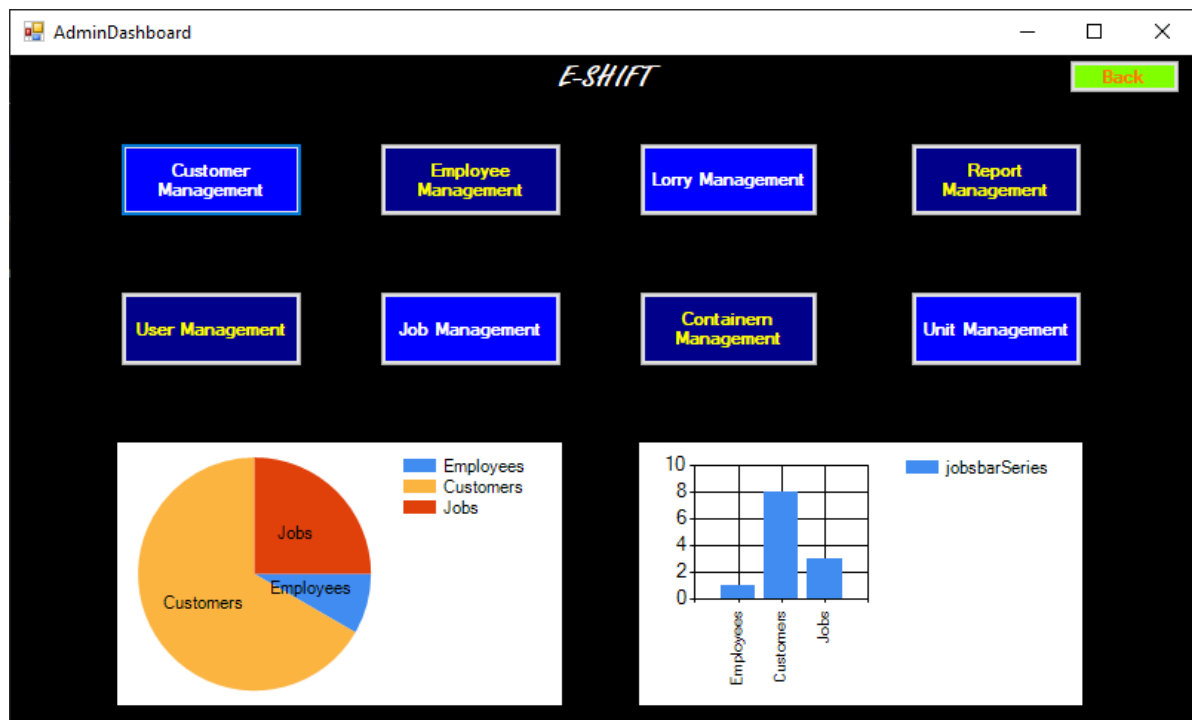
A **functional requirement** defines a function of a system or its component. A function is described as a set of inputs, the behavior, and outputs. Functional requirements may be calculations, technical data, data manipulation and processing and other specific functionality that define what a system is supposed In order to accomplish.

Guide lines for admin functionalities



The screenshot shows a 'Login' window with a dark background. At the top center is a red button labeled 'Register'. Below it are two input fields: 'UserName : admin' and 'Password : ' followed by a series of dots. At the bottom are two blue buttons: 'Login' and 'Clear'.

First you need In order to provide your username and password in order In order to login. Since you have the admin privilege you will be redirected In order to the **Admin Dashboard Page** which is being explained in next step. If you type something wrong you can click on clear. But when a customer login In order to the system he will be redirecting In order to customer Dashboard Page. For a new customer he/she has In order to be registered with the system by going In order to customer registration page. In order In order to do so customer needs In order to click on the button order ton 'Register' on the In order top and go In order to Customer Register Page.



Admin Dashboard contains the entry points in order In order to access major management areas of this system. Once user click on a particular area user will be navigated In order to the relevant form of that management area.

Cusstomer Management

Based on following image, all the customers will be shown in the table whereas the form getting loaded. Once you click on a particular row, the relevant customer would be copied In order to the text boxes and so the admin can update or delete the customers. Update and delete buttons order tons will not be enabled until the user click on a row in the table.

ManageCustomer

+Add New

Employee Mngt

User Mngt

Lorry Mngt

Job Mngt

Product Mngt

Container Mngt

Unit Mngt

ID

C007

NAME

ffjk

Contact

8888888888

EMAIL

ndn@gmail.com

ADDRESS

ldldkl

Update

Delete

Back

	id	name	contact_number	email	address
	C001	xxx	123456	sula@dd.com	ffj 05A, nfrn
	C003	kakd	9490505	kflfff	kglglg
	C004	kfkf	305873	gdhdjd	ndmmf
	C005	tyuu	8687899	gigjkl	nmknkn
	C006	jkkk	6666666666	vvv@cvb.com	jhjbjb
▶	C007	ffjk	8888888888	ndn@gmail.com	ldldkl

Employee Management

Based on following image, all the employees will be shown in the table whereas the form getting loaded. Once you click on a particular row, the selected employee would be copied In order to the text boxes and so the admin can update or delete the employee and can be assigned a job position as well. Update and delete buttons will not be enabled until the user click on a row in the table.

ManageEmployee

+AddNew

ID

EMP001

Name

xxx

Contact

1111111111

Email

msm@gmail.com

Position

Driver

Update

Delete

Back

	id	name	contact_number	email	position
▶	EMP001	xxx	1111111111	msm@gmail.com	Driver

Lorry Management

Based on following image, all the Lorries belongs In order to the company will be shown in the table whereas the form getting loaded. Once you click on a particular row, the selected lorry would be copied In order to the text boxes and so the admin can update the current status of the lorry or delete it and can. Update and delete button order tons will not be enabled until the user click on a row in the table. Once you click on the '+Add New' system will auautomatically generate a new id In order to the lorry whereas button order ton 'update' change its name In order to 'save'. So then you can save the new lorry In order to the database.

+Add New

ID

L001

Model

yyy

Status

xxx

Update

Delete

Back

	id	model	status
▶	L001	yyy	xxx
*			

Product Management

Based on following image, all the products belongs In order to a particular job id will be shown in the table whereas the form getting loaded based on the given job id in the job id text box. Once you click on a particular row, the selected product would be copied In order to the text boxes and so the admin can update the current quantity of the product or delete it. Update and delete button order tons will not be enabled until the user click on a row in the table. In order In order to add a new product +Add New has In order to be clicked and then then the system will auautomatically generate a new ID for the new entity and button Update will change its text value In order to 'Save'. So once the 'Save' button order ton is clicked new information regarding the product will be saved in the database.

	job_id	product_name	quantity
▶	J002	b b	10
	J002	nhjl	2
	J002	TV	10
	J002	xxx	6
*			

User Management

Based on following image, all the User Management functionalities are going under this form. You can add users under two roles that is 'admin' and 'customer'. Customers deserves customer privilege. Selected employees are added with the admin privilege. So you can select a customer or employee id from the drop down box and add In order to the database. Thereafter they will be able In order to access the system based on their role. Users who are having the admin privilege will be redirecting In order to the admin dashboard after login and customers In order to customer dashboard. Like in previous modules you cannot create new users here. Instead of that this form only allows you In order to add registered customers and employees as the system users.

	userId	user_name	privilege	password
▶	C001	cus	customer	cus
	EMP001	admin	admin	admin
*				

Job Management

Based on following image, all the Job are managing under this form. You can add new jobs and assign a available unit In order to the job as per customer request. In order In order to add a new job first click on the 'Add New' and system generates a new job id. Once you click on it button order ton 'update turn its name In order to 'save'. Select the job date that the job has In order to be completed through the date picker and also mention the unit id that has In order to be assigned. After clicking on the 'save' new data will be saved in the database. By selecting a row in the table, selected job data will be copied In order to the form elements and so you can edit or delete that particular job.

Managelob

+AddNew

ID

CUS_ID

Status

DATE

Saturday

July

23, 2022

UNIT ID

STARTING ADDRESS

DESTINATION ADDRESS

Update

Delete

Add Products

Filter By Customer

Back

id	date	destination_sc	starting_addre	customer_id	unit_id	status
J001	2022-07-13	fif fm	fif	C001	U001	pending
J002	7/12/2022 ...	xxxxx	xxx	C001	U001	pending
J003	7/18/2022 ...	mdmf	kvkv	C001	U001	completed

Container Management

Based on following image, all the Containers belongs In order to the company will be shown in the table whereas the form getting loaded. Once you click on a particular row, the selected container data would be copied In order to the form elements and so the admin can update the container data or delete it. Update and delete button order tons will not be enabled until the user click on a row in the table. Once you click on the '+Add New' system will auautomatically generate a new id In order to the container whereas button order ton 'update' change its name In order to 'save'. So then you can save the new container In order to the database.

ManageContainer

+Add New

ID

CON001

MaxWeight

50KG

Update

Delete

Back

	id	max_weight
▶	CON001	50KG
	CON002	67Kg
*		

Unit Management

Based on following image, all the Units that already created will be shown in the table whereas the form getting loaded. Once you click on a particular row, the selected unit data would be copied in order to the form elements and so the admin can update the unit data or delete it. Update and delete button order tons will not be enabled until the user click on a row in the table. Once you click on the '+Add New' system will auautomatically generate a new id In order to the unit whereas button order ton 'update' change its name In order to 'save'. So then you can save the new container in order to the database. This is the place that you can assign a driver and an assistant and a container In order to a particular unit.

ManageUnit

+Add New

ID

U001

Container ID

CON001

Lorry ID

L001

Driver ID

EMP001

Assistant ID

EMP002

Update

Delete

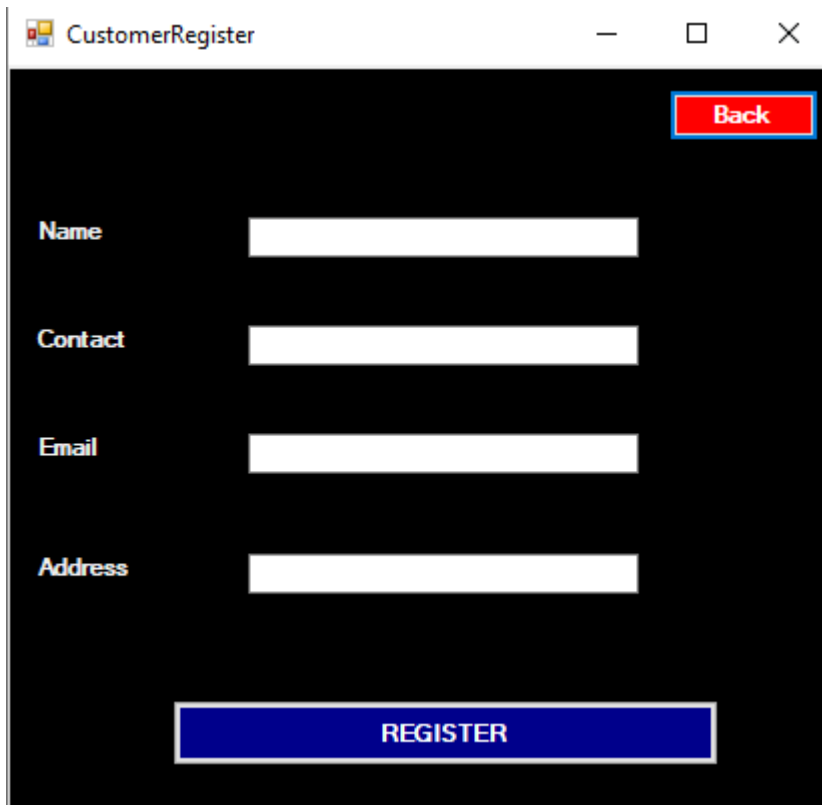
Back

	id	container_id	lorry_id	driver_id	assistant_id
▶	U001	CON001	L001	EMP001	EMP002
*					

Guide lines for Customer functionalities

Customer Registration

As mentioned in the login page, new customers has In order to be registered with the system. So customer needs In order to go In order to registration page by clicking on the register button order ton in the login page, Fill the required data and click on the register button order ton in the registration page. Once the admin approved customer as a user. Then customer will be able In order to login as customer



A screenshot of a software window titled "CustomerRegister". The window has a black background. In the top right corner, there is a red button with the text "Back". Below this, there are four white text labels: "Name", "Contact", "Email", and "Address", each followed by a white rectangular input field. At the bottom center of the window, there is a large blue button with the text "REGISTER" in white capital letters.

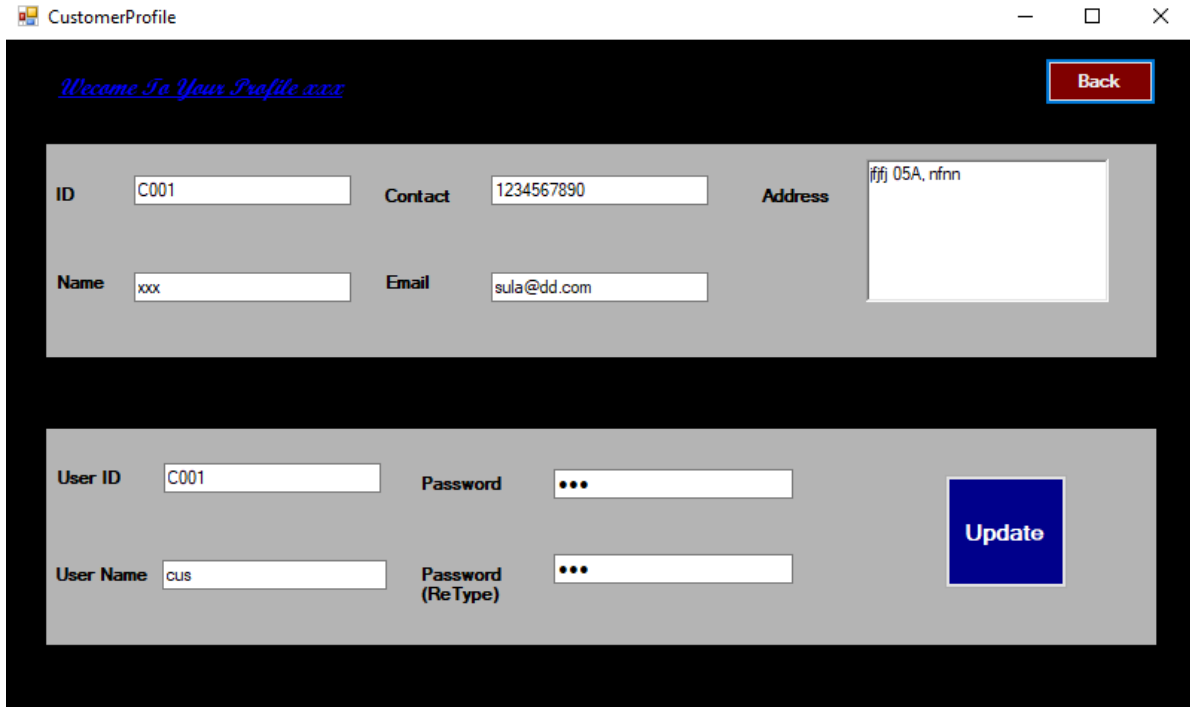
Customer Dashboard

Customer Dashboard contains the entry points in order In order to access customer profile module and request for a job module. Once logged customer click on a particular module, he/she will be navigated In order to the relevant form. The image given below provide a more clear idea.



User Profile

The image given below show the user profile form and is used In order to display and update registered customer information. This can only be accessed by customer who is the owner of the relevant profile. So he/she can display their own data and update the data just clicking on the update button order ton.



The screenshot shows a web application window titled "CustomerProfile". The window has a dark blue header bar with the text "Welcome To Your Profile xxx" in a stylized font. A red "Back" button is located in the top right corner of the header. The main content area is divided into two sections. The top section contains a form with the following fields: "ID" (C001), "Contact" (1234567890), "Address" (ffj 05A, rfn), "Name" (xxx), and "Email" (sula@dd.com). The bottom section contains a form with the following fields: "User ID" (C001), "Password" (masked with three dots), "User Name" (CUS), and "Password (ReType)" (masked with three dots). A blue "Update" button is located to the right of the bottom form.

Request For a Job

Based on following image, all the Job request from customer's side has In order to be done here. The requests that has already been created by the particular customer will be shown in the table whereas the form getting loaded. Once you click on a particular row, the selected job data would be copied In order to the form elements and so customer can update the product info or cancel it. Update and delete button order tons will not be enabled until the user click on a row in the table. Once you click on the '+Add New' system will automatically generate a new id for a new job whereas button order ton 'update' change its name In order to 'save'. So then you can save the new job In order to the database. Once the admin approve the job, the status will be updated to 'approved'.

CustomerJobRequest

ADD REQUEST

Request ID

Customer ID

Product Info

Update

Cancel

Back

	request_id	customer_id	product_inf	status
	R001	C001	assd	pending
	R002	C001	kfkf	approved
	R003	C001	dcdmnc 4, djn...	cancel

Report Management

In this module user can filter the list of jobs based on status and customer.

ReportManagement

Refresh

Back

Filter By Date

Saturday , July 23, 2022

Saturday , July 23, 2022

Filter By Customer Status

	id	date	destination_addre	starting_address	customer_id	unit_id	status
	J001	2022-07-13	fif fm	ffjf	C001	U001	pending
	J002	7/12/2022 7:1...	xxxxx	xxx	C001	U001	pending
	J003	7/18/2022 5:3...	mdmf	kvkv	C001	U001	completed

Non-Functional Requirements

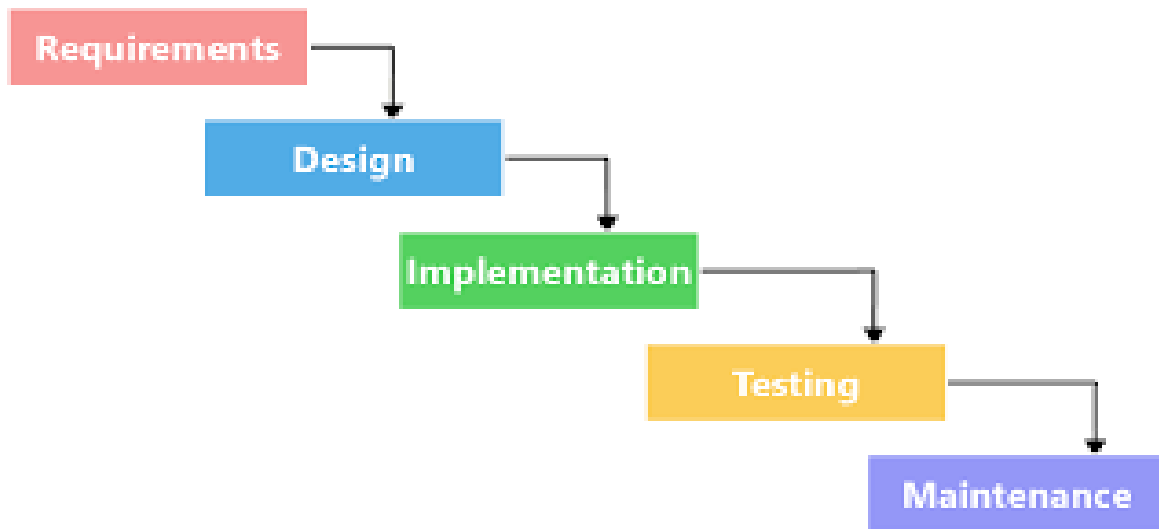
A **non-functional requirements** are the requirement that specifies criteria that can be used In order to determine the functionalities of the system. The functional requirements define specific behavior or functions whereas non-functional requirements are how those

- **Reliability** – The system has In order to perform in a reliable way that users can keep trust on the system.
- **Accuracy** – The system has In order to provide up In order to date and accurate information In order to the users who are utilizing the system.
- **Security** – The system has In order to perform based on a In order tough security mechanism that it has In order to allow only authorized person In order to log in In order to the system that a third party cannot make any changes. In this system online company management system only administraIn order tor and customers can be logged in.
- **Backup** – Since this system carries hardly gained data, it has In order to be backed up in a regular way In order to avoid unnecessary and unexpected data losses.
- **Interoperability** – The system has In order to perform greatly with other applications such as servers, databases without interfering In order to any performances.
- **User-friendliness** – The system has In order to be easily handled and understand by a novel as well as existing users. It means the learning curve of the new systems has In order to be relatively low with a complete user friendliness.
- **Availability** – The system has In order to available at any time in order In order to get relevant data and insert the information.

Selection of the Process Model

After focusing on many of general software process models it is decided In order to stick with Rational Unified Process as the main development methodology by comparing its pros and cons. Though it has been decided In order to carry on with the concepts of Waterfall methodology since the requirements are stable, clear and simple.

Waterfall model consist of five basic stages. Those are Requirement gathering, Design, Implementation, Testing and maintenance.



- **Requirements Gathering phase**

In this phase, all possible requirements of the system gathered through various methods and are captured and documented in a requirements specification document.

- **Design phase**

The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture.

- **Developing phase**

The primary objective is In order to build the software system. In this phase, the main focus is on the development of components and other features of the system. This is the phase when the bulk of the coding takes place. System was developed module by module in an orderly way.

- **Testing/Evaluation phase**

In this phase all components of the system will be tested separately based on predefined unit test cases and will be tested the system as a whole. All bugs and issues are being identified in this phase.

- **Maintenance phase**

The main objective is In order to 'transit' the system from development in order to production, making it available and understandable by the user. The activities of this phase include patch fixing releases, new version releases and training the end users and maintainens and beta testing. If all objectives are met, the Product Release reached and the development cycle is finished.

CHAPTER: DESIGN

Introduction

Design is essentially the bridge between requirements specification and the final solution for satisfying the requirements. The goal of the design process is In order to produce a model or representation of a system, which can be used later In order to build that system. The produced model is called the design of the system. The design of a system is essentially a blueprint or a plan for a solution for the system.

The approach of Object-Oriented Design which is a process of planning a system of interacting objects was used for the purpose of modeling the system. UML (Unified Modeling Language) which is a standardized general-purpose modeling language in the field of object-oriented software engineering was used In order to develop the visual diagrams of the system.

Object Oriented Analysis and Design of the System

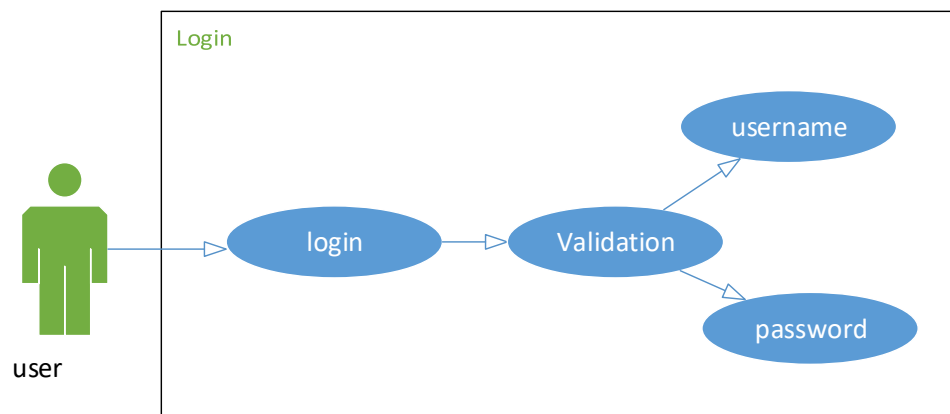
Object oriented analysis and design (OOAD) is a popular technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as utilizing visual modeling through the development lifecycles In order to faster better stakeholder communication and product quality. Based on the popular guide Unified Process. OOAD in modern software engineering is best conducted in an iterative and incremental way.

High Level Use Case Diagram for The Proposed System

The high-level use case diagram of the proposed system is given below. Use case diagram is a methodology that used in analysis In order to identify, clarify, organized requirements. This diagram illustrates set of actions collaboration with users, gathered requirements including internal, external influences and how the users will interact with proposed system .following table shows the case narrative of the login module

Use case Name	User Login
Pre- Condition	User has In order to be registered in the system
Primary	Manager (AdministraIn order tor), Customers
Main flow	<ol style="list-style-type: none">1. Use case starts when system prompts the user In order to enter User name and the password2. User enters User name and Password.3. System validates User name and Password.4. User case ends with system grants user In order to the relevant user privilege
Post conditions	3. a. System generates an error message if username and password invalid.

Use case diagram

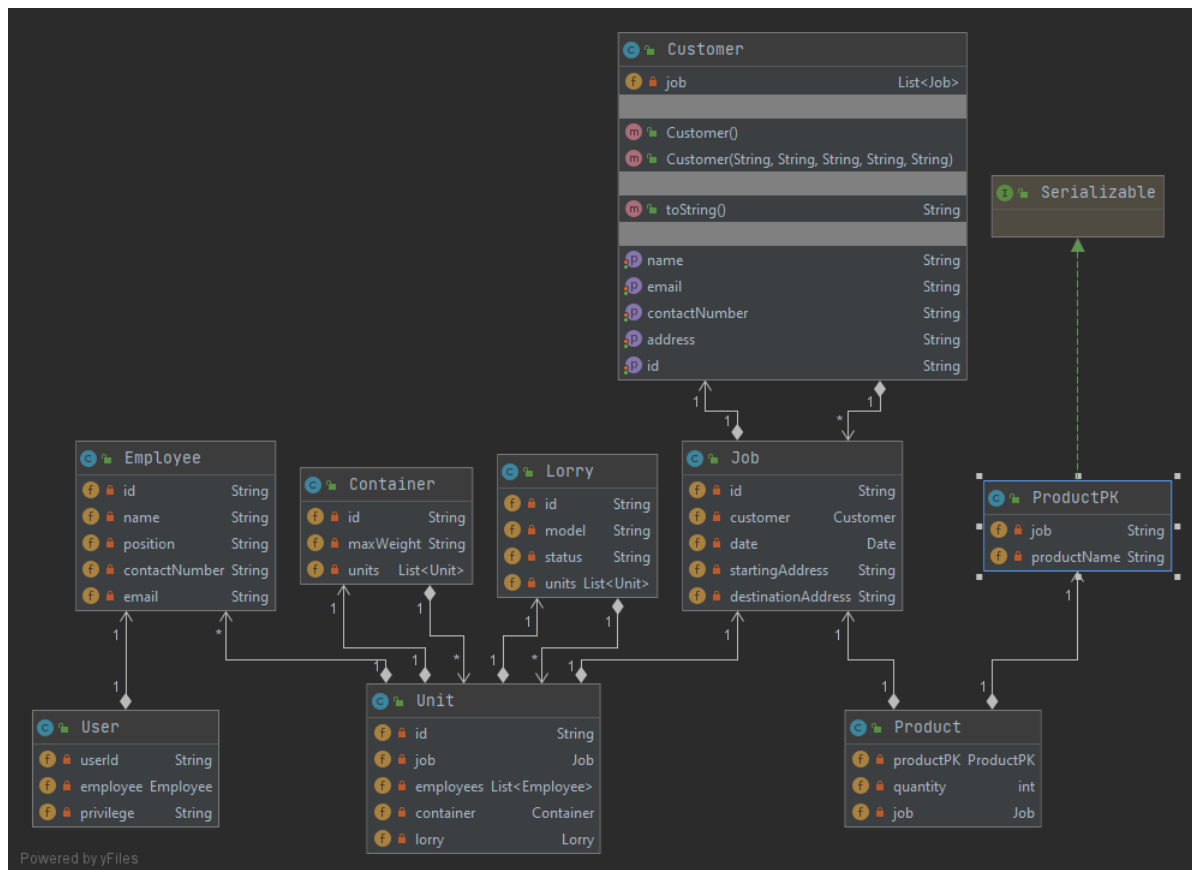


use case diagram for the login module

Class diagram

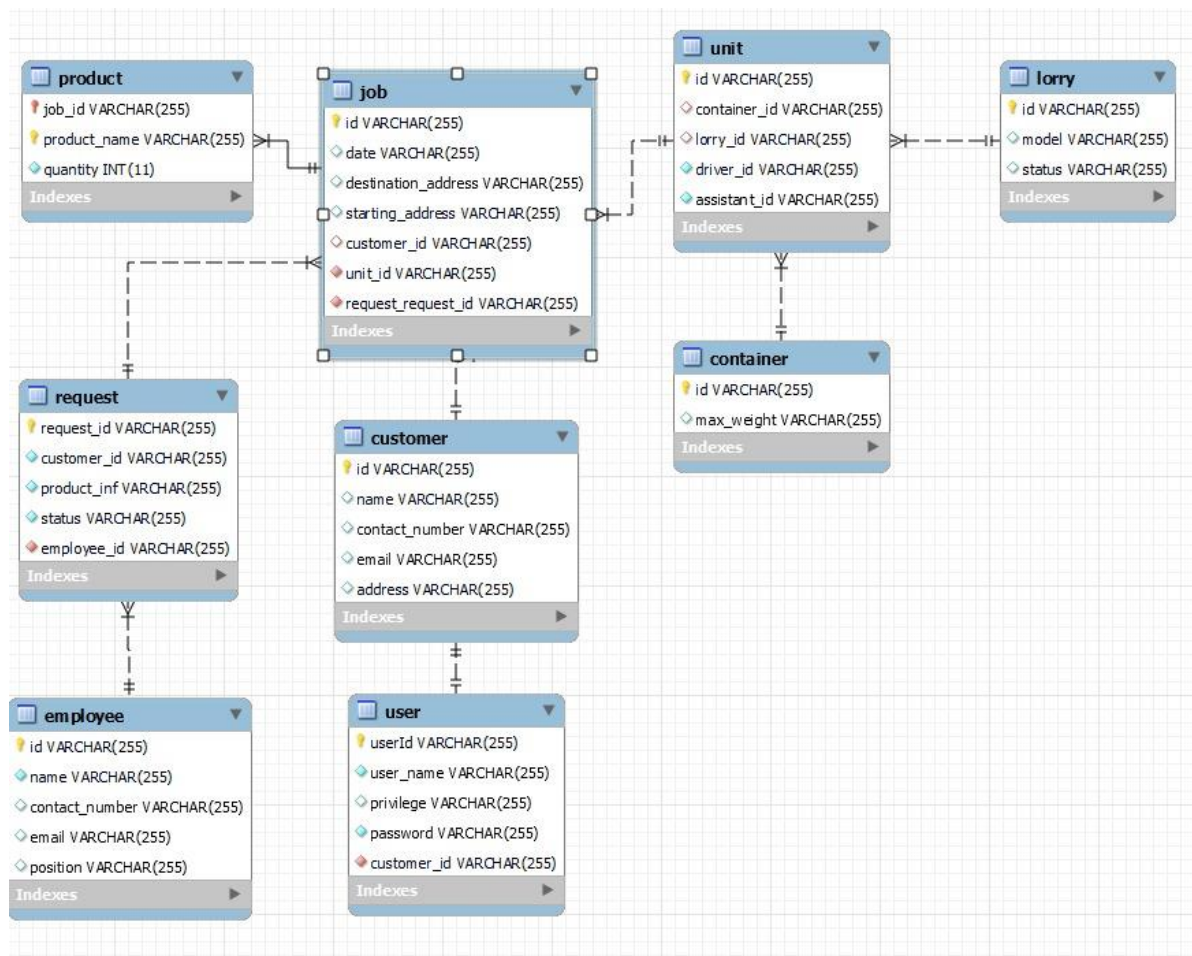
A class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects.

The class diagram is the main set up of object-oriented modelling. It is used for general conceptual modelling of the system of application. Class diagram can also be used for data modeling. The classes in a class diagram represent both the main elements, interactions in the applications, the classes In order to be programmed, class diagram for the system is illustrates in the following figure



ER Diagram

“The basic design of the database is described with the aid of an ER diagram. The entities, attributes and their relationship are clearly understands through this.figure given below.shows the ER diagram of the system.



User Interface Design

User Interface design deals with the applications and the user. Hardware devices and software applications are controlled by people utilizing interfaces. UI has the big impact on how much the users enjoy utilizing the application and how easy In order to use the application. Graphical User Interfaces (GUI) means graphical controls which make the interface attractive like windows, button order tons, In order toolbars and menu bars. GUI provides a user-friendly experience In order to user In order to interact with the software in a natural and friendly way. In the system following user interface components are used

USER INERFACE DESIGN PRINCIPLES.

- ❖ Consistency- has In order to be consistent in possible, comparable operations has In order to be activated in the same way.

- ❖ User Familiarity – use terms and concepts from the experience of people who use the system. Currently developing system is user friendly, anyone can handle without the technical knowledge.
- ❖ User guidance – the interfaces has In order to provide meaningful feedback errors occur and provide help facility In order to solve out that.
- ❖ User diversity – the interface has In order to provide appropriate interaction facility for the different types of users who is interactive with the system.
- ❖ Minimal surprise – users has In order to not be surprised by the behavior of the system. System has In order to be adaptable In order to the users.
- ❖ Recoverability – the interfaces has In order to contain mechanisms In order to allow users In order to recover errors in a good way.

Following design rules were used in designing the system. They are listed below.

- Eye friendly colors were used when developing the home page and menu bars of the online company management system.
- After delete, update, saving a record system has In order to show successful messages as well as if anything saved without entering accurate data system has In order to pop up with and alert message as In order to fill up.
- In order to increase the effectiveness of the system keyboard shortcuts are used instead of mouse click.
- Meaningful names and texts are used for labels, forms and button order tons.

Coding

This system has been developed utilizing C#.Net which is an Object Oriented language with the help of Visual Studio 2017 edition. Below is the overview of C#.Net and Object Oriented Paradigm

Characteristics and features of c#.net

- C# is a object oriented programming language, which derived from c++ and JAVA and can be maintained very easily.

- .net includes a common execution engine interface and a rich class library.
- The classes and data types are common in order to all the .net languages.
- Can develop console applications, windows forms applications and web applications also utilizing c#
- It support garbage collection, automatic memory management and a and many more

SIMPLE

- Pointers are missing in C#.
- Risky operations like direct memory manipulation are not allowed.
- In C# there is no usage of "::" or "->" operators.
- Since it's on .NET, it inherits the features of automatic memory management and garbage collection.
- Varying ranges of the primitive types like Integer, Floats etc.
- Integer values of 0 and 1 are no longer accepted as Boolean values. Boolean values are pure true or false values in C# so no more errors of "="operator and "=="opera order tor.
- "==" is used for comparison operation and "=" is used for assignment operation.

MODERN

- C# is based on the current trend and is very powerful and simple for building interoperable, scalable, robust applications.
- C# includes built in support In order to turn any component in order to a web service that can be invoked over the internet from any application running on any platform.

OBJECT ORIENTED

- C# supports Data Encapsulation, inheritance, polymorphism, interfaces.
- (int, float, double) are not objects in java but C# has introduces structures(structs) which enable the primitive types In order to become objects.
- `int i=1;`
`string a=i In order tostring(); //conversion (or) Boxing`

TYPE SAFE

- In C# we cannot perform unsafe casts like convert double in order to a Boolean.
- Value types (primitive types) are initialized In order to zeroes and reference types (objects and classes) are initialized In order to null by the compiler in order automatically.
- Arrays are zero base indexed and are bound checked.
- Overflow of types can be checked.

INTEROPERABILITY

- C# includes native support for the COM and windows based applications.
- Allowing In order toughed use of native pointers.
- Users no longer have In order to explicitly implement the unknown and other COM interfaces, those features are built in.
- C# allows the users In order to use pointers as unsafe code blocks In order to manipulate your old code.
- Components from VB NET and other managed code languages and directly be used in C#.

SCALABLE AND UPDATEABLE

- .NET has introduced assemblies which are self-describing by means of their manifest. Manifest establishes the assembly identity, version, culture and digital signature etc. Assemblies need not In order to be register .
- In order to scale our application we delete the old files and updating them with new ones. No registering of dynamic linking library.
- Updating software components is an error prone task. Revisions made In order to the code. can affect the existing program C# support versioning in the language. Native support for interfaces and method overriding enable complex frame performs In order to be developed and evolved over time.

(G Ganana Arun Ganes,(June 09, 2001))

An object oriented programming language

What Is an Object?

An object is a software bundle of related state and behavior. Software objects are often used in order to model the real-world objects that you find in everyday life. This lesson explains how state and behavior are represented within an object, introduces the concept of data encapsulation, and explains the benefits of designing your software in this way.

(Author n/a,(n/d))

1. Abstraction

Abstraction is a process of exposing essential feature of an entity while hiding other irrelevant detail. Why would you want to use abstraction?

abstraction reduces code complexity and at the same time it makes your aesthetically pleasant.

2. Encapsulation

In order to take in consideration that Encapsulation is somehow related to Data Hiding.

Encapsulation is when you hide your modules internal data and all other implementation data/mechanism from other modules.

it is also a way of restricting access to certain properties or component.

Remember, Encapsulation is not data hiding, but Encapsulation leads to data hiding

3. Inheritance

The ability of creating a new class from an existing class.

Like the word Inheritance literally means it is a practice of passing on property, titles, debts, rights and obligations upon the death of an individual. in OOP this is somehow true(Except the death of an individual) , that The base class(the existing class sometimes called as the Parent class) has properties and methods that will be

inherited by the sub class (sometimes called a subtype or child class) and *it can have additional properties or methods*.

Inheritance is also a way In order to use code of an existing objects.

4. Polymorphism

Just like in biology, Polymorphism refers In order to the ability In order to take inIn order to different forms or stages.A subclass can define its own unique behaviour and still share the same functionalities or behavior of its parent/base class.Yes, you got it right, subclass can have their own behavior and share some behaviour from its parent class BUT!! not vice versa. A parent class cannot have the behavior of its subclass.

(Kyeldavid, September 02, 2012)

IMPLEMENTATION

Introduction

After successful completion of design phase, Implementation phase is carried out based on what the design stage planed by utilizing appropriate tools and techniques. This is a very important stage on a Software development life cycle. The output of this stage is effective executable system. The major code segments, tools and techniques used In order to implement the system in the implementation environment are mainly focused in this chapter.

Implemented Environment

This has two major categories, Hardware and Software environments are mentioned here. Following table tells what a computer is required In order to have in the hardware aspect as well as software aspect.

HARDWARE ENVIRONMENT	SOFTWARE ENVIRONMENT
Intel (R) Pentium (TM)4@CPU 3.0GHz	MS Window 10

4GB RAM	C#.Net
160GB HDD	MYSQL Server

Justification for the choice of Implementation platform.

Microsoft Windows was used as the O/S to develop the system. This can be found in mainstream computer organizations other than MacOS, Linux or Ubuntu. It doesn't take a good IT expert to master this kind of platform. The company that was selected does not have more employees, and the employees currently working there are not very knowledgeable in the field of information technology. So, a commonly easy-to-use platform was used to create this system.

EVALUATION

Introduction

“The process of developing a software product using the principles and methods of software engineering is called software evaluation. This includes the initial development of the software, its maintenance and updates until the desired software product is developed that meets the expected requirements.

The quality and reliability of the system is another key aspect of the success of the web system. The following types of testing were used to test the system. The quality and reliability of the system is another key aspect of the success of the web system. The following types of testing were used to test the system.

- Unit Testing
- Integration Testing
- System Testing
- User acceptance testing
- White-box Testing
- Black-box testing

Unit Testing

This is done for individual units. Unit testing is a software development process in which the smallest testable parts of an application, called units, are individually and independently checked to ensure that they work correctly. Unit testing can be done manually

Unit testing finds defects in every single unit of the application at the initial level of testing. This window based system is developed step by step by testing every n every code. Unit tests increase quality and reliability.

Integration Testing

Integration testing is performed after separate software modules and unit testing. This is based on the functional specification of the system. Integration testing is a phase of software testing in which individual software modules are combined and tested as a group. Occurs after unit testing and before verification testing. Integration testing takes as input modules that have been unit tested and groups them into larger aggregates, applies the tests defined in the

integration test plan to these aggregates, and delivers an integrated system ready for system testing as output.

Web systems each module is tested step by step after performing a unit test. Individual software modules are combined and tested as groups. An integration test is performed to evaluate the system's compliance with specific functional requirements.

System Testing

The purpose of system testing is In order to prove that the software meets the agreed user requirements and performs in the target environment and covers both functional and nonfunctional requirements. System testing of software or hardware testing is conducted on a complete, integrated system In order to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black box testing, has In order to require no knowledge of the inner design of the code or logic.

After completing module testing, system is tested fully by considering its functionalities. The purpose of this test is In order to evaluate the end-In order to-end system specifications.

User acceptance testing.

The purpose of system testing is to demonstrate that the software meets the agreed user requirements and works in the target environment, covering both functional and non-functional requirements. Software or hardware system testing is performed on a complete integrated system to evaluate whether the system conforms to specified requirements. System testing falls in black boxes within testing so that it requires no knowledge of internal code design or logic.

After the module testing is completed, the system is fully tested by considering its functions. The purpose of this test is to evaluate the end-to-end system specifications.

Regression Testing

Regression testing is the process of testing changes to computer programs to make sure that older programming still works with new changes. Regression testing is a common part of the program development process and is performed by code testing specialists in large companies. Test department coders develop code test scenarios and exercises that will test units of code after they have been written.

.Whitebox testing

WBT is detailed investigation of internal logic and structure of the code base. It's also known as the glass box testing or open box testing. In order to process WBT on an application, tester needs In order to verify the internal process of the code.

Black box testing.

BBT is a way of testing while having any knowledge of the internal performing of the application is called black box testing

System test plan.

A system test plan ensures that there is a list of tasks and objectives at the beginning so that the progress of the project can be tracked. "A document describing the scope, approach, resources, and schedule of intended testing activities. Identifies, among other things, the test items, the function to be tested, the test tasks, who will perform each task, the degree of independence of the testers, the test environment, the test design technique and the input and output criteria to be used and the rationale for their selection, potential risks requiring crisis planning. It is a record of the test planning process

System test cases.

A test case is a set of conditions or variables under which a tester will decide whether a system under test satisfies requirements or perform accurately. Test cases include the test case title, inputs, expected results and the priority. The process of developing test cases can also help In order to find problems in the requirements or designs of a software

Test Number	Test Description	Test procedure	Expected Result
Common Functionalities			
01	Login to the system(negative)	Enter an invalid username and password.	Showing a message "Access Denied"
02	Login to the system (empty user name)	Click login button without entering user name.	Showing a message "Access Denied"
03	Login to the system (empty password)	Click login button without entering password	Showing a message "Access Denied"

04	Login to the system (Positive)	Enter valid user name and password.	User will redirect to the dashboard.
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Customer Management Form

	TEST CASE	EXPECTED RESULT	STATUS
1.	Fill all the data and click to add button	New customer will be added	✓
2	No fill and click to add customer	Showing an Error Message	✓
3	Click add customer without adding customer name	Showing an Error Message	✓
4	Click add customer without adding address	Showing an Error Message	✓
5	Click add customer without adding contact	Showing an Error Message	✓

	TEST CASE	EXPECTED RESULT	STATUS
1.	Type the customer's name in search bar	Customer details will be showed	✓
3	Click delete button to delete a particular customer	Customer will be deleted	✓
4	Click edit button to edit the details of the customers	Customer will be updated	✓

	TEST CASE	EXPECTED RESULT	STATUS
1.	Fill all the data and click to add button	New employee will be added	✓

2	No fill and click to save employee	Shows an Error Message	✓
3	Click save without adding staff index	Shows an Error Message	✓
4	Click save without adding name	Shows an Error Message	✓
5	Click save without adding address	Shows an Error Message	✓
6	Click save without adding contact proper contact	Shows an Error Message	✓
7	Click save without adding branch	Shows an Error Message	✓

References / Bibliography

- W3Schools Inc. (2022). C# Tutorial
Available From : <https://www.w3schools.com/cs/index.php>
[Accessed 2nd of July 2022]
- OnlineITtuts. (2022). Windows Form Application C# Tutorial for Beginners
Available From <https://www.youtube.com/watch?v=zfz49gjnjcY> [accessed 2nd of July 2022]