Higher Nationals

Internal verification of assessment decisions – BTEC (RQF)

INTERNAL VERIFICATION – ASSESSMENT DECISIONS			
Programme title	**BTEC HND in Computing**		
Assessor		**Internal Verifier**	
Unit(s)	**Unit 04: Database Design & Development**		
Assignment title	**Database Solution for Polly Pipe**		
Student's name	K M G M B ALAHAKOON		
List which assessment criteria the Assessor has awarded.	**Pass**	**Merit**	**Distinction**

INTERNAL VERIFIER CHECKLIST		
Do the assessment criteria awarded match those shown in the assignment brief?	Y/N	
Is the Pass/Merit/Distinction grade awarded justified by the assessor's comments on the student work?	Y/N	
Has the work been assessed accurately?	Y/N	
Is the feedback to the student: Give details: • Constructive? • Linked to relevant assessment criteria? • Identifying opportunities for improved performance? • Agreeing actions?	Y/N Y/N Y/N Y/N	
Does the assessment decision need	Y/N	

amending?			
Assessor signature		**Date**	
Internal Verifier signature		**Date**	
Programme Leader signature (if required)		**Date**	

Confirm action completed			
Remedial action taken Give details:			
Assessor signature		**Date**	
Internal Verifier signature		**Date**	
Programme Leader signature (if required)		**Date**	

Higher Nationals - Summative Assignment Feedback Form

Student Name/ID	K M G M B Alahakoon		
Unit Title	**Unit 04: Database Design & Development**		
Assignment Number	**1**	**Assessor**	
Submission Date		**Date Received 1st submission**	
Re-submission Date		**Date Received 2nd submission**	

Assessor Feedback:

LO1 Use an appropriate design tool to design a relational database system for a substantial problem

Pass, Merit & Distinction P1 ☐ **M1** ☐ D1 ☐

Descripts

LO2 Develop a fully functional relational database system, based on an existing system design

Pass, Merit & Distinction P2 ☐ **P3** ☐ **M2** ☐ **M3** ☐ **D2** ☐

Descripts

LO3 Test the system against user and system requirements.

Pass, Merit & Distinction P4 ☐ **M4** ☐ **D2** ☐

Descripts

LO4 Produce technical and user documentation.

Pass, Merit & Distinction P5 ☐ **M5** ☐ **D3** ☐

Descripts

Grade:	**Assessor Signature:**	**Date:**
Resubmission Feedback:		
Grade:	**Assessor Signature:**	**Date:**

Internal Verifier's Comments:
Signature & Date:

* Please note that grade decisions are provisional. They are only confirmed once internal and external moderation has taken place and grades decisions have been agreed at the assessment board.

Assignment Feedback

Formative Feedback: Assessor to Student
Action Plan
Summative feedback

Feedback: Student to Assessor			
Assessor signature		**Date**	
Student signature	**mayuraalahakoon@gmail.com**	**Date**	24-04-2022

Pearson Higher Nationals in

Computing

Unit 04: Database Design & Development

Assignment 01

General Guidelines

1. A Cover page or title page – You should always attach a title page to your assignment. Use previous page as your cover sheet and make sure all the details are accurately filled.
2. Attach this brief as the first section of your assignment.
3. All the assignments should be prepared using a word processing software.
4. All the assignments should be printed on A4 sized papers. Use single side printing.
5. Allow 1" for top, bottom , right margins and 1.25" for the left margin of each page.

Word Processing Rules

1. The font size should be **12** point, and should be in the style of **Time New Roman**.
2. **Use 1.5 line spacing**. Left justify all paragraphs.
3. Ensure that all the headings are consistent in terms of the font size and font style.
4. Use **footer function in the word processor to insert Your Name, Subject, Assignment No, and Page Number on each pag**e. This is useful if individual sheets become detached for any reason.
5. Use word processing application spell check and grammar check function to help editing your assignment.

Important Points:

1. It is strictly prohibited to use textboxes to add texts in the assignments, except for the compulsory information. eg: Figures, tables of comparison etc. Adding text boxes in the body except for the before mentioned compulsory information will result in rejection of your work.
2. Carefully check the hand in date and the instructions given in the assignment. Late submissions will not be accepted.
3. Ensure that you give yourself enough time to complete the assignment by the due date.
4. Excuses of any nature will not be accepted for failure to hand in the work on time.
5. You must take responsibility for managing your own time effectively.

6. If you are unable to hand in your assignment on time and have valid reasons such as illness, you may apply (in writing) for an extension.
7. Failure to achieve at least PASS criteria will result in a REFERRAL grade .
8. Non-submission of work without valid reasons will lead to an automatic RE FERRAL. You will then be asked to complete an alternative assignment.
9. If you use other people's work or ideas in your assignment, reference them properly using HARVARD referencing system to avoid plagiarism. You have to provide both in-text citation and a reference list.
10. If you are proven to be guilty of plagiarism or any academic misconduct, your grade could be reduced to A REFERRAL or at worst you could be expelled from the course

Student Declaration

I hereby, declare that I know what plagiarism entails, namely to use another's work and to present it as my own without attributing the sources in the correct form. I further understand what it means to copy another's work.

1. I know that plagiarism is a punishable offence because it constitutes theft.
2. I understand the plagiarism and copying policy of Edexcel UK.
3. I know what the consequences will be if I plagiarise or copy another's work in any of the assignments for this program.
4. I declare therefore that all work presented by me for every aspect of my program, will be my own, and where I have made use of another's work, I will attribute the source in the correct way.
5. I acknowledge that the attachment of this document signed or not, constitutes a binding agreement between myself and Pearson, UK.
6. I understand that my assignment will not be considered as submitted if this document is not attached to the assignment.

mayuraalahakoon@gmail.com	**30-04-2022**
Student's Signature:	**Date:**
(*Provide E-mail ID*)	**(*Provide Submission Date*)**

Higher National Diploma in Computing

Assignment Brief

Student Name /ID Number	K M G M B ALAHAKOON
Unit Number and Title	**Unit 4: Database Design & Development**
Academic Year	2021/22Database
Unit Tutor	Mrs. Ishani
Assignment Title	**Data base system for Polly Pipe**
Issue Date	
Submission Date	
IV Name & Date	

Submission format
Part 1: The submission should be in the form of an individual written report written in a concise, formal business style using single spacing and font size 12. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using Harvard referencing system. Please also provide in-text citation and bibliography using Harvard referencing system. The recommended word limit is 3,000–3,500 words, although you will not be penalised for exceeding the total word limit. Part 2: The submission should be in the form of a fully functional relational database system demonstrated to the Tutor; and an individual written report (please see details in Part 1 above). Part 3: The submission should be in the form of a witness statement of the testing completed by the Tutor; technical documentation; and a written report (please see details in Part 1 above).
Unit Learning Outcomes:

	LO1 Use an appropriate design tool to design a relational database system for a substantial problem. LO2 Develop a fully functional relational database system, based on an existing system design. LO3 Test the system against user and system requirements. LO4 Produce technical and user documentation.
	Assignment Brief and Guidance:

Assignment brief

Polly Pipe is a water sports provider and installer based in Braintree, England. They need you to design and implement a database that meets the data requirements. These necessities are defined in this scenario and below are samples of the paper records that the Polly Pipe preserves.

Polly Pipe is focused in placing aquariums at business customers. Customers can request several installations, but each installation is tailor-made for a specific customer. Facilities are classified by type. One or more employees are assigned to each facility. Because these facilities are often very large, they can include carpenters and masons as well as water installers. The facilities use equipment such as aquariums, air pumps and thermostats. There can be multiple computers in a facility.

Below are examples of paper records that Polly Pipe currently maintains.

Staff Management Record

Staff Number	Name	Type
SHA1	Dave Clark	Plumber
SHA8	John Smith	Installation Manager
SHA2	Freddy Davies	Aquatics installer
SHA11	McCloud	Aquatics installer
SHA23	Satpal Singh	Plumber
SHA66	Winstn Kodogo	Aquatics installer
SHA55	Alison Smith	Brick Layer

Equipment Type Table

Type	**Equipment**
Tanks	20 gallon tank, 50 gallon tank, 100 gallon tank, 200 gallon tank
Thermostats	Standard, Super
Air Pumps	Standard, Super

Filters	Air driven, Undergravel

Installation ID	Installation Type	Installation Name and Address	Customer	Equipment	Types of Staff Required	Period of Staff assignment

234	Freshwater Tropical	Oak House, 17 Wroxton Road, Hertfordshire, H5 667	Lee A. sun	2 air pumps 200 gallons fish tank 1 x standard thermostat	1 x Carpenter 1 x Aquatics installer 1 x Electrician	From 1st September 2012
654	Freshwater Cold	Bayliss House, Orange Street, Kent, K7 988	Sally Dench	2 air pumps 200 gallons fish tank Large Gravel Bag 2 x standard thermostats	5 x Carpenters 1 x Installation Manager 1 x Aquatics installer 1 x Plumber 3 x Labourers	1st June 2005 – 1st June 2011
767	Marine	Eaglestone Castle, Eaglestone, Kent	Perry Vanderrune	2 x 200 gallons fish tanks 500 Wood panels	10 x Carpenters 2 x Installation Manager 1 x Aquatics installer 1 x Plumber 3 x Labourers	From 30th June 2012
943	Marine	23 Sackville Street, Wilts. W55	Eric Mackintosh	2 air pumps 200 gallons fish tank 1 x standard	No staff required	

				thermostat		
157	Freshwater Tropical	Humbertson Castle, Kent, K8	Perry Vanderrune	2 air pumps 400 gallons fish tank 3 x standard thermostat	1 x Aquatics installer	1st September 2005 – 1st September 2012

Instillation Management Form

Activity 1

1.1. Identify the user and system requirements to design a database for the above scenario and design a relational database system using conceptual design (ER Model) by including identifiers (primary Key) of entities and cardinalities, participations of relationships. Convert the ER Model into logical database design using relational database model including primary keys foreign keys and referential Integrities. It should contain at least five interrelated tables. Check whether the provided logical design is normalised. If not, normalize the database by removing the anomalies.

(Note:-It is allowed to have your own assumptions and related attributes within the scope of the case study given)

1.2. Design set of simple interfaces to input and output for the above scenario using Wireframe or any interface-designing tool. Evaluate the effectiveness of the given design (ERD and Logical design) in terms of the identified user and system requirements .

Activity 2

Activity 2.1

a. Develop a relational database system according to the ER diagram you have created (Use SQL DDL statements). Provide evidence of the use of a suitable IDE to create a simple interface to insert, update and delete data in the database.

Implement proper security mechanisms in the developed database.

Evaluate the database solution developed and its effectiveness with relevant to the user and system requirements identified, system security mechanisms (EX: - User groups, access permissions) and the maintenance of the database.

Activity 2.2

a. Explain the usage of DML with below mentioned queries by giving at least one single example per each case from the developed database. Assess the usage of the below SQL statements with the examples from the developed database to prove that the data extracted through them are meaningful and relevant to the given scenario.

Select/ Where / Update / Between / In / Group by / Order by / Having

Activity 3

Activity 3.1

Provide a suitable test plan to test the system against user and system requirements. provide relevant test cases for the database you have implemented. Assess how the selected test data can be used to improve the effectiveness of testing.

Note:- Learner needs to give expected results in a tabular format and screenshots of the actual results with the conclusion

Activity 3.2

Get independent feedback on your database solution from the non-technical users and some developers (use surveys, questioners, interviews or any other feedback collecting method) and make recommendations and suggestions for improvements in a separate conclusion/recommendations section.

Activity 4

Produce a technical documentation and a user guide for the developed database system. Suitable diagrams diagrams (Use case diagram, class diagram, flow charts, DFD level 0 and

	1) should be included in the technical documentation to show data movement in the system. Assess the developed database by suggesting future enhancements to ensure the effectiveness of the system.

Grading Criteria	Achieved	Feedback
LO1 Use an appropriate design tool to design a relational database system for a substantial problem		
P1 Design a relational database system using appropriate design tools and techniques, containing at least four interrelated tables, with clear statements of user and system requirements.		
M1 Produce a comprehensive design for a fully functional system that includes interface and output designs, data validations and data normalization.		
D1 Evaluate the effectiveness of the design in relation to user and system requirements.		

LO2 Develop a fully functional relational database system, based on an existing system design		
P2 Develop the database system with evidence of user interface, output, and data validations, and querying across multiple tables.		
P3 Implement a query language into the relational database system		
M2 Implement a fully functional database system that includes system security and database maintenance.		
M3 Assess whether meaningful data has been extracted using query tools to produce appropriate management information.		

LO3 Test the systems against user and system requirements		
P4 Test the system against user and system requirements.		
M4 Assess the effectiveness of the testing, including an explanation of the choice of test data used.		
LO2 & LO3 **D2** Evaluate the effectiveness of the database solution in relation to user and system requirements, and suggest improvements.		
LO4 Produce technical and user documentation		
P5 Produce technical and user documentation.		
M5 Produce technical and user documentation for a fully functional system, including diagrams showing movement of data through the system, and flowcharts describing how the system works.		
D3 Evaluate the database in terms of improvements needed to ensure the continued effectiveness of the system.		

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Acknowledgments

I would like to express my gratitude to Mis. Ishani for her guidance and extreme patience in supervising this thesis. I am indebted to my parents and my sister for their continued support both financially and spiritually throughout my academic year.

Activity 1.1

1.1.0 Requirements of Polly Pipe System

Requirements are functionally expected by the user from the whole system.

There are three types of requirements.

1. Business Requirements
2. User Requirements
3. System Requirements

1.1.1 Business Requirements

These include a high-level statement of goals, objectives, and needs. Business requirements do not include any details or specific features. They just state the problem and the business objective to be achieved such as increased revenue/ throughput/ customer each, reduced expenses/ errors, improved customer service, etc. (altexsoft, 2022)

1.1.2 User Requirements

User requirements often referred to as user needs, describe what the user does with the system, such as what activities that user must be able to perform. User requirements are generally documented in User Requirements Documents (URD) using narrative text. (Parker, 2012)

User requirements in Polly Pipe

I. Inserting, Updating, Deleting, Uploading all the details into the system
II. Calculation of payments
III. Printing all the payments details
IV. Managing all the staff details
V. Analysing all the details
VI. Monitoring the system

1.1.3 System Requirements

System requirements describe specific characteristics that a product must have to meet the needs of the users and the business itself. (altexsoft, 2022)

System requirements can divide into two categories. There are,

1. Software requirements – There are two types of software requirements.
    I. Functional requirements- This defines what a product must do, and what its features and functions are.

    Functional requirements in Polly Pipe system.

    - A user must have to inserting, updating, and deleting all the details into the database
    - The system must have to GUI
    - A user must have done the authentication process
    - A user must have to do calculations (payments, salaries, etc…)
    - A user must have to manage all the staff and company details
    - A user should be able to check the installing process status
    - A user should be able to get a print outing

    II. Non-functional requirements – This defines the general properties of a system.

    - Accessibility
    - Security
    - Availability
    - Backup and restore
    - Compatibility of software, tools, standards, platform, database
    - Efficiency
    - Supportability

2. Hardware requirements – These are the requirements of a hardware device. Hardware requirements in Polly Pipe system.

Operating System	Windows 10 or any Linux Distributions (E.g., Ubuntu)
CPU	Intel or AMD processor with 64-bit support; Recommended: 2.8 GHz or faster processor
RAM	Minimum 4GB Ram Maximum 8 GB Ram
Monitor Resolution	1920x1080
GPU	Intel, Nvidia, or AMD; Recommend Intel(R) UHD Graphics 620 or up
Disk Storage	60 GB of free disk space
Internet	Wi-Fi or wired (Fiber cables etc.)

1.1.2 Entity Relationship Diagram

This is a type of flowchart that illustrates how “entities” such as people, objects, or concepts relate to each other within a system. ER Diagrams are most often used to design or debug relational databases in the fields of software engineering, business information systems, education, and research. (Lucidchart, 2022)

1.1.3 ER Diagram for Polly Pipe system

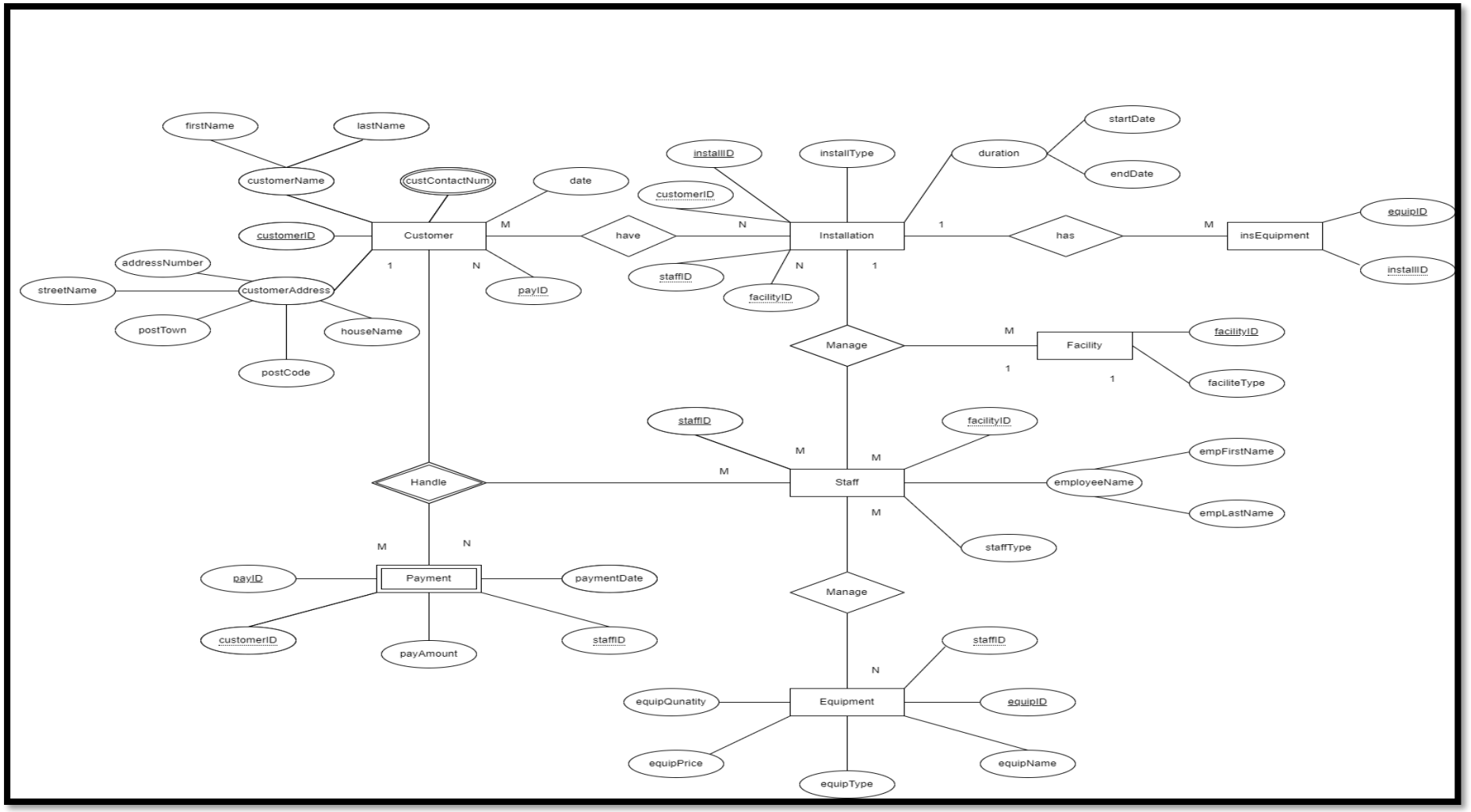


Figure 1 ER Diagram

1.1.4 Logical Relational Schema

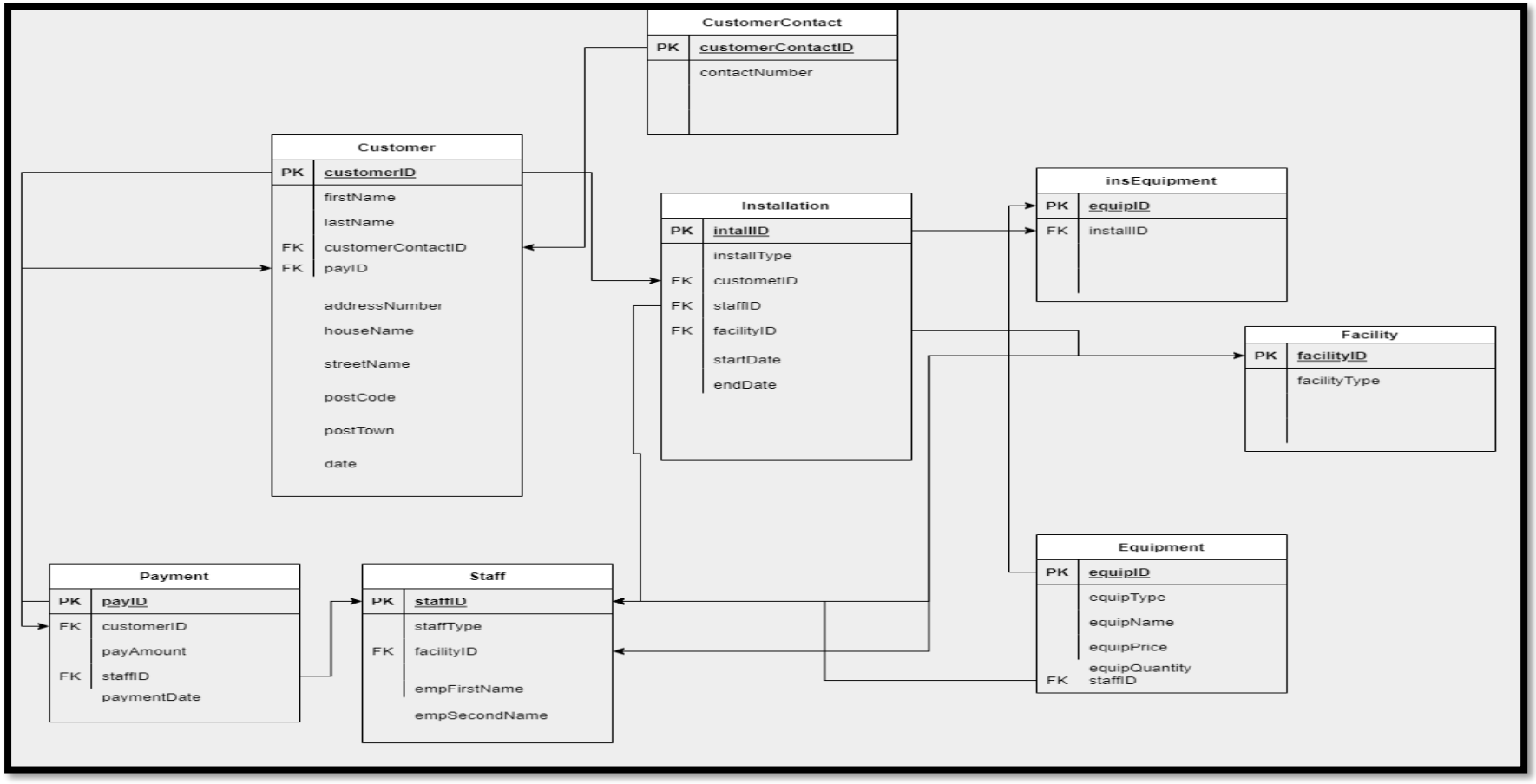


Figure2LogicalRelationalSchema

1.1.5 Data Dictionary

A Data Dictionary is a collection of names, definitions, and attributes about data elements that are being used or captured in a database, information system, or part of a research project. It describes the meanings and purposes of data elements within the context of a project and provides guidance on interpretation, accepted meanings, and representation. A Data Dictionary also provides metadata about data elements. (MERCED, 2022)

1. Data Dictionary of the Customer table

Name	Type	Length	Constraint	Description
firstName	Varchar	20	Not null	First name of customer
lastName	Varchar	20	Not null	Last name of customer
customerID	int	10	Not null	Unique number ID for all customers
addressNumber	int	10	null	Home address number of customers
houseName	Varchar	10	null	House name of customer
streetName	Varchar	10	null	The street name of customer
postTown	Varchar	10	null	Post town of customer
postCode	Varchar	10	null	Post code of customer

date	date	dd/mm/yyyy	null	The date of a customer came
payID	int	10	null	Unique number ID for Payment ID

2. Data Dictionary of the Payment table

Name	Type	Length	Constraint	Description
payID	int	10	Not null	Unique number ID for all payments
payAmount	money	-	Not null	Money of the payment
paymentDate	date	dd/mm/yyyy	Not null	Date for all payments
staffID	Varchar	10	Not null	Unique number ID for staff id
customerID	int	10	Not null	Unique number ID for the customer

3. Data Dictionary of the Staff table

Name	Type	Length	Constraint	Description
staffID	varchar	10	Not null	Unique ID for staff
staffType	Varchar	10	Not null	Type of staff

employeeName	Varchar	20	null	Name of employee
equipID	int	10	Not null	Unique number for Equipment ID
facilityID	int	10	Not null	Unique number of Facility

4. Data Dictionary of the Facility table

Name	Type	Length	Constraint	Description
facilityID	int	10	Not null	Unique number ID for each of facility
facilityType	Varchar	10	Not null	Name of facility

5. Data Dictionary of the Equipment table

Name	Type	Length	Constraint	Description
equipID	int	10	Not null	Unique number ID for each of equipment
equipType	Varchar	10	Not null	Type of equipment
equipName	Varchar	10	Not null	Name of equipment
equipQuantity	int	MAX	Not null	Quantity of equipment
equipPrice	money	-	Not null	Price of

				each equipment

6. Data Dictionary of the CustomerContact table

Name	Type	Length	Constraint	Description
customerContacID	int	10	Not null	Unique number ID for each of customer's contact numbers
contactNumber	int	1	Not null	Contact of Customer

7. Data Dictionary of the Installation table

Name	Type	Length	Constraint	Description
installID	int	10	Not null	Unique number ID for each of installation
installType	Varchar	10	Not null	Type of installation
staffID	int	10	Not null	Unique number ID for staff
startDate	date	dd/mm/yyyy	Not null	Start Date of installation
endDate	date	Dd/mm/yyyy	Not null	Last date of installation
facilityID	int	10	null	Unique number ID for facility

8. Data Dictionary of the insEquipment table

Name	Type	Length	Constraint	Description
equipID	int	10	Not null	Unique number ID for each of the Equipment
installID	int	10	Not null	InstallID from Installtion Table

1.1.6 Normalization

Normalization is the process of organizing data in a database. This includes creating tables and establishing relationships between those tables according to rules designed both to protect the data and to make the database more flexible by eliminating redundancy and inconsistent dependency. (Microsoft, 2022)

Normalization is the process of removing potential anomalies from the database. These are – Insertion, update, and deletion anomalies.

Types of normalization.

1.1.6.0 First normal form (1NF) —

i. Eliminate repeating groups in individual tables.
ii. Create a separate table for each set of related data.
iii. Identify each set of related data with a primary key.

Customer Table

installcustomerID	fisrtName	lastName	installID	customer ContactID	payID	Address Number	houseName	streetName	postTown	postCode	date
01	Lee	A.sun	234	222	333	17	Oak House	Wroxton Road		H5 667	6-5-2012
02	Sally	Dench	654	444	555		Bayliss House	Orange Street	Kent	K7 988	7-6-2011
03	Perry	Vanderrune	767	666	777		Eaglestone Castle		Kent		6-5-2012
04	Eric	Mackintosh	943	888	999	23		Sackville Steet	Wilts	W55	
03	Perry	Vanderrune	157	666	111		Humbertson Castle		Kent	K8	5-7-2005

New Table: Customer Address Table

CusAddressID	AddressNumber	houseName	streetName	postTown	postCode
1	17	Oak House	Wroxton Road		H5 667
2		Bayliss House	Orange Street	pst1	K7 988
3		Eaglestone Castle		pst1	
4	23		Sackville Street	pst2	W55
5		Humbertson Castle		pst1	K8

New Table: Post Town Table

postTownID	postTown
Pst ‘1	Kent
pst2	Wilts

Customer Table

installCustomerID	fisrtName	lastName	customer ContactID	payID	CusAddressID
01	Lee	A.sun	222	333	1
02	Sally	Dench	444	555	2
03	Perry	Vanderrune	666	777	3
04	Eric	Mackintosh	888	999	4
03	Perry	Vanderrune	666	777	5

Normalized Customer Table

customer ID	installCustomerID	payID	CusAddressID
01	01	333	1
02	02	555	2
03	03	777	3
04	04	999	4
05	03	777	5

Installation Equipment Table: UNF

equipID	installID
0008	234
0008	234
0005	234
0006	234
0009	654
0009	654
0005	654
0123	654
0006	654
0005	654
0005	654
0124	654
0012	943
0008	943
0008	943
0008	943
0006	943
0008	157
0008	157
0012	157
0006	157

Normalized Installation Equipment Table

installEquipID	equipID	installID
insEqui01	0008	234
insEqui02	0008	234
insEqui03	0005	234
insEqui04	0006	234
insEqui05	0009	654
insEqui06	0009	654
insEqui07	0005	654
insEqui08	0123	654
insEqui09	0006	654
insEqui10	0005	654
insEqui11	0005	654
insEqui12	0124	654
insEqui13	0012	943
insEqui14	0008	943
insEqui15	0008	943
insEqui16	0008	943
insEqui17	0006	943
insEqui18	0008	157
insEqui19	0008	157
insEqui20	0012	157
insEqui21	0006	157

1.1.6.1 Second normal form (2NF)-

i. Create separate tables for a set of values that apply to multiple records.

ii. Relate these tables with a foreign key.

Staff Table

staffID	staffType	empFirstName	empLastName
SHA1	Plumber	Dave	Clark
SHA8	Installation Manager	John	Smith
SHA9	Installation Manager	Adam	Tyler
SHA2	Aquatics installer	Freddy	Davies
SHA11	Aquatics installer	McCloud	
SHA23	Plumber	Satpal	Singh
SHA66	Aquatics installer	Winston	Kodagu
SHA55	Brick Layer	Alison	Smith
SHA77	Electrician	Andrew	Green
SHA88	Carpenter	Tom	Bruce
SHA99	Carpenter	Daniel	Christopher
SHA10	Carpenter	Robert	Charles
SHA12	Carpenter	James	Matthew
SHA13	Carpenter	David	Anthony
SHA18	Carpenter	Gary	Jacob
SHA19	Carpenter	Timothy	Nicholas
SHA20	Carpenter	Stephen	Larry
SHA21	Carpenter	Justin	Scott
SHA22	Carpenter	Samuel	Brandon
SHA15	Labourer	Donald	Trump
SHA16	Labourer	Paul	Walker

SHA17	Labourer	Kevin	Kenneth

New Table: TypeofStaff Table

staffTypeID	staffType
staty1	Plumber
staty2	Installation Manager
staty3	Aquatics installer
staty4	Brick Layer
staty5	Carpenter
staty6	Electrician
staty7	Labourer

Normalized Staff Table

staffID	staffTypeID	empFirstName	empLastName
SHA1	staty1	Dave	Clark
SHA8	staty2	John	Smith
SHA9	staty2	Adam	Tyler
SHA2	staty3	Freddy	Davies
SHA11	staty3	McCloud	
SHA23	staty1	Satpal	Singh
SHA66	staty3	Winston	Kodagu
SHA55	staty5	Alison	Smith
SHA77	staty7	Andrew	Green
SHA88	staty6	Tom	Bruce
SHA99	staty6	Daniel	Christopher
SHA10	staty6	Robert	Charles
SHA12	staty6	James	Matthew
SHA13	staty6	David	Anthony
SHA18	staty6	Gary	Jacob

SHA19	staty6	Timothy	Nicholas
SHA20	staty6	Stephen	Larry
SHA21	staty6	Justin	Scott
SHA22	staty6	Samuel	Brandon
SHA15	staty7	Donald	Trump
SHA16	staty7	Paul	Walker
SHA17	staty7	Kevin	Kenneth

Equipment Table

equipID	equipName	equipType	equipPrice	equipQuantity
0001	Tanks	20-gallon		
0002	Tanks	50-gallon		
0004	Tanks	100-gallon		
0005	Tanks	200-gallon		
0012	Tanks	400-gallon		
0006	Thermostats	Standard		
0007	Thermostats	Super		
0008	Air Pumps	Standard		
0009	Air Pumps	Super		
0010	Filters	Air driven		
0011	Filters	Under-gravel		
0111	Gavel Bag	Small		
0122	Gavel Bag	Medium		
0123	Gavel Bag	Large		
0124	Wood Panel	500-panel		

New Table: Equipment Name Table

equipNameID	equipName
eq01	Tanks
eq02	Thermostats
eq03	Air Pumps
eq04	Filters
eq05	Gavel Bag
eq06	Wood Panel

New Table: Equipment Type Table

equipTypeID	equipType	equipQuantity	equipPrice
eqType01	20-gallon		
eqType02	50-gallon		
eqType03	100-gallon		
eqType04	200-gallon		
eqType05	400-gallon		
eqType06	Standard		
eqType07	Super		
eqType08	Air-driven		
eqType09	Undergravel		
eqType10	Small		
eqType11	Medium		
eqType12	Large		
eqType13	500-panel		

Normalized Equipment Table

equipID	equipNameID	equipTypeID
0001	eq01	eqType01
0002	eq01	eqType02
0004	eq01	eqType03
0005	eq01	eqType04
0012	eq01	eqType05
0006	eq02	eqType06
0007	eq02	eqType07
0008	eq03	eqType06
0009	eq03	eqType07
0010	eq04	eqType08
0011	eq04	eqType09
0111	eq05	eqType10
0122	eq05	eqType11
0123	eq05	eqType12
0124	eq06	eqType13

Install Table

installID	CustomerID	installType	staffID	facilityID	startDate	endDate
234	01	Freshwater Tropical	SHA88 SHA2 SHA77		1-09- 2012	

654	02	Freshwater Cold	SHA88 SHA99 SHA10 SHA12 SHA13 SHA8 SHA66 SHA23 SHA15 SHA16 SHA17		1-06-2005	1-06-2012
767	03	Marine	SHA88 SHA99 SHA10 SHA12 SHA13 SHA18 SHA19 SHA20 SHA21 SHA22 SHA8 SHA9 SHA11 SHA23 SHA15 SHA16 SHA17		30-06-2012	

943	04	Marine			1-09-2005	1-09-2012
157	03	Freshwater Tropical	SHA66			

New Table: Installation Type Table

installTypeID	installType
insTy01	Freshwater Tropical
insTy02	Freshwater Cold
insTy03	Marine

New Table: Installation Employee Table

installEmployeeID	staffID	instalID
insEpm01	SHA88	234
insEpm02	SHA2	234
insEpm03	SHA77	234
insEpm04	SHA88	654
insEpm05	SHA99	654
insEpm06	SHA10	654
insEpm07	SHA12	654
insEpm08	SHA13	654
insEpm09	SHA8	654
insEpm10	SHA66	654
insEpm11	SHA23	654
insEpm12	SHA15	654

insEpm13	SHA16	654
insEpm14	SHA17	654
insEpm15	SHA88	767
insEpm16	SHA99	767
insEpm17	SHA10	767
insEpm18	SHA12	767
insEpm19	SHA13	767
insEpm20	SHA18	767
insEpm21	SHA19	767
insEpm22	SHA20	767
insEpm23	SHA21	767
insEpm24	SHA22	767
insEpm25	SHA8	767
insEpm26	SHA9	767
insEpm27	SHA11	767
insEpm28	SHA23	767
insEpm29	SHA15	767
insEpm30	SHA16	767
insEpm31	SHA17	767
insEmp32	SHA66	157

New Table: InstallID Table

installID	installTypeID
234	insTy01
654	insTy02
767	insTy03
943	insTy03
157	insTy01

New Table: FinalInstallation Table

insFinalID	customerID	installEmployeeID	instStartDate	instEndDate
ins01	01	insEpm01	stdt01	
ins02	01	insEpm02	stdt01	
ins03	01	insEpm03	stdt01	
ins04	02	insEpm04	stdt02	endt01
ins05	02	insEpm05	stdt02	endt01
ins06	02	insEpm06	stdt02	endt01
ins07	02	insEpm07	stdt02	endt01
ins08	02	insEpm08	stdt02	endt01
ins09	02	insEpm09	stdt02	endt01
ins10	02	insEpm10	stdt02	endt01
ins11	02	insEpm11	stdt02	endt01
ins12	02	insEpm12	stdt02	endt01
ins13	02	insEpm13	stdt02	endt01
ins14	02	insEpm14	stdt02	endt01
ins15	03	insEpm15	stdt03	
ins16	03	insEpm16	stdt03	
ins17	03	insEpm17	stdt03	
ins18	03	insEpm18	stdt03	
ins19	03	insEpm19	stdt03	
ins20	03	insEpm20	stdt03	
ins21	03	insEpm21	stdt03	
ins22	03	insEpm22	stdt03	
ins23	03	insEpm23	stdt03	
ins24	03	insEpm24	stdt03	
ins25	03	insEpm25	stdt03	
ins26	03	insEpm26	stdt03	
ins27	03	insEpm27	stdt03	
ins28	03	insEpm28	stdt03	
ins29	03	insEpm29	stdt03	

ins30	03	insEpm30	stdt03	
ins31	03	insEpm31	stdt03	
ins32	03	insEmp32		
ins33	04		stdt04	endt02

1.1.6.2 Third normal form (3NF)-

i. Eliminate fields that do not depend on the key

ii. Remove transitive dependencies into a new relation.

New Table: Installation Start date table

instStartDate	startDate
stdt01	1-09- 2012
stdt02	1-06-2005
stdt03	30-06-2012
stdt04	1-09-2005

New Table: Installation End date table

instEndDate	endDate
endt01	1-06-2012
endt02	1-09-2012

Already Normalized Tables:

Payment table

payID	payAmount	paymentDate	customerID	staffID
333			01	
555			02	
777			03	
999			04	
111			03	

CustomerContact

customerContactID	contactNumber

Facility Table

facilityID	facilityType

Activity 1.2

1.2.0 GUI for PollyPIPE system

Login Form of PollyPIPE System

Figure 3 Login GUI

Customer Details Form

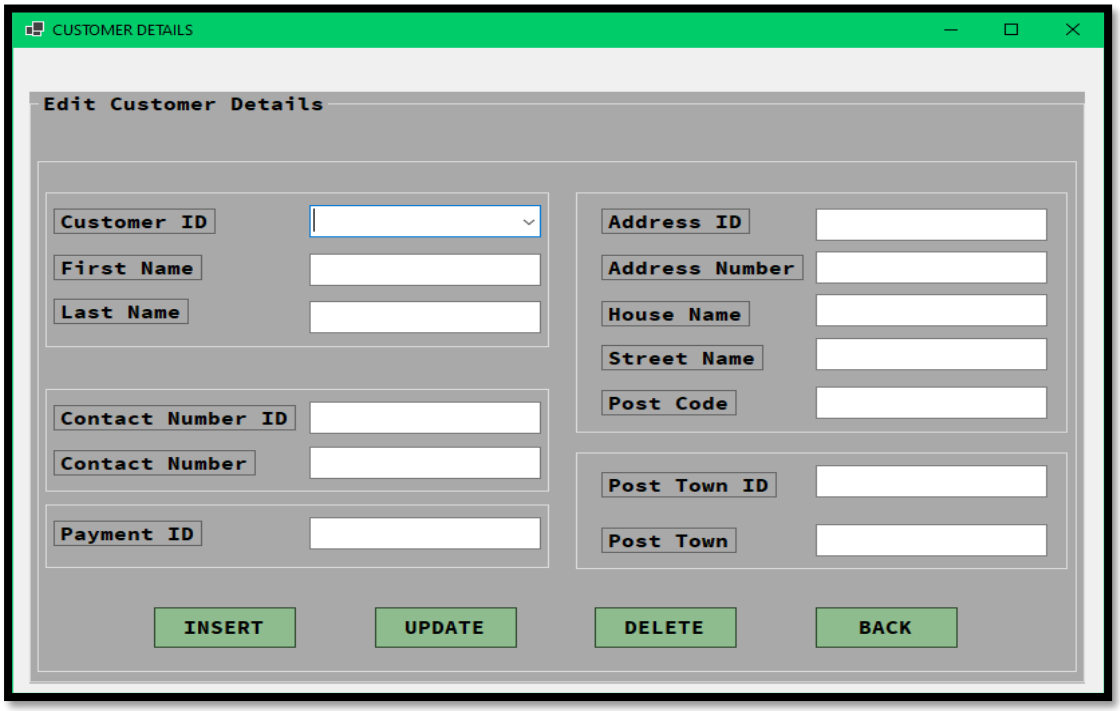


Figure 4 Customer Details GUI

Payment & Staff Details Form

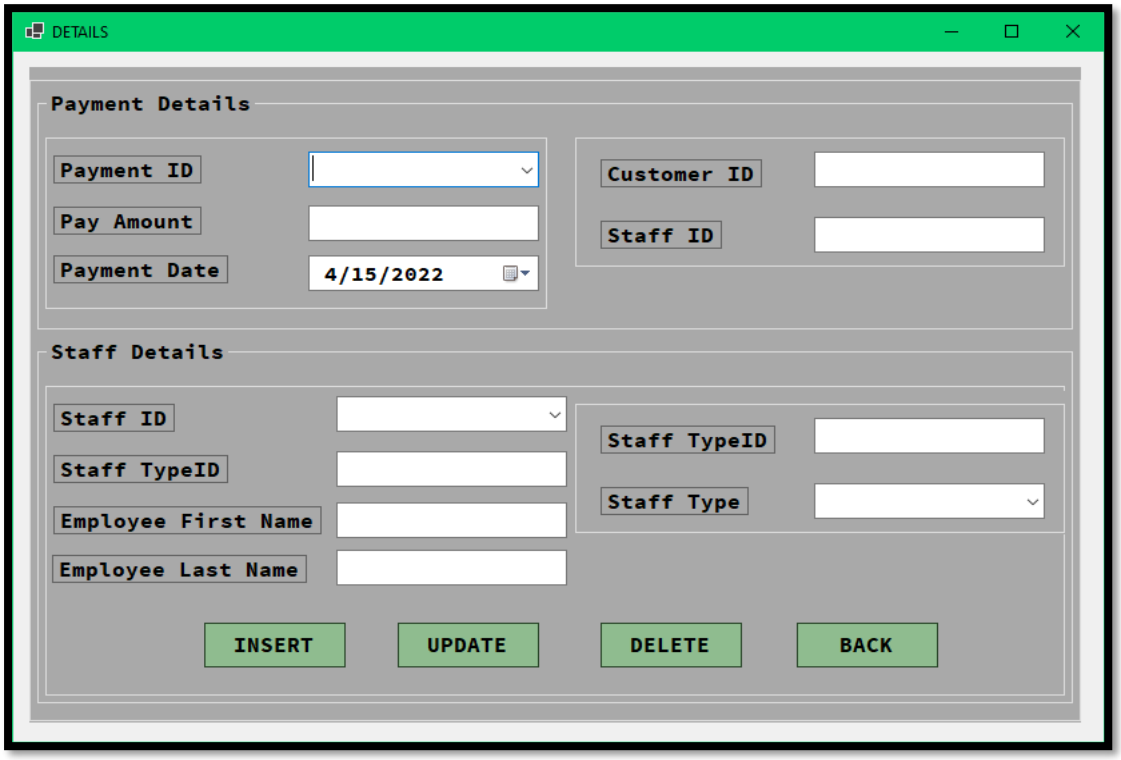


Figure 5 Payment & Staff Details GUI

Equipment Details Form

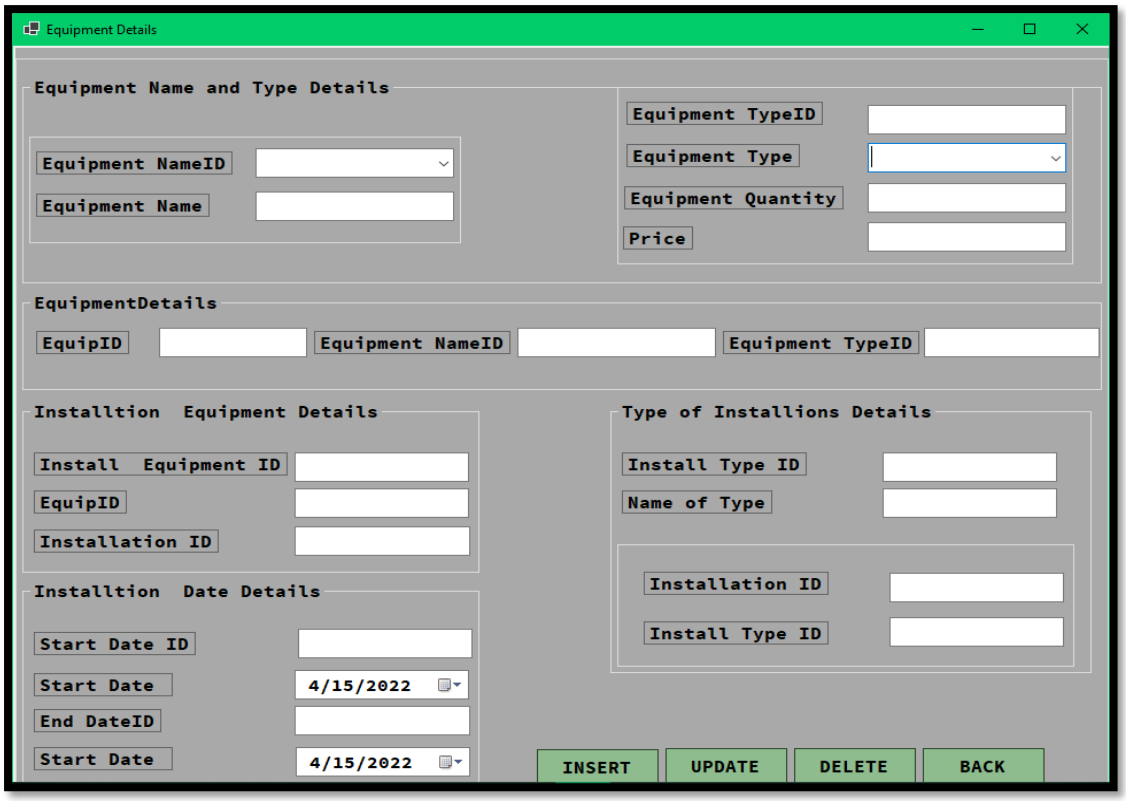


Figure 6 Equipment Details From

Installation Employee Details Form

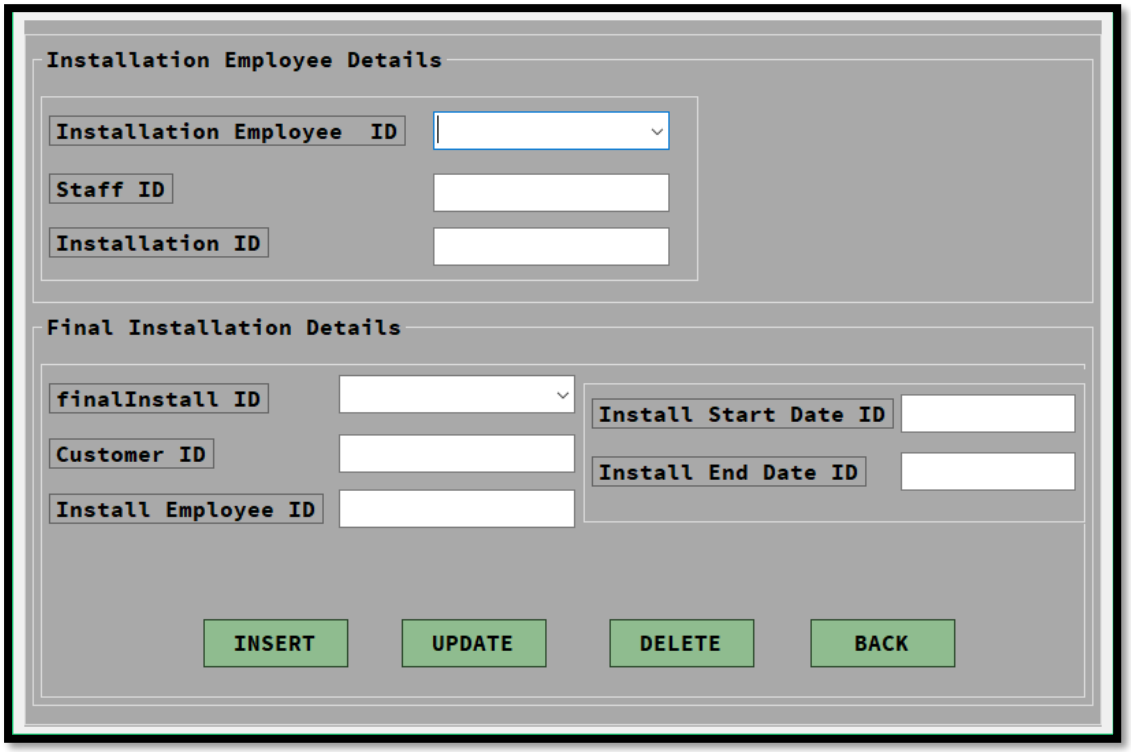


Figure 7 Installation Employee Details form

Main Menu Form

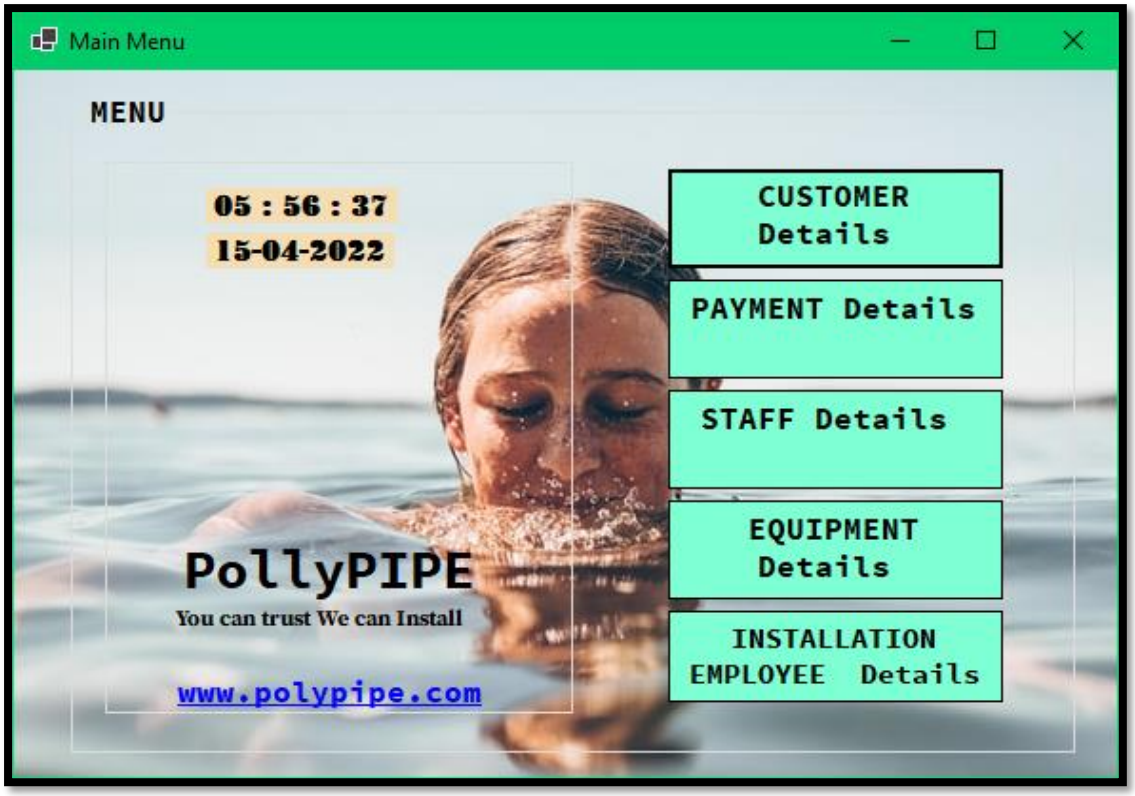


Figure 8 System Main Menu

In the given scenario Polly Pipe company must collect customer data, and their requirements, staff details, equipment details, and payment details. Above ER Diagram and Logical database schema is the first step to identifying user and system requirements like this. Therefore, the above design mentioned all the database tables and data dictionaries for this system. In ERD mentioned the Customer table, Staff table, Installation table, Payment table, and Equipment table for the store of all the data saving it in the database. According to the design of the database, all information is stored in one place, and it will be the easiest way to control.

For example, Customers can give their first name, last name, address details, contact number, and installation requirements to Polly Pipe. Then the system can store all the customer details under the Customer Details table. In the installation, the system can store the installation start date, and the end date, using equipment details, and employee details under the Installation table. It has particular fields for that. This database can manage all the equipment details like their prices, and quantities under the Equipment table. Above mentioned GUI can control all functions and it is very user-friendly for the company.

The above design mentioned describes and represents the system requirements to retrieve the effectiveness and the efficiency of the database.

2.0 Data Definition Language

Data definition language (DDL) statements in SQL are used to create schema and to define the type and structure of the data that will be stored in a database.

1. CREATE – This query is used to create a database, tables
1. ALTER – This command is used to modify the structure of an already existing table.
2. DROP – This command is used to delete an existing database or an object within a database

2.1 CREATE

Creating a database for PollyPIPE

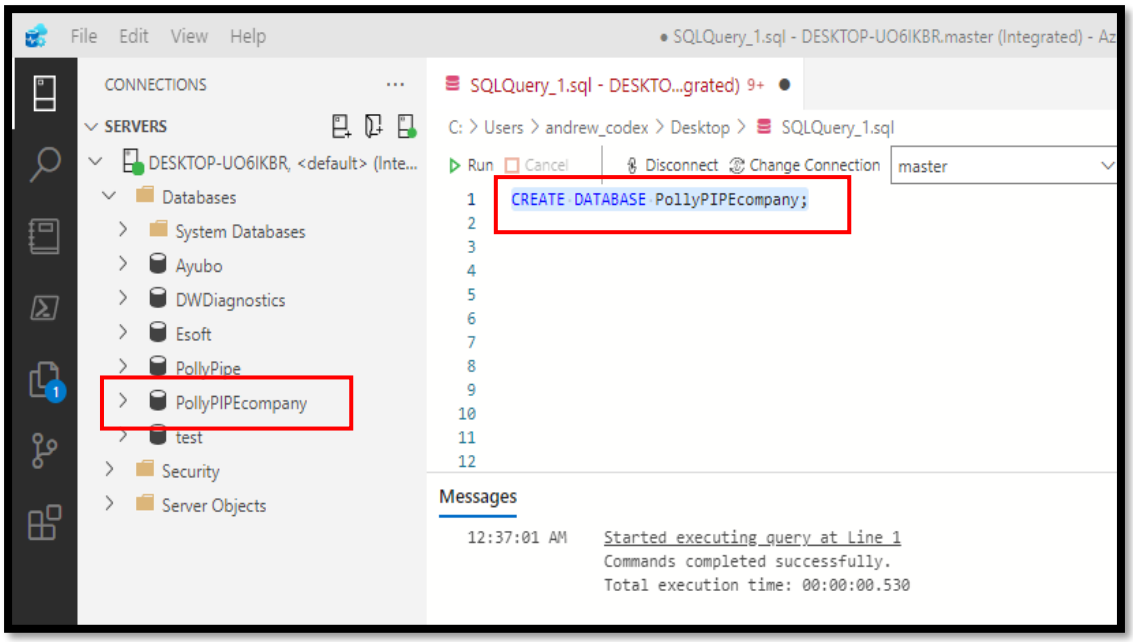


Figure 9 Example of create statement 0

Creating Customer Details data table for PollyPipe

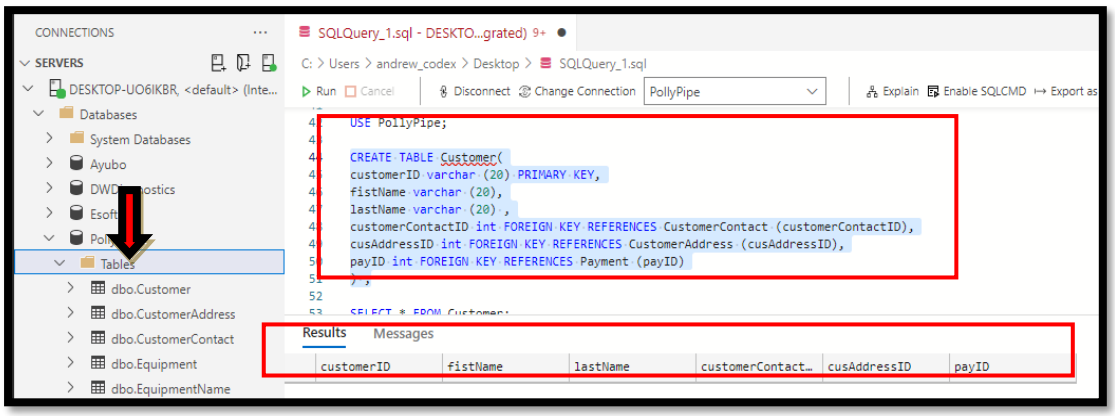


Figure 10 Example of Create statement 1

Creating Customer Contact Details table for PollyPipe

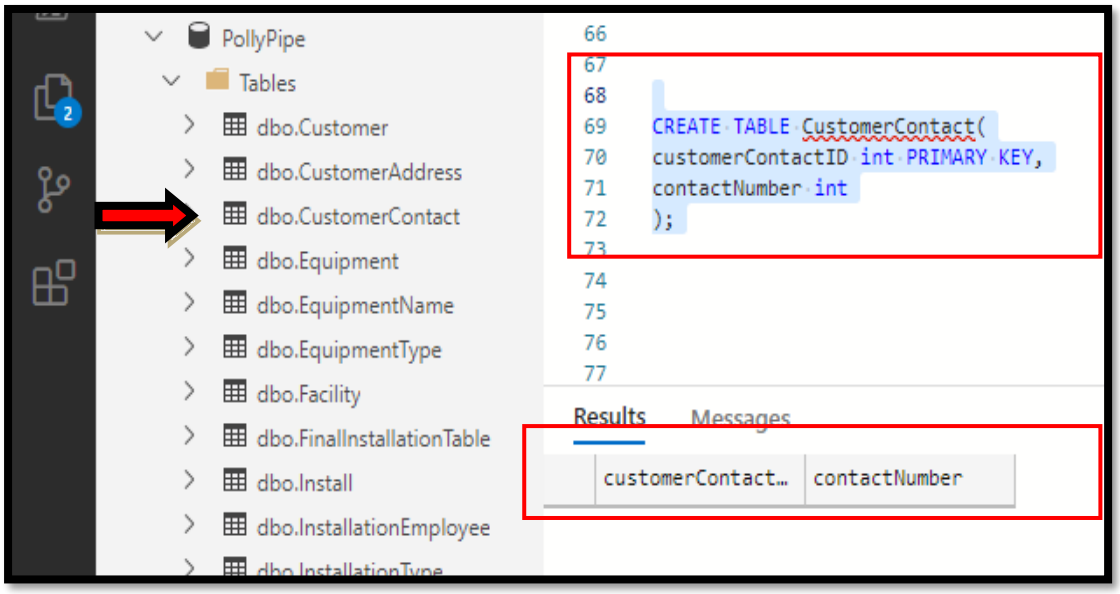


Figure 11 Example of create statement 2

Creating Customer Address Details table for PollyPipe

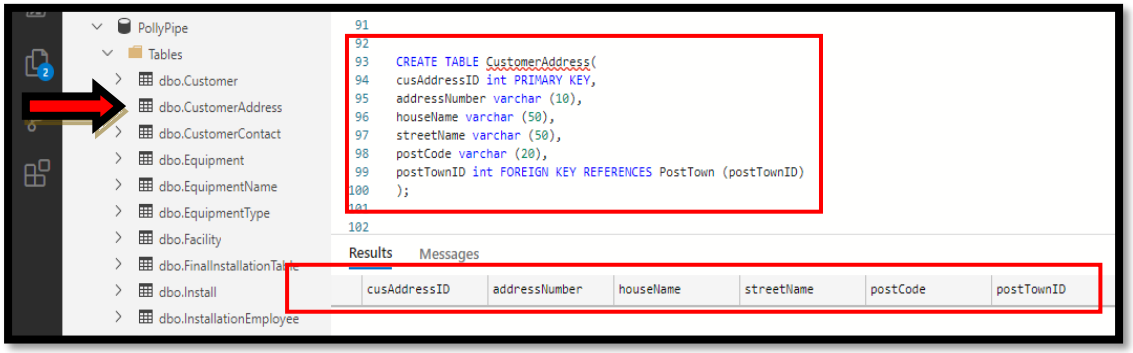


Figure 12 Example of create statement 3

Creating Customer Post Town Details table for PollyPipe

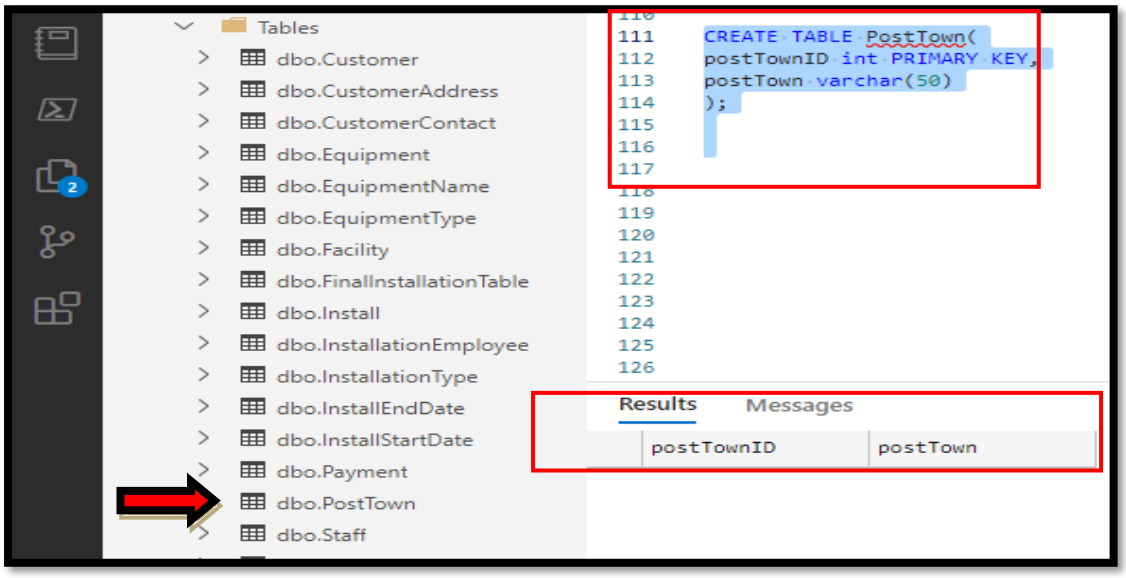


Figure 13 Example of create statement 4

Creating Payment Details table for PollyPipe

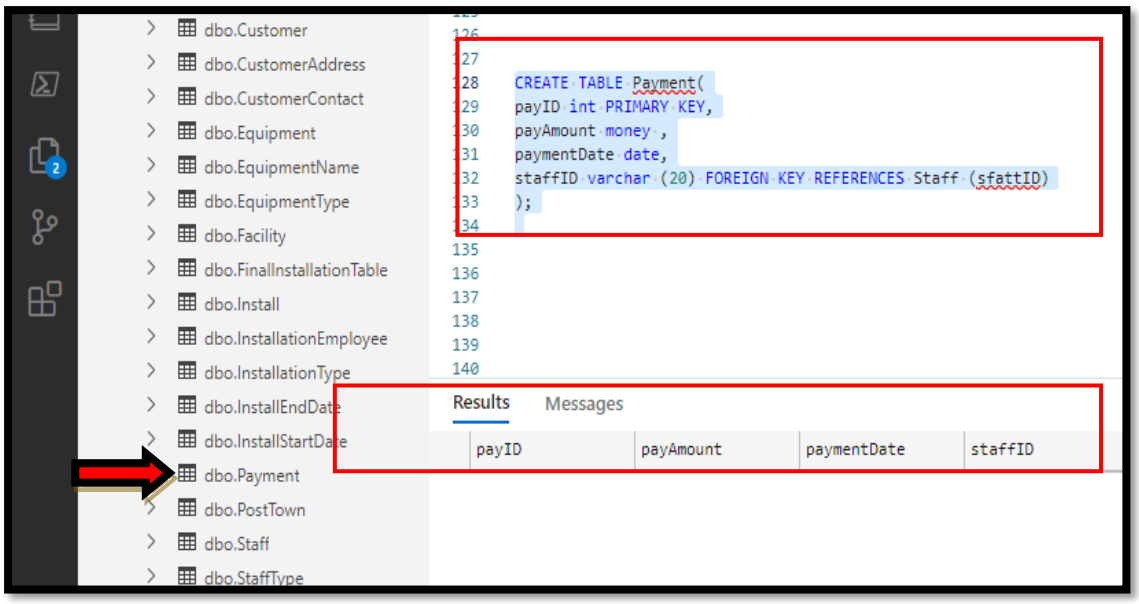


Figure 14 Example of create statement 5

Creating Staff Details table for PollyPipe

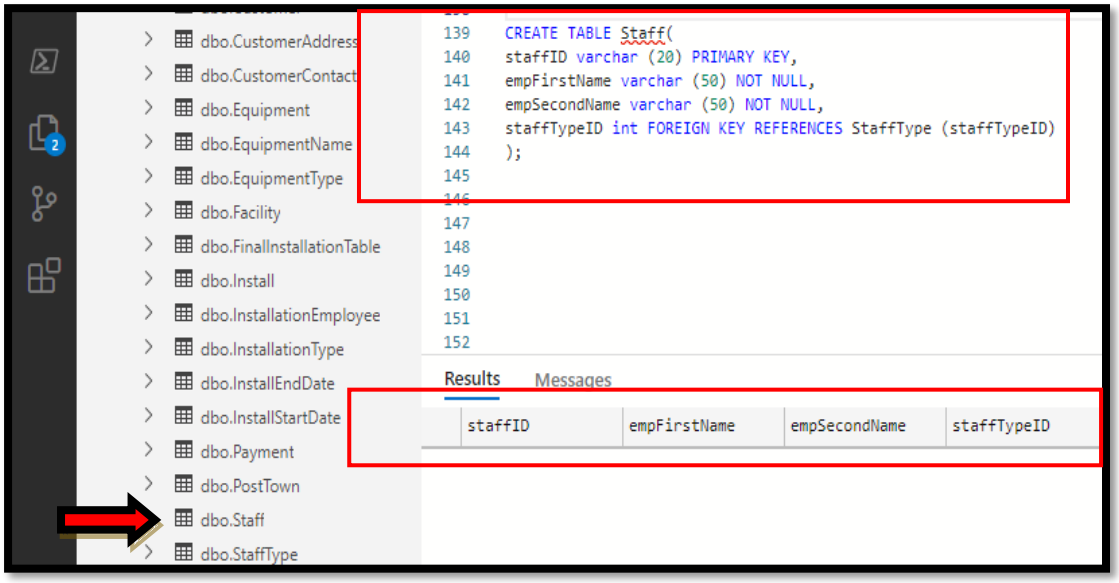


Figure 15 Example of create statement 6

Creating Staff Type Details table for PollyPipe

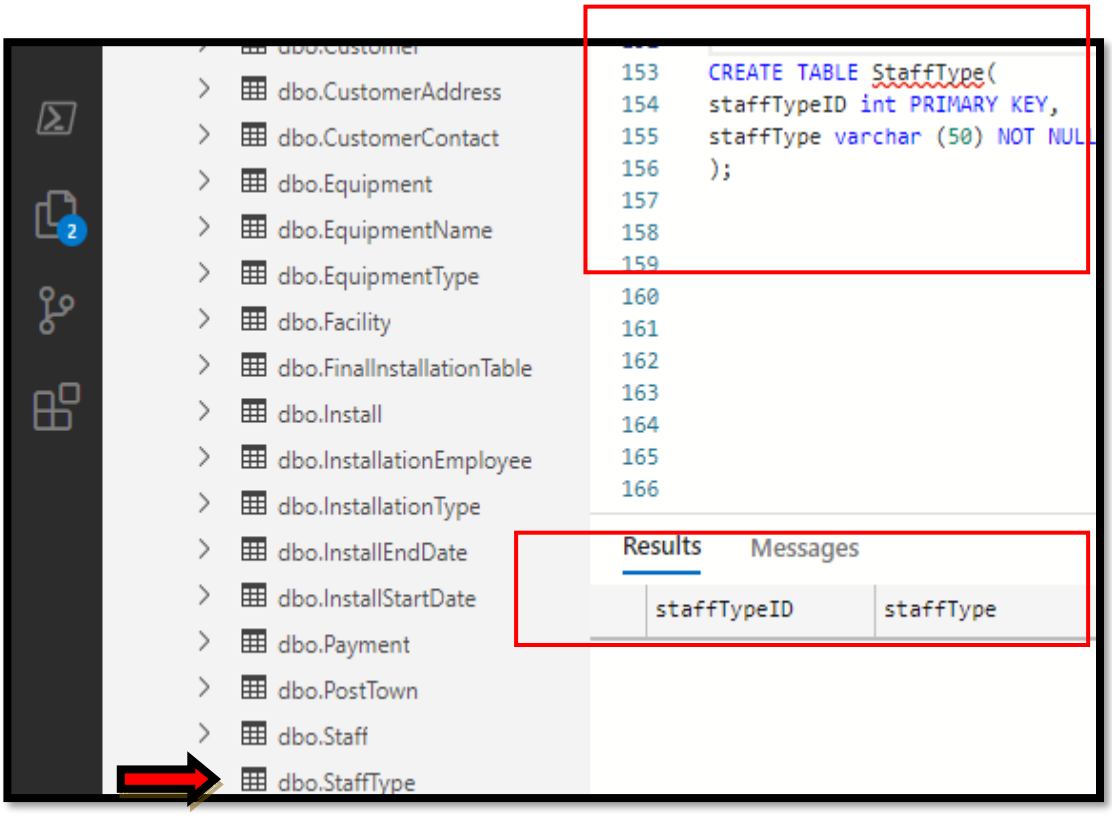


Figure 16 Example of create statement 7

Creating EquipmentName, EquipmentType, Equipment tables for PollyPipe

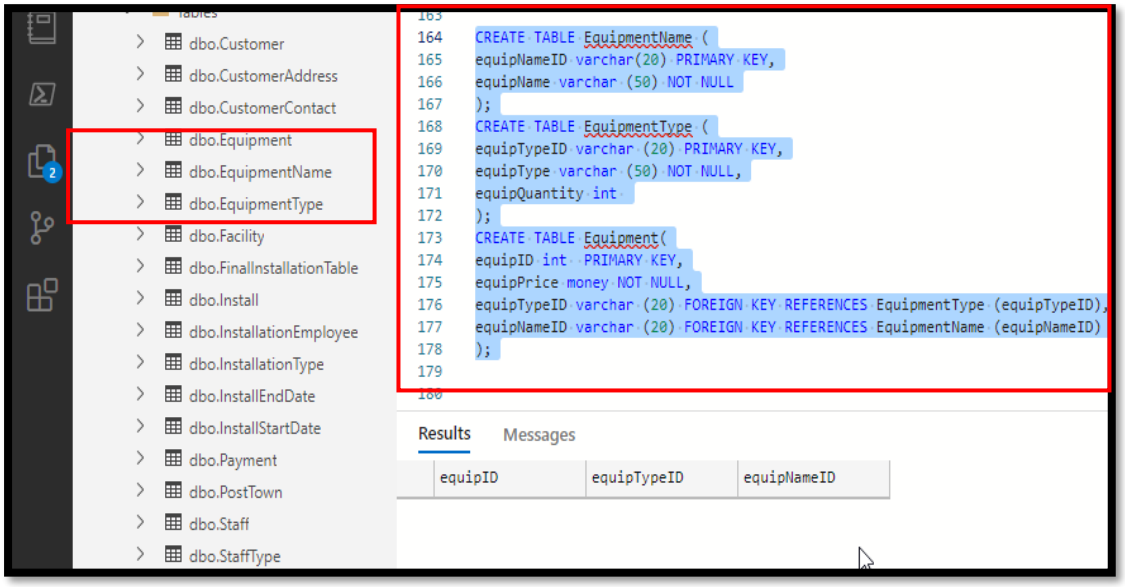


Figure 17 Example of create statement 8

Creating InstallEquipment, Facility, InstallationType tables for PollyPipe

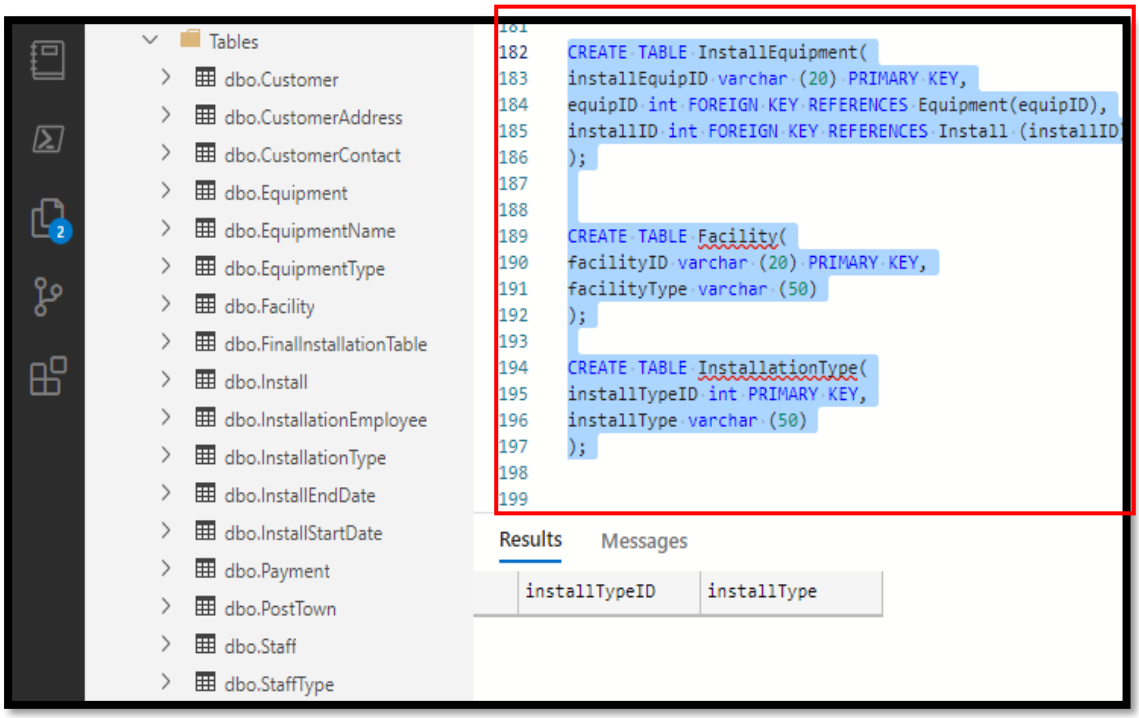


Figure 18 Example of create statement 9

Creating InstallationEmployee, InstallationStartDate, InstallationEndDate tables for PollyPipe

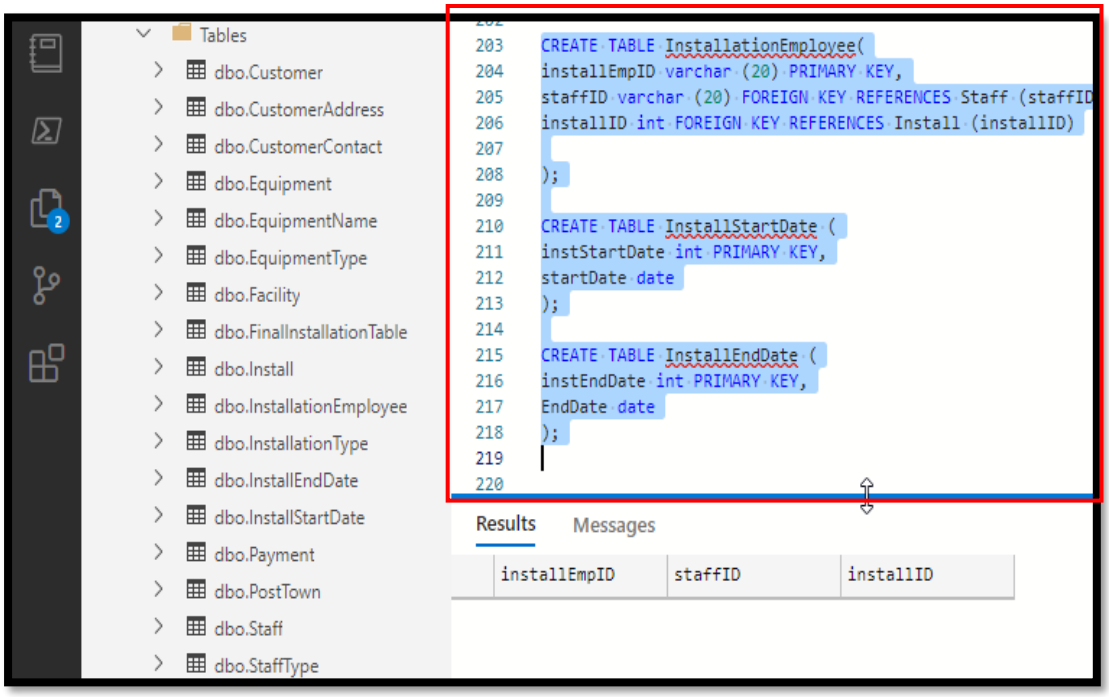


Figure 19 Example of create statement 10

Creating Install, FinalInstallation tables for PollyPipe

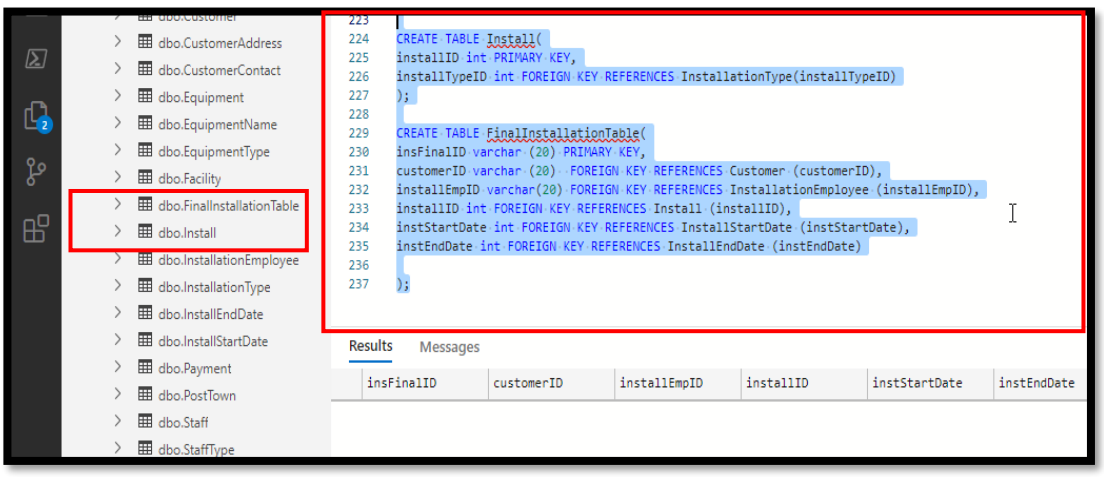


Figure 20 Example of create statement 11

2.2 DROP DDL Statement

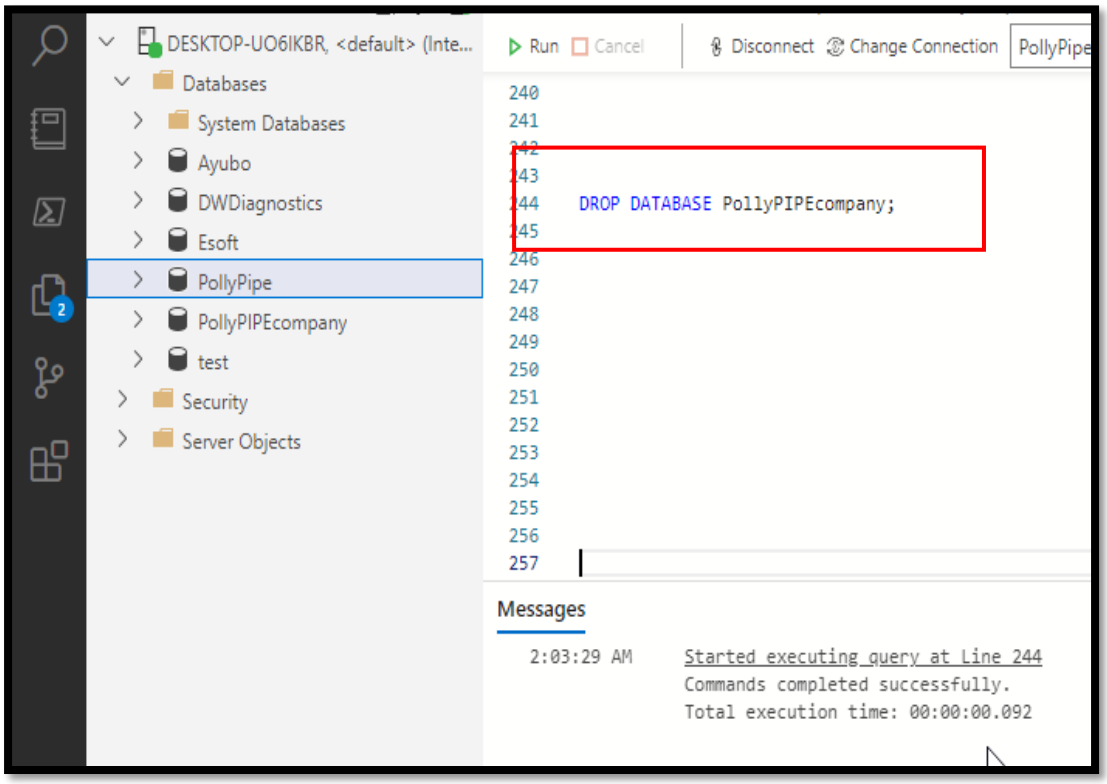


Figure 21 Example of DROP statement 0

2.3 ALTER DDL Statement

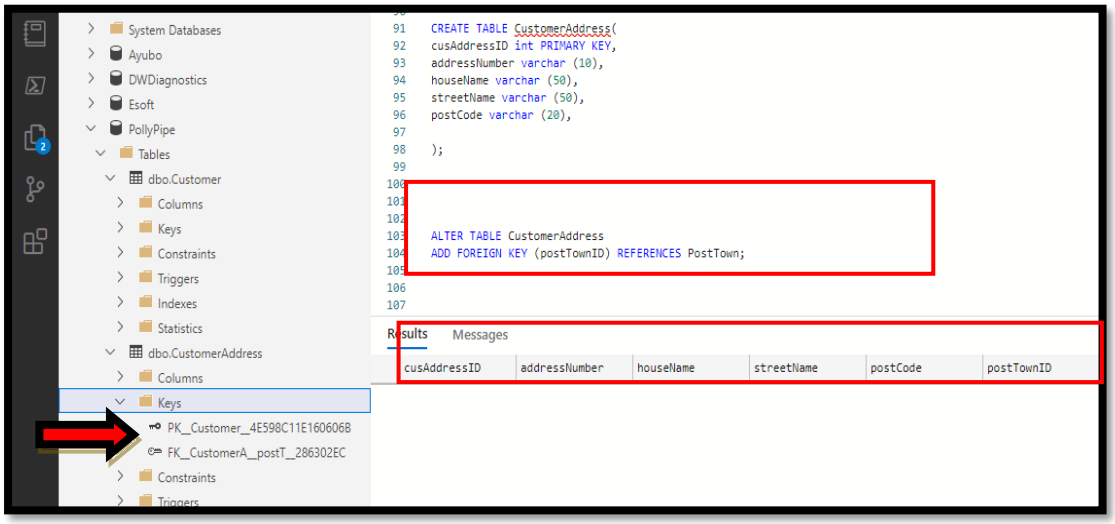


Figure 22 Example of ALTER statement 0

2.4 Evaluate the above-mentioned GUI

Polypipe can manage this system using above mentioned GUI interfaces and these are very user-friendly and simple. In ER Diagram it displayed all data tables in the database. Therefore, above created GUI interfaces can handle all the user requirements. For example, collecting customer details and their installation requirements can be input into the system easily. It has a Login interface and when the admin needs control of this system firstly, he/she needs to use their unique username and password. If the username and password match, he/she can handle the system.

In the company, they have to store their staff details, equipment details, installation details, and customer details. This system has GUI interfaces for these particular requirements. For example, if a company needs to store their staff details, they can use GUI for that. It will be more efficient and time-saving. The above already mentioned main menu GUI has function buttons for controlling all the system requirements and user requirements and it is a centralized GUI.

2.5 Database security

Database security is where the company or owners secure databases and their objects at various levels by adopting adequate access control measures inside the database system. It has 4 categories. These are,

1. Authentication
2. Authorization
3. Data protection
4. SQL Server configurations

2.5.0 Authentication

This is the first step to connecting to the databases. It is a process to recognize that some authentic person is using a valid principal or login to connect to the database. If someone using an invalid principal, then we can say your authentication is failed and you cannot connect to the database. (Singh, 2022)

Login with valid details

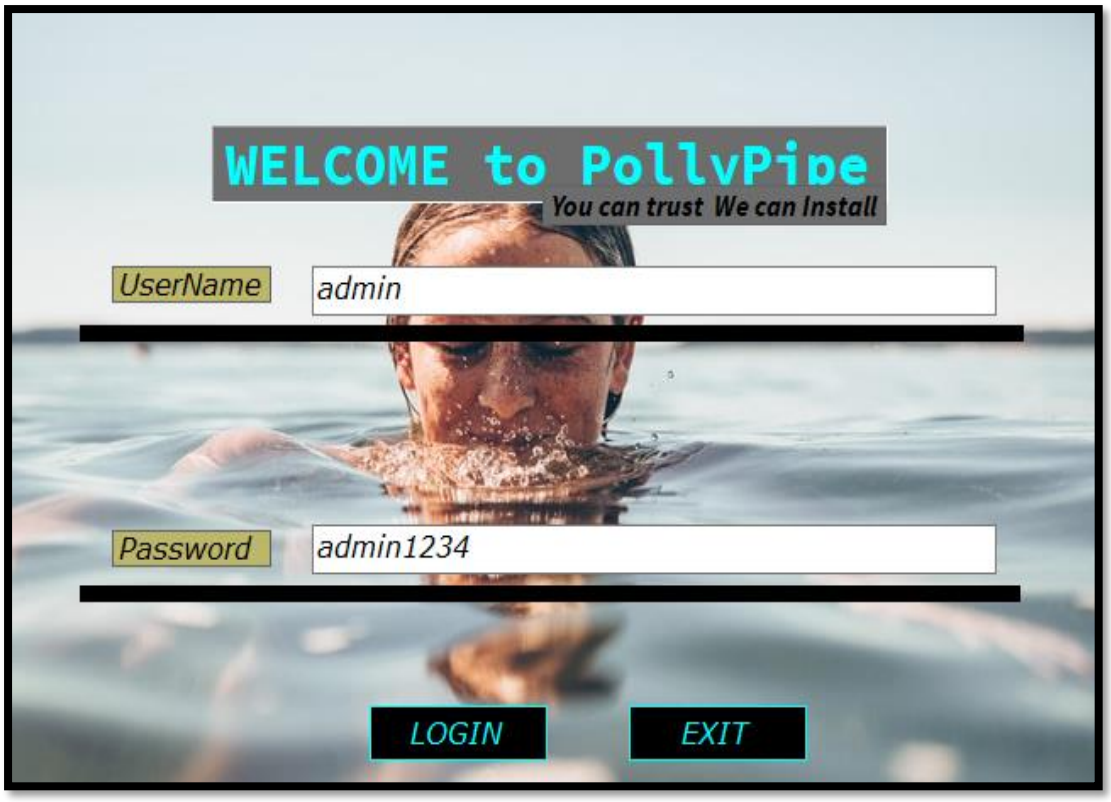


Figure 23 Login with valid details

Figure 24 Main Menu

Login with invalid details

Figure 25 Login with invalid details

Login details in the database

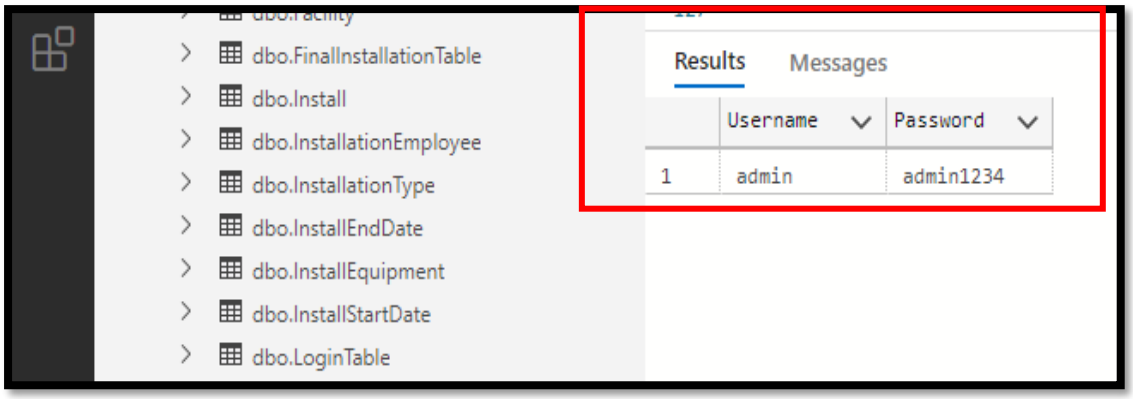


Figure 26 Login details in the database

2.5.1 Authorization

This is a process to grant access to objects. Owners can restrict or authorize somebody on his principal to access that database object. Even owners can control the type of access if they don't want them to write or update anything in the database object then owners/companies can do that by denying these rights on that specified object. (Singh, 2022)

Figure 27 user authorization menu

2.5.2 Data protection

This is very popular these days to protect data using encryption from unauthorized use. It is used to encrypt our data at rest or on transit for SQL Server databases. SQL Server offers multiple options to apply encryption or masking for various types of needs like Transparent Data Encryption, Always Encryption, Data masking, etc. Database backups can also be encrypted to prevent any unauthorized access to its data. (Singh, 2022)

2.6 Data Manipulation Language (DML)

A data manipulation language (DML) is a family computer language including commands permitting users to manipulate data in a database. This manipulation involves inserting data into database tables, retrieving existing data, deleting data from existing tables, and modifying existing data. DML is mostly incorporated in SQL databases. (techopedia, 2014)

- SELECT – This command is used to retrieve rows from a table. The syntax is SELECT [column name] from [table name] where [conditions]. This is the most widely used DML command in SQL.
- UPDATE – This command modifies data of one or more records. An update command syntax is UPDATE [table name] SET [column name = value] where [condition].
- INSERT – This command adds one or more records to a database table. The insert command syntax is INSERT INTO [table name] [column] VALUES [value(s)].
- DELETE – This command removes one or more records from a table according to specified conditions. Delete command syntax is DELETE FROM [table name] where [condition]. (techopedia, 2014)

2.6.0 INSERT Statement

Figure 28 Example of INSERT statement

2.6.1 SELECT Statement

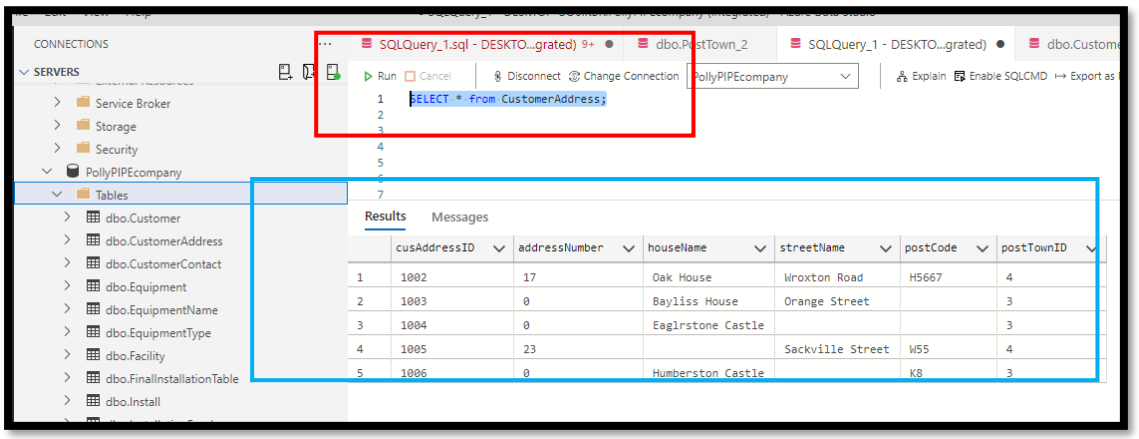


Figure 29 Example of select statement 0

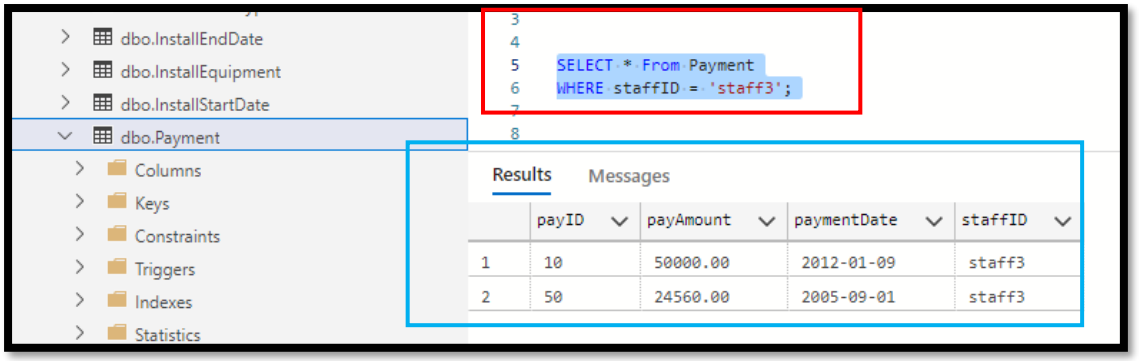


Figure 30 Example of select statement 1

2.6.2 ORDER BY Statement

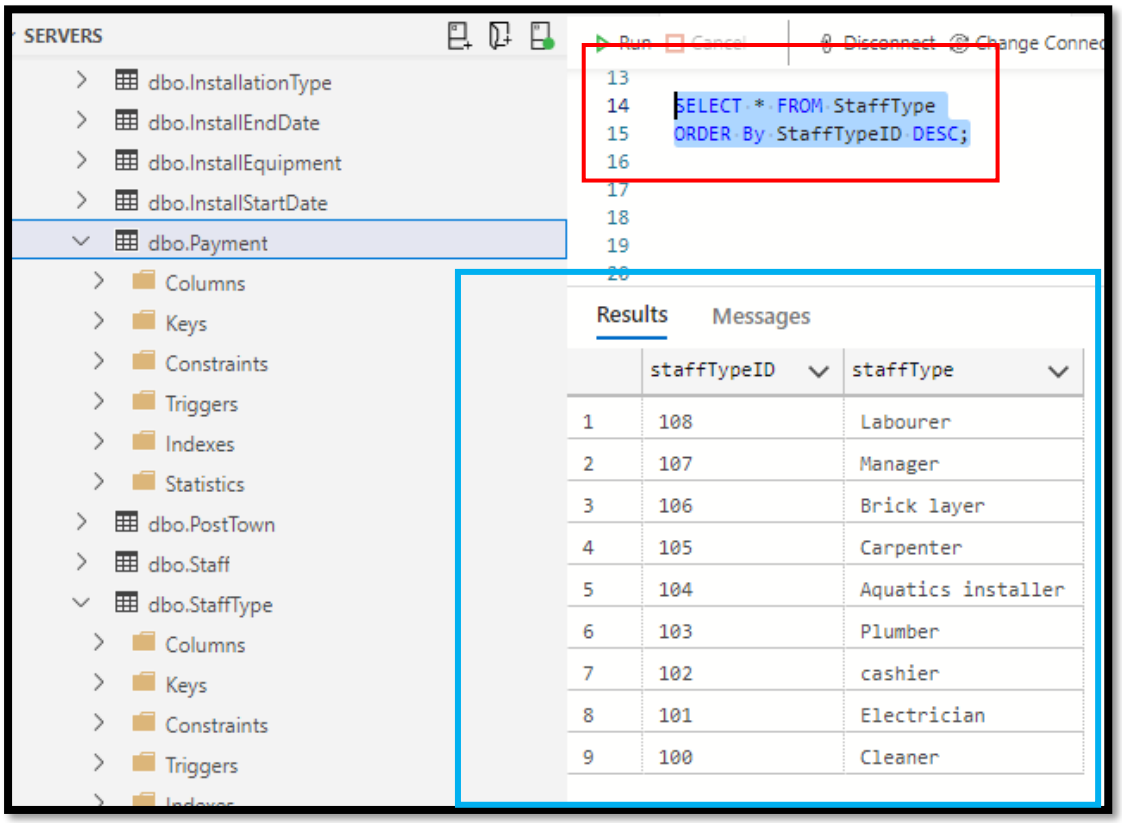


Figure 31 Example of ORDER statement

2.6.3 UPDATE Statement

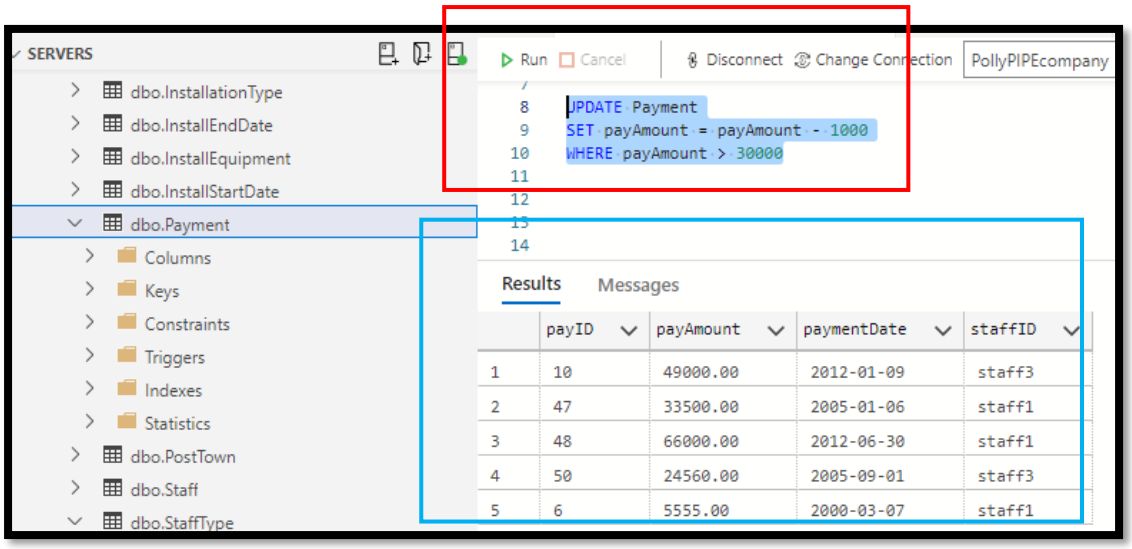


Figure 32 Example of UPDATE statement

2.6.4 GROUP BY Statement

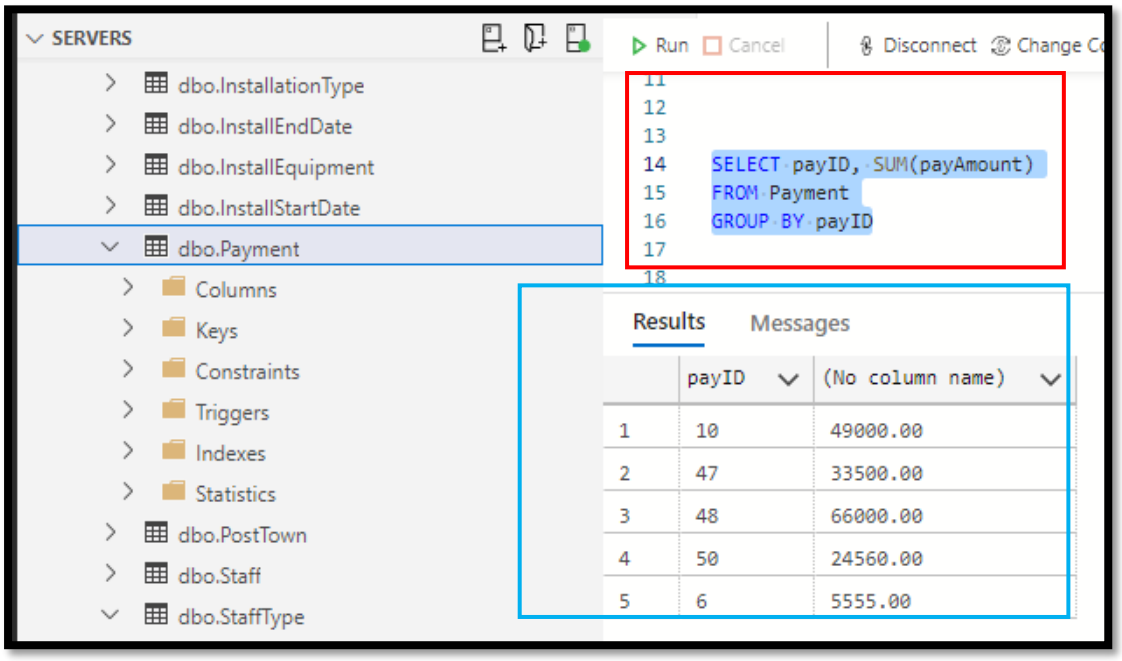


Figure 33 Example of GROUP statement

2.6.5 IN Statement

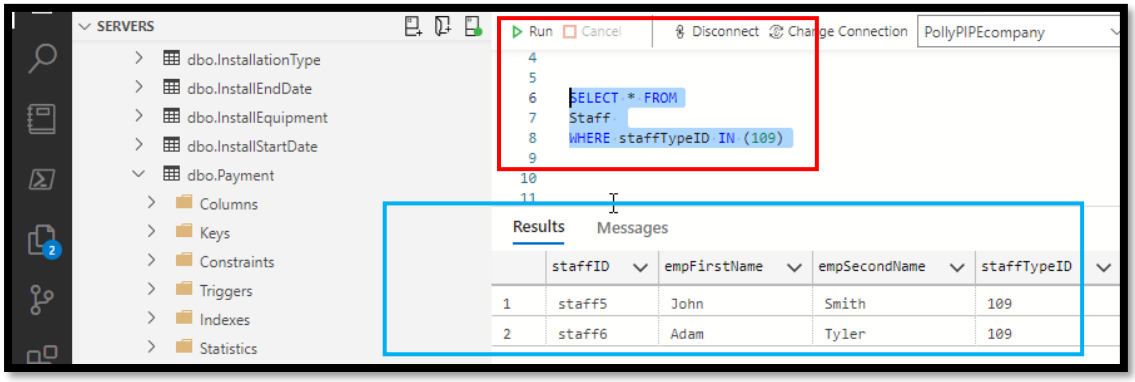


Figure 34 Example of IN statement

2.6.6 BETWEEN Statement

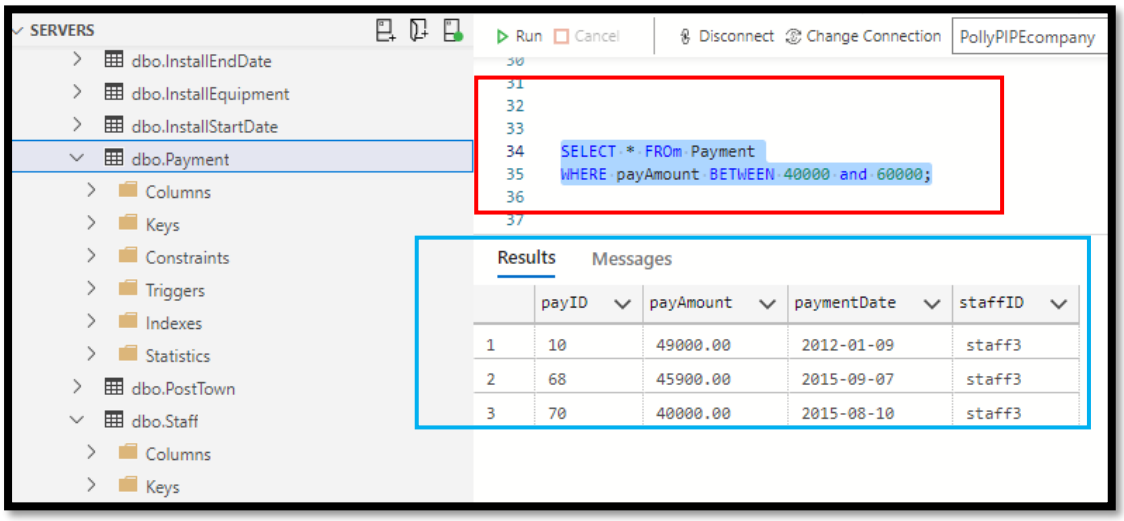


Figure 35 Example of BETWEEN statement

2.6.7 HAVING Statement

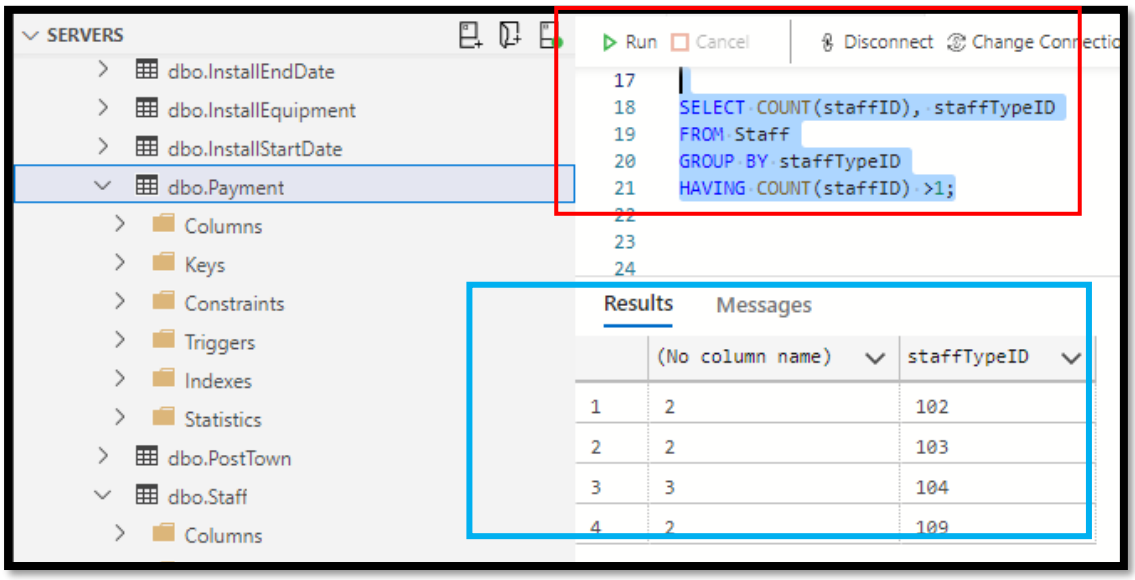


Figure 36 Example of HAVING statement

Activity 3.1

3.0 Testing the developed PollyPIPE system

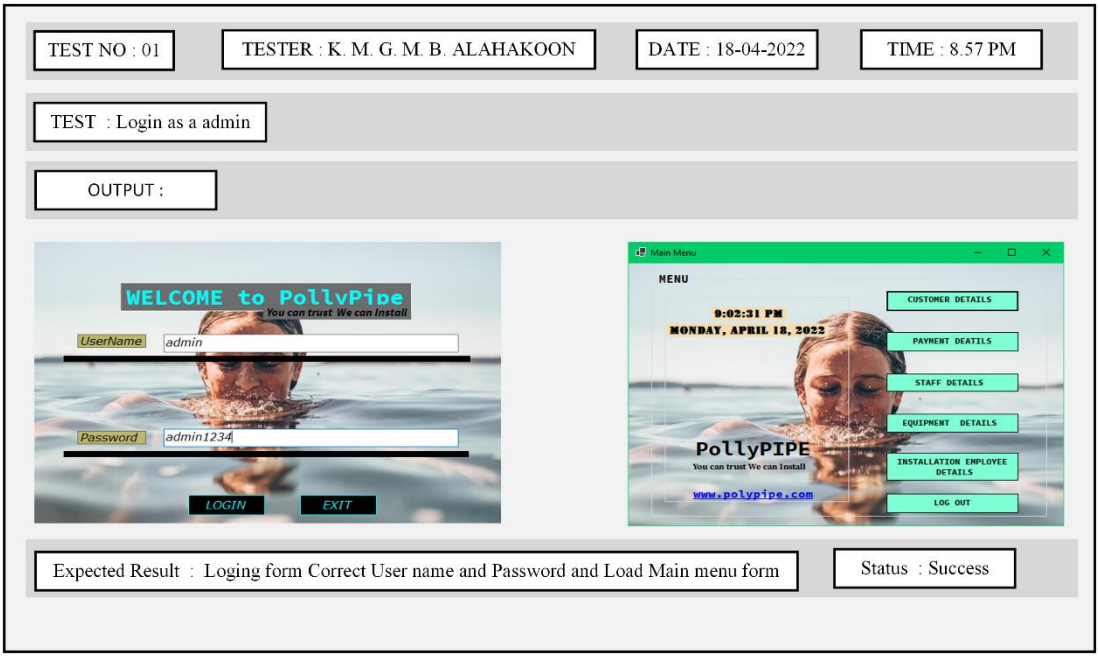


Figure 37 Test case 0

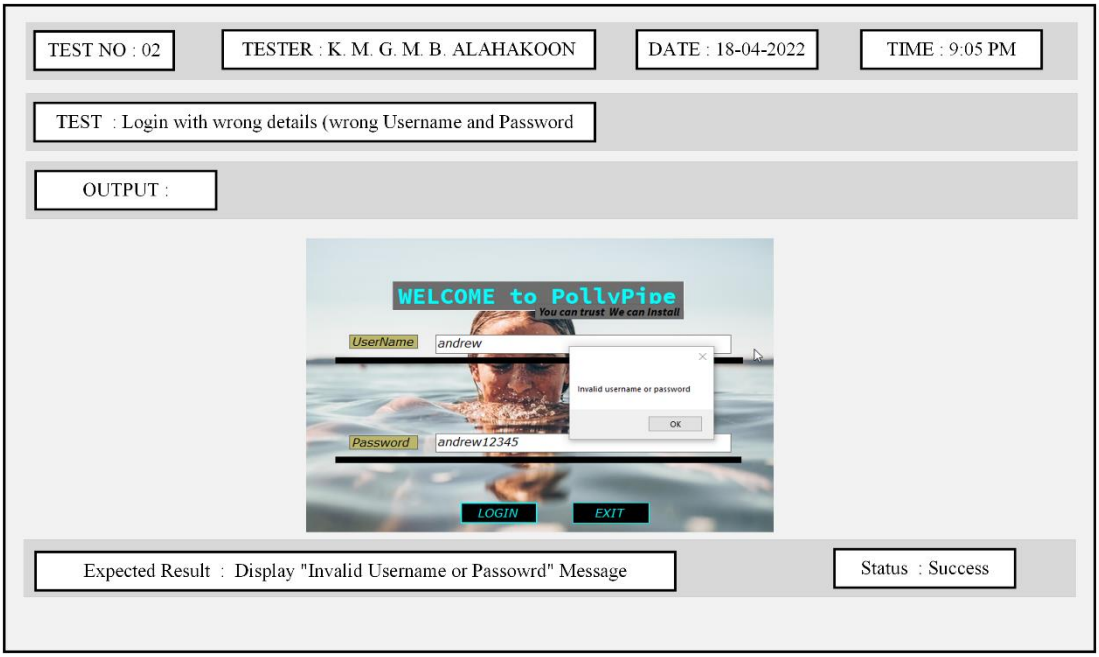
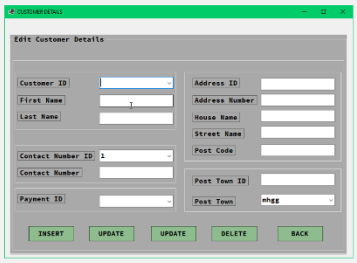


Figure 38 Test case 1

TEST NO : 03	TESTER : K. M. G. M. B. ALAHAKOON	DATE : 18-04-2022	TIME : 9:10 PM

TEST : Check CUSTOMER DETAILS Button

OUTPUT :



Expected Result : Show CUSTOMER DETAILS Window

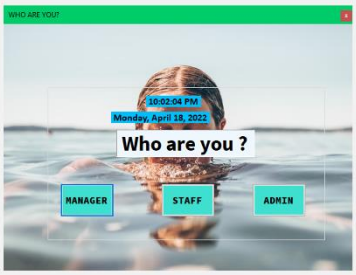
Status : Success

Figure 39 Test case 2

TEST NO : 04	TESTER : K. M. G. M. B. ALAHAKOON	DATE : 18-04-2022	TIME : 9:20 PM

TEST : Check LOG OUT Button

OUTPUT :



Expected Result : Show WHO ARE YOU? Window

Status : Success

Figure 40 Test case 3

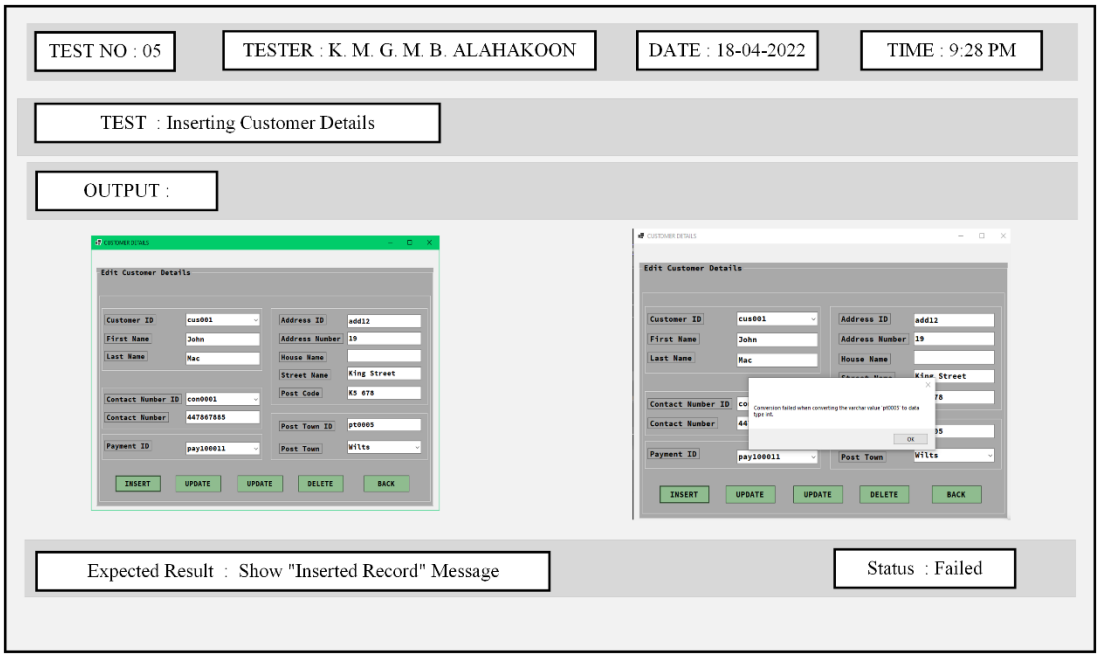


Figure 41 Test case 4

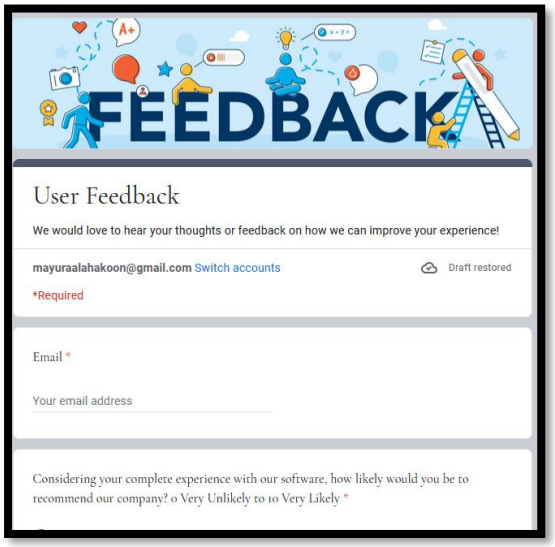
In test case 1, this test case shows how to Login into that system. The test case was passed, and it shows the Login function is working fine. It means that code has not any bugs. In test case 2, it was tested how if authorized person trying to log that system. The output was showing expected results. Therefore, we can assure that code has not any bugs and it's working correctly.

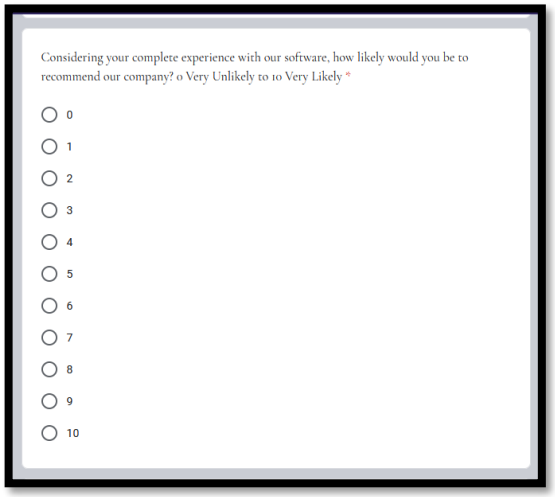
In test case 3and 4 has checked CUSTOMER DETAILS button and Log Out Button The outputs was expected result. Therefore, also we can assure these buttons are working correctly. But in Test case 5 has failed. That case shows the output was not expected result. Then we can say it has bugs and we must do debugging that code. These test cases are very effective for final product. Without doing test cases it will be occurs lot of problems in developed systems.

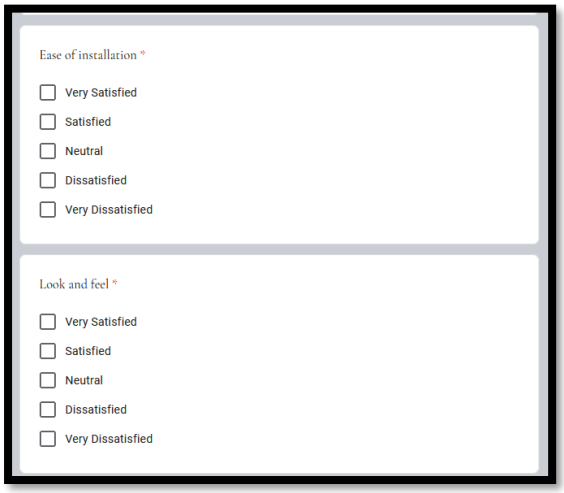
These test cases results can be defined as how effectively run developed systems and it will show how that system can achieved customer requirements. Test effectiveness and test efficiency are very important to count for a software product on the market value or an asset to the customer or end user. And this a process of finding bugs in the software and make the software bug free.

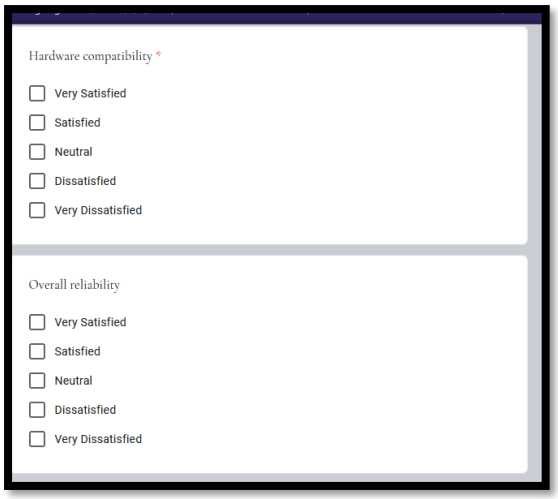
Activity 3.2

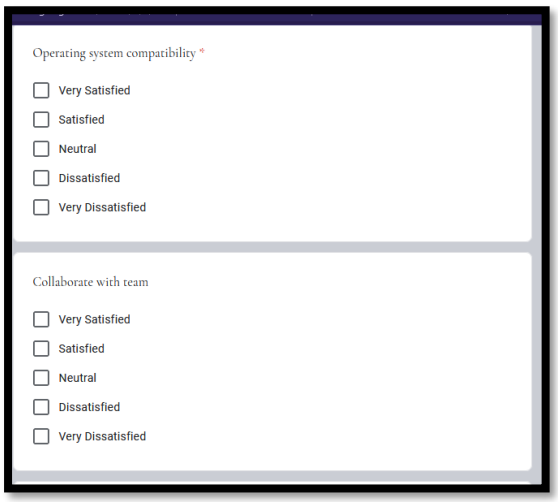
3.1 Get independent feedback form using Google From

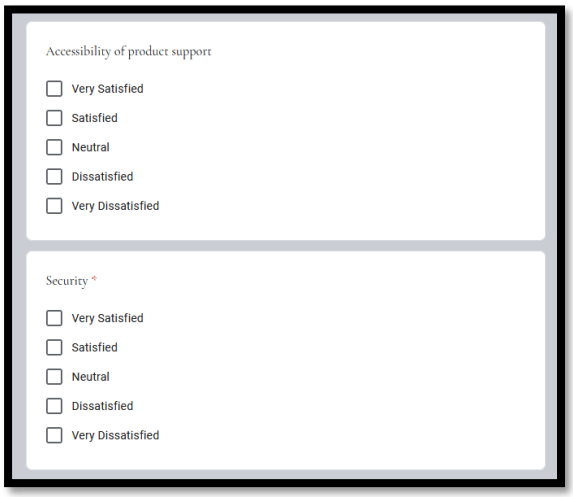







Hardware compatibility *
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied
Overall reliability
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied


Operating system compatibility *
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied
Collaborate with team
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied


Accessibility of product support
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied
Security *
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied

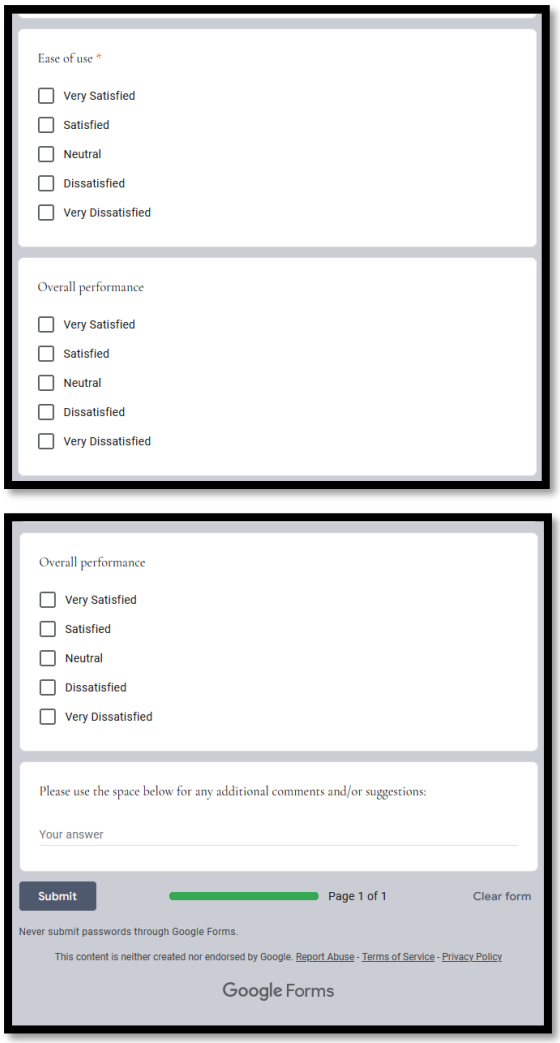


Figure 42 User Feedback

3.2 Analysing feedback data

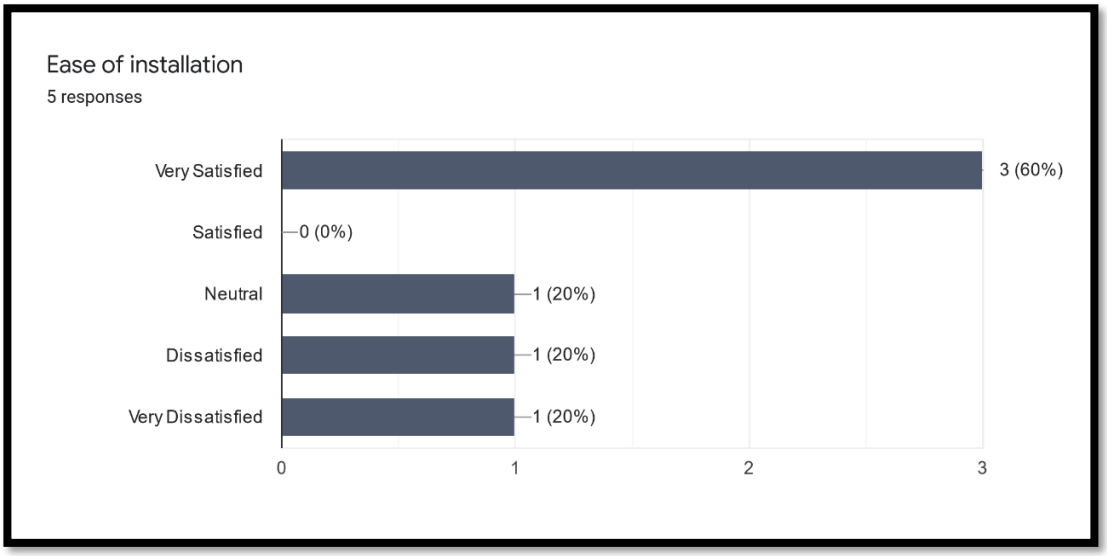


Figure 43 Analysing feedback data 0

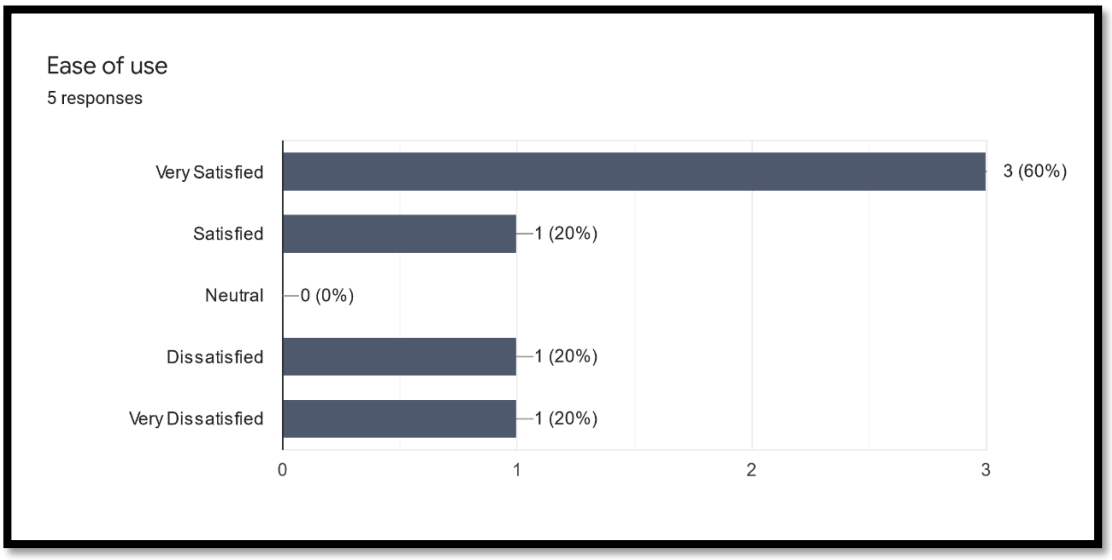


Figure 44 Analysing feedback data 1

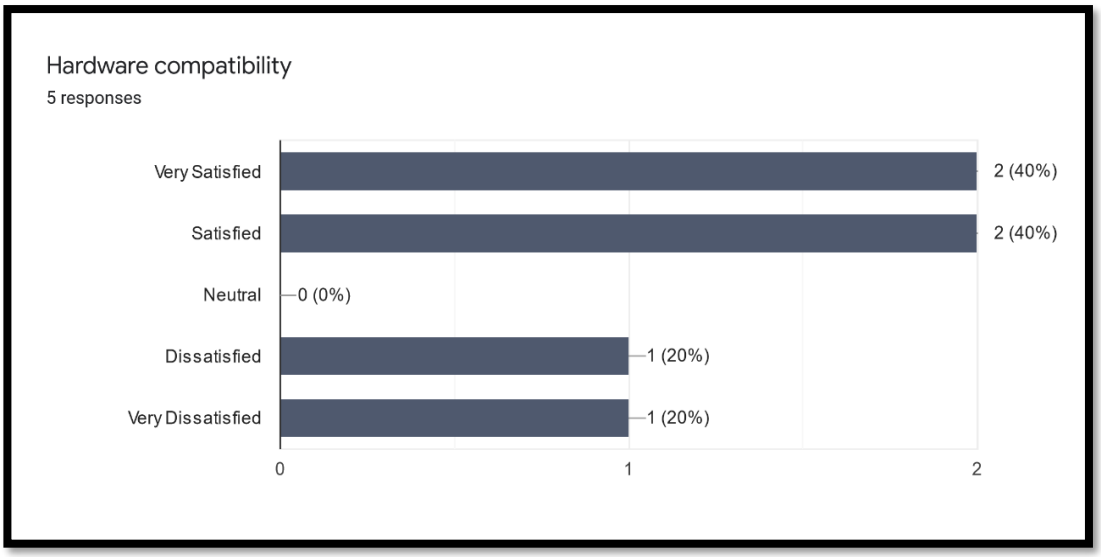


Figure 45 Analysing feedback data 2

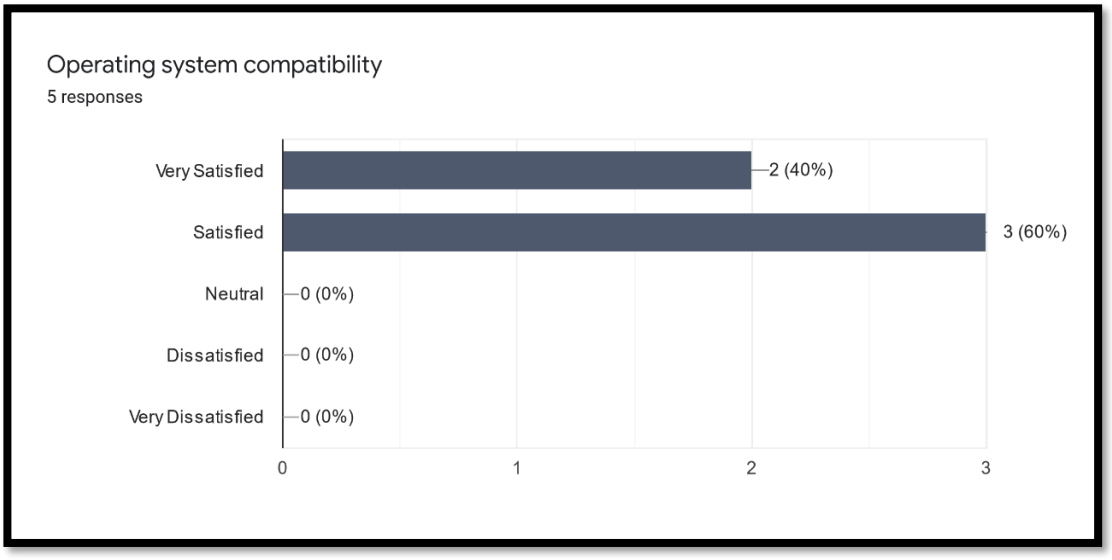


Figure 46 Analysing feedback data 3

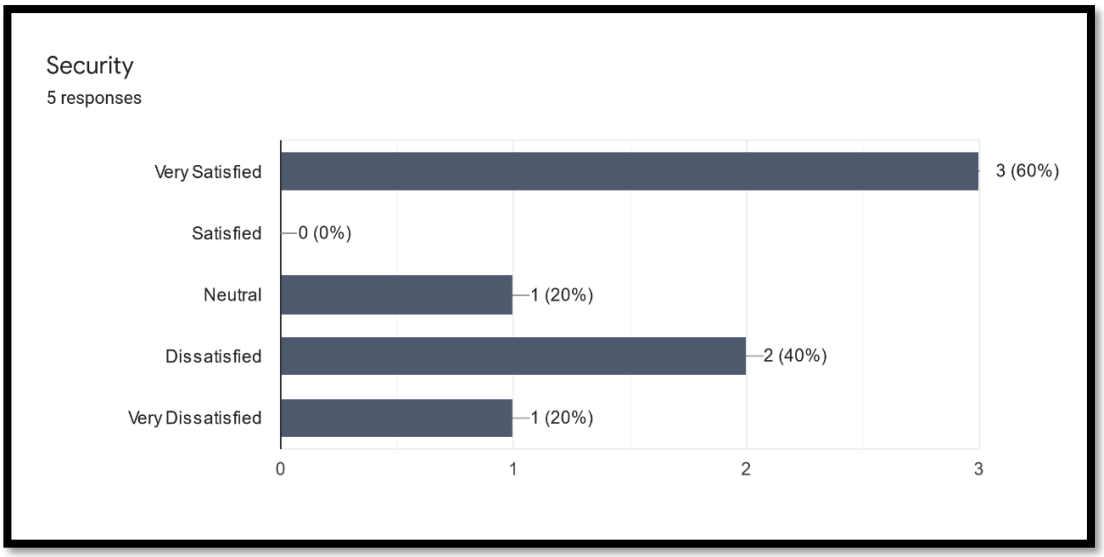


Figure 47 Analysing feedback data 4

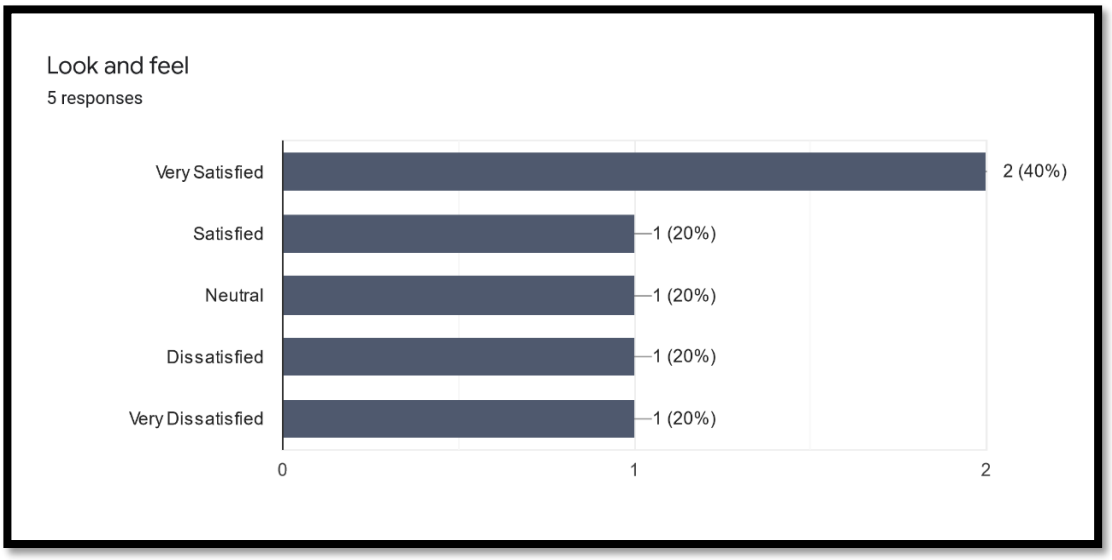


Figure 48 Analysing feedback data 5

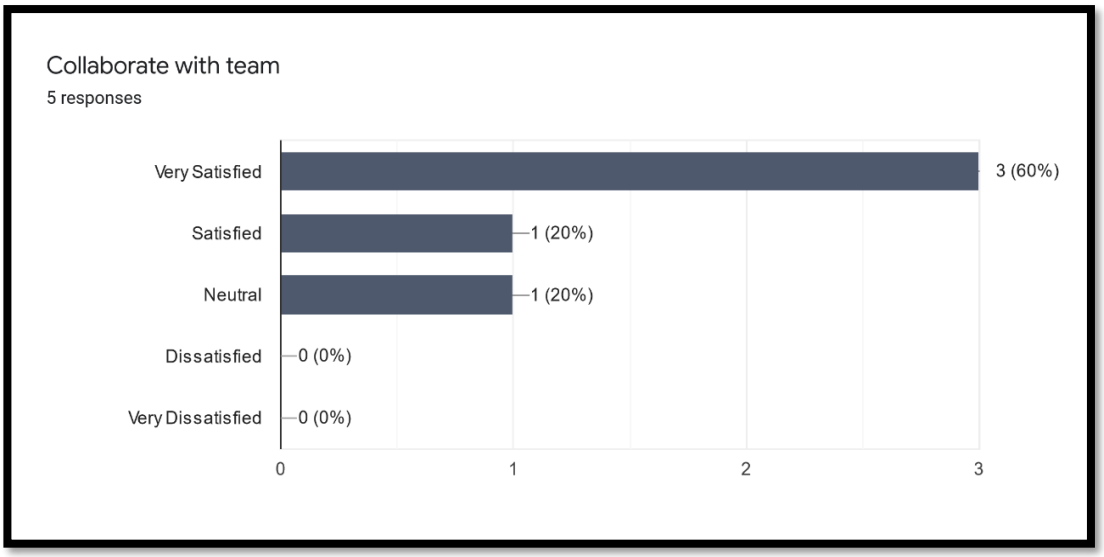


Figure 49 Analysing feedback data 6

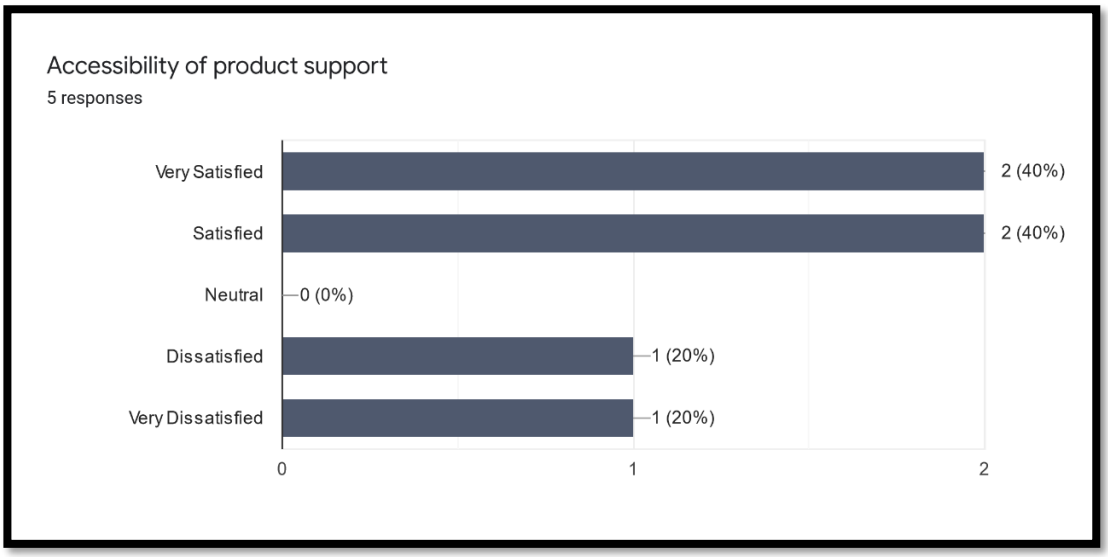


Figure 50 Analysing feedback data7

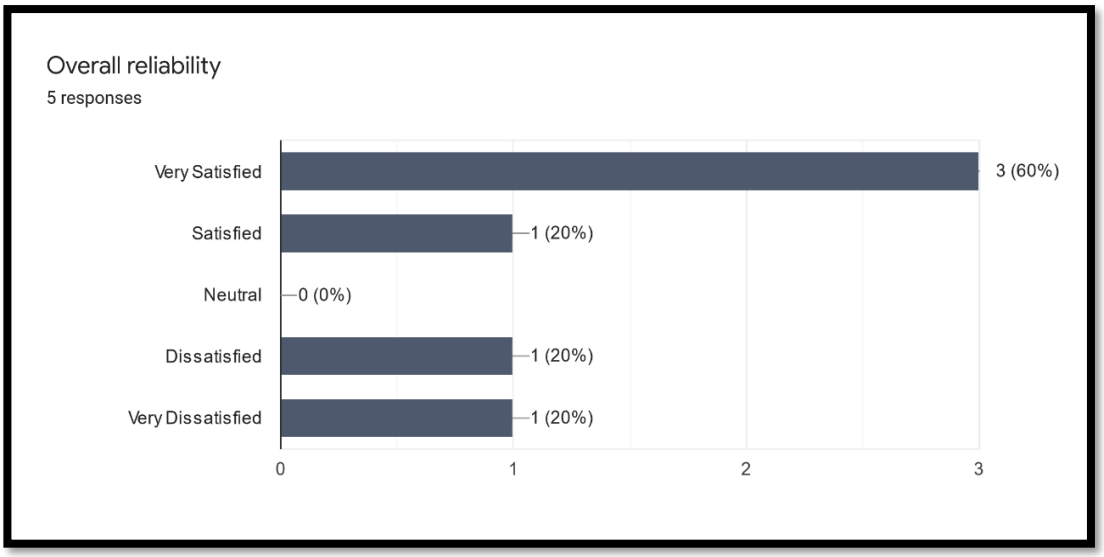


Figure 51 Analysing feedback data 8

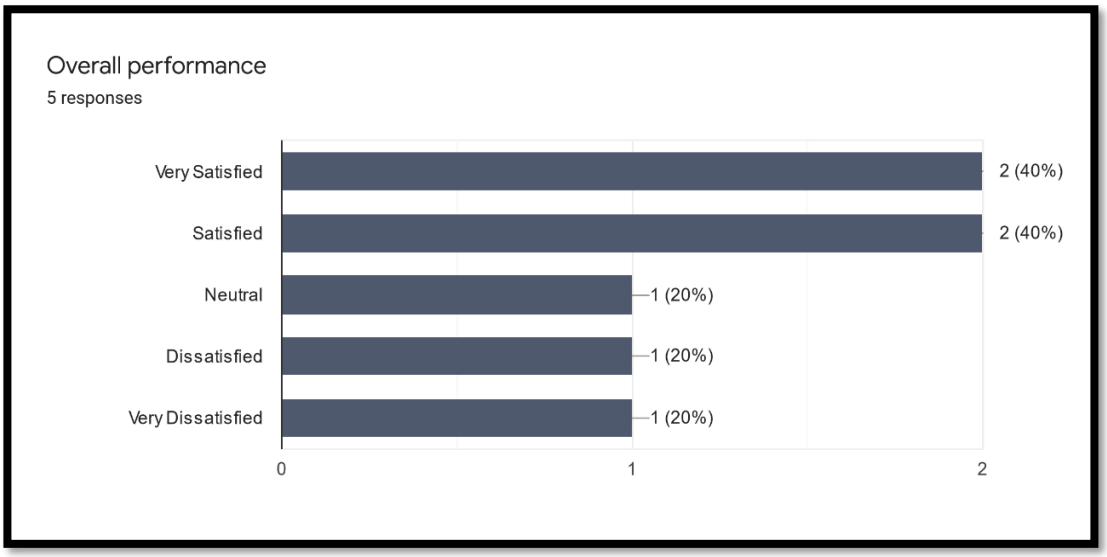


Figure 52 Analysing feedback data 9

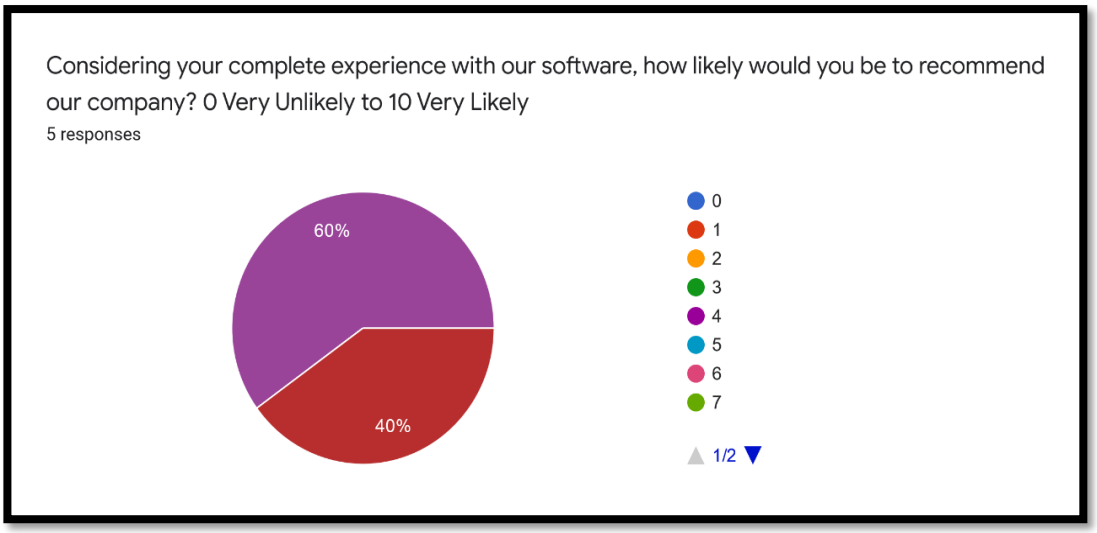


Figure 53 Analysing feedback data 10

Figure 54 Analysing feedback data 11

Customer feedback is information provided by clients about whether they are satisfied or dissatisfied with a product or service and the general experience they had with a product. Customer opinion is a resource for improving customer experience and adjusting your actions to their need. (Niepewna, n.d.)

In the above feedback form, one person said our system design needs to improve. As a developer of this PollyPIPE system, a developer must consider that feedback and all the other improvements that come with the next version of that system.

Activity 4

4.0 Technical Documentation

Technical documentation refers to any document that explains the use, functionality, creation, or architecture of a product. (MacKay, 2018)

The main system functional requirements of the Polly Pipe system.

- A user must have to inserting, updating, and deleting all the details into the database
- The system must have to GUI
- A user must have done the authentication process
- A user must have to do calculations (payments, salaries, etc…)
- A user must have to manage all the staff and company details
- A user should be able to check the installing process status
- A user should be able to get a print outing

These main requirements are included in this system. The company can easily install this system on their devices and control it. Below mentioned user guide can use for training their employees. Because all the employees are not technical people.

4.1 User guide for developed Polly PIPE system

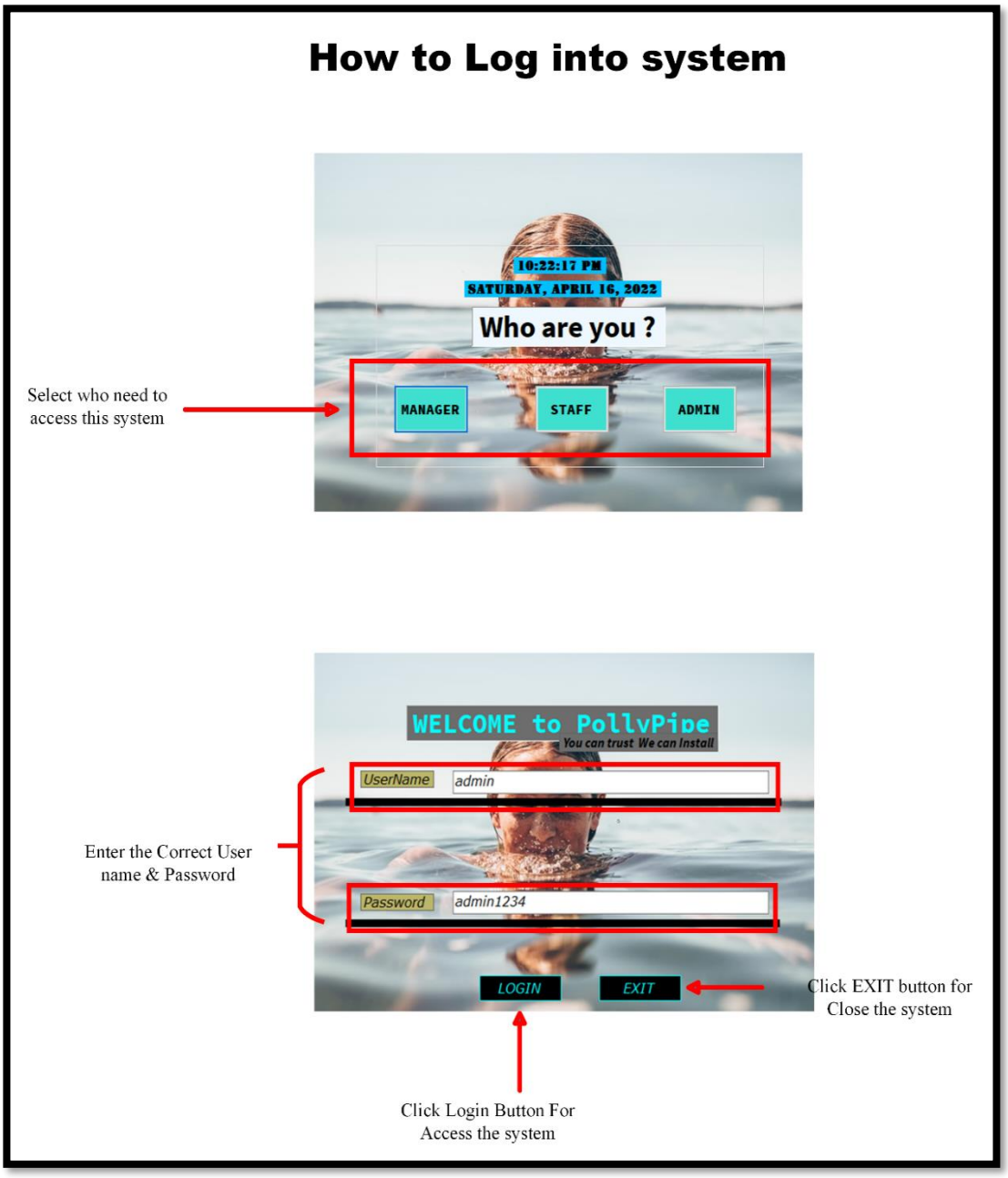


Figure 55 User guide 0

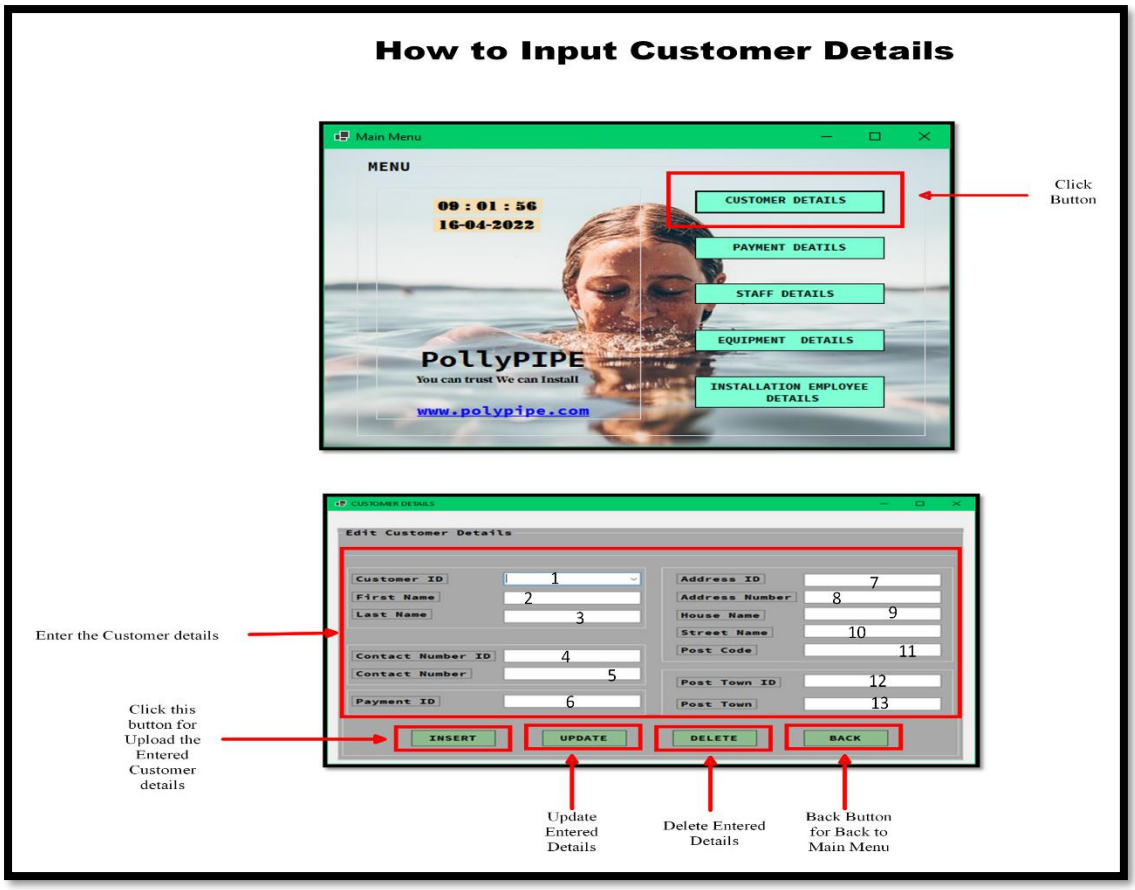


Figure 56 User guide 1

1 – Input the customer ID (Every customer has unique Customer ID)

2- Input the customer first name

3- Input the customer second name

4- Input the customer Contact Number ID (Every customer has unique customer contact id)

5- Input the customer Contact Number

6- Input the Customer Payment ID (Every customer has unique customer Payment ID)

7- Input the Customer Address ID (Every customer has unique Customer AddressID)

8- Input the Customer Address Number

9- Input the Customer House Name

10 – Input the Customer Street Name

11- Input the Customer Post Code

12- Input the Customer Post Town ID (Every customer has unique Post town ID)

13- Input the customer Post Town

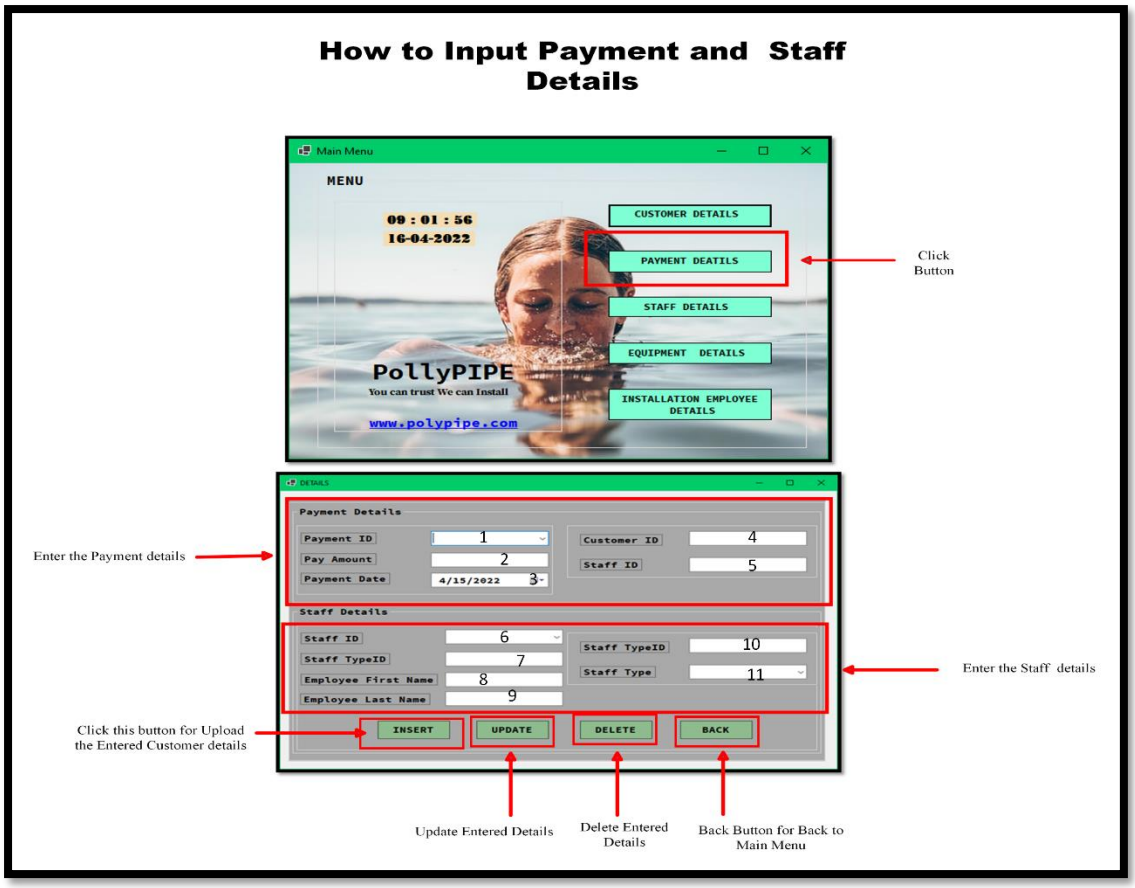


Figure 57 User guide 2

1 – Input the Payment ID (Every Payment has unique ID)

2- Input the Pay amount

3- Input the Payment Date

4- Input the Customer ID

5- Input the involved staff ID

6- Input the Staff ID (Every Staff has Unique ID)

7- Input the Staff Type ID

8- Input the Staff Employee first name

9- Input the Staff Employee last name

10. Input the Staff Type ID

11. Input the Staff Type name

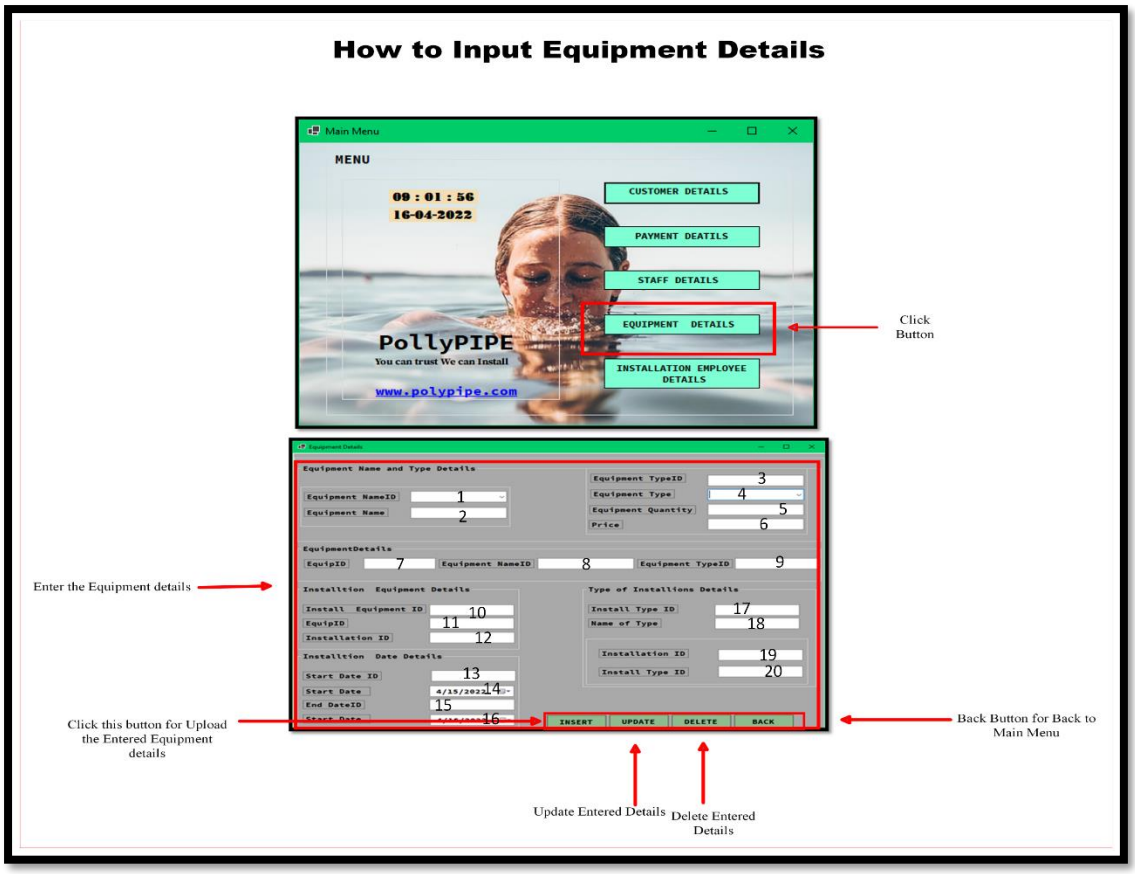


Figure 58 User guide 2

1- Input the Equipment Name Id (Every Equipment name has Unique ID)

2- Input the Equipment Name

3- Input the Equipment Type ID (Every Equipment Type has Unique ID)

4- Input the Equipment Type

5- Input the Equipment Quantity

6- Input the Price of each equipment

7- Input the EquipID (Each of Equipment has Unique ID)

8- Input the Equipment Name ID

9- Input the Equipment Type ID

10- Input the Installation Equipment ID (Unique ID)

11- Input the Equip ID

12- Input the Installation ID

13- Input the Installation Start Date ID (Unique ID)

14- Select Starting Date

15- Input the Installation Ending Date ID (Unique ID)

16- Select Installation Ending Date

17- Input the Installation type ID (Unique Id)

18- Input the Name of Type

19- Input the Installation ID

20- Input the Installation Type ID

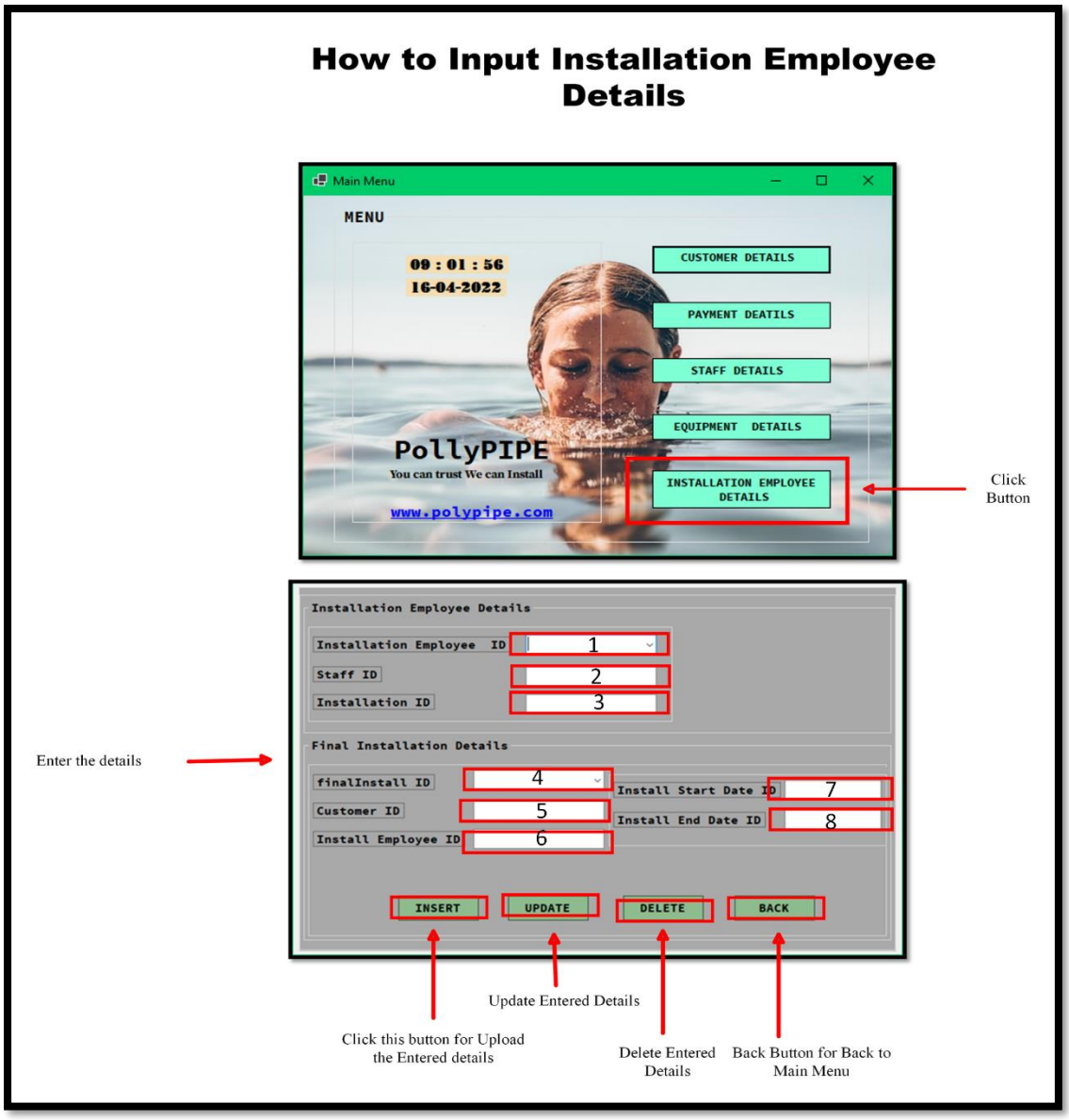


Figure 59 User guide 3

1 – Input the Installation Employee ID (Every Employee has unique Install Employee ID)

2- Input the Staff ID that Employee has

3- Input the Installation ID that Employee must work

4- Input the final Installation ID

5- Input the Customer ID

6- Input the Install Employee ID

7- Input the Installation Start Date ID

8- Input the Installation End Date ID

4.2 A use case diagram for the PollyPIPE system

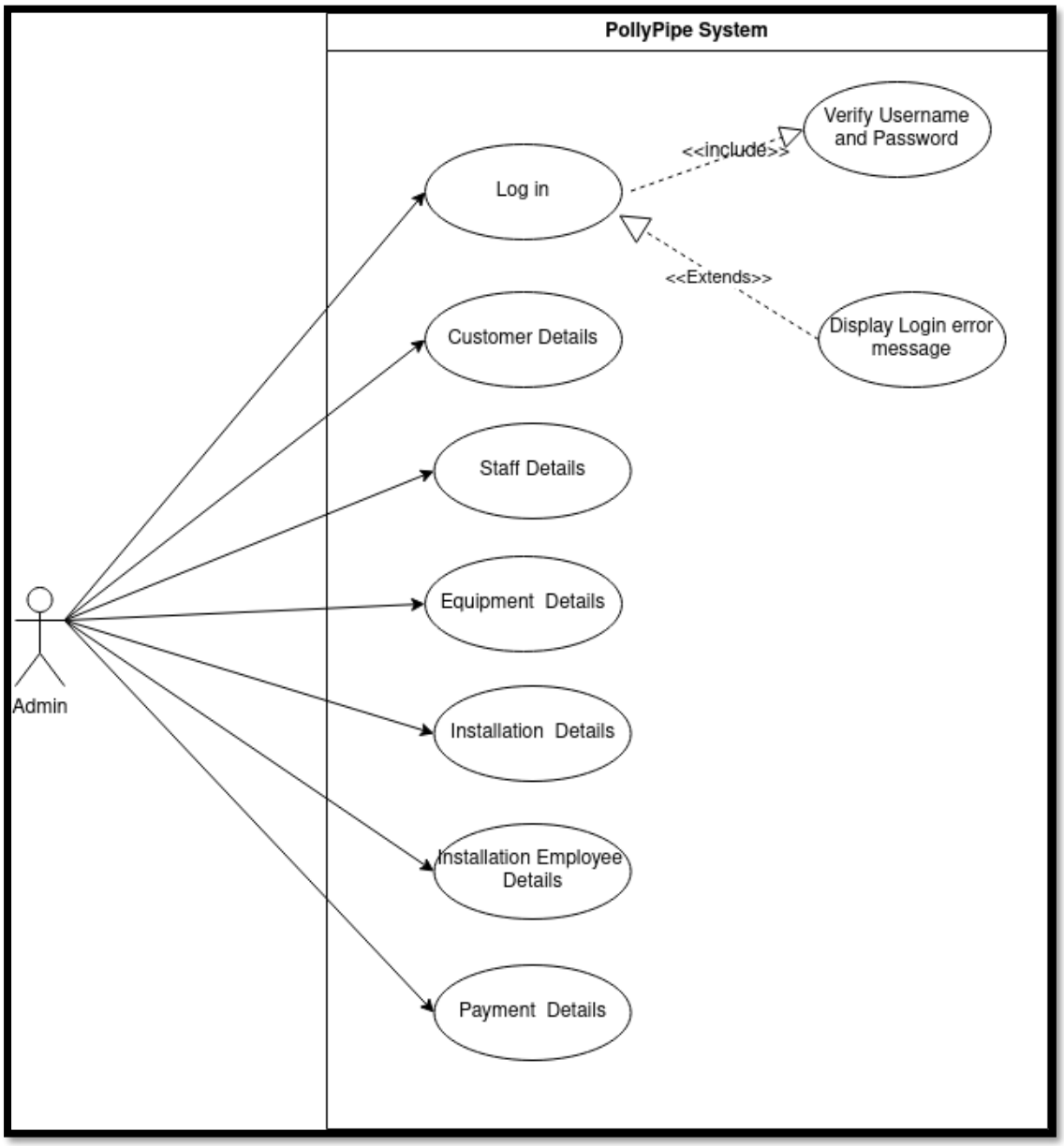


Figure 60 User case diagram

4.3 Class Diagram for PollyPIPE system

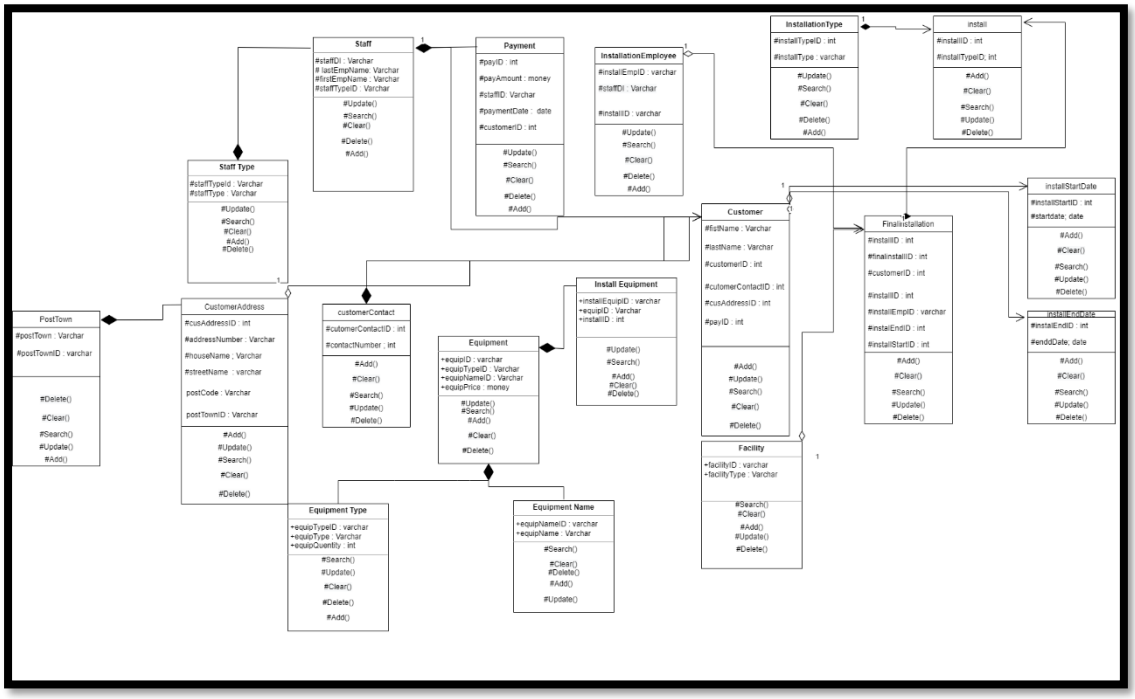


Figure 61 Class diagram

4.4 Flow chart for PollyPIPE system

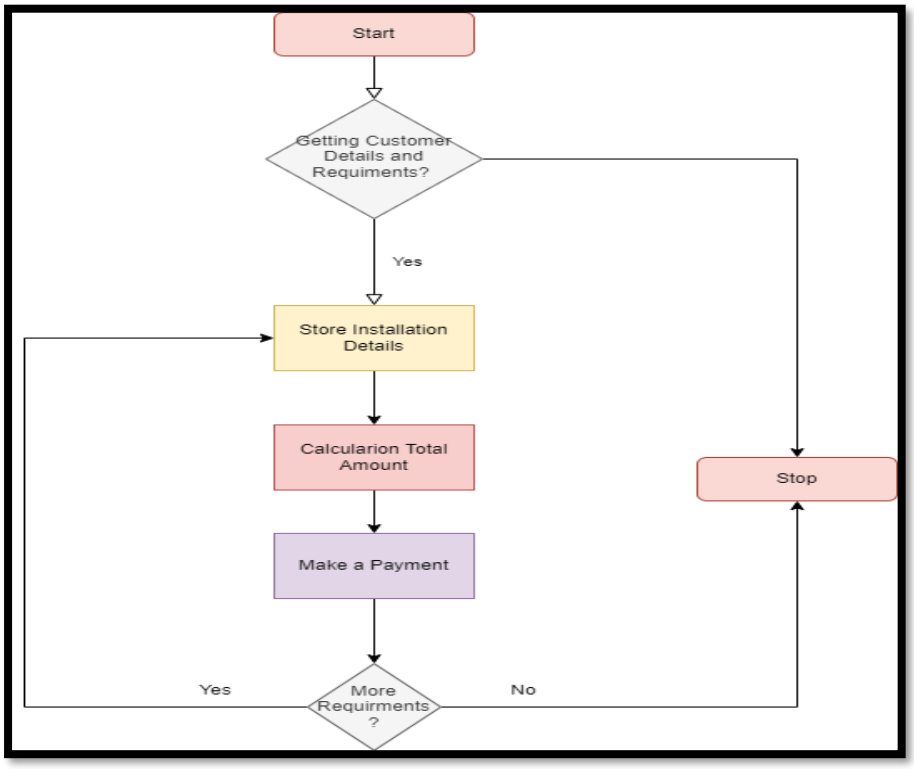


Figure 62 Flow chart

4.5 Future enhancements for the PollyPIPE system

1. Updating current Database version – The major factor in database performance is the version of SQL server that system currently deploying. Staying up to date with the latest version of that system database can have a significant impact on overall database performance. It's possible that one query may perform better in older versions of SQL than in new ones, but when looking at overall performance, new versions tend to perform better.

2. Upgrading Disk Types – The type of disks in this PollyPIPE system server can greatly impact the performance of that SQL query. Therefore, adding SSD disks into the system and working with SSD disks can significantly improve overall database performance and specifically SQL query performance.

3. Go to Cloud service – It will reduce the physical storage that system has. Examples: AW Cloud, Oracle, Microsoft Azure, Google Cloud Platform

4. Allocating more memory in the system- Basically, having more memory available will help to boost the system's efficiency and overall performance.

5. Improving GUI for getting a good user experience.

6. Adding Data Encryption methods to the system for protecting customer details.

Consolations

In conclusion, this report gives you the fundamental knowledge of Database Design and Development. In this scenario, I had a build system using SQL server and C# Windows application for a company called Polypipe (Pvt) Ltd, and their main requirements are mentioned. This report gives you all the information about SQL, the type of SQL language, examples, GUI for systems, how to collect user feedback and analyze, a user guide for the developed system, testing process, and future enhancements for the developed system.

Gantt Chart

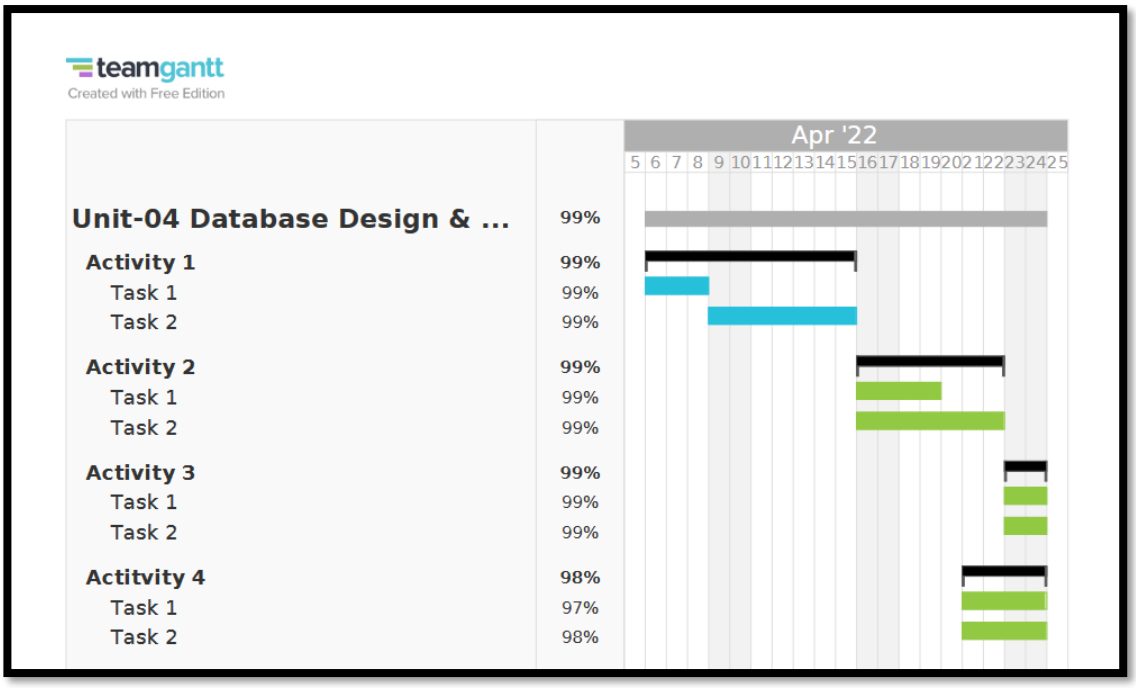


Figure 63 Gantt chart

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