DEVELOPMENT OF AN INFORMATION SYSTEM TO MANAGE VEHICLE REPAIR AND MAINTENANCE

DETAILS OF SRI LANKA TELECOM

By

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DECLARATION

I certify that this dissertation does not incorporate without acknowledgement, of any material previously submitted for a degree or diploma in any other university and to the best of my knowledge and belief this does not contain any material previously published in writing or orally communicated by another person where due reference is made in the text

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ABSTRACT

The transport section of Sri Lanka Telecom (SLT), repair and maintain the entire vehicles belongs to SLT. The information related to vehicle repairs was handled by transport section using a computer base system. But part of the information related to vehicle repairs was handled manually because the existing system contained limited number of operations. Further the existing system did not meet all the user requirements.

The aim of this project was to develop user-friendly software system to handle all the information related for vehicle repairs and maintenance.

After analyzing the project the linear sequential method was used. First the functional requirements were analyzed by interviewing the top-level management and some potential users of the system of the transport section. Then a database was developed using Microsoft Access to meet the functional requirements. Next the interfaces and reports were developed using Visual Basic (VB). The interface and reports were connected to the database using Structured Quarry Language (SQL). Then all interfaces and tables were subjected to both unit testing and system testing. Finally the management of the transport section of the SLT accepted the system.

The outcome of this project was a more user friendly and more efficient software system to handle all the information related for vehicle repairs and maintenance. The system contained 10 forms, 03 reports and 01 database with 10 tables. Results of testing, verification and validation procedures revealed that it matches with the original user requirements. The robustness of the system adds a strong point to its acceptability thus ensuring that it is less likely to collapse.
Allowing the online access for the users and providing report-generating tool such as Seagate Crystal Reports could further develop the system.

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01- INTRODUCTION

1.1 SLT at a glance

Sri Lanka Telecom is the largest listed company in the country with over 25,000 shareholders. It has been among the few highly quoted companies in the Colombo Stocks Exchange for many years. The company is semi government and its privatization was done in 1997. Currently 51% of its shares have been acquired by the NTT, which oversees its management. A workforce of around 10,000 employees serves for the company presently.

A CEO appointed by the NTT is the top of the administrative hierarchy and the organization has been divided into several groups and they in turn have been divided into sections for easy administration. For each group and section there is a head of group (HG) and a head of section (HS) has been appointed.

The complete acquisition of the mobile operator Mobitel has strengthened and repositioned SLT as a leader and the only complete and fully-fledged telecommunication provider in Sri Lanka.

SLT network expansion reached 750,000 customers in 2002 and it expects to achieve the 1,000,000 landmarks in the year of 2005.

1.1.2 Services Offered

SLT being the largest provider of fixed telephone facilities in the country caters for a multitude of other needs of its residential, business and official customers. They are:

1. IDD facilities
2. Voice mail and Fax mail
3. SLT net – provides comprehensive packages for Internet surfing
4. SLT Plus
5. SLT CLI
6. ISDN
7. ADSL
8. Satellite assisted services- INMARSAT, Radio Maritime calls

1.2 Overview of the Project

1.2.1 Project Description

Sri Lanka Telecom's headquarters requires a vehicle fleet of around 1500 to operate its activities in the Colombo metropolitan area and in the suburbs. A separate section called transport section has been established within the organization to handle the task of maintenance of these vehicles. The transport section of SLT is located at Nugegoda and there is a separate head to oversee this activity.

The information related to vehicle repairs was handled by transport section using a computer base system. But part of the information related to vehicle repairs was handled manually. The existing system contained limited number of operations and it did not meet all the user requirements. Therefore the users of this system faced great amount of difficulties when operating the system.

1.2.2 Objectives

The main objective of this project is to develop user-friendly software system to handle all the information related for vehicle repairs and maintenance. The proposed system meets all the user requirements. To make this information system user friendly, a Graphical User Interfaces (GUI) will be added.

1.2.3 Specific objectives

-To develop the application with minimum resources in the minimum time frame.
-To study the software development methodologies.

-Analysis of the effectiveness of the available methodologies for this project.

The current project has been selected in the view of addressing the above issue in order to handle the data volume in an efficient manner using the state-of-the-art of software development technology.

The interfaces of the system are to be developed by using Visual Basic language and the database is to be designed and implemented by using Microsoft Access.

02- LITERATURE REVIEW

2.1 Software development methodologies

There are several types of methodologies available for software development. IEEE has proposed a number of standards for this purpose. Before selecting a methodology the developer must concern a set of rules that has to be followed in the development process. These key features are the time availability for project development; entering releases, and clear definition of the problem. According to the development method the way to reach end product will vary .The model will be selected by the developer according to the environment of customer requirements. But the final product should be well standardized and should fulfill the customer requirements. The following models are frequently used for the software development process.

(a) Linear sequential model
(b) Evolutionary model
(c) Spiral model

There are no clear arguments about quality and reliability of those models. They rely upon the user requirements.

2.1.1 Linear sequential model

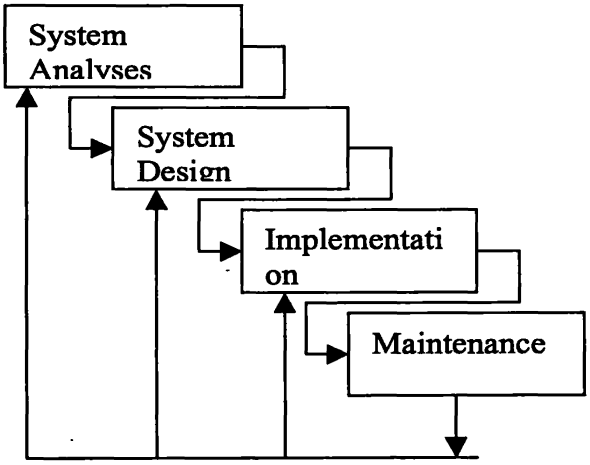

Figure 2.1 Linear sequential model

This model provides a very clear view from the managerial aspect and easy to model, plan, monitor and understand. However for these models nearly all requirements need to be understood very clearly. In this process this model is more appropriate when requirements are stable and well understood.

Linear sequential model is more suitable for a project with relatively long time duration. There are usually no bypasses in the original pathway.

2.1.2 Evolutionary model

Evolutionary model is more applicable when the requirements are not well defined or understood or likely to undergo significant changes. In this process, users evaluate the system capabilities.

The process cycle is repeated until every stakeholder is satisfied.

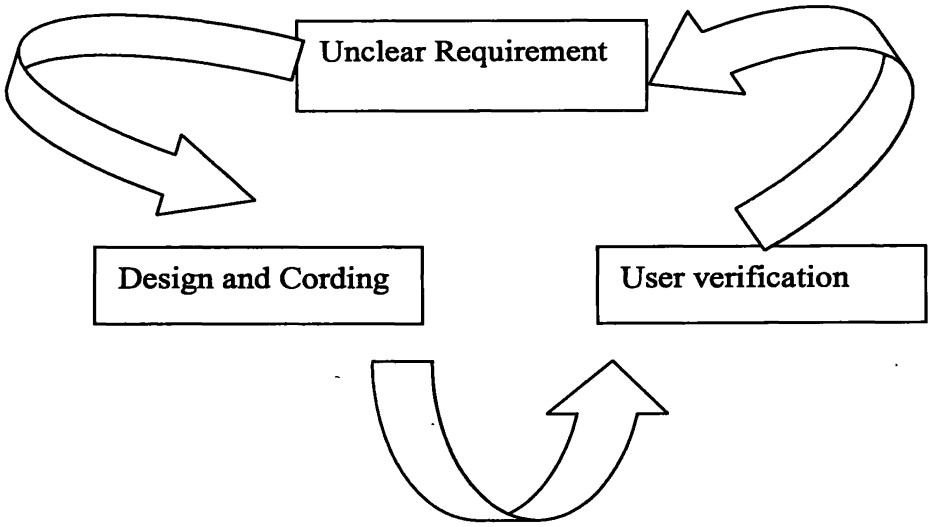

Figure 2.2 Evolutionary model

2.1.3 Spiral model

This model is most appropriate for system requirements in terms of reliability and risk management. This process focuses its attention on early error elimination and puts quality objectives up run integrating development and maintenance and provides a framework for simultaneous risk assessment. However this process is time costly and may not be possible due to some contractual reasons (Pressman, 2001).

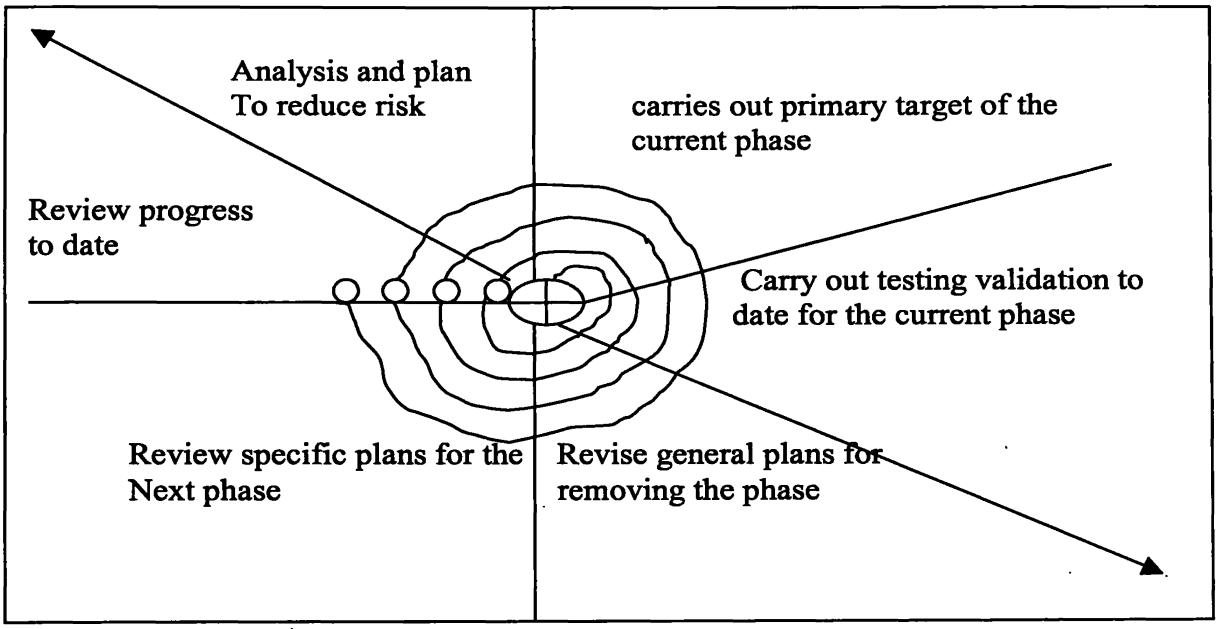

Figure 2.3 Diagram for Spiral model

2.2 System Development Life Cycle (SDLC)

The development process undergoes several stages. These stages are collectively called the System Development Life Cycle (SDLC). The stages in the SDLC are the following.

1.Requirements analysis

2.Software design

3.Coding

4.Testing

5. Maintenance (Sommerville, 1996).

2.2.1 Requirements Analysis

The requirements gathering process focuses especially on software to understand the nature of the computer program to be developed. A system analyst can be employed to understand the user requirements very well.

The functional requirements of the software system as well as the performance and interfaces are taken into consideration. The output of this phase is the software requirements specification.

Software Engineers are often faced with major problems regarding a particular project and usually understanding the major problem involves huge cost. If the system is new and there are no automated systems at the moment to be used as a possible model for the proposed system the situation would be still more complicated. Identifying the services that the system must provide and the constraints under which the system must operate is referred to as requirement analysis. There are three types of document produced during this stage.

1. Requirement definition document
2. Requirement specification document
3. Software requirement specification document

The requirements definition document is prepared using natural language and defines the services. The proposed system is expected to provide this document must be prepared in such way it is understand. Even by non-technical person.

2.2.2 Software Design

Software designing is the process of deriving solutions that satisfy the software requirements where derive solution means modeling or describing the problem in suffusion detail so that it can be easy implemented.

One of the typical stages in design is the problem understanding and looking at the problem from different angles to discover the desired

solution. Other one is to identify one or more solution after evaluating the set of possible solutions and finding the most appropriate one.

2.2.2.1 Data design

The data design part transforms the information model created during analysis in to the data structures that will be required to implement the software. The data objects and relationships defined in the entity relationship diagram and detailed data content define the data dictionary and provide the basis for the data design activity.

The concept of information hiding and data abstraction provide the foundation form the approach to data design .The primary activity during data design is to select logical representations of objects (data structures). Objects are usually identified during the requirements definition and specification phase. The selection process may involve algorithmic analysis of alternative structures in order to determine the most efficient design or may simply involve the use of a set of modules that provides the desired operations upon some representation of an object. Data structures and dictionary descriptively included in the later.

2.2.2.2 Architectural design

The primary objective of architectural design is to develop a modular program structure representing the control relationships between Modules. The process flow diagrams are used to depict flow of data between the modules.

2.2.2.2.1 Object identification

In this stage a behavioral approach is used to identify the objects. The various behaviors are assigned to different parts of the system and an understanding is derived as to who initiates and participates in these behaviors. In practice, many different sources of knowledge have to be used to discover objects and object classes. Objects and operations are initially identified from the informal system description that was the start point for the design. Further information from application domain knowledge or scenario analyzes are used to define and extend the initial objects. This information has been collected from requirements specification documents, discussion with prospective users and conducting an analysis of existing systems.

2.2.2.2.2 ER Diagram

After identifying the object of the system, a conceptual model is developed. An object is described using the following three features.

1 Entities
2 Relationships
3 Attributes

An entity is specific distinct real world item in the application. Relationships connect entities and represent meaningful dependence between them. Attributes specify properties of entities and relationships.

2.2.2.3 Database Design

Considering the design protocol, objects are arranged in the tables with fields, after developing the attributes. Usually normalization procedure is a prerequisite in this process and hence the table fields are redefined.

The normalization process is carried up to the 3rd normal form thus minimizing the repeating data and reducing the complexity of table data.

Microsoft Access is an easy-to-handle database management environment available for the Windows platform. Documentation of database designing has to be completed in parallel with the designing to avoid any mishaps. It is purely important for future reengineering process

2.2.2.3.1 Relational databases

A relational database is a collection of related data. This indicates relation among data elements. A data field contains the smallest element of data that can be stored in a database. Data records are collections of related data fields. Records can contain several related data fields, and database can contain several related tables.

Complex data can be stored very efficiently by using relationships. By establishing meaningful relationship between data tables, flexible data structures can be created that are easy to maintain.

One-to-one relationships are used to link records in a master table to a single related record in another table. One- to- many relationships are used to link records in a master table to multiple records in another table.

2.2.2.3.1.1 Key fields

Primary key

The main role of the primary key is to maintain the internal integrity of a data table and for that reason no two records in a data table can have the same primary key value.

Foreign key

The main role of the foreign key is to define and maintain relationships between data tables in a database. For this reason foreign key fields are not unique in the data table in which they exist.

2.2.2.3.1.2 Database normalization

Data normalization is a process of refining database structures to improve the speed at which data can be access and to increase database integrity, patting a database together involve discovering the data elements that are needed and then creating a set of the database table to hold those elements.

A well-normalized database minimizes the number of times each specific bit of information is entered in to the database. Inconsistencies caused by the data change do not occur when data is located at only one place.

Databases built for maximum integrity have many small data table each of which can have several indexes. Most foreign keys are referencing other tables in the database.

First normal form.

The first rule of data normalization states that, a separate table for each set of related columns is constructed and a primary key is given to each table.

Second normal form

If the columns depend only on part of a multi-valued key it is removed to a separate table. In other words if it is needed to fill in two fields in order to truly identify the record but only one of those fields is needed to perform a look of in the table, a new table is needed.

Third normal form

If a column does not fully describe the index key, that column should be moved to a separate table or in other words if the columns in the table don't really needed to be in this table, they probably need to be somewhere else.

The table should not contain two or more one- to- many or many- to- many relationships that are not directly related. In other words, if the data element is important but not directly related to other element in the record.

The related multiple relationships should be isolated within the database. In other wards, if several complex relationships exist in the database, separate each of the relationship into its own table (Podlin and Palmer, 2000).

2.2.2.4 Interface design

2.2.2.4.1 Event driven model

Even_ driven programming means that most of the cord will be run as users do things writhing the program or even when certain things happen in windows-when event occur. Programming this way means when event occurs and have to write cord that will make program do something in response to the event.

Procedure defined as any block of cord that can be called from within the application. This procedure cord might be used to move objects around on the form, calculate a value from a formula, or write data to a database.

2.2.2.4.2 Object oriented concept

Object is an entity that has state and defines set of operation, which operates on that state. The state is represented as a set of objects attributes. The operation associate with the object provides services to other object, which request the services when some computation is required.

Objects are created according to some object class definition and object class definition serve as a template for object. It includes clear ate all attribute and services which should be associated with an object and that class.

Objects are abstraction of real world or system entity, which is responsible for managing their own private state and offering services to other objects. Objects are independent entities that may readily be change because state and representation information is held within the objects. Change to the representation may be made with out reference to other system objects.

2.2.2.4.2.1 Data Access Object (DAO) database Engine

DAO is used to access to multiple type of data in one interface. DAO jet engine has set of routines and talks to a set of translation routines, which convert the request in to a format that the target database can understand.

DAO has own query engine, search, and order, filter the data. This database engine is stand alone in local area network.

2.2.2.4.2 Remote Data Object Model (RDO)

All data work will be against remote database servers over the network connections.

RDO is quite similar to DAO. One of the obvious differences is in the size of the object models. The DAO model has over twenty major objects to work with, and the RDO model has less than fifteen. RDO interface was meant for use when connecting to large multi-user database systems such as SQL server, oracle.

2.2.2.4.2.2 ActiveX Data Object Model

Database project is needed to interact with user connected via web services and support the data programming.

ADO model is the smallest database object model. It provides a quick and effective way to build record set from connected database. Even better, it create a record set, disconnect from the server_ even save the record set to a local disk file_ and then, later, connect back to the database and send updated record set.

Visual Basic 6.0 application that shows how to use the ADO model in code to create connection and record set, and to run parameter queries against both Microsoft Access and SQL Server databases.

In fact, there only three key objects in the model:

1. Connection represents the actual database connection,
2. Command is used to execute queries against the data connection.
3. Record set represent the set of records colleted from the query issued via the Command object.

2.2.3. Coding

There are several important features that should be followed when writing a program.

a. Structured programming.
   A given program segment has a single entry and single exit. The use of go to statement is avoided as much as possible.
b. Use of meaningful identifiers (Constants, Variable names and functions)
c. Comments-: use comments to briefly explain the activity of program segment.

2.2.4. Testing

Many software systems deal with large number complex formulas, functions and algorithms. The size of the project number of people involves and add complexity. The process of error is unavoidable

2.2.4.1 Validation and Verification

Validation ensures whether the right specifications are there, and then verification checks that those specifications are achieved. Those are concerned with assuring that a software system meets a user's needs. It takes a place through out the software life cycle catering for two main objectives. First one is discover the defects of the system. Second is assessment of whether or not the system is usable in an optional situation.

2.2.5 Maintenance

Software maintenance is modifying a program after it has been put into service. Maintenance management is concerned with planning and predicting the process of the change.

2.3 The use of the Visual Basic language as a Rapid Application Development tool

VISUAL BASIC is a high level programming language evolved from the earlier DOS version called BASIC. BASIC means Beginners' All-purpose Symbolic Instruction Code. It is a fairly easy programming language to learn. The codes look a bit like English Language. Different software companies produced different version of BASIC, such as Microsoft QBASIC, QUICKBASIC, GWBASIC, IBM BASICA and so on.

VISUAL BASIC is a VISUAL and events driven Programming Language. These are the main divergence from the old BASIC. In BASIC, programming is done in a text-only environment and the program is executed sequentially. In VISUAL BASIC, programming is done in a graphical environment. Because users may click on a certain object randomly, so each object has to be programmed independently to be

able to response to those actions (events). Therefore, a VISUAL BASIC Program is made up of many subprograms, each has its own program codes, and each can be executed independently and at the same time Each can be linked together in one-way or another (Sheffield Hallam University, 2004).

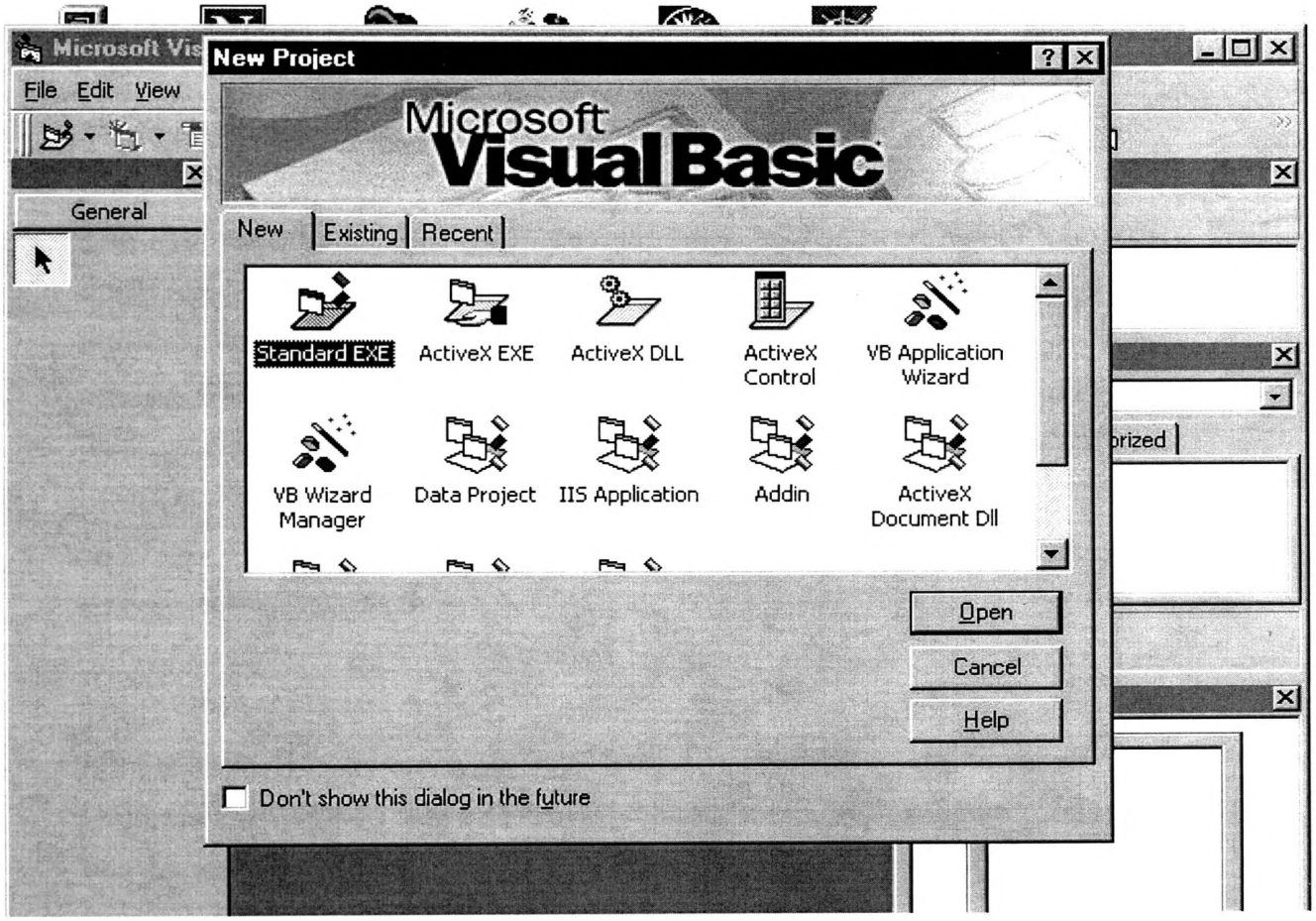

Figure 2.4 The Visual Basic Start-up Dialog Box

Visual basic Editions

Visual basic 6 is available in four editions, each designed to meet specific development requirements. The following sections discuss these editions.

Learning Editions

The learning Editions is designed to allow programmers to easily create powerful applications for Windows 95, 98, and NT. This edition includes buttons all intrinsic controls, such as command buttons, list boxes and option buttons. It also has grid, tab, and data bound controls. The Learning edition is the entry-level edition of Visual Basic and is geared toward students and the home user.

Professional Edition

The Professional Edition gives developers a full-featured set of tools for application development. It includes all features of the Learning Edition and has several additional ActiveX controls and wizards. Most notable among these additional controls are Internet controls. This edition, as well as the Enterprise Edition, is designed to meet the needs of the professional programmer.

Enterprise Edition

The Enterprise Edition gives developers who need to create distributed applications in a team environment. It includes all features the Professional Edition as well as advanced tool: Automation manager, component project oriented version control system, among others.

Control Creation Edition

The control Creation Edition is a recent addition to the Visual Basic product line. This edition is designed specifically to be use to create ActiveX controls easily and quickly .It differs from the other three editions in that it cannot be purchased at retail outlets. This edition cannot be used to create stand alone applications; it can only create ActiveX controls for use in other development environments (Podlin and Pamela, 2000).

03 - METHODOLOGY

Fist the requirements were analyzed. The requirements were clear, not changed frequently and the proposed system was going to be used for a long time. Therefore the linear sequential model was used for development process.

The entire development process was carried out in the following stages.

- Requirements analysis
- Data design
- Interface design
- Database design
- Coding
- Testing

  Documentation

3.1 Requirements Analysis

This stage was conducted with the participation of the stakeholders or those who directly benefited and involved with the system. In the requirements definition all necessary details were gathered referring to the documents they had been using and also from the people who involved with the manual system. Moreover following personnel were interviewed.

- Head of the Section (HS)
- Technical officer
- Foreman
- Mechanics
- Data entry operators

Next the feasibility study was done.

After the preliminary study of the system the feasibility report was submitted to the HS for the approval.

3.2 Data Design

After requirement analysis, the description of the entire system was written in English. And the entities, relationships, attributes were identified. To identify above features a special technique was used as follows.

All the nouns were identified as entities or attributes of entities, and all the verbs as relationships. Then Entity Relationship (ER) Diagram was drawn. Appendix I illustrates the ER diagram.

3.3 Interface Design

The Visual Basic development environment was preferred by the management for this purpose. Then the interface generation was carried out using Visual Basic 6.0 Enterprise Edition.

The following basic elements comprised the interfaces.

- Forms
- Reports
- Data Grids and Data Controls
- Other screens: Login dialog boxes and menus.

3.3.1 Forms

They were developed as the gateway points to access key areas of the system. The following controls were utilized in forms.

- Text boxes
- Command buttons
- Combo boxes
- List boxes
- Labels
- Frames
- Picture boxes
- Timer

The hierarchy of the forms was as follows.

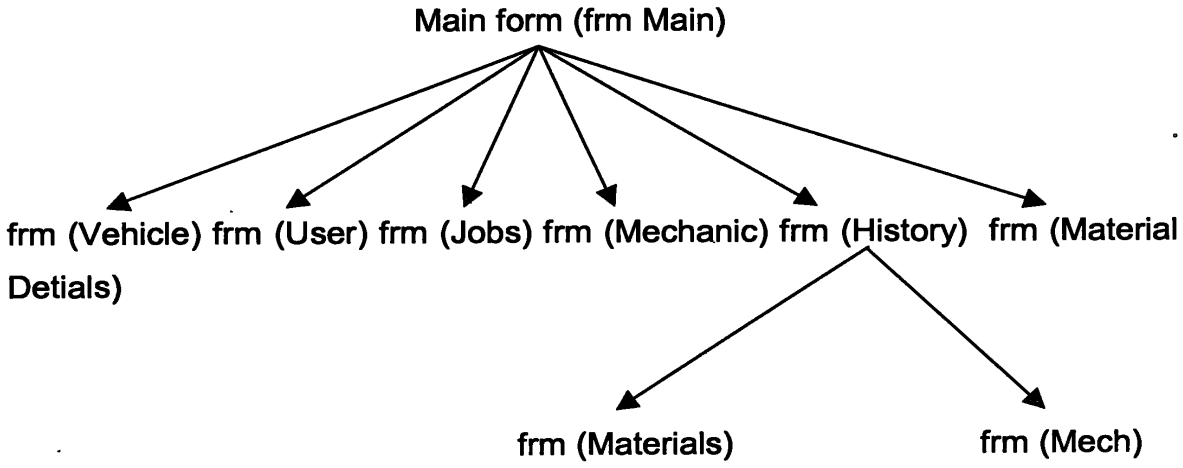

Figure 4.1 Forms of this project

The Appendix II illustrates the Job Card form, User Information form and Vehicle information form and Main form and Material details form.

3.3.2 Reports

Three reports were designed to display the following information.

- Job card details- displays all the details related to a particular vehicle repair job.
- Vehicle details.
- User information.

The built-in data environment facility was utilized in generating these reports.

The appendix-III illustrates the reports

3.3.3 Data grids and Data controls

Two data grids and data controls were incorporated with the Job History form to view job data as they appear in the database. These are shown along with the respective form in Appendix II.

3.3.4 Other screens

A Login dialogue box was designed to authenticate the access to the system. Also a menu was incorporated with the main form for easy navigation.

3.4 Database Design

The relevant ER Diagram was drawn and then it was converted into the tables. Then the table were normalized up to forth normalization. A top down designing approach was followed in the normalization process when arranging the data into tables. The Microsoft Access 2000 development environment was utilized for the creation of the database,

which was designed to contain the following tables.

- Job
- Job_Task
- Task_Mech
- Task_Metirial
- Material
- Mechanic
- Vehicle
- User
- History

Appendix IV illustrates the tables and their fields

3.5 Coding

Visual Basic was used as the programming language. This ensured the establishment of the database connection through a basic module with the built-in support provided for MS Jet Database Engine (ADO). Validation rules and security features were also implemented in this phase. For example following codes were generated to connect frmHistory form and the Job, Job_Task, Task_Material tables.

Table 3.1 Some example Property of Job History form

Control	Property	Setting
Form	Caption Name	Job History frmHistory
Frame	Caption Name	Summery Frame 1
Text Box	Name Height	txtJob_No 285
Label	Caption Font	Job No Ms sans serif
Date Control	Caption Weight	Data 1 2700
Data Grid	Caption	Grid 1

```
        Option Explicit
Dim Rec_History As ADODB.Recordset

Private Sub cmdView_Click()

With Rec_History
  .Supports adSeek
  .LockType = adLockPessimistic
  .Open "SELECT * FROM Job WHERE Job_No='" & txtJob_No.Text
& "' ", , adOpenDynamic

    If .EOF = False Then
      txtJob_No.Text = !Job_No
      txtVehicle_No.Text = !Vehicle_no
      txtDate_Start.Text = !Date_Start
      txtDate_Finished.Text = !Date_Finished
      txtStatus.Text = !Status
    End If
  .Close
End With

With Rec_History
  .Supports adSeek
  .LockType = adLockPessimistic
  .Open "SELECT * FROM Job_Task WHERE Job_No='" &
txtJob_No.Text & "' ", , adOpenDynamic

    If .EOF = False Then
      'txtTask_Cont.Text = !Task_cont
      txtChecked_By.Text = !Checked_By
    End If

   Frame5.Visible = True
```

```
    Adodc1.Visible = True
    DataGrid1.Visible = True
    With Adodc1
      .RecordSource                    =                    "SELECT
Emp_No,Start_Time,Finish_Time,Total_Hours,Amount_Paid   FROM
Task_Mech WHERE Job_No='" & txtJob_No.Text & "'"
    End With
      Adodc1.Refresh
      DataGrid1.Refresh

    Frame6.Visible = True
    Adodc2.Visible = True
    DataGrid2.Visible = True
    With Adodc2
      .RecordSource = "SELECT Material_Id,Material_Name,Tot_Cost
FROM Task_Material WHERE Job_No='" & txtJob_No.Text & "'"
    End With
      Adodc2.Refresh
      DataGrid2.Refresh

 .Close
End With
End Sub

Private Sub Form_Load()
Call CON
 Set Rec_History = New ADODB.Recordset
 Rec_History.ActiveConnection = db
End Sub
```

3.6 Testing

The process was done according to test plan. This allowed the detection of errors or bugs in the system and to be fixed. Three basic test approaches were employed in the process.

3.6.1 Unit test

Individual modules of the system were tested for consistency.

3.6.2 System test

This was performed to ensure the integrity of each module in the system to act as a single unit.

3.6.3 Acceptance test

The overall acceptability and compatibility of the new system was tested. The management of the Transport Section participated for this test. Finally they accepted the system.

04 RESULTS AND DISSCUTION

4.1. Results

The out come of this software project is a user-friendly information system to handle information related to vehicle repairs and maintenance of the transport section of SLT. This system meets all the user requirements and overcome all the drawbacks of existing system.

4.1.1 Components of the final system

The ultimately validated and approved system contains following components.

1. Interfaces: 10 forms
2. Reports: 03
3. Databases: 01 with 10 tables in it

4.2 Discussion

The system was consistently checked for its consistency with the original goals and the results of testing, verification and validation procedures revealed that it matches with the original user requirements.

Also the other features of this system were up to the expected standards and hence the overall acceptability for the entire system was in satisfaction level.

The robustness of the system adds a strong point for its acceptability thus ensuring that it is less likely to collapse.

The database in this system was created by Access. Even though an Access data base system is in limited operation, it is not efficient enough to maintain all such records. Therefore recreating of this system using SQL (Standard Quarry Language) database will provide a broad facilities.

05- CONCLUSIONS AND RECOMMENDATION

Since the original objective of developing a user-friendly system has been achieved in the view of the stakeholders, the project work can be regarded as up to the customer expectation and satisfaction.

However, continuous monitoring must be done in order to check whether the system meets its goals in the long run.

The following can be suggested for further work.

1. Development of the on-line accessible features of the system
2. Use of a report-generating tool such as Seagate Crystal Reports for the purpose of enhanced report generation

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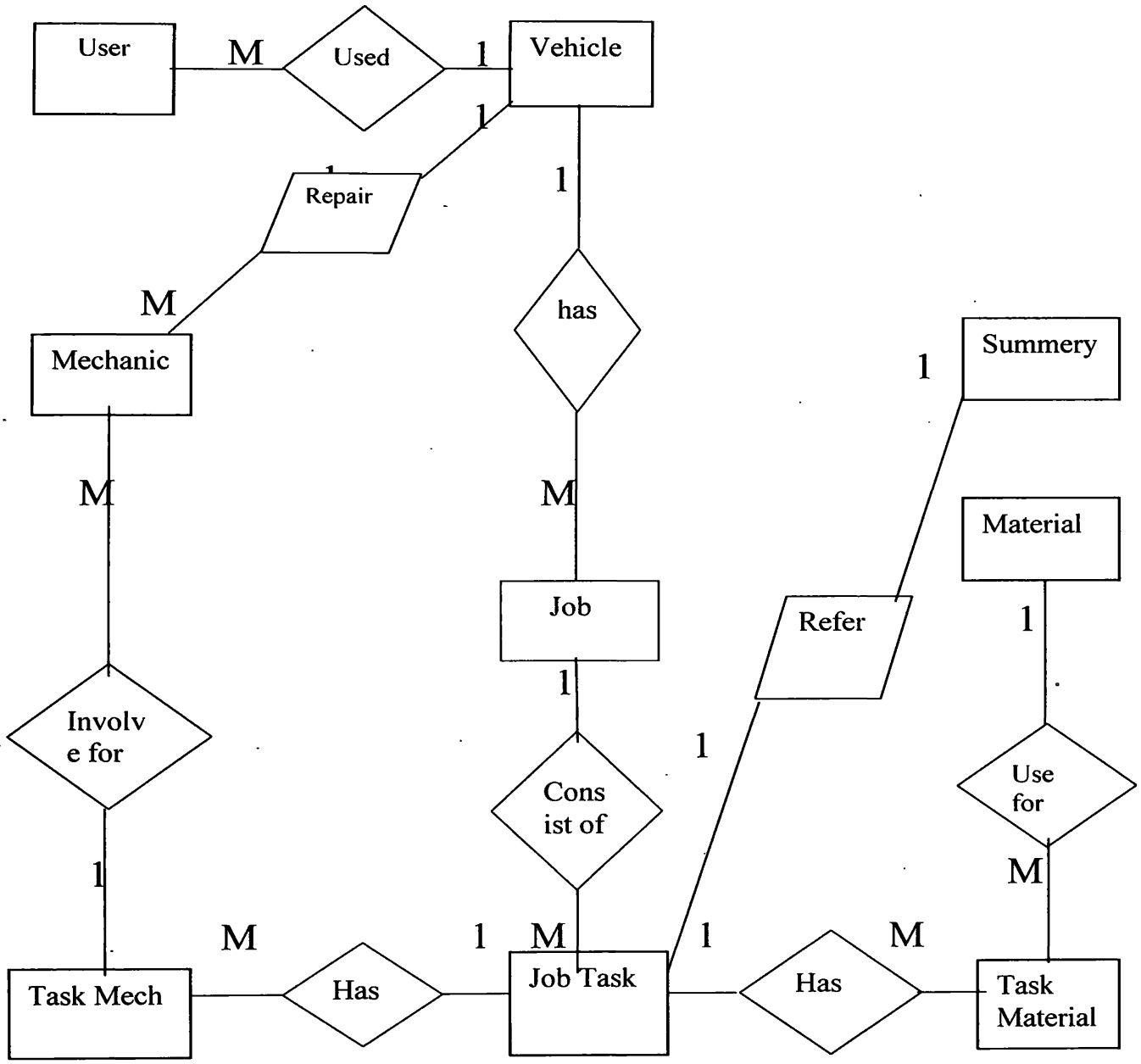
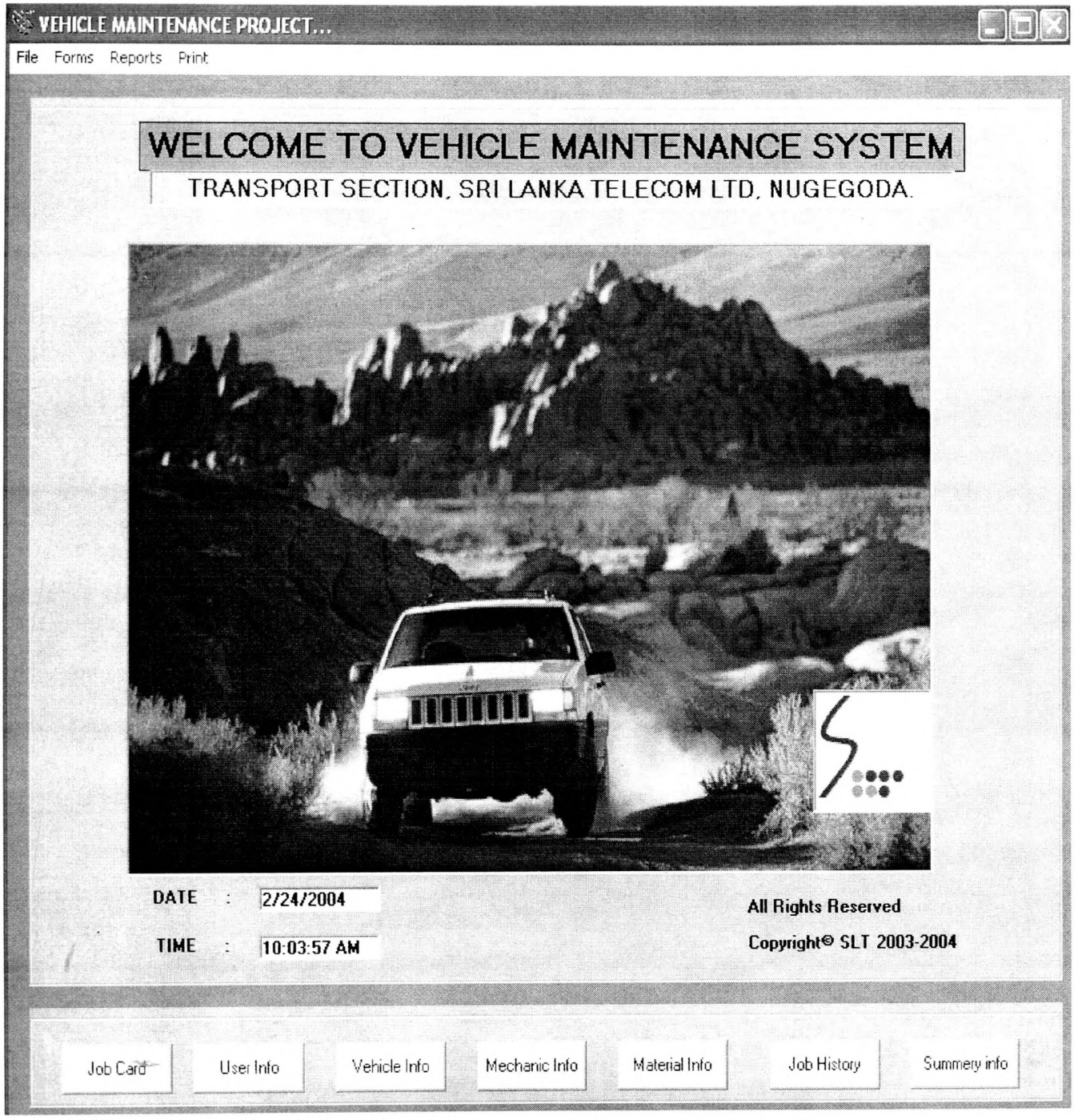
APPENDIX I

ER diagrams

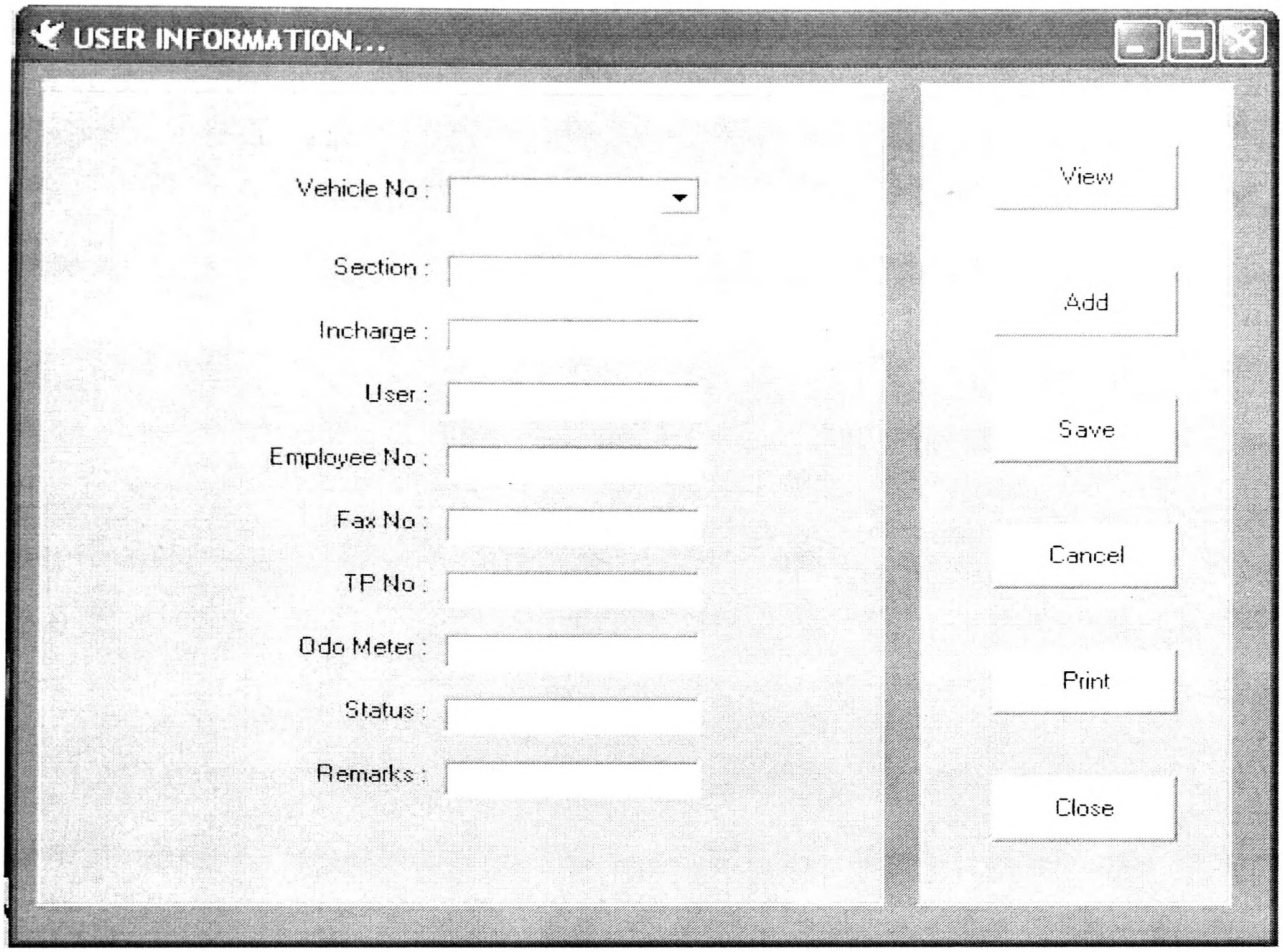


APPENDIX II

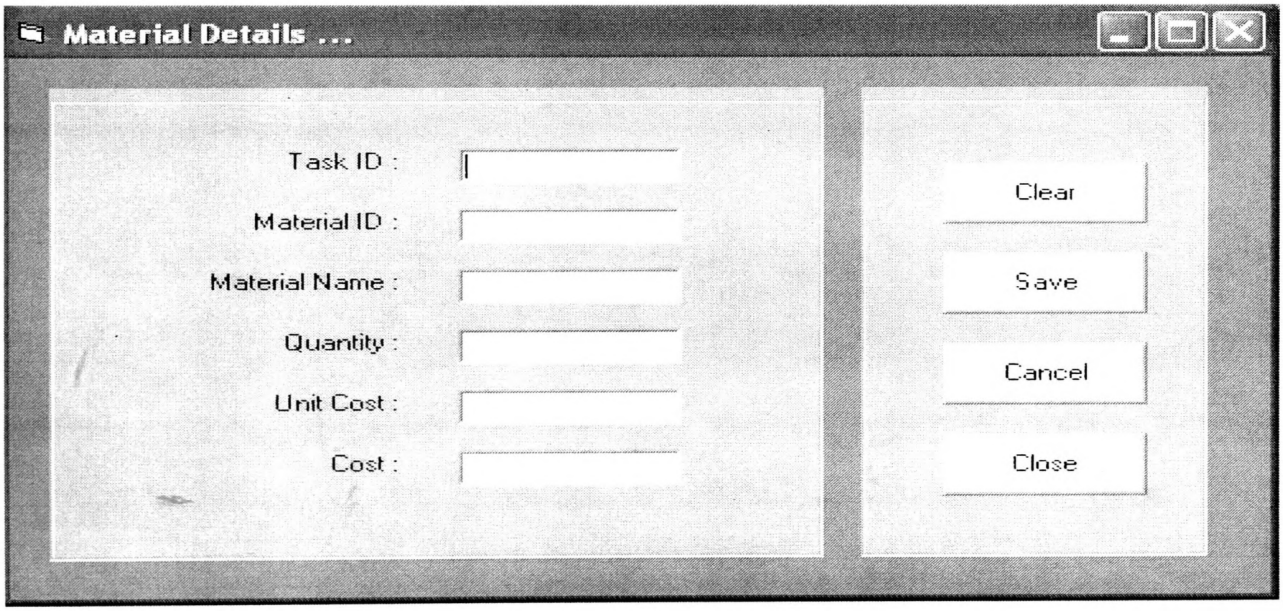
Forms:



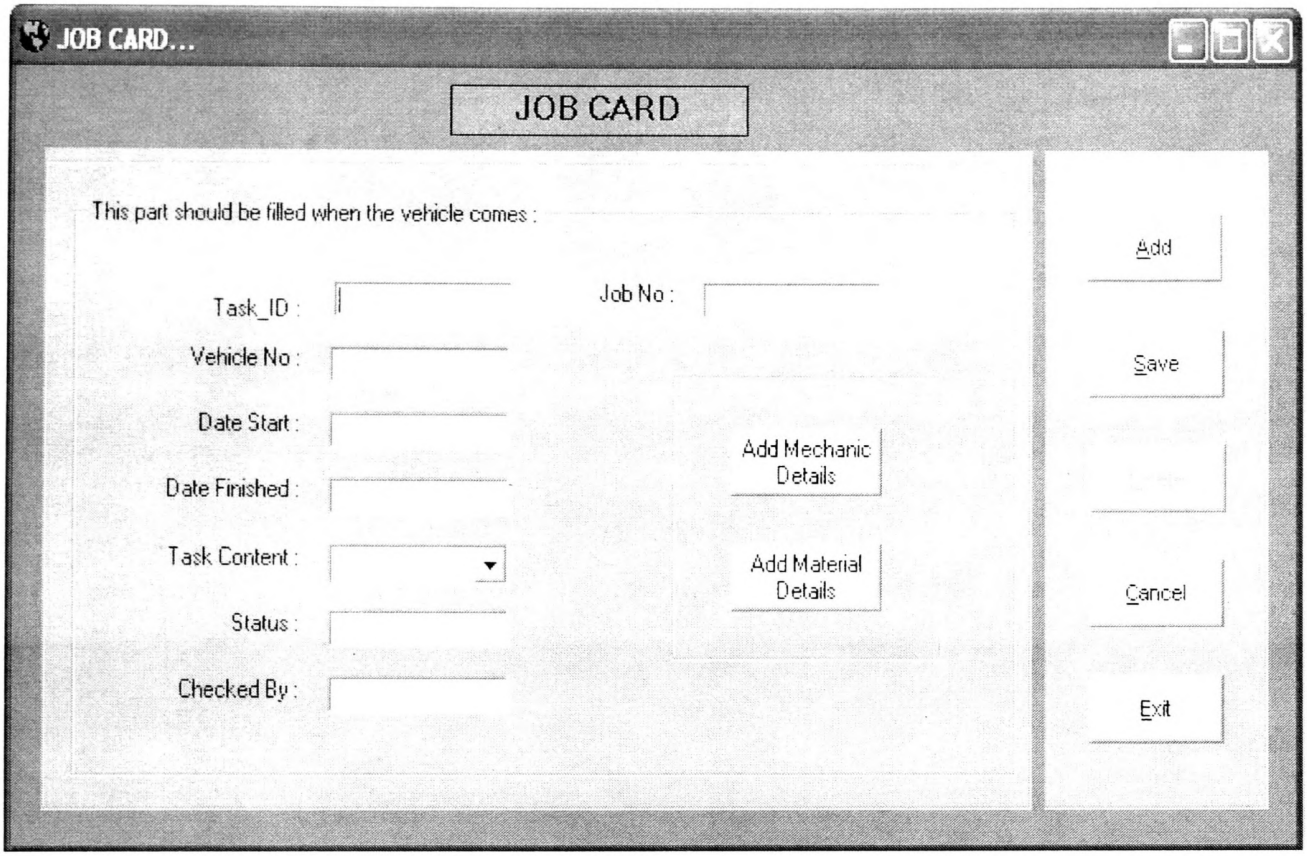
From of main



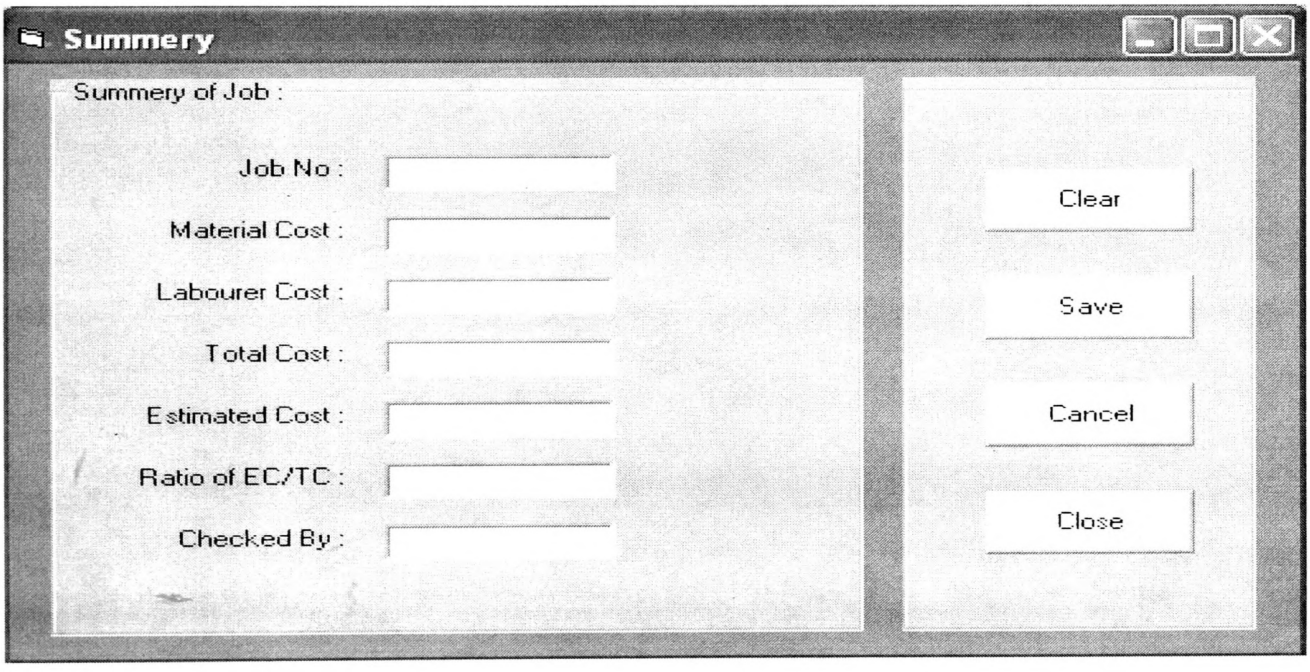
Form user information



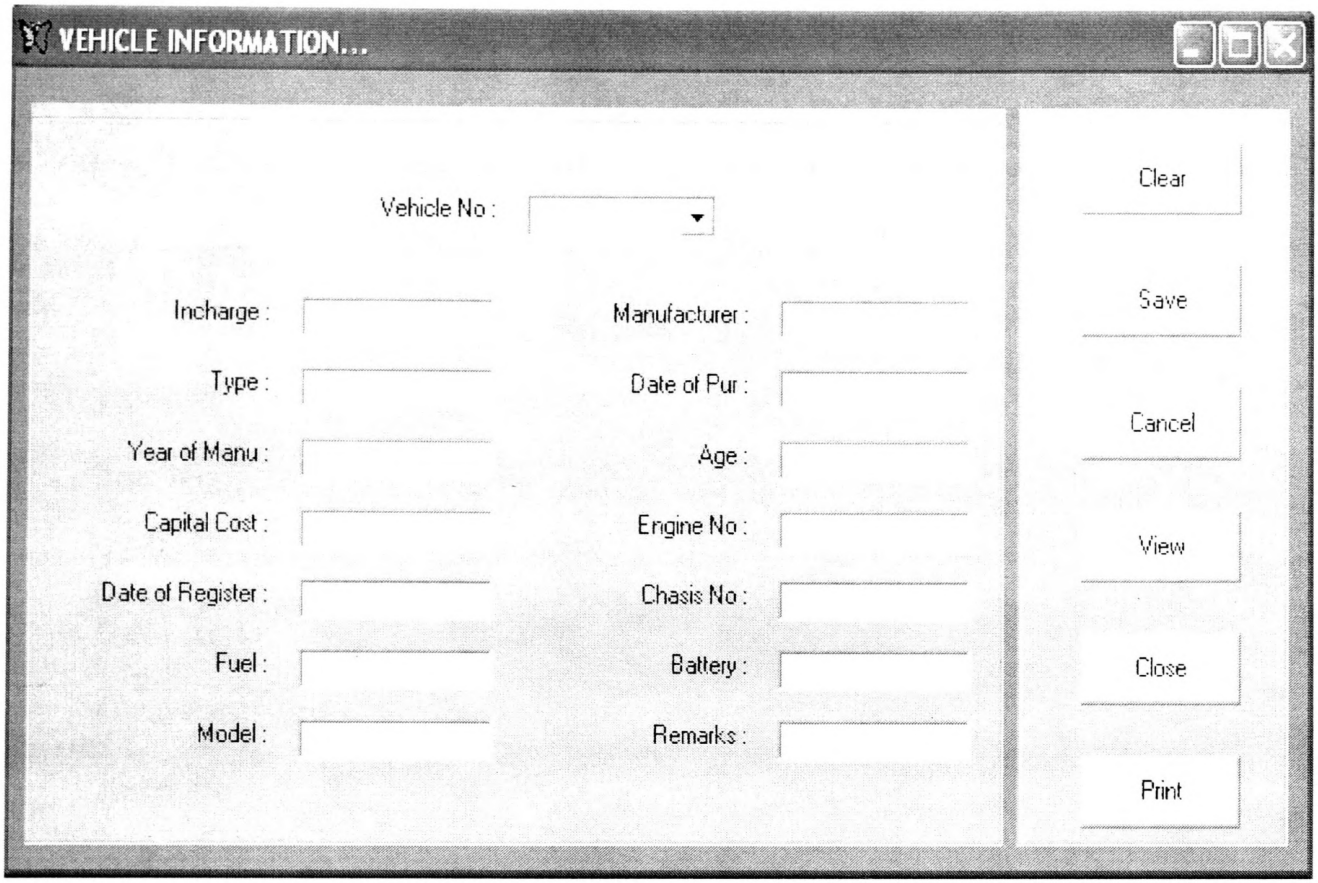
Form of Material details



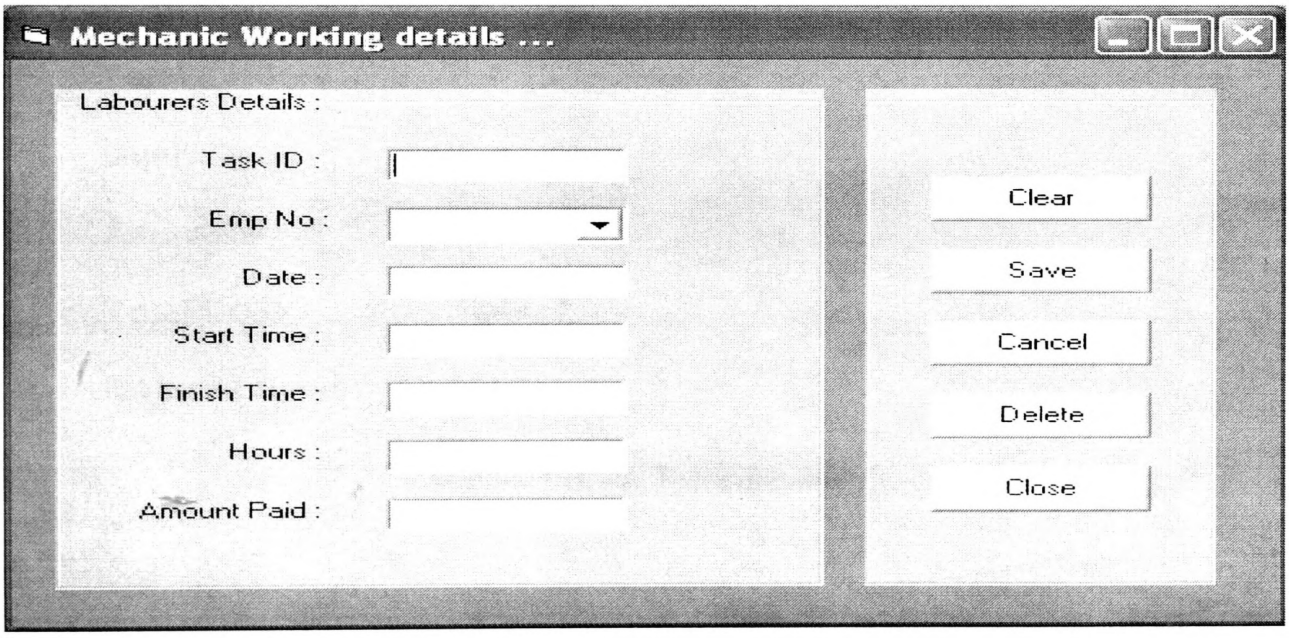
Form of Job Card



Form of Summery



Form of Vehicle Information



Form of mechanic Working details

APPENDIX III

JOB CARD

TRANSPORT SECTION,
NUGEGODA
TP-854488
Fax-824566

Task Id	:	01
Job No	:	00010
Vehicle No	:	18-2092
Date Start	:	2/3/2008
Date Finished	:	2/3/2008
Emp No	:	10020
Date	:	3/15/2004
Start Time	:	3:00:00 PM
Finish Time	:	5:00:00 PM
Totalal Hours	:	2
Quantity	:	2
Amount Paid	:	500
Total Cost	:	3000
Material Name	:	gdgd

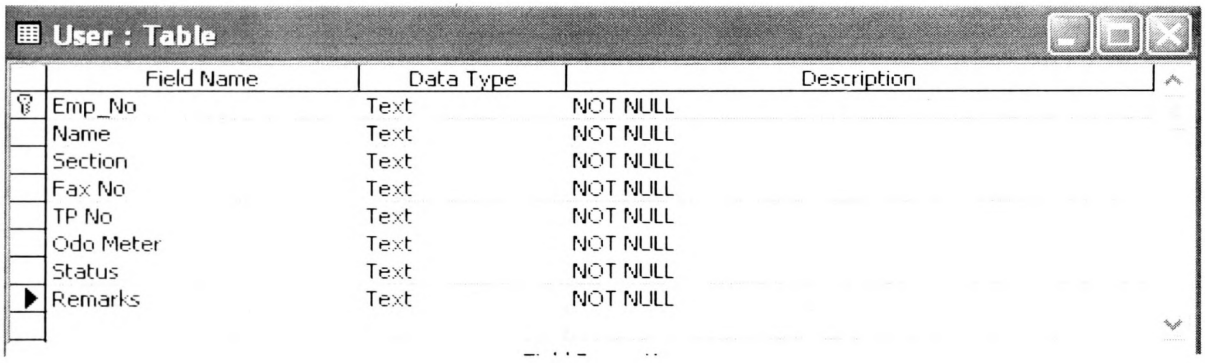
VEHICLE
TRANSPORT SECTION,
NUGEGODA
TP-854488
Fax-824566

Vehicle_No	:	18-2092
Type		CAR
Year_Of_Manu	:	13/05/1998
Capital Cost	:	575000
Date_Of_Register:		10/10/1999
Fuel		DIESEL
Model		HJJJH
Manufacturer	:	NISSAN
Date_Of_Purchse:		15/12/2000
Age		4
Engine_ No	:	12000
Chassis_ No	:	10000
Battery		333
Remarks	:	FJGLKDFJ

APPENDIX IV

Table Definitions

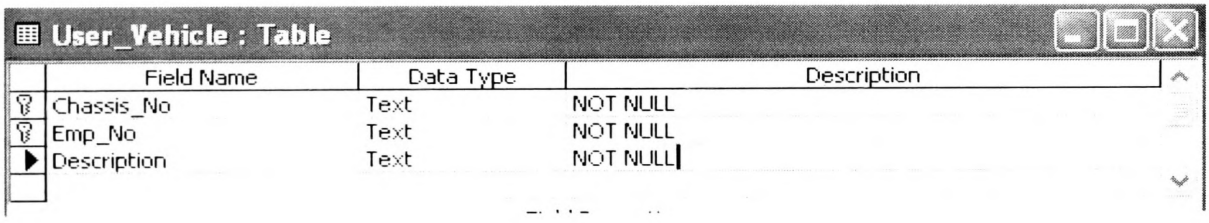
Definitions of ever application system table and security module table in the data are given below. The attributes used as the identifier (**Primary Key/s**) of the entity is underlined and the attributes that links with other tables **(foreign key/s**) are shown with a star (*),



User : Table

Field Name	Data Type	Description
Emp_No	Text	NOT NULL
Name	Text	NOT NULL
Section	Text	NOT NULL
Fax No	Text	NOT NULL
TP No	Text	NOT NULL
Odo Meter	Text	NOT NULL
Status	Text	NOT NULL
Remarks	Text	NOT NULL

Table of User



User_Vehicle : Table

Field Name	Data Type	Description
Chassis_No	Text	NOT NULL
Emp_No	Text	NOT NULL
Description	Text	NOT NULL

Table of User_Vehilce

Vehicle : Table

Field Name	Data Type	Description
Vehicle_No	Text	NOT NULL
Type	Text	NOT NULL
Year_Of_Manu	Text	NOT NULL
Capital Cost	Text	NOT NULL
Date_Of_Register	Date/Time	NOT NULL
Fuel	Text	NOT NULL
Model	Text	NOT NULL
Manufacturer	Text	NOT NULL
Date_Of_Purchase	Text	NOT NULL
Age	Text	NOT NULL
Engine_No	Text	NOT NULL
Chassis_No	Text	NOT NULL
Battery	Text	NOT NULL
Remarks	Text	NOT NULL

Table of Vehicle

Job_Task : Table

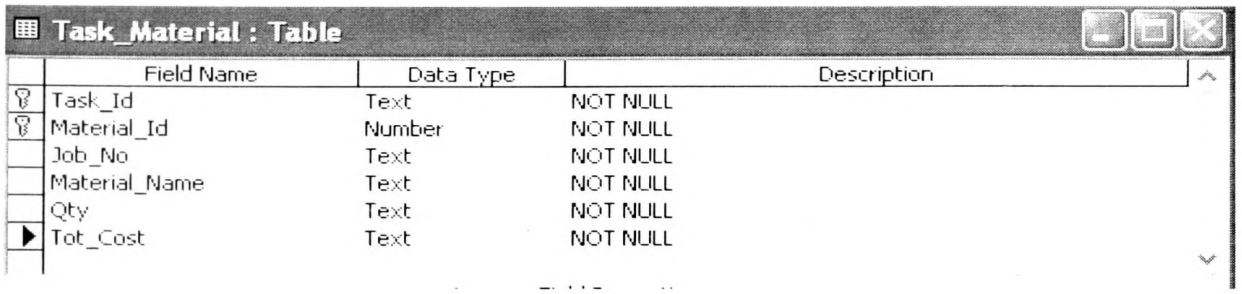
Field Name	Data Type	Description
Task_Id	Text	NOT NULL
Job_No	Text	NOT NULL
Vehicle_No	Text	NOT NULL
Chassis_No	Text	NOT NULL
Task_content	Text	NOT NULL
Checked_By	Text	NOT NULL

Table of Job_Task

Task_List : Table

Field Name	Data Type	Description
Task_Code	Text	NOT NULL
Descirption	Text	NOT NULL

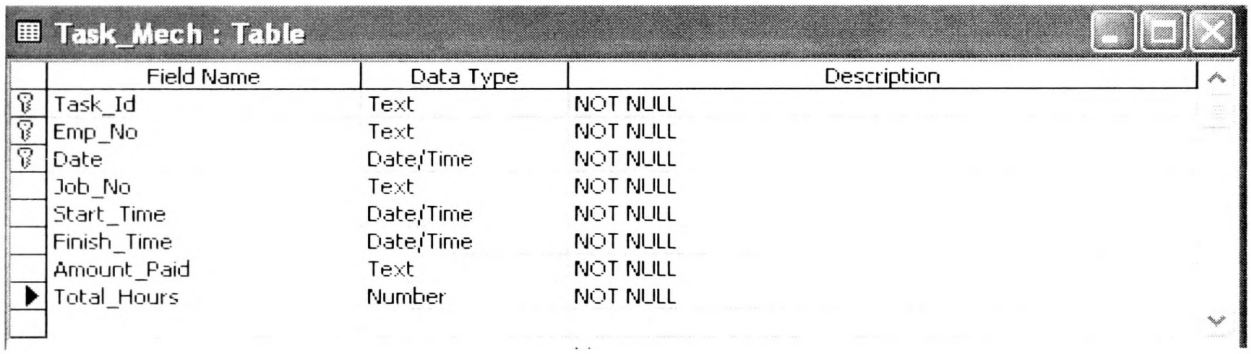
Table of Task_List



Task_Material : Table

Field Name	Data Type	Description
Task_Id	Text	NOT NULL
Material_Id	Number	NOT NULL
Job_No	Text	NOT NULL
Material_Name	Text	NOT NULL
Qty	Text	NOT NULL
Tot_Cost	Text	NOT NULL

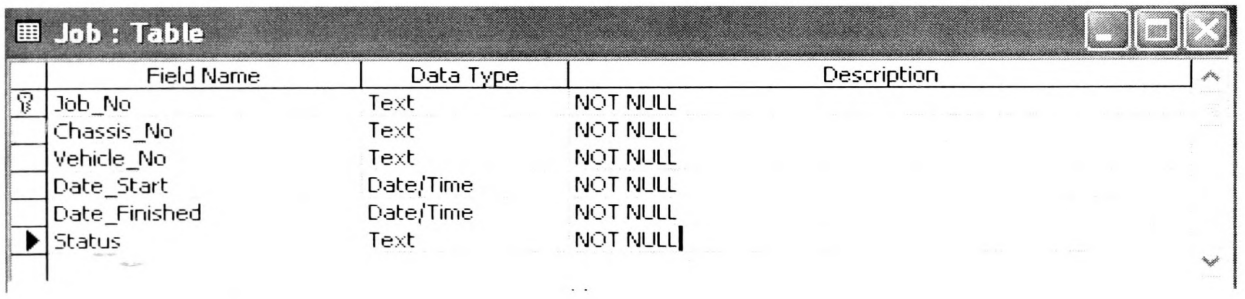
Table of Task_Material



Task_Mech : Table

Field Name	Data Type	Description
Task_Id	Text	NOT NULL
Emp_No	Text	NOT NULL
Date	Date/Time	NOT NULL
Job_No	Text	NOT NULL
Start_Time	Date/Time	NOT NULL
Finish_Time	Date/Time	NOT NULL
Amount_Paid	Text	NOT NULL
Total_Hours	Number	NOT NULL

Table of Task_Mech



Job : Table

Field Name	Data Type	Description
Job_No	Text	NOT NULL
Chassis_No	Text	NOT NULL
Vehicle_No	Text	NOT NULL
Date_Start	Date/Time	NOT NULL
Date_Finished	Date/Time	NOT NULL
Status	Text	NOT NULL

Table of Job

MEC_MASTER : Table

Field Name	Data Type	Description
Emp_No	Text	NOT NULL
Name	Text	NOT NULL
Dept_Name	Text	NOT NULL
Address	Text	NOT NULL
TP_no	Text	NOT NULL
Age	Number	NOT NULL
Date_Of_App	Date/Time	NOT NULL
Rate	Number	NOT NULL
Salary	Number	NOT NULL

Table of Mec_Master

Material : Table

Field Name	Data Type	Description
Material_Id	Number	NOT NULL
Code	Text	NOT NULL
Name	Text	NOT NULL
Description	Text	NOT NULL
Unit_Cost	Text	NOT NULL

Table of material

PASSWORD : Table

Field Name	Data Type	Description
User_Name	Text	NOT NULL
Password	Text	NOT NULL

Table of Password

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