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## 1. Introduction

This chapter gives a brief theoretical preview upon the database information systems and goes through the essence of the problem that should be resolved.

### 1.1 Background

Most of the contemporary Information systems are based on the Database technology as a collection of logically related data, and DBMS as a software system allowing the users to define, create, maintain and control access to the database.

The process of constructing such kind of systems is not so simple. It involves a mutual development of application program and database. The application program is actually the bridge between the users and the database, where the data is stored. Thus, the well-developed application program and database are very important for the reliability, flexibility and functionality of the system.

The so defined systems differentiate to each other and their development comprises a great variety of tasks to be resolved and implemented.

The basic idea can be depicted on Figure 1.1 below:

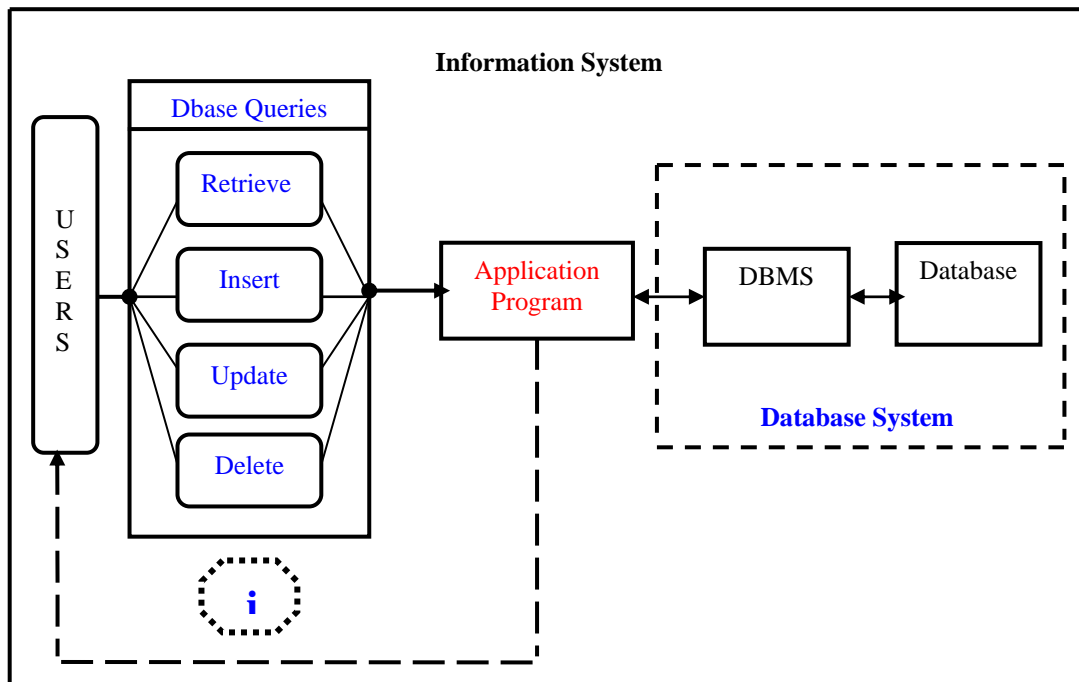


Figure 1.1 Database information systems - principle scheme

Information system suggests a computer technology to be used in order to provide information to users in an organization (for instance), as for the purposes of data transformation into useful information; computer hardware and software are designed and used [2].

A particular case is the Human Resources Information System development. This kind of systems are responsible for storing data of the staff within an organization and generating reports upon request.

Such kind of system could be integrated with other Information systems or modules: Accounting Information System (AIS) – designed to transform financial data into information, or Management Information System (MIS) that provides decision-oriented information to managers, and so on...

“Organizations depend on Information Systems in order to stay competitive. Productivity, which is crucial to staying competitive, can be increased through better Information Systems.” [2].

## **1.2 Problem Statement**

This report’s documentation goes through the whole process of both application program and database development. It also comprises the development tools have been utilized for these purposes.

## **1.3 Problem Discussion**

This system should consist of an application program, on one hand, and a database (repository of data) on the other. The program should perform the basic operations upon the database as retrieving, inserting, updating and deleting data. Any additional functionality is a goal of a further module development.

It is a kind of strategy to start the development from designing and constructing the database, as this structure will determine the further structure of the application program.

The logical database model (tables, their content and the relationships between them) should respond to the given task and cover the basic requirements.

The Interface of the program should be user-friendly, and the program should be as easy for use as it is possible.

Both controls and forms should logically and functionally be related within the program and fully respond to the structure of the database.

Another problem is establishing the connections with the database, every time, when a query is needed to be performed upon it. Exception-handling should also be taken into an account during the system’s development due to eventual exceptions that may occur.

## **1.4 Report Overview**

The next chapter and its subsections will turn the attention to the method for resolving the problem, the programming environments used for developing the system and the implementation of the operations performed upon the database.

## 2. Problem's Solution

This chapter involves some subsections that concern the basic scheme of resolving the given task and comprise both the methods and tools of its development as well.

### 2.1 Method

At the very commencement, I proceeded to a decision to carry out the development of my task into the following steps:

1. Exploring the available development environments and techniques.
2. Database Analyzing.
3. Database design and Implementation.
4. Program's Structure Analyzing.
5. GUI (Graphical User Interface) constructing.
6. Bringing all the stuff together (controls data binding and functions implementation).
7. Tests.

Each one of these steps could be explained in some brief details as follows:

#### *1. Exploring the available development environments and techniques*

There is a lot of programming environments available to be used for such kind of elaborations. The point is to choose such an environment that we will be able to operate with in a convenient and easy way. This is more or less optional and individual process, that depends on the developer's experience as well.

#### *2. Database Analyzing*

It concerns all of the demands, put upon the database content and its functionality. The database should be designed and implemented in a way that the user would expect it to be.

#### *3. Database design and Implementation*

This step is tightly related with the previous one as it is completely determined by the requirements, analyzed and discussed in step2.

#### *4. Program's Structure Analyzing*

The application program as an interface between the users and the database should be an accurate "reflection" of the database on the screen; hence a well analyzed and defined structure is needed.

#### *5. GUI Constructing*

After analyzing the program's structure and defining what it should consist of, a graphical representation of this stuff is needed in order to enable the user to interact with the data.

#### *6. Bringing all the stuff together*

The next step that should be taken is connecting the program with the database and performing the necessary functionality upon all of the controls.

#### *7. Tests*

To ensure that everything works properly and as it has been expected, test performance has to be done upon the system's functionality.

## 2.2 Programming Environments

The given task concerns a small company (organization). For instance, for the needs of a small company, we could use one set of tools, but for the needs of a larger one, it would be much better if we apply our approach by using some different, that could be more appropriate and would fit much better the requirements we have to satisfy.

I decided to use the Access Database Environment as a Database Management System and C# as a programming language for developing my project.

Before proceeding to the explanatory notes of how I have developed the software, I would like to take a preview upon the programming tools (environments) that have been used during this project's development course.

- Database Environment: Access is a typical environment for constructing relational databases.

The database is the skeleton and the underlying framework of most of the contemporary Information Systems. The evolution of the Database systems could be divided into three phases: the Manual-filing System, the File-based systems, and the Database and the Database Management systems (DBMS).

- The manual-filing system contains files of information, related to a project, product, task, client, or employee and they are usually labeled and stored in one or more cabinets. The cabinets may be located in the secure area of the building, for safety. To facilitate the process of searching and to find out what we want, more quickly, the different types of item can be put in separate folders and they remain logically related.

Actually, the needs of the contemporary industrial world could not be covered or satisfied by using such kind of systems, and especially what concerns their reliability and efficiency.

- Thus, we historically reach to the second phase of the Database systems evolution – the File-based systems. This kind of systems had been developed in response to the needs and demands of industry for a more efficient data access [1]. The basic idea into the development of this type of systems, is that each Department in an organization (for instance) has an access to its own data (files) through application programs. (Figure 2.1):

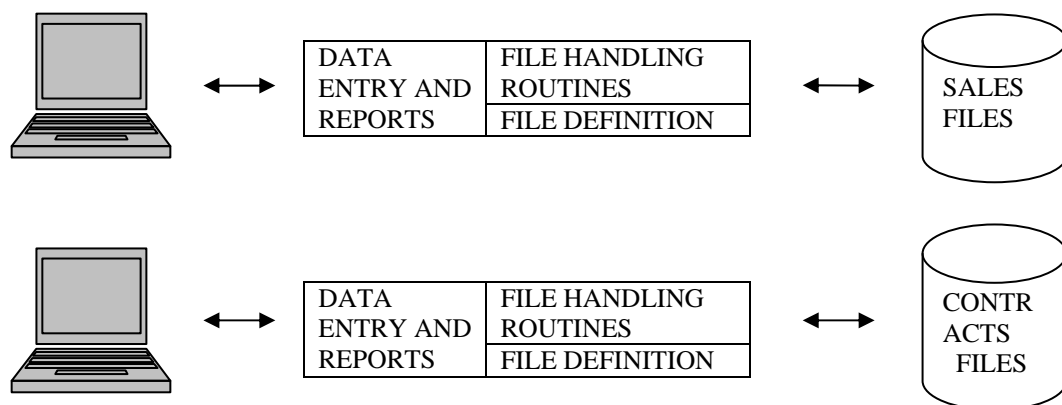


Figure 2.1 File-based information system

There are some limitations of the File-based systems:

- Data Duplication: It is undesirable as it costs time and money, and takes additional storage space.
  - Dependency of Data: That's a kind of inconvenience as the physical structure and storage of the data files and records are defined in the application code.
  - Data Isolation: It is some difficult to access data, isolated in separate files.
  - Incompatibility of the file formats: It concerns the file structure as a dependent on the programming language, in which one the application program has been developed and implemented, as the file's structure is embedded in the application program.
- o After taking a new and more effective approach, the Database and the Database Management System (DBMS) have been created. Most of the contemporary systems are based on the Database technology as a collection of logically related data and the DBMS as a software system allowing the users to define, create, maintain and control access to the Database.

The DBMS is a really powerful set of tools, enabling users to operate easily with data into a database as: Inserting, Updating, Deleting and Retrieving data. It prevents unauthorized access to the database and maintains the consistency of the stored data. The DBMS also restores the data in case of hardware or software failure and reduces the loss of data in this way.

MS-Access 2000 (Microsoft Access 2000) is a contemporary development environment for dealing with databases:

Access is a computerized management system with relational database. The whole information is stored in separate tables in one file. Such an information arrangement is more or less convenient as we can view, add and delete information using online forms, and search or retrieve by using queries.

The term "Database" comprises collection of objects (tables, forms, pages, queries, macros) for manipulating, retrieving and storing data.

It is a very good advantage that the information (data) can be populated in different tables (related to each other) and it is not necessary to store all data into one table. That leads to a less redundancy of data and reduces the required disk storage space, and speeds up processing as well. There are three relationships between the tables in a database: (one-to-many), (one-to-one) and (many-to-many).

One of the mostly used relationships is the (one-to-many) type. If we have a main table (so called Parent table) and some other obedient tables (so called Child tables), then let us assume that the relationship between the parent table and the child tables is of type (one-to-many). It means that every single record from the parent table could have several records into each one of its related child tables. The tables are related by their key-values. The key into the parent table is called primary key, and the keys into its child tables are called foreign keys. The primary and the foreign key have the same unique value.

These conclusions are based on a theory in [3].

The main window-frame of MS-Access can be seen on Figure 1 (Appendix A).

C# and the .Net Framework: For the purposes of my project I chose to work with Visual Studio of Microsoft, in particular with the C# as a programming language. My choice is based on the reliable programming environment offered by C# and the highly cleared syntax of this programming language as well. C# is a good proof for a highly developed modern technology based on the contemporary object-oriented theory in programming and lying on a very powerful, reliable and flexible platform as such as it is the .Net Framework.

The main window of the Visual Studio and the .Net Framework basic architecture could be seen on Figure 2: Visual Studio main window and Figure 3: Basic architecture of .Net Framework – Appendix A, [4]:

Based on [4] we can say that the .Net Framework is a development of Microsoft Corporation. In fact, a lot of efforts, time and investments have been spent on this research and development.

As a class library, .Net Framework allows “cross-language” development and can be used by any .Net language to perform different kind of tasks. There are approximately 40 languages with compilers for the .Net Framework, but only some of them are supported by Microsoft Corporation: C#, Visual Basic .Net, C++/CLI, J#, Jscript .Net, Eiffel, and some more.

“. Net has several designed intentions:

- Interoperability for existing code in COM libraries.
- Common Runtime Engine: languages compiled to an intermediate language, Common Intermediate Language.
- Language Independence: using a Common Type System that defines all possible data-type and programming concepts supported by the CLR (Common Language Runtime).
- Base Class Library: also known, as the Foundation Class Library is a library of types available to all languages using .Net.
- Simplified Installation: for the Windows Platform, due to eliminating registry setting and dll-problems.
- Security: by letting code execute in different trust levels.” [4].

The language of choice – C# as an object-oriented programming language, has a procedural, object-oriented syntax based on C++. It includes some aspects and features of other programming languages as: Java, Visual Basic and Delphi.

The developers of C# have emphasized on the language simplification as: fewer symbolic and decorative requirements.

### 2.3 Database Analyzing, design and implementation

The database for the system should include information of company's staff, respectively of its employees. The data is subdivided into the following groups:

Employees' Basic Details	Working History	Time_Information
Employee_ID_Number Personal_ID_Number First_Name Middle_Name Last_Name Day_of_Birth Month_of_Birth Year_of_Birth Cellular_Phone Home_Phone City Address Postal_Code Qualification Current_Experience Start_Date_Day Start_Date_Month Start_Date_Year End_Date_Day End_Date_Month End_Date_Year Type_of_Employee Gender Marital_Status	Employee_ID_Number Company_Name Employer_Name Company_Employer_Address Company_Employer_Cellular_Phone Company_Employer_Office_Phone Previous_Qualification Previous_Experience p_Start_Date_Day p_Start_Date_Month p_Start_Date_Year p_End_Date_Day p_End_Date_Month p_End_Date_Year	Employee_ID_Number Wroked_Hours Off_Hours Days_off Over_Time Extra_Days w_From_Date_Day w_From_Date_Month w_From_Date_Year w_To_Date_Day w_To_Date_Month w_To_Date_Year



Salary Information	Contact Person Information	Holiday Information
Employee_ID_Number Monthly_Salary Monthly_Money_Currency monthly_Taxes monthly_Deductions monthly_Insurances ms_From_Date_Day ms_From_Date_Month ms_From_Date_Year ms_To_Date_Day ms_To_Date_Month ms_To_Date_Year  Weekly_Salary Weekly_Money_Currency weekly_Taxes weekly_Deductions weekly_Insurances ws_From_Date_Day ws_From_Date_Month ws_From_Date_Year ws_To_Date_Day ws_To_Date_Month ws_To_Date_Year	Employee_ID_Number c_First_Name c_Middle_Name c_Last_Name c_Cellular_Phone c_Home_Phone c_City c_Address	Employee_ID_Number Holiday h_From_Date_Day h_From_Date_Month h_From_Date_Year h_To_Date_Day h_To_Date_Month h_To_Date_Year

I have constructed a database that consists of six data tables. There will be one main table (parent table) and five child tables, related to each other. Patently, for this purpose the necessary primary and foreign keys should be defined into the responding tables. The so defined structure above is made up in conformity with the user's needs and demands. Each employee of the staff is intended to have several records, responding to his Working History, Contact Person Information, Salary Information, Time Information and Holiday Information, and only one record containing his basic information within the company – his personal details as: date of birth, gender, marital status, address and phone details, and his current working record. An employee is supposed to have not only one record of his Working history, or his Contact Person Information.....For instance, if we take a look to the Time Information data table – an employee may have several records in case he has some experience within the current company. It is absolutely the same with the Salary Information, Contact Person Information and Holiday Information data tables.

The relationships between the data tables are shown in Figure 4-Appendix A. In Figure 4 we can distinguish six tables that the database consists of. All of the relationships are of type: “one-to-many”. (For more details about the data tables, see Appendix A: Figure 5 - Parent data table Employee\_Details and Child data tables - Figure 6, Figure 7, Figure 8, Figure 9, Figure 10).

The primary key fields could be set to Auto-number data type as Access creates these values in an ascending order to ensure that they are unique within a table. Some of the fields should be “adjusted” to accept null-values. It is quite important to be done as it is tightly related to the input fields of the application program. I decided to perform it in the following way: those fields that are compulsory to be filled by the user I have set not to accept any null-values of data and on the other hand, those ones, that can be left blank, are set to accept null-values. It is easy to be performed by changing the Allow Zero Length setting (Appendix A: Figure 11 – Setting a data-field to accept null-values).

It is just needed to go to the desired field that has to be set, and switch between the two options, offered into the “Allow Zero Length” field. In the example, shown above, the Personal\_ID\_Number field is set not to allow any null-values thus its field’s length can not be zero as its value is quite essential for identifying an employee as an individual and distinctive person.

That has been considered and done for a kind of convenience as the user would wish not to enter all of the data at the moment, and come back later.

## **2.4 Program’s Structure Analyzing and GUI Constructing**

After getting the database prepared, application program should be constructed and implemented in some programming environment to enable the users to communicate with the database.

Graphical User Interface (GUI) is intended to be built up as a basic structure of the program. The first general advice when constructing GUIs is to “know thy users” as there is a large number of rules and requirements, concerning the whole process of GUI development. Every GUI consists of certain number of controls (text-boxes, combo-boxes, buttons...etc.). The list of all properties and methods for all controls is called Application Programming Interface (API). The Program’s GUI is shown in (Appendix B: Figure 1):

A set of controls is used in order to reach the desired purpose, what concerns the functionality of the application, including Labels, Text boxes, Combo Boxes, Data Grid, Buttons, Group Boxes, Panels, Tab controls etc. All of these controls, available in the program, are fitted to the corresponding forms that are used in the application.

The Program contains two basic forms:

- General - used as a platform (Appendix B: Figure 2 Basic form):
- And a second one (Appendix B: Figure 3) that is loaded onto the first (General) form.

One control that is heavily used is the Label control. It is used to display text on the form. A Label-control is declared as:

- Private Label label\_name;

And afterwards - instantiated by the initComponents method:

- Label\_name = new Label();

For all controls, the default constructor is used as their properties are set after that.

A set of Label controls is depicted on Figure 4 – Appendix B. The role of the Label is to point at the responding text field, showing what it is intended to be used for. Other set of controls, used in the program, is the set of text boxes and combo boxes, shown in Figure 5 – Appendix B. All of the text boxes and combo boxes are marked with green-coloured circle points.

“Windows Forms text boxes are used to get input from the user or to display text. The TextBox control is generally used for editable text, although it can also be made read-only. Text boxes can display multiple lines, wrap text to the size of the control, and add basic formatting. The Windows Forms ComboBox control is used to display data in a drop-down combo box. By default, the ComboBox control appears in two parts: the top part is a text box that allows the user to type a list item.” [5].

It can be noticed that almost all of the controls are grouped and placed on a special field (platform) and we can switch from one group to another by clicking on the responding titles - Figure 2.2:

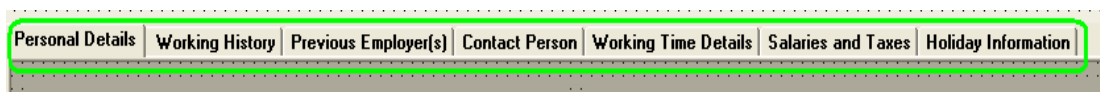


Figure 2.2 – Tab-control for switching from one set of controls to another.

This control is called: tab-Control and I have used it for convenience in order to switch from one tab to another as every single tab consists of controls, which ones are specifically related to a data table of the database.

“The Windows Forms TabControl displays multiple tabs, like dividers in a notebook or labels in a set of folders in a filing cabinet. The tabs can contain pictures and other controls. The most important property of the TabControl is TabPages, which contains the individual tabs. Each individual tab is a TabPage object. When a tab is clicked, it raises the click event for that TabPage object.” [5].

In order to be able to perform different operations upon the controls and their responding data, a set of Buttons is also included in the program’s implementation - Figure 2.3:



Figure 2.3 General functional buttons

Or Figure 2.4:

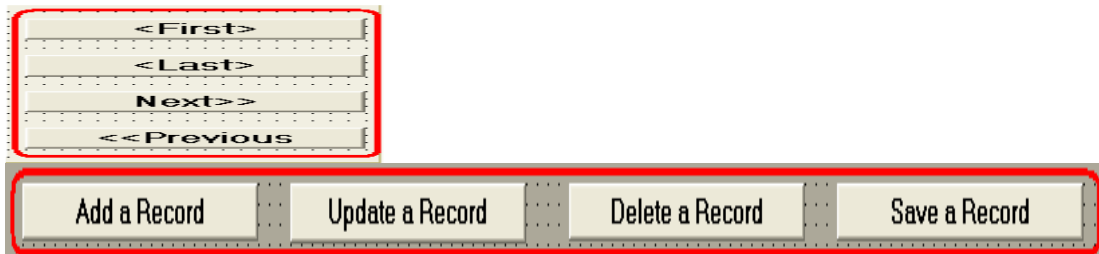


Figure 2.4 Buttons for records operations

Some of the buttons are deliberately omitted to be shown here. The following snippet of code represents a normal button in the graphical interface:

```
this.add_button.FlatStyle = System.Windows.Forms.FlatStyle.System;  
this.add_button.Font = new System.Drawing.Font("Arial Black", 10F,  
System.Drawing.FontStyle.Italic, System.Drawing.GraphicsUnit.Point,  
((System.Byte)(0)));  
this.add_button.Location = new System.Drawing.Point(24, 24);  
this.add_button.Name = "add_button";  
this.add_button.Size = new System.Drawing.Size(128, 32);  
this.add_button.TabIndex = 0;  
this.add_button.Text = "&Add Employee";
```

The buttons are connected to their respective Event Handlers through their click methods:

```
this.add_button.Click += new  
System.EventHandler(this.add_button_Click);
```

A very essential role in the program plays the dataGrid control as it is used as an interface (“bridge”) between the dataset (the buffer-table between the database and the application program) and the user, enabling a visual representation of the data, uploaded into the dataset - Figure 2.5:

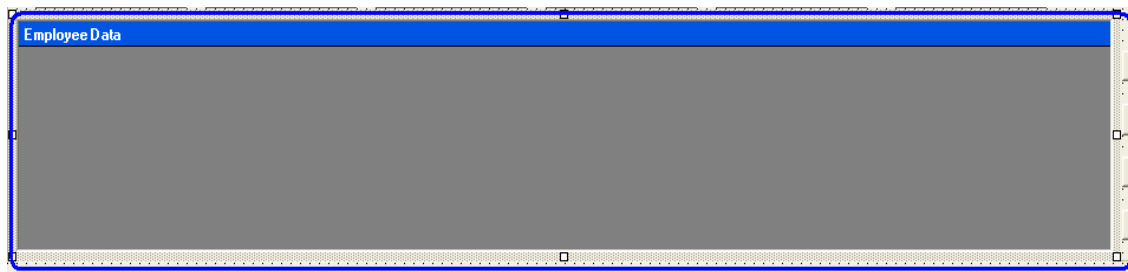


Figure 2.5 Dataset outer appearance

“The Windows Forms DataGrid control provides a user interface to ADO.NET datasets, displaying tabular data and allowing for updates to the data source. When the DataGrid control is set to a valid data source, the control is automatically populated, creating columns and rows based on the shape of the data. The DataGrid control can be used to display either a single table or the hierarchical relationships between a set of tables.” [5].

## 2.5 Database Connections and Code-Implementation

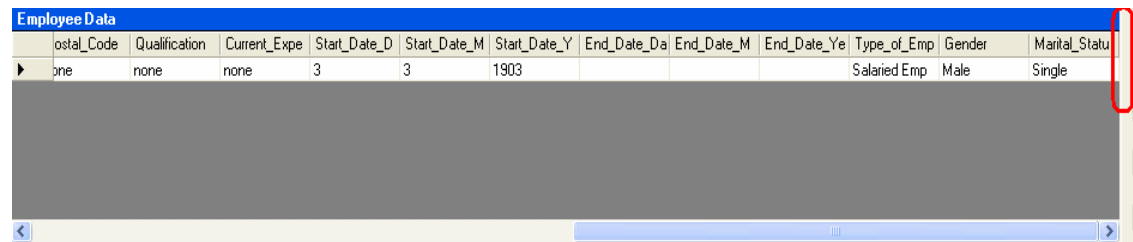
This subsection represents the main approach that has been made up in order to establish the connections with the database:

The dataGrid control could be previewed as first:

```
// dataGrid1  
this.dataGrid1.CaptionText = "Employee Data";  
this.dataGrid1.DataMember = "";  
this.dataGrid1.HeaderForeColor =  
System.Drawing.SystemColors.ControlText;  
this.dataGrid1.Location = new System.Drawing.Point(8, 64);  
this.dataGrid1.Name = "dataGrid1";  
this.dataGrid1.ReadOnly = true;  
this.dataGrid1.Size = new System.Drawing.Size(928, 176);  
this.dataGrid1.TabIndex = 8;  
this.dataGrid1.CurrentCellChanged += new  
System.EventHandler(this.dataGrid1_CurrentCellChanged);
```

That's the Initialization of the basic properties of this control. In order to perform some operations upon the functionality of the control (for instance: when the current cell's index changes...or when the control's size is exceeded etc.), I constructed a function, shown in Appendix B: Figure 6 – to prevent exceeding the control's borders.

As it is shown in Figure 2.6, when the user exceeds the control's borders, an exception is instantly thrown, warning about the error has occurred:



Postal_Code	Qualification	Current_Exp	Start_Date_D	Start_Date_M	Start_Date_Y	End_Date_Da	End_Date_M	End_Date_Year	Type_of_Emp	Gender	Marital_Status
one	none	none	3	3	1903				Salaried Emp	Male	Single

Figure 2.6 Trying to go beyond the control's ends

The table's end is enclosed with a red marker - Figure 2.6. The following message-box in Figure 2.7 pops up on the screen every time when we try going beyond this limit by clicking outside the control's borders.

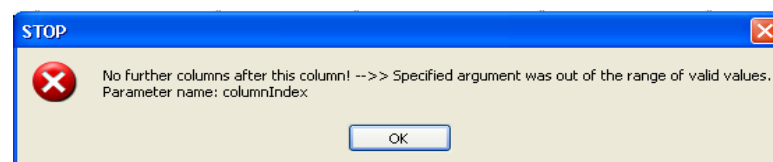


Figure 2.7 Warning message

It can be seen from Figure 2.6, we have a data-record into the dataGrid. In order to be able to perform such kind of operations, concerning the process of uploading data into a data-table, or into a text-box field and so on, we need to establish a connection to the database, upload the desired data-fields into our buffer (the dataset) and afterwards perform the necessary data-binding operations:

- Establishing the data-connection: For this purpose, a DataAccessClass has been created and placed into a separate file – “DataAccessClass.cs”. In this class, not only functions dealing with retrieving of data are included, there are also functions for saving data into the database, updating data, etc. On a first time, we have to manage to the connection with the data source, which one is the database (“Employees\_Database.mdb”):

```
public class DataAccessClass
{
    public OleDbConnection    con;
    public OleDbDataAdapter    dAdapter;
    public DataSet             dSet;

    public string conString=@"Provider=Microsoft.Jet.OLEDB.4.0;Data Source=...\\Employees_Database.mdb";
}
```

Figure 2.8 Preparing to get a connection established

There are few steps until the data source get connected to the application program's components:

- Specifying the connection string:  

```
public string  
conString=@"Provider=Microsoft.Jet.OLEDB.4.0;Data  
Source=..\..\Employees_Database.mdb";
```
- Making up a query-string to be performed upon the database:  

```
this.select_query1=" select* from Employees_Details order  
by Last_Name,First_Name";
```
- Creating a data adapter to communicate between the dataset and the database using the already specified connection- and query-strings:  

```
public OleDbDataAdapter dAdapter;  
...  
dAdapter=new OleDbDataAdapter(this.select_query1, con);
```

A bit more about the data adapter: “The ADO.NET DataSet is a memory-resident representation of data that provides a consistent relational programming model independent of the data source. The DataSet represents a complete set of data including tables, constraints, and relationships among the tables. Because the DataSet is independent of the data source, a DataSet can include data local to the application, as well as data from multiple data sources. Interaction with existing data sources is controlled through the DataAdapter...The Fill method of the DataAdapter is used to populate a DataSet with the results of the SelectCommand of the DataAdapter...” [5].

- Creating the Dataset to be populated with data:  

```
public DataSet dSet;  
...  
dSet=new DataSet();
```
- Populating the Dataset with data using the so constructed Data-adapter:  

```
dAdapter.Fill(dSet,"Employees_Details");
```

After getting the connection established and populating the desired data-fields into the Dataset, we can connect the Datagrid control with the Dataset by explicitly showing the data source - Figure 2.9:

```
//connection was ok.  
this.dataGrid1.AlternatingBackColor=Color.Wheat;  
this.dataGrid1.ReadOnly=true;  
  
this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];  
fnSetCurrencyManager();
```

Figure 2.9 Connecting the Datagrid with the Dataset control

We also call the Currency Manager Set Function - Figure 2.10:

```
public void fnSetCurrencyManager()  
{  
  
    //Initialize CurrencyManager for the table "Employees_Details"  
    currManager=(CurrencyManager)this.BindingContext[datc.dSet.Tables["Employees_Details"]];  
}
```

Figure 2.10 Initializing the CurrencyManager for the Parent data-table

“The CurrencyManager derives from the BindingManagerBase class. The BindingManagerBase enables the synchronization of data-bound controls on a Windows Form that are bound to the same data source. For example, suppose that a form contains two TextBox controls that are bound to the same data source but to different columns. The data source might be a DataTable that contains customer names, while the columns might contain the first and last names. The two controls must be synchronized in order to display the correct first and last names together for the same customer. The CurrencyManager, which inherits from the BindingManagerBase class, accomplishes this synchronization by maintaining a pointer to the current item in the data source. The TextBox controls are bound to the current item so they display the information for the same row. When the current item changes, the CurrencyManager notifies all the bound controls, so that they can refresh their data. Furthermore, you can set the Position property to specify the row in the DataTable that the controls point to.

To determine how many rows exist in the data source, use the Count property. The Current property returns the current item in the underlying list. To change the current item, set the Position property to a new value. The value must be greater than 0 and must be less than the value of the Count property.” [5].

After setting the properties in an appropriate way, we can proceed to data-bind the controls (text boxes and combo boxes) and the data source to load and display the data from the data source. For this purpose a set of data-binding functions responding to each data table of the database was constructed.

To load and display the data, responding to the Employees\_Details data table, the following consequence of operations has to be performed:

- Trying to establish the connection - Appendix B: Figure 7.

At the end of the set of operations we use the

(“fnGetDataBindingForEmployees\_Details();”) function which role can be depicted by using the snippets of code in Appendix B: Figure 8 and Figure 9 – Data-binding operations. The operations shown in Figure 8 are also performed and for the controls of Working History tab-page as they are related to the data content of Employees\_Details data table - Appendix B: Figure 10. This is operatively repeated and for the rest types of controls on this tab-page.

One thing should always be taken into an account when we perform such operations: We are not allowed to perform a data binding operation more than once at a time, thus a function should be made up for clearing the control's collection of any data bindings. A ("control.DataBindings.Clear();") function is called every time when we commit to a data binding operation upon a control. Otherwise, an exception would be thrown and we have just to quit the program. Such kind of exceptions are not only undesirable, they are not allowable in the practice as well.

After loading the available data records from the database, we are already able to take a preview upon them:

The screenshot shows a web application interface. At the top, there is a blue header bar with the text "Employee Data". Below this is a table with 12 columns: Personal\_ID, First\_Name, Middle\_Name, Last\_Name, Day\_of\_Birth, Month\_of\_Birth, Year\_of\_Birth, Cellular\_Phon, Home\_Phone, Employee\_ID, City, and Address. The table contains four rows of data. The second row is highlighted in blue. To the right of the table is a vertical stack of four buttons: "<First>", "<Last>", "Next>>", and "<<Previous". Below the table is a horizontal scrollbar.

Personal_ID	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birth	Year_of_Birth	Cellular_Phon	Home_Phone	Employee_ID	City	Address
2112121212	Dragan		Cankov	2	2	1941			197	unknown	unknown
7777777777	Shone		Figgis	1	10	1973			198	Canterbury	not specified
8210011540	Kancho		Kanchev	1	10	1982			195	none	none
0123456789	Pelko		Pelkov	3	2	1952			196	unknown	unknown

Figure 2.11 Data records uploaded into the Datagrid control

The data records - Figure 2.11 concern only the main data table Employees\_Details as we are now in the first and second tab-pages of the tab-control. If we switch to the next tab-page (s), the responding data table's information will be uploaded into the dataGrid control and shown as text into the corresponding text fields, located on the same form.

The available record (if such one exists) is uploaded into the data grid control and shown up on the screen - Figure 2.12:

The screenshot shows a web application interface. At the top, there is a blue header bar with the text "Employee Data". Below this is a table with 12 columns: Personal\_ID, First\_Name, Middle\_Name, Last\_Name, Day\_of\_Birth, Month\_of\_Birth, Year\_of\_Birth, Cellular\_Phon, Home\_Phone, Employees\_D, City, and Address. The table contains one row of data. The first cell of the first row is highlighted in blue. Below the table is a horizontal scrollbar.

Personal_ID	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birth	Year_of_Birth	Cellular_Phon	Home_Phone	Employees_D	City	Address
7777777777	Shone		Figgis	1	10	1973			198	Canterbury	not specified

Figure 2.12 A certain data record uploaded into the data grid

- All data included into the data grid control above is uploaded into editable text fields as well - Appendix B: Figure 11.

We can walk through all the tab-pages, taking a preview upon all records of a person - Appendix B: Figure 12.

In case of two or more available records, we are also allowed to use navigation buttons shown under the text boxes and enclosed by a group box (Records Preview).

These patterns are used to demonstrate how the retrieving-data function of my program operates. Some tests examples, comprising all operations performed upon the database will also be included a bit later.

The four basic functions upon the database will be the main subject to be discussed: Retrieving, Saving, Updating and Deleting data.



### 2.5.1 Retrieving data from the database

Retrieving data from a database is less or more tightly related to dealing with the SELECT query that should be applied to the database in order to extract the desirable result, which one should satisfy certain conditions. This SQL query has the following structure:

```
SELECT <column_name>
```

```
FROM <table_name>
```

```
WHERE [(condition_1), (condition_2), .....(condition_n)].
```

Into the WHERE-statement, the following logical and arithmetical operators are included as well: [AND, OR, <, <=, >, >=, =]. The data from the database is retrieved in three different ways:

By clicking on the (Load Records) button: It calls the event handler, associated with this event, and operates as follows – Appendix B: Figure 13 – Load/Edit button click event and Figure 14 – Trying to establish a connection to the database, evoked by the Load/Edit button click event. It sets some of the functionality properties of some of the other buttons, logically related to the eventual operations that may be performed upon the retrieved data and calls a function that establishes a connection to the database and performs the desirable SQL query upon it. Its implementation is shown in Appendix B: Figure 15.

Function ( fnGetDataConnection() ) is implemented in a separate class, located in a different file. Actually, all of the functions dealing with the data operations in the program have been put there.

The SELECT query here retrieves all data from Employees\_Details data table. This data is uploaded into the data grid and all text fields of personalDetails and cWorkingHistory pages, which ones are related to the content of Employees\_Details data table.

- After loading the available records existing into the main table, we can proceed to upload and other existing records from another table by switching from one tab-page to another. That performs a SQL query for retrieving data from the main table plus data from its related (child) table. It is shown in Appendix B: Figure 16 – Function performing the select query expression.

In this expression, we use the primary and the foreign key values from the parent and the child tables, as the relationship between them should be explicitly specified. We also use a WHERE- statement in order to specify and the person these records belong to. Afterwards, a result table is constructed by joining the records from the child table to their related record from the parent data table.

The operation performed in this way, is a kind of convenience as the data source is still Employees\_Details and it is not necessary to switch our data-binding process to another source of data every time, when we go to any other table of the database. It is very important to know which person (employee) these records belong to. In accordance with that, the function above takes three input parameters:

fName=First Name, lName=Last Name and idNumber= Personal ID Number, and applies them to the WHERE-statement's condition.

These explanatory notes are graphically presented on Figure 2.13:

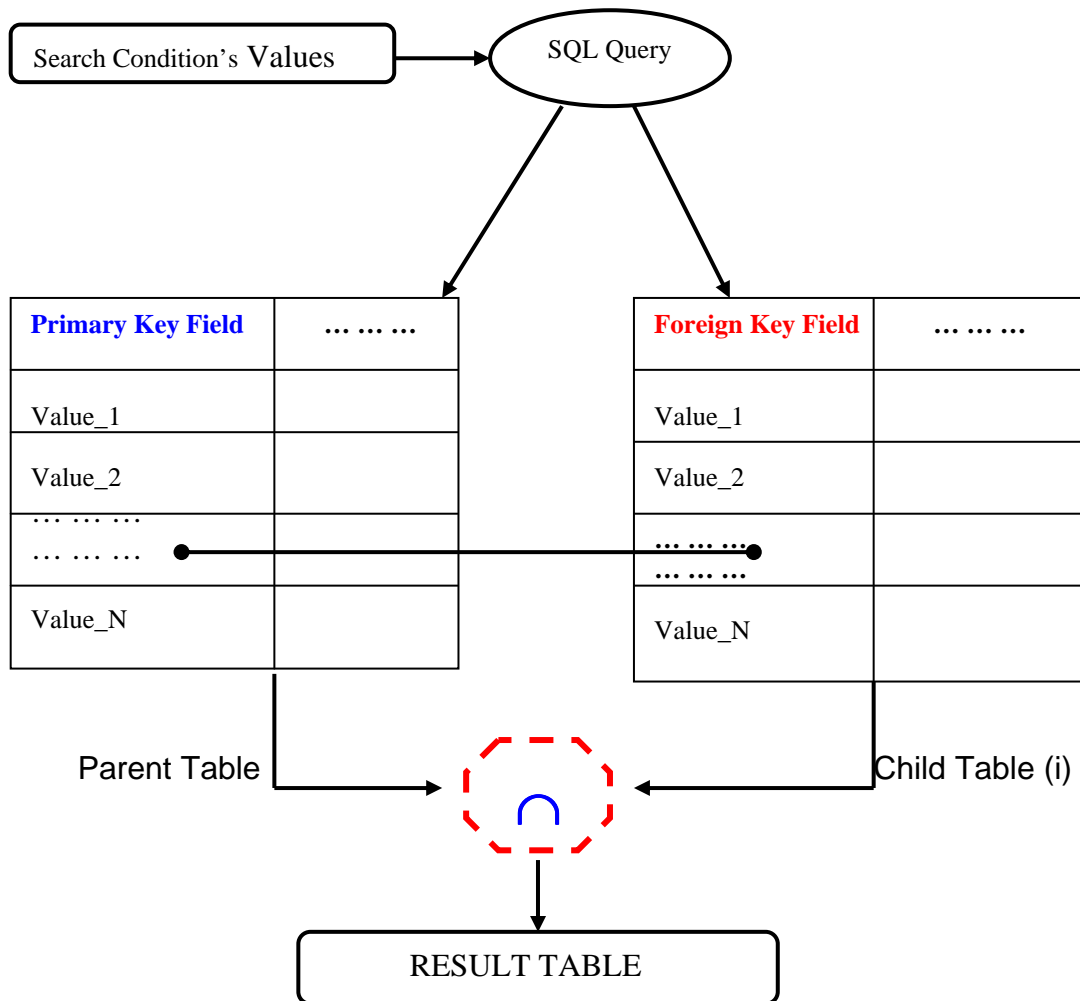


Figure 2.13 Retrieving records scheme

The last way of retrieving data into the program is by the Search field, provided for seeking certain employee's data.

Search by certain condition (given values): The search field consists of two functional buttons and three text fields for giving the input parameters as string values through which ones the search process will be performed. The first functional button is located above the data grid and put in a line with other functional buttons. Actually, it unlocks the search field and enables it for receiving data - Figure 2.14:

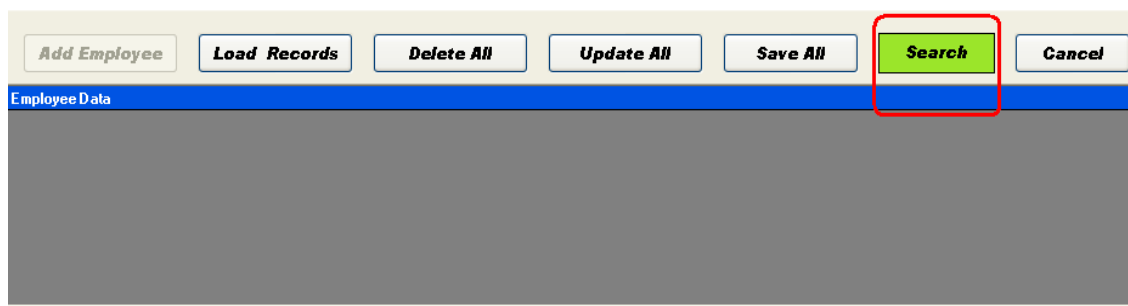


Figure 2.14 Search button activated

Every time, when it's clicked, its current style and colour properties are changed in order to show that is in active mode. After clicking upon it, we can proceed to the Search field, located a bit further below - Figure 2.15:

Figure 2.15 Search engine fields

The search engine operates with the exact values of the First Name, Last Name and Personal ID Number attributes.

Sufficient and correct information has to be input unless we want zero records to be found. Four available cases have been considered:

- a. First Name and Personal ID Number.
- b. Last Name and Personal ID Number.
- c. First Name and Last Name.
- d. Personal ID Number.

This search conditions are embedded in a SELECT-query as follows - Figure 2.16:

```
string query1=" SELECT * FROM Employees_Details e WHERE "+
" ((e.Personal_ID_Number = '" + search_value3 + "') "+
" AND (e.First_Name = '" + search_value1 + "') ) "+
" OR ((e.Last_Name = '" + search_value2 + "') "+
" AND (e.Personal_ID_Number = '" + search_value3 + "') ) "+
" OR ((e.First_Name = '" + search_value1 + "') "+
" AND (e.Last_Name = '" + search_value2 + "') ) "+
" OR (e.Personal_ID_Number = '" + search_value3 + "') ) "+
" ORDER BY e.First_Name, e.Last_Name ";
```

Figure 2.16 Select query expression

It could be rewritten in the following way, just to get the clue:

```
SELECT * FROM PARENT TABLE [(e)-indicator]
WHERE ( ( (Condition_1) AND (Condition_2) )
        OR ( (Condition_3) AND (Condition_1) ) ...
        OR ( (Condition_3) AND (Condition_2) )
        OR (Condition_3) )
ORDER BY e. ColumnName_x, e. ColumnName_y
```

After the search query execution upon the database, we need to populate the data grid and the relevant text fields with this data – Appendix B: Figure 17 - Uploading data into the Datagrid, in order to be on disposal of the program's users.

If no any data record is found, a message box pops up on the screen, telling the user that such a person doesn't exists into the database – Appendix B: Figure 18.

To upload the data into the text fields of the form, a data-binding function is called:

```
this.fnGetDataBindingForEmployees_Details();
```

The entire function's body is shown in Appendix B: Figure 19 Search function – code implementation.

For test samples, see Appendix C: Figure 2.1- successful Search operation and Figure 2.2-Search failure.

### **2.5.2 Saving data into the database**

This kind of operation upon the database is subdivided into two groups: Saving a new employee's records (Populating all of the tables with data) and Add a record to an employee's data records.

Saving new employee's records: The whole process comprises a few actions, but not all of them are compulsory to be accomplished at once! First of all, to unlock the fields in order to get them prepared for accepting new data, the ("Add Employee") button has to be clicked. Afterwards, we can go to the desired form and fill the required data in. It's not necessary to fill in all of the forms with an exception of the two first, which ones hold the data for the parent table into the database, and to be able to perform a successful save into the database, we need to fill in all of the fields required there! Of course, if not all of the rest forms are populated with data, a message appears on screen asking the user whether he would like to proceed anyway saving only the data, filled till the moment, or go back and fill them in.

The next approach has been made up to resolve the saving problem: Firstly, it is known that the primary key values in all tables are automatically generated by saving a record as they have been set to an AutoNumber type. When data is saved into the parent table, we have the primary key, which one is the Employee\_ID\_Number, but this value is also needed for proceeding to another (child) table and populate it with data as the DBMS needs to know the responding record into the parent table! Apparently, we need to specify to which employee (person) from the parent table, the current record we are trying to save, belongs to.

As it concerns all child tables into the database, it could be done in the following way: When a record is populated into the parent table and we try to save another one into a child table, the primary key's value is taken and put into the child table where we want to save the current record. Afterwards, we go to the child table and save the record there. To implement this in code, a few functions have been constructed (one for each child table and one for establishing the connection between the parent and the child tables).

The whole process can be graphically represented on Figure 2.17.:

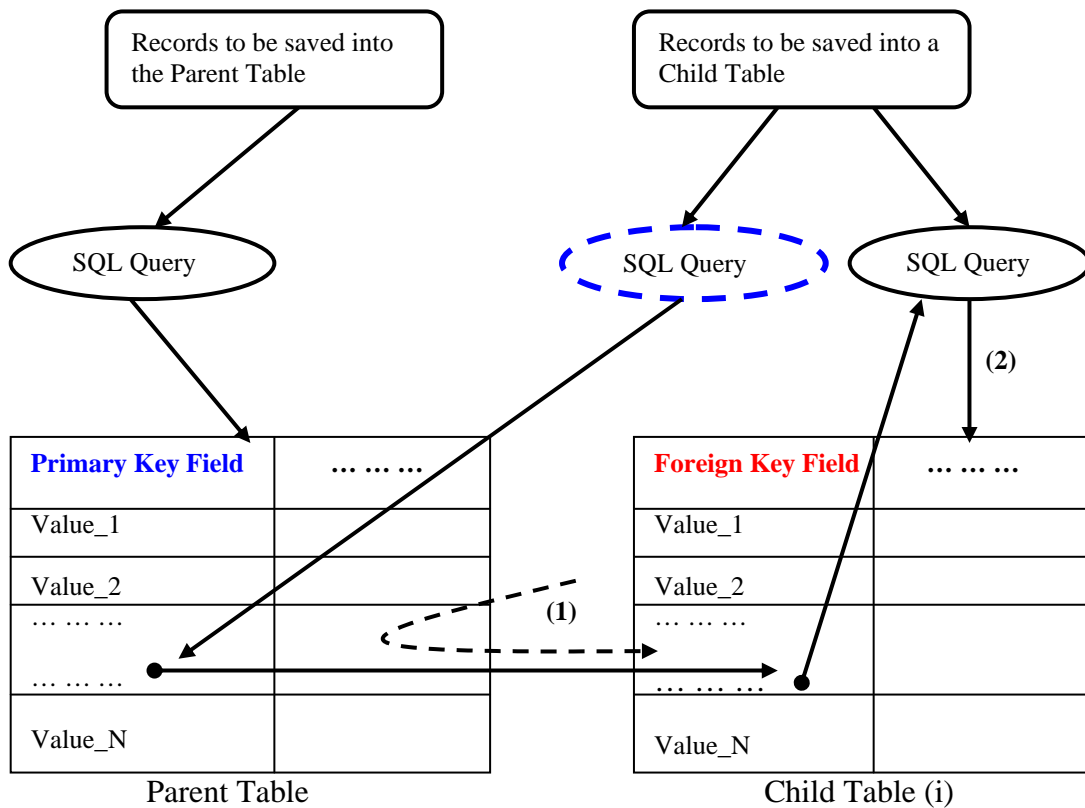


Figure 2.17 Saving records scheme

Some details are going to be given about the functions, called by clicking upon the “Save All” button. It firstly calls a set of functions, checking whether all of the required fields have been filled correctly, and if not then a message pops up on the screen showing where there is insufficient information and whether we can proceed saving the data or not. Afterwards, the responding save functions are called and the data is saved into the database.

In Appendix B: Figure 20, a few lines of code, implementing this stuff, are applied.

These Boolean variables are passed to an array and initialized with the values returned by functions, checking the information of the fields. The values of these functions actually determine into which table we can save records and into which – not, and whether we can save records at the moment at all.

Into the code – snippet on Figure 20 it can be seen that if we have the sufficient information for the parent table, then we can save it ... Plus performing save operations and upon those of the child tables, which relative fields on the form contain the sufficient and necessary information for this purpose.

If all of the fields are filled in, then – Appendix B: Figure 21 Saving functions – source implementation.

One of the check-functions, used in the code on Figure 2.21, is shown in the next figure – Appendix B: Figure 22.

All of this stuff is really useless without the functions, operating with the database.

The function, saving data into the parent table (Employees\_Details) is shown in Appendix B: Figure 23.

We can see how and the other functions operate. For simplicity, only one of them is going to be shown - Appendix B: Figure 24 Function, saving data into the child data-table Working\_History, as they are constructed to act almost in the same way.

All of these functions use the Get\_Connection(Table\_Name, ID) and Get\_Primary\_Key(Table\_Name, Primary\_Key\_Value, ID) methods, which ones are very essential for the purposes, they have been constructed. Get\_Connection() Method is shown in Appendix B: Figure 25. When the method (function) shown in Figure 24 is called, then the primary key's value is taken from the parent table and after that the obtained value is inserted into the relative child table.

Another method is embedded within these functions – Appendix B: Figure 26. This method extracts the maximum value of the primary key, which has been automatically generated beforehand and just put it into the condition of the UPDATE statement, in order to save the data on the appropriate and correct place into the database, as every next record should be inserted after the last one. The maximum value is easily obtained by using the SELECT query as all of the primary key values are set to be generated in an ascending order.

Adding a record to the database: We need to press the “Add a Record” button in order to enable the “Save a Record” button and to prepare the fields for the input stream of data - Figure 2.18:

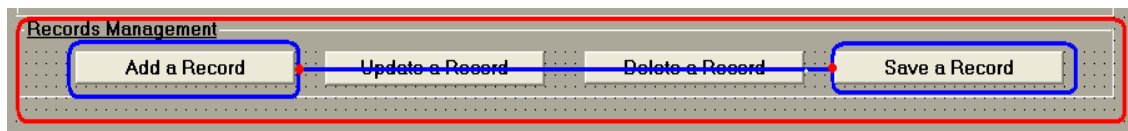


Figure 2.18 Adding a record to the database

After filling the required information into the text fields, all of the fields are checked whether sufficient information is given or not. The test-samples are shown in Appendix C.2.

That's all concerning the Save-data process as such as it has been implemented into my program.

### 2.5.3 Updating records into the database

This operation, performed upon a database, is less or more essential as it is tightly related to the “Edit”- and “Refresh”-modes of operating with data. One thing should always be taken into an account when we deal with records-updating: We need to know the primary key's value of the current record that we would like to get updated by the system, as in other way a rather different record would be updated.

Two cases have been considered:

- **Update All:** It means, all of the records into the database, concerning a certain employee, to be updated at once. For this purpose, it is desirable, but not compulsory, all of the fields on the forms to be filled in with data (edited data, for instance) and after that we need to press the “Update All” button. The program doesn't allow the user to update not existing records or records where insufficient information has been detected!

This process of updating data could be depicted as follows - Figure 2.19:

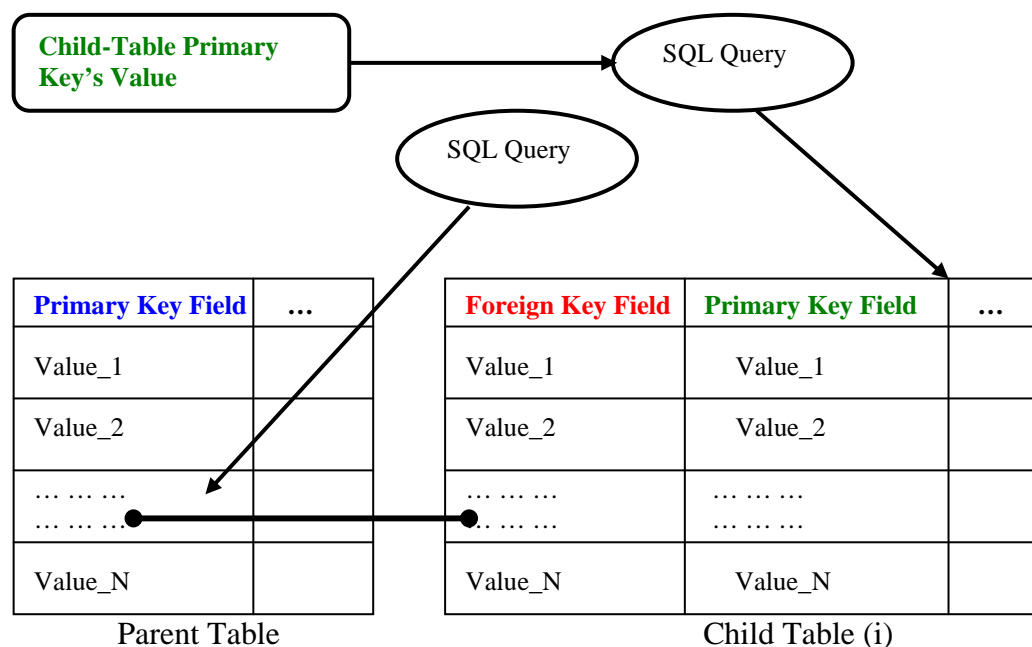


Figure 2.19 Updating records scheme

The snippets of code in Appendix B: Figure 27 and Figure 28 shows what happens into the Click-event's mechanism of this update-button. Only few of the functions are going to be exposed here as the rest ones are operatively the same.

The Update\_Employees\_Details() function - is going to be shown as first – Appendix B: Figure 29. As it could be noted, this method calls another one within itself, which one actually executes the SQL query upon the database. This method has the next body implementation, shown in Appendix B: Figure 30 SQL implementation for updating records into the parent table. The methods shown in Figure 29 and Figure 30 affect the parent table's records only. For the child tables' records, other functions have been constructed and that can be seen from the code snippets above. The methods, dealing only with Working\_History data table, are going to be presented here, as the methods for the rest data tables are constructed by using the same approach – Appendix B: Figure 31 and Figure 32.

A test responding to these functions' performance is depicted on the Figures in Appendix C.3.1.

- Update Single Records into the database: This can be performed by clicking the "Update a Record" button - Figure 2.20:

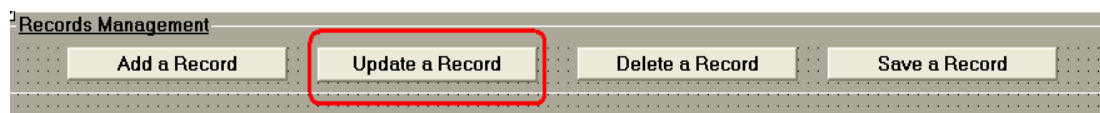


Figure 2.20 Updating a record into the database

The click-event calls the same update-functions as such as they were shown in the figures, concerning all records-updating. Each "Update a Record" button calls the appropriate function, responding to a certain data table.

Two test-samples are shown in Appendix C.3.2.

#### 2.5.4 Deleting data from the database

This kind of operation, performed upon the database, is subdivided into two parts: Single Records Deletion and All Records Deletion. Both parts concern only single employee's data into the database. Deleting a single record from the database means moving to a certain child table, selecting the record we want to be deleted and press the "Delete a Record" button. The result is instantly reflected into the database and back into the program as well. There is a bit difference between performing single record deletion into the child tables and performing a delete operation upon the whole amount of records of an employee. In the second case we need to delete the employee's record into the parent table as well, but before proceeding to this final action we have to ensure that all of his records into the child tables are fully erased. Otherwise, the DBMS will not allow any data into the parent table to be deleted! I made up as simple approach as it was possible: I have constructed a delete function for every single child table, erasing all of the records of the selected employee. These functions go through the child tables and when all data gets deleted, a function, erasing the record into the parent table, is called as last.

- **Single Record Deletion:** means that only the current record we want to delete, shall be removed from the database. For this purpose, we can use the functional buttons, related to a record in each data table. The click-event of such a button is shown in Appendix B: Figure 33 Click-event function and Figure 34 Delete function, evoked within the click-event's body. The test-samples are shown in Appendix C.4.1.
- **All Records Deletion:** To perform successfully this kind of operation upon the whole data of an employee, existing into the database, we firstly need to delete consequently all of his records into the child tables and then proceed to the parent table. By clicking the "Delete All" button, a click-event is involved as it is shown in Appendix B: Figure 35. Into the code in Figure 35, we get, or at least try to obtain the primary key values from every single child table in order to ensure that there is (are) available record(s) there, because in other way exception is thrown and the operation crashes down.

To cope with these special cases, a "try-catch" statement has been considered and put to deal with the emergencies of this kind. In case there is no any record, then the primary key is automatically initialized to zero (0), unambiguously showing that there is no any available record into the current child table – Appendix B: Figure 36 Function obtaining the primary key's value. If the primary key is not zero, then the delete function is called to be performed upon the found record(s) – Appendix B: Figure 37 Function, deleting all records of an employee. Afterwards, we go back to the basic function, in which body all of this stuff is involved, and keep on operating in the same way with the rest of the child tables until we reach to the parent table's operative function, shown in Appendix B: Figure 38 and Figure 39 – Delete function, operating upon the records into the parent data table.

A test-sample showing this function's performance is illustrated in Appendix C.4.2.



### **3. Conclusion**

In this report, an information system's development has been presented. It was emphasized on the basic steps, consequently taken during the project's development course as a particular attention was turned to the basic operative functions performed upon the data into the database.

The report's content comprises the whole task solution, starting from the programming environments have been selected, going through the database, the application's analyze and construction, and finishing with the code-implementation and test-samples, shown separately in Appendix chapters.

As a future work, some additional stuff could be implemented and integrated into the application code making it much more reliable and flexible; especially what concerns a pay-roll module, for instance.

Apparently, the role of such systems is basic and essential within each company that wants to keep a really good control and record concerning its personnel data, functionality and performance on all levels in its structure. Every organization, in nowadays, has the necessity of managing its staff on a really good level as the staff has definitely the greatest merit of building up a company as such as it is. The well-managed staff means giving the appropriate financial award-ness and all kind of benefits as such as they have been deserved. That's why the development of such systems is not just a programming business – a lot of people are ordinarily involved in such projects and one of the basic requirements is the reliability of the system, especially what concerns the storage of data and all of the operations that will be performed upon it.

#### 4. References

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## Appendix A: Programming Environments and Database Content

This section will give some visual details about the content and the structure of the database that has been designed and constructed for the purposes of the program.

- MS-Access (2000):

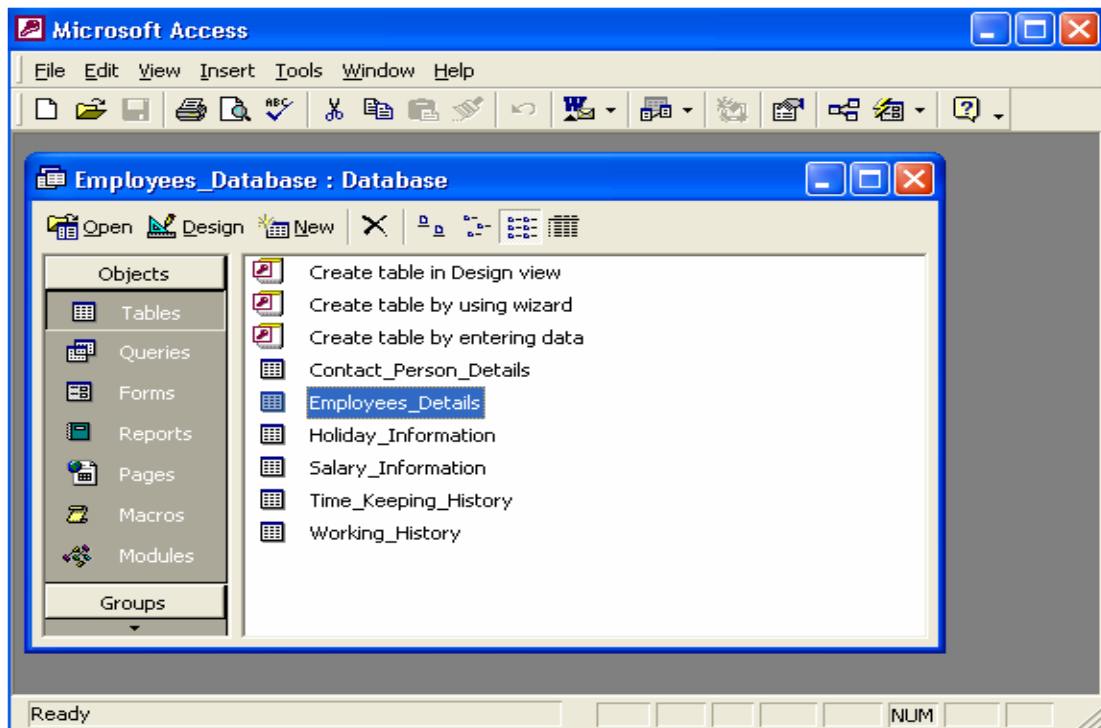


Figure A.1

- Visual Studio – Microsoft:

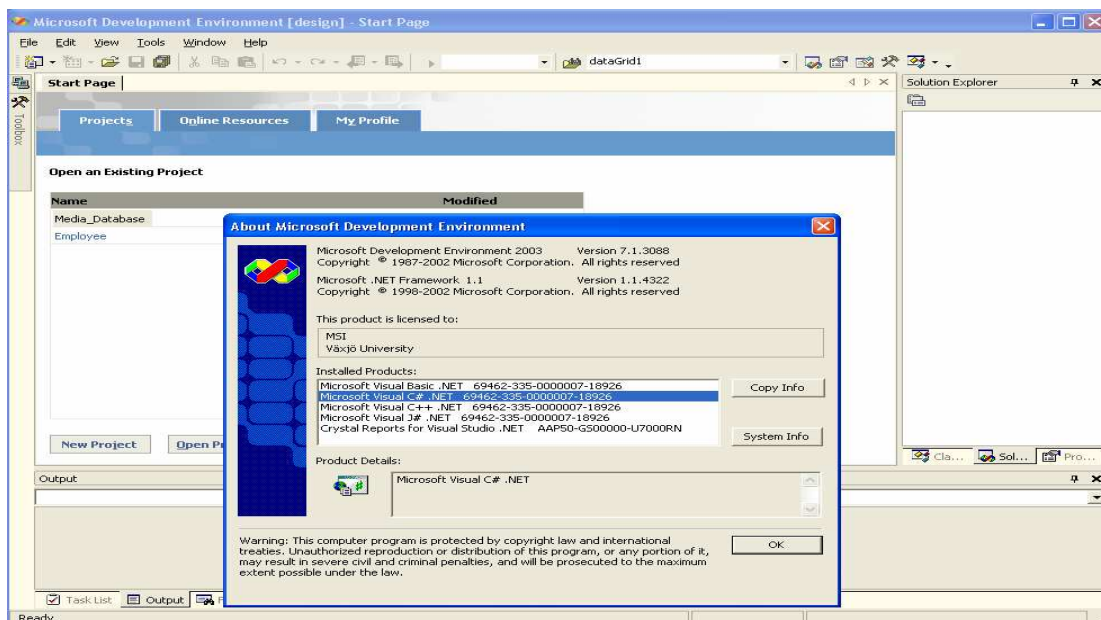


Figure A.2

- .Net Framework – basic structure (Lectures in C#-[4]):

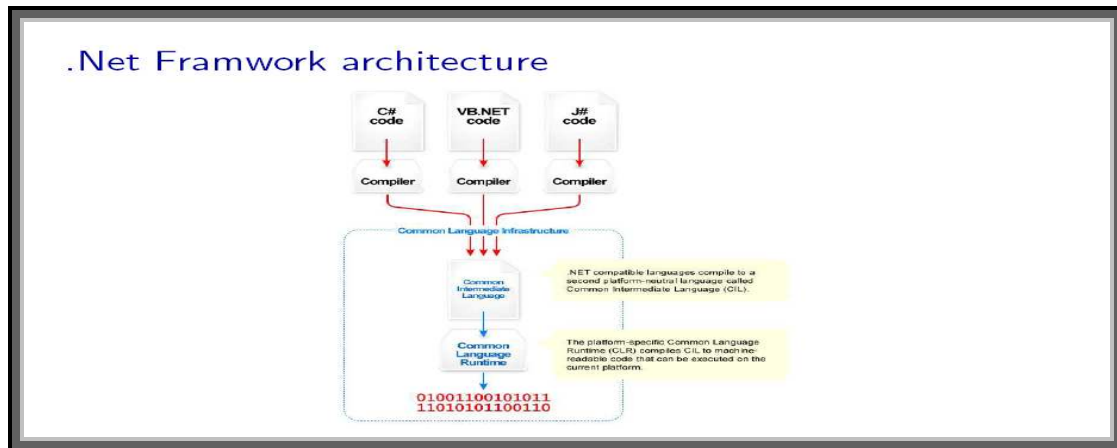


Figure A.3

- Database relationships:

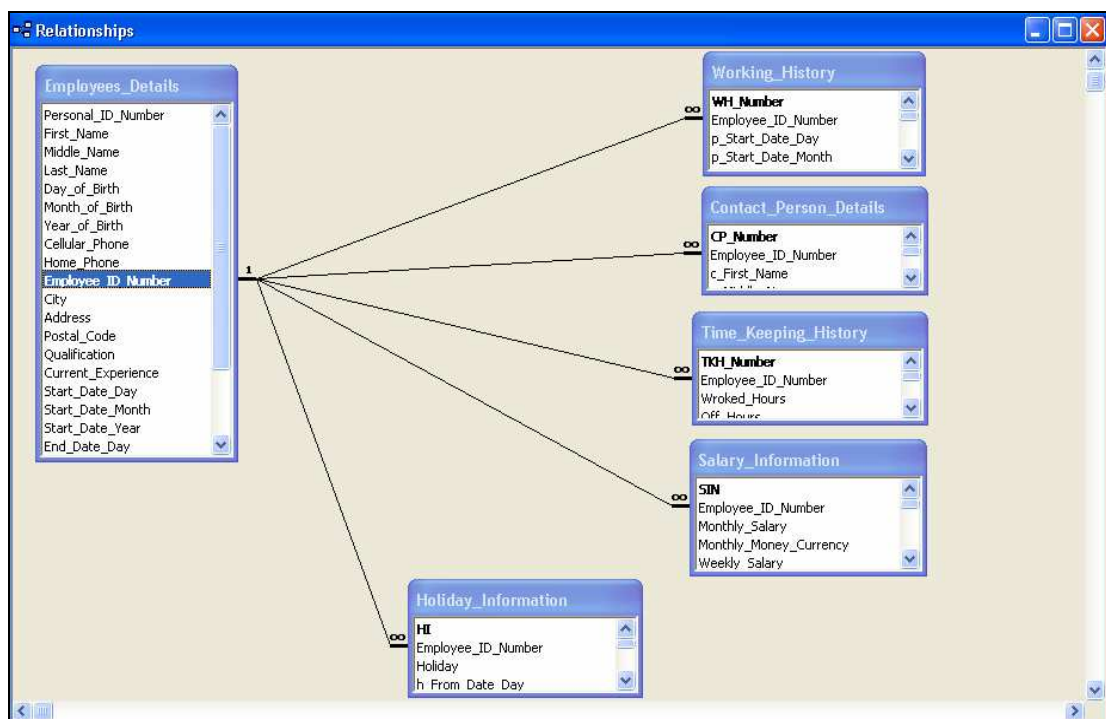


Figure A.4

- Employees\_Details data table:

**Employees\_Details : Table**

Field Name	Data Type	Description
Personal_ID_Number	Text	That's the unique and only one number everyone gets by his birth.
First_Name	Text	First Name of the Employee
Middle_Name	Text	Middle Name of the Employee
Last_Name	Text	Last Name of the Employee
Day_of_Birth	Text	Employee's day of Birth
Month_of_Birth	Text	Employee's month of Birth
Year_of_Birth	Text	Employee's year of Birth
Cellular_Phone	Text	Employee's Cellular Phone
Home_Phone	Text	Employee's Home Phone
Employee_ID_Number	AutoNumber	That's the number every employee receives by getting employed in the company.
City	Text	That's the city where an employee lives at principle or is living now in.
Address	Text	That's address an employee is living now on.
Postal_Code	Text	Postal code of the city or area where he/she is living now.
Qualification	Text	That's the employee's qualification responding to the duty he/she is occupying in the company now.
Current_Experience	Text	This field represents the experience in years or months that every employee has in the current company.
Start_Date_Day	Text	These three fields (the current one plus the other two fields below) form the date an employee has started working since.
Start_Date_Month	Text	
Start_Date_Year	Text	
End_Date_Day	Text	These three fields (the current one plus the other two fields below) form the date an employee has been working until.
End_Date_Month	Text	
End_Date_Year	Text	
Type_of_Employee	Text	This field represents the type of every single employee which data is stored on the database.
Gender	Text	This is the gender every single employee belongs to.
Marital_Status	Text	That's the marital status of an employee.

**Field Properties**

General | Lookup

Field Size: Long Integer  
 New Values: Increment  
 Format:  
 Caption:  
 Indexed: Yes (No Duplicates)

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.5

- Working\_History data table:

**Working\_History : Table**

Field Name	Data Type	Description
WH_Number	AutoNumber	That's a primary key field, which one is not compulsory to be integrated in this table!
Employee_ID_Number	Number	That's the foreign key field related to the primary key in the main table (Employee_Personal_Details).
p_Start_Date_Day	Text	That's the date an employee had started working since either in a previous company or for a previous employer.
p_Start_Date_Month	Text	
p_Start_Date_Year	Text	
p_End_Date_Day	Text	That's the date an employee had been working till either in a previous company or for a previous employer.
p_End_Date_Month	Text	
p_End_Date_Year	Text	
Previous_Qualification	Text	That's the qualification responding to the duty an employee had been occupying in his previous company.
Previous_Experience	Text	That represents the employee's experience in years or months he has collected working in a previous company.
Company_Name	Text	That's the name of the company an employee had been working for.
Employer_Name	Text	This is the name of the previous Employee an employee had been working for.
Company_Employer_Address	Text	This field requires to be filled in by giving an information concerning the address details of the Company or the Employer for
Company_Employer_Cellular	Text	Phone details of the previous company or employer have to be given to this field.
Company_Employer_Office_F	Text	

**Field Properties**

General | Lookup

Field Size: Long Integer  
 Format:  
 Decimal Places: Auto  
 Input Mask:  
 Caption:  
 Default Value: 0  
 Validation Rule:  
 Validation Text:  
 Required: No  
 Indexed: No

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.6

- Contact\_Person\_Details data table:

Field Name	Data Type	Description
CP_Number	AutoNumber	That's a primary key field, which one is not compulsory to be integrated in this table!
Employee_ID_Number	Number	That's the foreign key field related to the primary key in the main table (Employee_Personal_Details).
c_First_Name	Text	That's the Contact Person's first name.
c_Middle_Name	Text	That's the Contact Person's second name.
c_Last_Name	Text	That's the Contact Person's last (family) name.
c_Cellular_Phone	Text	Contact Person's Cellular Phone
c_Home_Phone	Text	Contact Person's Home Phone
c_City	Text	That's the city where an employee lives at principle or is living now in.
c_Address	Text	That's address an employee is living now on.

**Field Properties**

General | Lookup

Field Size: Long Integer

Format:

Decimal Places: Auto

Input Mask:

Caption:

Default Value: 0

Validation Rule:

Validation Text:

Required: No

Indexed: Yes (Duplicates OK)

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.7

- Time\_Keeping\_History data table:

Field Name	Data Type	Description
TKH_Number	AutoNumber	That's a primary key field, which one is not compulsory to be integrated in this table!
Employee_ID_Number	Number	That's the foreign key field related to the primary key in the main table (Employee_Personal_Details).
Wroked_Hours	Text	The total number of hours worked by an employee.
Off_Hours	Text	The total number of hours not worked in the working schedule.
Days_off	Text	The total number of days-off.
Over_Time	Text	The total number of hours over the eight hour.
Extra_Days	Text	The number of extra worked days.
w_From_Date_Day	Text	That's the starting point of the certain period of time, the filed's values above are supposed to be specified for.
w_From_Date_Month	Text	
w_From_Date_Year	Text	
w_To_Date_Day	Text	That's the ending point of the certain period of time, the filed's values above are supposed to be specified for.
w_To_Date_Month	Text	
w_To_Date_Year	Text	

**Field Properties**

General | Lookup

Field Size: Long Integer

Format:

Decimal Places: Auto

Input Mask:

Caption:

Default Value: 0

Validation Rule:

Validation Text:

Required: No

Indexed: Yes (Duplicates OK)

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.8

- Salary\_Information data table:

**Salary\_Information : Table**

Field Name	Data Type	Description
SIN	AutoNumber	
Employee_ID_Number	Number	That's the foreign key field related to the primary key in the main table (Employee_Personal_Details).
Monthly_Salary	Number	This is the amount of money received by every employee, who is paid on a monthly basis.
Monthly_Money_Currency	Text	
Weekly_Salary	Number	his is the amount of money received by every employee, who is paid on a weekly basis.
Weekly_Money_Currency	Text	
ms_From_Date_Day	Text	That's the date since an employee is paid the money.It concerns the monthly salary!
ms_From_Date_Month	Text	
ms_From_Date_Year	Text	
ms_To_Date_Day	Text	That's the date until an employee is paid the money.It concerns the monthly salary!
ms_To_Date_Month	Text	
ms_To_Date_Year	Text	
ws_From_Date_Day	Text	It concerns the weekly salary!
ws_From_Date_Month	Text	
ws_From_Date_Year	Text	
ws_To_Date_Day	Text	
ws_To_Date_Month	Text	
ws_To_Date_Year	Text	
weekly_Taxes	Number	That's the governmental and coucil taxes every employee has to pay.
weekly_Deductions	Number	That's the deductions made on the current salary.
weekly_Insurances	Number	That's the Insurance taxes has to be paid for Contributory and Pension benefits.
monthly_Taxes	Number	
monthly_Deductions	Number	
monthly_Insurances	Number	

**Field Properties**

General | Lookup

Field Size: Long Integer  
 Format:   
 Decimal Places: Auto  
 Input Mask:   
 Caption:   
 Default Value: 0  
 Validation Rule:   
 Validation Text:   
 Required: No  
 Indexed: Yes (Duplicates OK)

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.9

- Holiday\_Information data table:

**Holiday\_Information : Table**

Field Name	Data Type	Description
HI	AutoNumber	
Employee_ID_Number	Number	That's the foreign key field related to the primary key in the main table (Employee_Personal_Details).
Holiday	Text	That's the name of the holiday has been given to an employee.
h_From_Date_Day	Text	That's the date a holiday has started on.
h_From_Date_Month	Text	
h_From_Date_Year	Text	
h_To_Date_Day	Text	That's the date a holiday has ended on.
h_To_Date_Month	Text	
h_To_Date_Year	Text	

**Field Properties**

General | Lookup

Field Size: Long Integer  
 Format:   
 Decimal Places: Auto  
 Input Mask:   
 Caption:   
 Default Value: 0  
 Validation Rule:   
 Validation Text:   
 Required: No  
 Indexed: No

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Figure A.10

- Set the Allow Zero Length Property:

**Employees\_Details : Table**

Field Name	Data Type	Description
Personal_ID_Number	Text	That's the unique and only one number eve
First_Name	Text	First Name of the Employee
Middle_Name	Text	Middle Name of the Employee
Last_Name	Text	Last Name of the Employee

**Field Properties**

General | Lookup

Field Size: 10

Format:

Input Mask:

Caption: Personal ID Number

Default Value:

Validation Rule:

Validation Text:

Required: No

Allow Zero Length: No

Indexed: Yes

Unicode Compression: No

Allow zero-length strings in this field?

Figure A.11



## Appendix B: Program's Structure and Code Implementation

This section will give some visual details about the structure of the program has been designed and constructed for the purposes of the program and its basic functions' code implementation as well.

- Application program's GUI:

The screenshot displays the 'Employee Maintenance' window of the 'EMPLOYEE MANAGEMENT SYSTEM'. The interface includes a menu bar with 'References' and 'Help'. Below the menu bar, there are buttons for 'Add Employee', 'Load/Update All', 'Delete All', 'Save All', 'Search', and 'Cancel'. A large 'Employee Data' table is present, with navigation buttons '<First', '<Last', 'Next>', and '<<Previous'. Below the table, there are search filters for 'Search by First Name', 'Search by Last Name', and 'Search by ID Number', along with a 'Search>>' button. A 'Selected Employee' section shows fields for 'First Name', 'Last Name', and 'ID Number'. The main form is divided into several tabs: 'Personal Details', 'Working History', 'Previous Employed(s)', 'Contact Person', 'Working Time Details', 'Salaries and Taxes', and 'Holiday Information'. The 'Personal Details' tab is active, showing fields for 'Personal ID Number', 'First Name', 'Second Name', 'Family Name', 'Date of Birth' (with day, month, and year dropdowns), 'City', 'Postal Code', 'Address', 'Family and Gender Status' (with gender and marital status dropdowns), and 'Phone Details' (with cellular and home phone fields). A 'Quit Programme' button is located at the bottom left.

Figure B.1

- Basic form:

This screenshot shows the 'Employee Maintenance' window with a simplified layout. The menu bar includes 'References' and 'Help'. The main area is a large, empty grid. A 'Quit Programme' button is located at the bottom left. The title bar reads 'Employee Maintenance' and the window title is 'EMPLOYEE MANAGEMENT SYSTEM'.

Figure B.2

- User control form:

The screenshot shows a user control form with a title bar and a menu bar. The menu bar includes buttons for 'Add Employee', 'Load Records', 'Delete All', 'Update All', 'Save All', 'Search', and 'Cancel'. Below the menu bar is a large gray area labeled 'Employee Data'. Underneath this is a search section with three text boxes: 'Search by First Name:', 'Search by Last Name:', and 'Search by ID Number:'. Below the search section is a 'Selected Employee:' section with three text boxes: 'First Name', 'Last Name', and 'ID Number'. Below this is a tabbed interface with tabs for 'Personal Details', 'Working History', 'Previous Employer(s)', 'Contact Person', 'Working Time Details', 'Salaries and Taxes', and 'Holiday Information'. The 'Personal Details' tab is selected, showing two sections: 'Personal Information' and 'Additional Information'. The 'Personal Information' section has three text boxes: 'Personal ID Number:', 'First Name:', and 'Second Name:'. The 'Additional Information' section has two text boxes: 'City:' and 'Postal Code:'. There are red error icons next to each of these text boxes.

Figure B.3

- Label-controls:

The screenshot shows a user control form for employee details. The form has a title bar and a menu bar. The menu bar includes buttons for 'Personal Details', 'Working History', 'Previous Employer(s)', 'Contact Person', 'Working Time Details', 'Salaries and Taxes', and 'Holiday Information'. The 'Personal Details' tab is selected, showing two sections: 'Personal Information' and 'Additional Information'. The 'Personal Information' section has four text boxes: 'Personal ID Number:', 'First Name:', 'Second Name:', and 'Family Name:'. The 'Additional Information' section has three text boxes: 'City:', 'Postal Code:', and 'Address:'. There are red error icons next to each of these text boxes. Below the 'Personal Information' section is a 'Date of Birth' section with three text boxes: 'Day of Birth:', 'Month of Birth:', and 'Year of Birth:'. Below the 'Additional Information' section is a 'Family and Gender Status' section with two text boxes: 'Gender:' and 'Marital Status:'. Below the 'Family and Gender Status' section is a 'Phone Details' section with two text boxes: 'Cellular Phone:' and 'Home Phone:'. On the right side of the form is a 'Properties' window showing the properties for the 'personalIDNumber\_Label' control. The properties include Accessibility, Appearance, Text, and Behavior.

Figure B.4

- Textbox- and Combobox-controls:

Figure B.5

- Data grid control: CurrentCellChanged function:

```
private void dataGrid1_CurrentCellChanged(object sender, System.EventArgs e)
{
    /*be warned: if you click the last cell on the Datagrid you get
    an unhandled exception of type 'System.ArgumentOutOfRangeException.
    because there is no further columns after the last column
    to avoid this I tried a different way: in a try-catch get the right
    cell content. if the last column cell clicked display the exception
    and the cell content one before
    */
    //get the row number on the DataGrid
    int iRownr=this.dataGrid1.CurrentCell.RowNumber;
    //get the column number on the DataGrid
    int iColnr=this.dataGrid1.CurrentCell.ColumnNumber;
    //get the content of the cell in the clicked cell on the Datagrid
    object cellvalue1=this.dataGrid1[iRownr, iColnr];
    //get the next cell content in the same row
    object cellvalue2=null;
    try
    {
        cellvalue2=this.dataGrid1[iRownr, iColnr+1];
        //display (cellvalue1+cellvalue2) in TextBox "textBox1"
        //this.textBox1.Text=cellvalue1.ToString()+" "+cellvalue2.ToString();
    }
    catch(Exception ex)
    {
        //the exception occurs here because we increment iColnr+1
        //delete or comment MessageBox.Show-line you won't get the error message
        MessageBox.Show("No further columns after this column! -->> "+ex.Message,"STOP",MessageBoxButtons
        cellvalue2=this.dataGrid1[iRownr, iColnr-1];
        //display this time (cellvalue2+cellvalue1) in TextBox "textBox1"
        //this.textBox1.Text=cellvalue2.ToString()+" "+cellvalue1.ToString();
    }
}
//catch
```

Figure B.6

- Controls data-binding - Figure B.7, Figure B.8, Figure B.9:

```
//check the connection to database
if (this.datc.fnGetDataConnection())
{
    //connection was ok.
    this.dataGrid1.AlternatingBackColor=Color.Wheat;
    this.dataGrid1.ReadOnly=true;

    //Updates the data into the Database:

    //We automatically go to the see the main table data of a person:
    tabControl.SelectedIndex=0;

    this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];

    fnSetCurrencyManager();
    fnGetDataBindingForEmployees_Details();
}
```

Figure B.7

```
//The function below concerns the DataBinding of those Controls
//related to the Employees_Details table:
private void fnGetDataBindingForEmployees_Details()
{
    //To see whose data we are operating with, the following function is called:
    this.fnGetDataBindingForCurrentRecord();
    //DataBindings for the Controls on the personalDetails_tabPage:
    //1--->DataBindings for all TextBox Controls:
    this.ID_Box.DataBindings.Clear();
    this.ID_Box.Focus();
    this.personalIDNumber_label.ForeColor=System.Drawing.Color.GreenYellow;
    this.ID_Box.DataBindings.Add("Text", datc.dSet.Tables["Employees_Details"], "Personal_ID_Number");

    this.firstName_Box.DataBindings.Clear();
    this.firstName_Box.DataBindings.Add("Text", datc.dSet.Tables["Employees_Details"], "First_Name");

    this.secondName_Box.DataBindings.Clear();
    this.secondName_Box.DataBindings.Add("Text", datc.dSet.Tables["Employees_Details"], "Middle_Name");

    this.lastName_Box.DataBindings.Clear();
    this.lastName_Box.DataBindings.Add("Text", datc.dSet.Tables["Employees_Details"], "Last_Name");
}
```

Figure B.8

```

//2--->DataBindings for all ComboBox Controls:
this.dayOfBirth_comboBox.DataBindings.Clear();
this.Day_Generator(this.dayOfBirth_comboBox,"");
this.dayOfBirth_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Day_of_Birth");

this.monthOfBirth_comboBox.DataBindings.Clear();
this.Month_Generator(this.monthOfBirth_comboBox);
this.monthOfBirth_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Month_of_Birth");

this.yearOfBirth_comboBox.DataBindings.Clear();
this.Year_Generator(this.yearOfBirth_comboBox);
this.yearOfBirth_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Year_of_Birth");

this.gender_comboBox.DataBindings.Clear();
this.gender_comboBox.Items.AddRange(new object[] {
    "Female",
    "Male",});

this.gender_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Gender");

this.MaritalStatus_comboBox1.DataBindings.Clear();
this.MaritalStatus_comboBox1.Items.AddRange(new object[] {
    "Single",
    "Married",
    "Divorced"});

```

Figure B.9

```

//DataBindings for the Controls on the cWorkingHistory_tabPage:
//1--->DataBindings for all TextBox Controls:
this.qualification_textBox.DataBindings.Clear();
this.qualification_textBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Qualification");
this.cExperience_textBox.DataBindings.Clear();
this.cExperience_textBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Current_Experience");

//2--->DataBindings for all ComboBox Controls:
this.typeEmployee_comboBox.DataBindings.Clear();
this.typeEmployee_comboBox.Items.Clear();
this.typeEmployee_comboBox.Items.AddRange(new object[] {
    "Salaried Employee",
    "Hourly Employee",
    "Commission Employee",
    "Base Plus Commission Employee"});

this.typeEmployee_comboBox.DataBindings.Clear();
this.typeEmployee_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Type_of_Employee");

this.startDateDay_comboBox.DataBindings.Clear();
this.Day_Generator(this.startDateDay_comboBox,"");
this.startDateDay_comboBox.DataBindings.Add("Text",datc.dSet.Tables["Employees_Details"],"Start_Date");

```

Figure B.10

- Preview upon the database records by using text and combo-boxes: Figure B.11 and Figure B.12

Figure B.11

Figure B.12

- Load/Edit button click-event - Figure B.13 and Figure B.14:

```
//Edit-button Click-Event:
private void edit_button_Click(object sender, System.EventArgs e)
{
    this.edit_button_click=true;

    tabControl.Enabled=true;

    this.ID_Box.Enabled=false;

    this.add_button.Enabled=false;

    this.save_button.Enabled=false;

    this.Error_Cleaner();
}
```

Figure B.13

```
//check the connection to database
if (this.datc.fnGetDataConnection())
{
    //connection was ok.
    this.dataGrid1.AlternatingBackColor=Color.Wheat;
    this.dataGrid1.ReadOnly=true;

    //We automaticaly go to the see the main table data of a person:
    tabControl.SelectedIndex=0;

    this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];

    fnSetCurrencyManager();
    fnGetDataBindingForEmployees_Details();

    this.fnEnableOnOff(this.next_button, this.previous_button, this.first_button);
}
else
{
    MessageBox.Show("Connection failed...");
    Application.Exit(); //end the program
}
```

Figure B.14

- Performing SQL-queries upon the database - Figure B.15 and Figure B.16:

```
//This function establishes a connection for the personalDetails and cWorkingHistory tabpages only!
public bool fnGetDataConnection()
{
    this.select_query1=" select* from Employees_Details order by Last_Name,First_Name ";

    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.select_query1, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Employees_Details");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}
```

Figure B.15

```
//This function establishes a connection for the pWorkingHistory tabpage only!
public bool fnGetDataConnection2(string fName, string lName, string idNumber)
{
    //Employees_Details.Personal_ID_Number, Employees_Details.First_Name, Employees_Details
    this.select_query2=" select* from Employees_Details "+
    " inner join Working_History on Working_History.Employee_ID_Number = Employees_Details.
    " where (Employees_Details.First_Name='"+ fName +"') or (Employees_Details.Last_Name='"
    " order by Employees_Details.First_Name, Employees_Details.Last_Name ";

    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.select_query2, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Employees_Details");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}
```

Figure B.16



- Populating the data grid control with data, from the data source:

```
datc.dSet.Clear();
OleDbDataAdapter adapter = new OleDbDataAdapter(query1, datc.con);

adapter.Fill(datc.dSet, "Employees_Details");
this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];
```

Figure B.17

- In case, no any records are found:

```
fnSetCurrencyManager();

if(currManager.Count==0)
{
    MessageBox.Show("Bad Input! "+this.iRowIndex+" records found!Either INCORRECT or INSUFFIC
    this.fnEnableDisableButtons(this.next_button,this.previous_button,false);
    this.fnEnableDisableButtons(this.first_button,this.last_button,false);
}
else if (currManager.Count==1)
{
    int rowIndex=this.iRowIndex+1;

    this.fnEnableDisableButtons(this.next_button,this.previous_button,false);
    this.fnEnableDisableButtons(this.first_button,this.last_button,false);
}

else
{
    int records_count=currManager.Count;

    this.fnEnableDisableButtons(this.next_button,this.previous_button,true);
    this.fnEnableDisableButtons(this.first_button,this.last_button,true);
}
```

Figure B.18

- The Search Function's code-implementation:

```
private void searchPerson_button_Click(object sender, System.EventArgs e)
{
    this.searchPerson_button_click=true;

    this.tabControl_Cleaner();

    datc.fnGetDataConnection();

    //The input arguments are taken:
    string search_value1=this.search_textBox1.Text;
    string search_value2=this.search_textBox2.Text;
    string search_value3=this.search_textBox3.Text;
```

.....

```
string query1=" SELECT * FROM Employees_Details e WHERE "+
    " ((e.Personal_ID_Number = '" + search_value3 + "') "+
    " AND (e.First_Name = '" + search_value1 + "')) "+
    " OR ((e.Last_Name = '" + search_value2 + "') "+
    " AND (e.Personal_ID_Number = '" + search_value3 + "')) "+
    " OR ((e.First_Name = '" + search_value1 + "') "+
    " AND (e.Last_Name = '" + search_value2 + "')) "+
    " OR (e.Personal_ID_Number = '" + search_value3 + "') ) "+
    " ORDER BY e.First_Name, e.Last_Name ";

datc.dSet.Clear();
OleDbDataAdapter adapter = new OleDbDataAdapter(query1, datc.con);
adapter.Fill(datc.dSet, "Employees_Details");
this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];
fnSetCurrencyManager();
if(currManager.Count==0)
{
    MessageBox.Show("Bad Input! "+this.iRowIndex+" records found!Either INCORRECT or
    this.fnEnableDisableButtons(this.next_button,this.previous_button,false);
    this.fnEnableDisableButtons(this.first_button,this.last_button,false);
}
else if (currManager.Count==1)
{
    int rowIndex=this.iRowIndex+1;

    this.fnEnableDisableButtons(this.next_button,this.previous_button,false);
    this.fnEnableDisableButtons(this.first_button,this.last_button,false);
}
else
{
    int records_count=currManager.Count;
    this.fnEnableDisableButtons(this.next_button,this.previous_button,true);
    this.fnEnableDisableButtons(this.first_button,this.last_button,true);
}
this.fnGetDataBindingForEmployees_Details();
```

Figure B.19

- “Save All” Button click-event

```
private void save_button_Click(object sender, System.EventArgs e)
{
    //Several actions are performed upon the fields that require the necessary information
    //in order to be able to know in which data-table(s) we are not ready to save data:
    bool readyFor_Employees_Details_Table=false;

    bool readyFor_Working_History_Table=false;

    bool readyFor_Contact_Person_Details_Table=false;

    bool readyFor_Time_Keeping_History_Table=false;

    bool readyFor_Salary_Information_Table=false;

    bool readyFor_Holiday_Information_Table=false;
}
```

```
    string []data_tables={"Employees_Details","Working_History","Contact_Person","Time_Keeping_Histo

    bool []functions_array={this.Fill_In_Check_Function_Employee_Details_Table(),this.Fill_In_Check_Function_W
this.Fill_In_Check_Function_Contact_Person_Details_Table(),this.Fill_In_Check_Function_Time_Keeping_History
this.Fill_In_Check_Function_Salary_Information_Table(),this.Fill_In_Check_Function_Holiday_Information_Tab

    bool []variables_array={readyFor_Employees_Details_Table,readyFor_Working_History_Table,readyFor
        readyFor_Time_Keeping_History_Table,readyFor_Salary_Information_Table

    string eString="";

    for (int i=0;i<=5;i++)
    {
        variables_array[i]=functions_array[i];
    }
}
```

```
string[] not_ready=new string[6];
int j=0;
bool flag=true;
do
{
    if (!variables_array[j])
    {
        not_ready[j]=data_tables[j];
        flag=false;
    }
    j=j+1;
}
while (j!=6);

//We need an instance of this class in order to be able to get the button
//pressed by the user when a MessageBox Control is shown up on the screen:
DialogResult result=new DialogResult();
System.Text.StringBuilder sb = new System.Text.StringBuilder();
bool saved=false;
if (!flag)
{
    for (int i=0;i<not_ready.Length;i++)
    {
        sb.Append("<");
        sb.Append(not_ready[i]);
        sb.Append(">");
        eString=sb.ToString();
    }
    MessageBox.Show("Insufficient Information Detected!\nResponding to Data Tables:\n--->" +eStr
}
}
```

```

if (!flag&&variables_array[0])
{
    result=MessageBox.Show("As you have already filled in the Basic Table's Required Information,"+
        "\n you can save this data! This Data will be saved as a Basical Person Information but "+
        "\n No Any Records will be added to the following Data Tables:"+
        "\n" +String+""+
        "\n Do you want to proceed in this way?",
        "!!!",
        MessageBoxButtons.OKCancel, MessageBoxIcon.Question);

    if (result==DialogResult.OK)
    {
        //If we have the sufficient and necessary information for Employees_Details Data-table,
        //then we can proceed to save it:
        this.datc.fnSaveData_Into_Employees_Details_Table(this.ID_Box.Text, this.firstName_Box.Text, this.se
        this.dayOfBirth_comboBox.Text, this.monthOfBirth_comboBox.Text, this.yearOfBirth_comboBox.Text, th
        this.postalCode_textBox.Text, this.address_textBox.Text, this.gender_comboBox.Text, this.MaritalS
        this.cellularPhone_textBox.Text, this.homePhone_textBox.Text,
        this.qualification_textBox.Text, this.cExperience_textBox.Text, this.typeEmployee_comboBox.Text,
        this.startDateDay_comboBox.Text, this.startDateMonth_comboBox.Text, this.startDateYear_comboBox
        this.endDateDay_comboBox.Text, this.endDateMonth_comboBox.Text, this.endDateYear_comboBox.Text

        if (variables_array[1])
        {
            this.datc.fnSaveData_Into_Working_History_Table(this.companyName_textBox.Text, this.employerName_textBox
            this.company_employerCellularPhone_textBox.Text, this.company_employerOfficePhone_textBox.Text, t
            this.pWorking_startDateDay_comboBox.Text, this.pWorking_startDateMonth_comboBox.Text, this.pWorkin
            this.pWorking_endDateDay_comboBox.Text, this.pWorking_endDateMonth_comboBox.Text, this.pWorking_e

        }

        if (variables_array[2])
        {
            this.datc.fnSaveData_Into_Contact_Person_Details_Table(this.cp_fName_textBox.Text, this.cp_sName_textBox
            this.cPersonCellularPhone_textBox.Text, this.cPersonHomePhone_textBox.Text, this.cp_city_textBox
        }
    }
}

```

Figure B.20

- In case, all of the required fields are filled in:

```

//In case, all of the tables are rady to be populated with data:
if (flag)
{
    this.datc.fnSaveData_Into_Employees_Details_Table(this.ID_Box.Text, this.firstName_Box.Text, this.se
    this.dayOfBirth_comboBox.Text, this.monthOfBirth_comboBox.Text, this.yearOfBirth_comboBox.Text, th
    this.postalCode_textBox.Text, this.address_textBox.Text, this.gender_comboBox.Text, this.MaritalS
    this.cellularPhone_textBox.Text, this.homePhone_textBox.Text,
    this.qualification_textBox.Text, this.cExperience_textBox.Text, this.typeEmployee_comboBox.Text,
    this.startDateDay_comboBox.Text, this.startDateMonth_comboBox.Text, this.startDateYear_comboBox
    this.endDateDay_comboBox.Text, this.endDateMonth_comboBox.Text, this.endDateYear_comboBox.Text);

    this.datc.fnSaveData_Into_Working_History_Table(this.companyName_textBox.Text, this.employerName_textB
    this.company_employerCellularPhone_textBox.Text, this.company_employerOfficePhone_textBox.Text, t
    this.pWorking_startDateDay_comboBox.Text, this.pWorking_startDateMonth_comboBox.Text, this.pWorkin
    this.pWorking_endDateDay_comboBox.Text, this.pWorking_endDateMonth_comboBox.Text, this.pWorking_e
}

```

... ..

... ..

```

        this.datc.fnSaveData_Into_Holiday_Information_Table(this.holiday_textBox.Text,
            this.holidayFromDateDay_comboBox.Text, this.holidayFromDateMonth_comboBox.Text, this.ho
            this.holidayToDateDay_comboBox.Text, this.holidayToDateMonth_comboBox.Text, this.holida
            this.ID_Box.Text);
        saved=true;
    }
    if (saved)
    {
        dataSaved_Form newform=new dataSaved_Form();
        newform.Show();
        this.search_panel.Enabled=true;
    }
}

```

Figure B.21

- Check-function for the information related to one of the data tables:

```
//This function checks all of the Controls necessary to be filled in and
//which information is related to the Holiday_Information data-table:
private bool Fill_In_Check_Function_Holiday_Information_Table()
{
    bool flag=true;

    if (this.holiday_textBox.Text=="")
    {
        flag=false;
    }

    if (this.holidayFromDateDay_comboBox.Text=="" || this.holidayFromDateMonth_comboBox.Text=="")
    {
        flag=false;
    }

    if (this.holidayToDateDay_comboBox.Text=="" || this.holidayToDateMonth_comboBox.Text=="")
    {
        flag=false;
    }

    if (!flag)
    {
        error_epd.SetError(this.holiday_groupBox,"Please, fill in the required information!");
    }

    if (flag)
    {
        this.Error_Cleaner();
    }

    return flag;
}
```

Figure B.22

- Function, saving data into the parent table (Employees Details):

```
//This region consists of several functions for Saving data into the Data-tables:
#region
public bool fnSaveData_Into_Employees_Details_Table(string id, string fname, string sname, string lname,
string birth_day, string birth_month, string birth_year, string city, string postal_code,
string address, string gender, string m_status, string cell_phone, string h_phone,
string qualification, string experience, string employee_type,
string start_Day, string start_Month, string start_Year,
string end_Day, string end_Month, string end_Year)
{
    this.insert_query1=" insert into Employees_Details (Personal_ID_Number, First_Name, Middle_Name,
    " Day_of_Birth, Month_of_Birth, Year_of_Birth, City, Postal_Code, Address, Gender, Marital_S
    " Start_Date_Day, Start_Date_Month, Start_Date_Year, End_Date_Day, End_Date_Month, End_Date_
    " values ( '"+ id + "', '"+ fname + "', '"+ sname + "', '"+ lname + "', "+
    " '"+ birth_day + "', '"+ birth_month + "', '"+ birth_year + "', '"+ city + "', '"+ postal_code
    " '"+ address + "', '"+ gender + "', '"+ m_status + "', '"+ cell_phone + "', '"+ h_phone + "', '"+
    " '"+ start_Day + "', '"+ start_Month + "', '"+ start_Year + "', "+
    " '"+ end_Day + "', '"+ end_Month + "', '"+ end_Year + "' ) ";

    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.insert_query1, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Employees_Details");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}
```

Figure B.23

- Function, saving data into a child table (Working History):

```
public bool fnSaveData_Into_Working_History_Table(string comp_name, string empl_name, string comp_emp,
string office_phone, string qualification, string experience, string pStart_Day, string pStart_Mo
string pEnd_Day, string pEnd_Month, string pEnd_Year, string id)
{
    //If the connection to the Working_History Data-table is established, then
    //we can proceed to populate it with data:
    if ( this.Get_Connection("Working_History",id) )
    {
        pKey_variable=this.Get_Primary_Key("Working_History", "WH_Number", id);

        this.save_query1= " update Working_History "+
            " set Company_Name='"+ comp_name +"', Employer_Name='"+ empl_name +"', Company_Employer_
            " Company_Employer_Cellular_Phone='"+ cell_phone +"', Company_Employer_Office_Phone='"+ c
            " Previous_Qualification='"+ qualification +"', Previous_Experience='"+ experience +"',
            " p_Start_Date_Day='"+ pStart_Day +"', p_Start_Date_Month='"+ pStart_Month +"', p_Start_I
            " p_End_Date_Day='"+ pEnd_Day +"', p_End_Date_Month='"+ pEnd_Month +"', p_End_Date_Year='
            " where "+
            " ( select Employee_ID_Number from Employees_Details "+
            " where "+
            " (Working_History.Employee_ID_Number=Employees_Details.Employee_ID_Number) and (Employee
            " and (Working_History.WH_Number="+ pKey_variable +" ) ) ";

        try
        {
            con =new OleDbConnection(conString);
            dAdapter=new OleDbDataAdapter(this.save_query1, con);

            dSet=new DataSet();
            //refreshes rows in the DataSet
            dAdapter.Fill(dSet,"Working_History");
        }
        catch(Exception ex)
        {
            MessageBox.Show("Error : "+ex.Message);
            //connection failed
            return false;
        }
    }
}
```

Figure B.24

- Function, establishing the relationships:

```
//This function establishes the tables relations:
public bool Get_Connection(string table_name, string id)
{
    this.insert_query= " insert into "+ table_name +" ( Employee_ID_Number ) "+
        " select Employee_ID_Number from Employees_Details "+
        " where Employees_Details.Personal_ID_Number = '"+ id +" ' ";

    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.insert_query, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,table_name);
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);

        //connection failed
        return false;
    }
    return true;
}
```

Figure B.25

- Function, extracting the maximum value of the primary key:

```
//This function below takes the maximum value of the primary_key:
public int Get_Primary_Key(string table_name, string column_name, string id)
{
    int store_variable=0;

    //We perform this operation in order to:
    //1--->Extract the Last (maximum value) primary key responding to this record!
    //2--->Add a new (next) record to the data-records of a person after the last one!
    string str_query=" select max("+ column_name +") from "+ table_name +" "+
        " where "+
        " ( select Employee_ID_Number from Employees_Details "+
        " where "+
        " ( "+ table_name +".Employee_ID_Number=Employees_Details.Employee_ID_Number) and (Employees_

    try
    {
        con.Open();

        OleDbCommand command=new OleDbCommand(str_query,con);
        OleDbDataReader reader = command.ExecuteReader();

        reader.Read();

        //store_string=reader.GetString(0);

        store_variable=Convert.ToInt16(reader.GetValue(0));

        return store_variable;

    }
    catch (Exception ex)
    {
        MessageBox.Show("Error: "+ex.Message);

        return store_variable=0;
    }
}
```

Figure B.26

- “Update All” button click-event - Figure B.27 and Figure B.28

```
//Update all records into the Database:
private void updateButton_Click(object sender, System.EventArgs e)
{
    MessageBox.Show(this.workedHours_textBox.Text);
    bool all_ready=false;
    DialogResult result=new DialogResult();
    if (this.Fill_In_Check_Function_Employee_Details_Table() && this.Fill_In_Check_Function_Working_History_T
    {
        this.Update_Employees_Details();
        this.Update_Working_History();
        this.Update_Contact_Person_Details();
        this.Update_Time_Keeping_History();
        this.Update_Salary_Information();
        this.Update_Holiday_Information();

        all_ready=true;
    }
    else
    {
        MessageBox.Show("You can not update all of the records now\n As not all the required fields have be
    }
}
```

Figure B.27

```

if (this.Fill_In_Check_Function_Employee_Details_Table() && !all_ready)
{
    result=MessageBox.Show("Your data can be partially updated for the time being!", "SYSTEM'S QUESTION!");
    if (result==DialogResult.Yes)
    {
        this.Update_Employees_Details();

        if (this.Fill_In_Check_Function_Working_History_Table())
        {
            this.Update_Working_History();
        }

        if (this.Fill_In_Check_Function_Contact_Person_Details_Table())
        {
            this.Update_Contact_Person_Details();
        }

        if (this.Fill_In_Check_Function_Time_Keeping_History_Table())
        {
            this.Update_Time_Keeping_History();
        }

        if (this.Fill_In_Check_Function_Salary_Information_Table())
        {
            this.Update_Salary_Information();
        }

        if (this.Fill_In_Check_Function_Holiday_Information_Table())
        {
            this.Update_Holiday_Information();
        }
    }
}

```

Figure B.28

- Functions - Figure B.29 and Figure B.30, dealing with the records updating into the parent table:

```

private void Update_Employees_Details()
{
    if (this.ID_Box.Text!="")
    {
        this.datc.fnUpdateData_EmployeeDetails(this.ID_Box.Text, this.firstName_Box.Text, this.secondName_Box.Text,
        this.dayOfBirth_comboBox.Text, this.monthOfBirth_comboBox.Text, this.yearOfBirth_comboBox.Text,
        this.postalCode_textBox.Text, this.address_textBox.Text, this.gender_comboBox.Text, this.cellularPhone_textBox.Text,
        this.homePhone_textBox.Text, this.qualification_textBox.Text, this.cExperience_textBox.Text, this.typeEmployee_comboBox.Text,
        this.startDateDay_comboBox.Text, this.startDateMonth_comboBox.Text, this.startDateYear_comboBox.Text,
        this.endDateDay_comboBox.Text, this.endDateMonth_comboBox.Text, this.endDateYear_comboBox.Text);
    }
}

```

Figure B.29



```

//This function updates all the information into Employees_Details Data-table:
public bool fnUpdateData_EmployeeDetails(string id, string fname, string sname, string lname,
string birth_day, string birth_month, string birth_year, string city, string postal_code,
string address, string gender, string m_status, string cell_phone, string h_phone,
string qualification, string experience, string employee_type,
string start_Day, string start_Month, string start_Year,
string end_Day, string end_Month, string end_Year)
{
    this.update_query1=" update Employees_Details "+
    " set Personal_ID_Number='"+ id +"', First_Name='"+ fname +"', Middle_Name='"+ sname +"', La
    " Day_of_Birth='"+ birth_day +"', Month_of_Birth='"+ birth_month +"', Year_of_Birth='"+ birth
    " City='"+ city +"', Postal_Code='"+ postal_code +"', Address='"+ address +"', "+
    " Gender='"+ gender +"', Marital_Status='"+ m_status +"', Cellular_Phone='"+ cell_phone +"',
    " Qualification='"+ qualification +"', Current_Experience='"+ experience +"', Type_of_Employe
    " Start_Date_Day='"+ start_Day +"', Start_Date_Month='"+ start_Month +"', Start_Date_Year='"+
    " End_Date_Day='"+ end_Day +"', End_Date_Month='"+ end_Month +"', End_Date_Year='"+ end_Year
    " where Employees_Details.Personal_ID_Number= '"+ id +"' ";

    try
    {
        con =new OleDbConnection(conString);
        ddaapter=new OleDbDataAdapter(this.update_query1, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        ddaapter.Fill(dSet,"Employees_Details");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}

```

Figure B.30

- Functions - Figure B.31 and Figure B.32, dealing with the records updating into a child table (Working History):

```

private void Update_Working_History()
{
    if (this.pKey_textBox1.Text!="")
    {
        this.pKey=int.Parse(this.pKey_textBox1.Text);

        this.datc.fnUpdateData_Woking_History(this.companyName_textBox.Text, this.employerName_textBox
        this.company_employerCellularPhone_textBox.Text, this.company_employerOfficePhone_textBox
        this.pWorking_startDateDay_comboBox.Text, this.pWorking_startDateMonth_comboBox.Text, this
        this.pWorking_endDateDay_comboBox.Text, this.pWorking_endDateMonth_comboBox.Text, this.p

        this.datc.fnGetDataConnection2(this.firstName_Box.Text, this.lastName_Box.Text, this.ID_Box.

        this.dataGrid1.AlternatingBackColor=Color.Wheat;
        this.dataGrid1.ReadOnly=true;

        this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];

        fnSetCurrencyManager();
        this.fnGetDataBindingForWorking_History();
    }
}

```

Figure B.31

```

//This function updates all the information into Working_History Data-table:
public bool fnUpdateData_Woking_History(string comp_name, string empl_name, string comp_empl_address,
string office_phone, string qualification, string experience, string pStart_Day, string pStart_Mo
string pEnd_Day, string pEnd_Month, string pEnd_Year, string id, int pKey)
{
    this.update_query2= " update  Working_History "+
    " set   Company_Name='"+ comp_name +"', Employer_Name='"+ empl_name +"', Company_Employer_Addr
    " Company_Employer_Cellular_Phone='"+ cell_phone +"', Company_Employer_Office_Phone='"+ offic
    " Previous_Qualification='"+ qualification +"', Previous_Experience='"+ experience +"', "+
    " p_Start_Date_Day='"+ pStart_Day +"', p_Start_Date_Month='"+ pStart_Month +"', p_Start_Date_
    " p_End_Date_Day='"+ pEnd_Day +"', p_End_Date_Month='"+ pEnd_Month +"', p_End_Date_Year='"+ p
    " where "+
    " ( select Employee_ID_Number from Employees_Details "+
    " where (Working_History.Employee_ID_Number=Employees_Details.Employee_ID_Number) and (Employ
    " and (Working_History.WH_Number="+ pKey +") ) ";
    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.update_query2, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Working_History");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }//try-catch
    //connection ok!
    return true;
}

```

Figure B.32

- “Delete a Record” button click-event (deleting a record from Working History):

```

private void deleteRecord_button1_Click(object sender, System.EventArgs e)
{
    if (this.pKey_textBox1.Text!="")
    {
        this.pKey=int.Parse(this.pKey_textBox1.Text);

        if (this.datc.fnDeleteData_Working_History(this.pKey))
        {
            MessageBox.Show("The Current Record Has Been Deleted!", "RECORD-DELETION!", MessageBoxButtons.OK, MessageBoxIcon.Information);
        }

        this.datc.fnGetDataConnection2(this.firstName_Box.Text, this.lastName_Box.Text, this.ID_Box.Text);

        this.dataGrid1.AlternatingBackColor=Color.Wheat;
        this.dataGrid1.ReadOnly=true;

        this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];

        fnSetCurrencyManager();
        if (currManager.Count==0)
        {
            this.deleteRecord_button1.Enabled=false;
        }
        this.fnGetDataBindingForWorking_History();
        this.pWorkingHistory_tabPage_Cleaner();
    }
    else
    {
        MessageBox.Show("You can not delete not existing record!", "DATABASE ERROR!", MessageBoxButtons.OK, MessageBoxIcon.Information);
    }
}

```

Figure B.33

The function in Figure B.34 is called within the click-event's body of the "Delete a Record" button. If there is an existing record into a table, related to the current person we are operating with, then the delete-function is called:

```
public bool fnDeleteData_Working_History(int pKey)
{
    this.delete_query2=" delete * from Working_History "+
        " where (Working_History.WH_Number="+ pKey +") ";

    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.delete_query2, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Working_History");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}
```

Figure B.34

- "Delete All" button click-event:

```
//Delete-button Click-Event:
private void delete_button_Click(object sender, System.EventArgs e)
{
    int pKey_Working_History_Records=this.datc.Get_Primary_Key("Working_History", "WH_Number", this.ID_Box.Text);
    int pKey_Contact_Person_Records=this.datc.Get_Primary_Key("Contact_Person_Details", "CP_Number", this.ID_Box.Text);
    int pKey_Time_Information_Records=this.datc.Get_Primary_Key("Time_Keeping_History", "TKH_Number", this.ID_Box.Text);
    int p_Key_Salary_Information_Records=this.datc.Get_Primary_Key("Salary_Information", "SIN", this.ID_Box.Text);
    int pKey_Holiday_Information_Records=this.datc.Get_Primary_Key("Holiday_Information", "HIN", this.ID_Box.Text);

    if (pKey_Working_History_Records!=0)
    {
        if (this.datc.fnDeleteAll_Working_History(this.ID_Box.Text))
        {
            this.datc.fnGetDataConnection2(this.firstName_Box.Text, this.lastName_Box.Text, this.ID_Box.Text);
            this.dataGrid1.AlternatingBackColor=Color.Wheat;
            this.dataGrid1.ReadOnly=true;
            this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];
            fnSetCurrencyManager();
            this.fnGetDataBindingForWorking_History();
            this.pWorkingHistory_tabPage_Cleaner();
        }
    }
}
```

Figure B.35

- Function, obtaining the primary key's value:

```
public int Get_Primary_Key(string table_name, string column_name, string id)
{
    int store_variable=0;
    //We perform this operation in order to:
    //1--->Extract the Last (maximum value) primary key responding to this record!
    //2--->Add a new (next) record to the data-records of a person after the last one!
    string str_query=" select max("+ column_name +") from "+ table_name +" "+
        " where "+
        " ( select Employee_ID_Number from Employees_Details "+
        " where "+
        " ( "+ table_name +".Employee_ID_Number=Employees_Details.Employee_ID_Number) and (Employees_Detail:
    try
    {
        con.Close();
        con.Open();
        OleDbCommand command=new OleDbCommand(str_query,con);
        OleDbDataReader reader = command.ExecuteReader();
        reader.Read();
        //store_string=reader.GetString(0);
        try
        {
            store_variable=Convert.ToInt16(reader.GetValue(0));
        }
        catch
        {
            store_variable=0;
        }
        return store_variable;
    }
    catch (Exception ex)
    {
        MessageBox.Show("Error: "+ex.Message);
        return store_variable=0;
    }
}
```

Figure B.36

- Function, deleting all records in a child table, related to a certain employee:

```
public bool fnDeleteAll_Working_History(string id)
{
    this.delete_query2=" delete * from Working_History "+
        " where "+
        " (select Employee_ID_Number from Employees_Details "+
        " where (Working_History.Employee_ID_Number=Employees_Details.Employee_ID_Number) "+
        " and (Employees_Details.Personal_ID_Number='"+ id +"') ) ";
    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.delete_query2, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Working_History");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }
    //try-catch
    //connection ok!
    return true;
}
```

Figure B.37

- The Delete function is called - Figure B.38 and Figure B.39, what concerns the records into the parent table:

```

if (this.datc.fnDeleteData_Employees_Details(this.ID_Box.Text))
{
    this.datc.fnGetDataConnection();
    this.dataGrid1.AlternatingBackColor=Color.Wheat;
    this.dataGrid1.ReadOnly=true;
    this.dataGrid1.DataSource=datc.dSet.Tables["Employees_Details"];
    fnSetCurrencyManager();
    this.fnGetDataBindingForEmployees_Details();
    this.personalDetails_tabPage_Cleaner();
    this.cWorkingHistory_tabPage_Cleaner();

    MessageBox.Show("All Data Related To The Current Employee Has Been Deleted!", "DATA DELETION!", M
}

```

Figure B.38

```

public bool fnDeleteData_Employees_Details(string id)
{
    this.delete_query1=" delete * from Employees_Details "+
        " where (Employees_Details.Personal_ID_Number='"+ id +"') ";
    try
    {
        con =new OleDbConnection(conString);
        dAdapter=new OleDbDataAdapter(this.delete_query1, con);

        dSet=new DataSet();
        //refreshes rows in the DataSet
        dAdapter.Fill(dSet,"Employees_Details");
    }
    catch(Exception ex)
    {
        MessageBox.Show("Error : "+ex.Message);
        //connection failed
        return false;
    }//try-catch
    //connection ok!
    return true;
}

```

Figure B.39

## Appendix C: Tests Performance

This section provides a visual presentation of all test-samples have been performed upon the program's functionality.

### 1. Search Engine test – Figure C.2.1 and Figure C.2.2:

The screenshot shows the 'Employee Data' application interface. At the top, there are buttons: 'Add Employee', 'Load Records', 'Delete All', 'Update All', 'Save All', 'Search' (highlighted in green), and 'Cancel'. Below these is a table with columns: Personal\_ID\_#, First\_Name, Middle\_Name, Last\_Name, Day\_of\_Birth, Month\_of\_Birth, Year\_of\_Birth, Cellular\_Phone, Home\_Phone, Employee\_ID, City, and Address. The first row contains data for Kancho Kanchev. To the right of the table are navigation buttons: '<First>', '<Last>', 'Next>>', and '<<Previous'. Below the table is a search section with three input fields: 'Search by First Name:' (containing 'Kancho'), 'Search by Last Name:' (containing 'Kanchev'), and 'Search by ID Number:'. A 'Search>>>' button is to the right. Below the search section is a 'Selected Employee:' section with three input fields: 'First Name' (containing 'Kancho'), 'Last Name' (containing 'Kanchev'), and 'ID Number' (containing '8210011540').

Personal_ID_#	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birth	Year_of_Birth	Cellular_Phone	Home_Phone	Employee_ID	City	Address
8210011540	Kancho		Kanchev	1	10	1982			195	none	none

Figure C.2.1

That's a test for a successful search. If no sufficient or incorrect information is entered, then the system instantly sends a message to the user's attention:

The screenshot shows the same 'Employee Data' application interface as Figure C.2.1, but with an error message displayed. The error message is a blue dialog box with a red 'X' icon and the text: 'No Results!!!' and 'Bad Input! 0 records found! Either INCORRECT or INSUFFICIENT information must have been input!'. The 'Search' button is still highlighted in green. The search input fields are empty, and the 'Selected Employee' section is also empty.

Figure C.2.2

## 2. Saving data into the database:

We shouldn't be allowed to save a record if no any person has been selected –

- Figure C.2.3:

The screenshot shows the 'Employee Data' application interface. At the top, there are search fields for 'First Name', 'Last Name', and 'ID Number'. Below these is a 'Selected Employee' section with input fields for 'First Name', 'Last Name', and 'ID Number'. The main area contains several tabs: 'Personal Details', 'Working History', 'Previous Employer(s)', 'Contact Person', 'Working Time Details', 'Salaries and Taxes', and 'Holiday Information'. The 'Personal Details' tab is active, showing sections for 'Company / Employer Details', 'Experience and Qualification Details', and 'Company / Employer Phone Details'. A blue error dialog box is overlaid on the form, titled 'DATABASE ERROR!'. The message inside reads: 'You can not perform this operation as No any person (Employee) to add this record to Has been selected!'. There is an 'OK' button at the bottom of the dialog. At the bottom of the application window, there are buttons for 'Add a Record', 'Update a Record', 'Delete a Record', and 'Save a Record'.

Figure C.2.3

The second test involves adding a new employee's data to the database. For simplicity, only data for the parent table is going to be input, thus the system will throw a warning, but after clicking on the "OK" button, the data will be successfully saved into the database - Figure C.2.4 and Figure C.2.5:

The screenshot shows the 'Employee Data' application interface with the 'Personal Information' and 'Additional Information' sections. The 'Personal Information' section includes fields for 'Personal ID Number' (8210011540), 'First Name' (Kancho), 'Second Name' (empty), 'Family Name' (Kanchev), and 'Date of Birth' (Day: 1, Month: 10, Year: 1982). The 'Additional Information' section includes 'Current Location Details' (City: Rousse, Postal Code: 7000, Address: Bulgaria), 'Family and Gender Status' (Gender: Male, Marital Status: Single), and 'Phone Details' (Cellular Phone: empty, Home Phone: empty).

Figure C.2.4

Qualification :

Current Experience :

Type of Employee :

Start Date

Day :  Month :  Year :

End Date

Day :  Month :  Year :

Figure C.2.5

After clicking on the “Save All” button, the check-result could be seen –  
- Figure C.2.6:

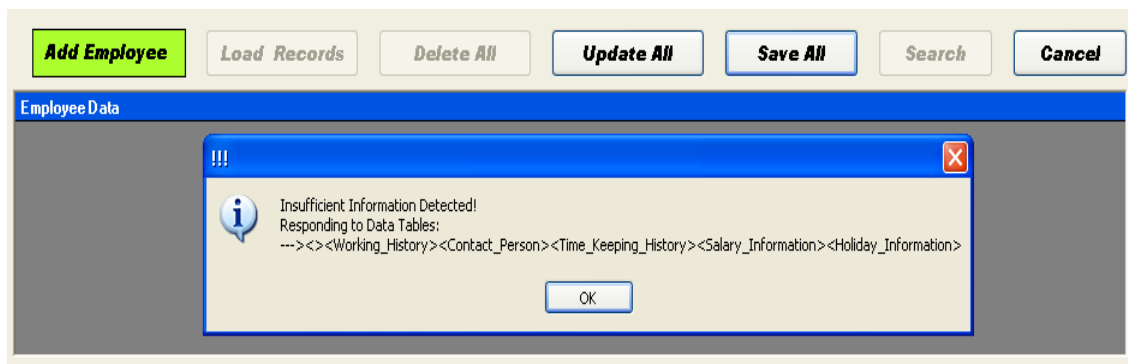


Figure C.2.6

...Click on “OK” button - Figure C.2.7:

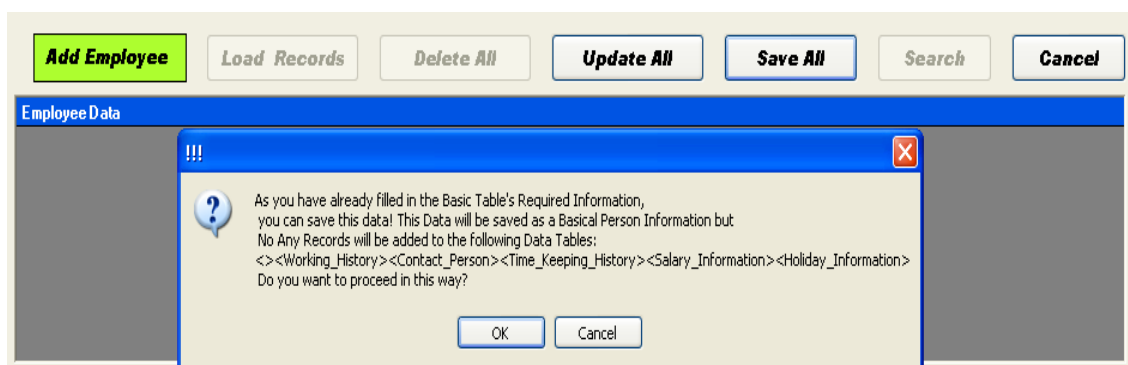


Figure C.2.7

The message box, in the figure above, says we can proceed anyway, and shows us which data tables will not be populated with data.



If there is nothing else to be shared with the database thus we can click on the “OK” button - Figure C.2.8:

The screenshot shows a web application interface for managing employee data. At the top, there's a section titled "Selected Employee:" with input fields for "First Name", "Last Name", and "ID Number". Below this are several tabs: "Personal Details", "Working History", "Family Information", and "Contact Information". The "Personal Details" tab is active, showing a form for "Personal Information". This form includes fields for "Personal ID Number", "First Name" (filled with "Kanchev"), "Second Name", "Family Name" (filled with "Kanchev"), "Date of Birth" (with a dropdown for "Day of Birth" set to "1"), "City" (filled with "Rousse"), "Postal Code" (filled with "7000"), "Address" (filled with "Bulgaria"), and "Family and Gender Status" (with a dropdown for "Gender" set to "Male"). A yellow dialog box with the text "Data has been successfully saved into the database!!!" and an "OK" button is overlaid on the form.

Figure C.2.8

As there is a record into the parent table, respectively there is employee's basic data into the database; a record can be added to any of the other tables, responding to the Previous Working Experience, Salary Information, Holiday Information and so on.

A new record is going to be added now to his Previous Experience by switching to the Previous Employer(s) Tab page - Figure C.2.9:

The screenshot shows the same web application interface, but with the "Previous Employer(s)" tab selected. The form is divided into two main sections: "Company / Employer Details" and "Qualification Details". The "Company / Employer Details" section includes fields for "Company Name" (filled with "not specified"), "Employer Name" (filled with "not specified"), "Company / Employer Address" (filled with "unknown"), "Company / Employer Phone Details" (with fields for "Cellular Phone" and "Office Phone"), and "Start Date" (with dropdowns for "Day", "Month", and "Year"). The "Qualification Details" section includes a field for "End Date" (with dropdowns for "Day", "Month", and "Year"). A blue dialog box with the text "Record-Saved!" and "The Record has been successfully saved into the Database!" and an "OK" button is overlaid on the form. At the bottom of the interface, there are two sections: "Records Preview" with navigation buttons like "<First Record'", "<Last Record'", "Next Record'>>", and "<<Previous Record'", and "Records Management" with buttons for "Add a Record", "Update a Record", "Delete a Record", and "Save a Record".

Figure C.2.9

In this way, we can add records to all of the child tables into the database.

### 3.1. All Records Update:

The screenshot displays a web application interface with a tabbed menu at the top: Personal Details, Working History, Previous Employer(s), Contact Person, Working Time Details, Salaries and Taxes, and Holiday Information. The 'Personal Details' tab is active. The form is divided into two main sections: 'Personal Information' on the left and 'Additional Information' on the right. The 'Personal Information' section includes fields for 'Personal ID Number', 'First Name', 'Second Name', 'Family Name', and 'Date of Birth' (with sub-fields for Day, Month, and Year). The 'Additional Information' section includes 'Current Location Details' (with an 'Address' field), 'Family and Gender Status' (with 'Gender' and 'Marital Status' dropdowns), and 'Phone Details' (with 'Cellular Phone' and 'Home Phone' fields). A blue warning dialog box titled 'INSUFFICIENT INFORMATION!!!' is centered over the form. It contains an information icon and the text: 'You can not update all of the records now As not all the required fields have been filled in!'. An 'OK' button is at the bottom of the dialog. Red exclamation mark icons are visible next to several input fields, indicating required data is missing.

Figure C.2.10

A Warning Message is displayed on the screen, as we have not the sufficient information to perform such kind of operation!

In case only some of the required blanks are filled in, then - Figure C.2.11:

This screenshot shows the same 'Personal Details' form as Figure C.2.10, but with different data entered. 'Qualification' and 'Current Experience' are both set to 'not specified'. 'Type of Employee' is set to 'Salaried Employee' in a dropdown menu. The 'Start Date' section has 'Day' set to 4, 'Month' to 6, and 'Year' to 2006. The 'End Date' section has empty dropdowns for Day, Month, and Year. A blue dialog box titled 'SYSTEM'S QUESTION!' is displayed. It features a question mark icon and the text: 'Your data can be partially updated for the time being!'. There are 'Yes' and 'No' buttons at the bottom of the dialog.

Figure C.2.11

The screenshot above shows that we can proceed to update the data even though not all of the form's fields have been filled.

### 3.2. Single Record Update:

The screenshot shows a web application interface with a tabbed menu at the top: Personal Details, Working History, Previous Employer(s), Contact Person (selected), Working Time Details, Salaries and Taxes, and Holiday Information. The main form area is divided into two sections: 'Personal Details' on the left and 'Address Details' on the right. In the 'Personal Details' section, there are input fields for 'First Name', 'Second Name', and 'Last Name'. In the 'Address Details' section, there are input fields for 'City/Village' and 'Address'. A modal dialog box is displayed in the center of the screen, with a blue header and a red 'X' icon. The text inside the dialog box reads: 'You can not update not existing record!!!'. Below the text is an 'OK' button. There are also red exclamation mark icons next to the 'First Name' and 'Address' input fields, indicating validation errors.

Figure C.2.12

A Warning message is shown up, as a not-existing record has been tried to be updated. Thus to update a record, we need to have an existing record into the database.

The screenshot shows the same web application interface as Figure C.2.12, but with the 'Contact Person' tab selected. The 'Personal Details' section now contains the following data: 'First Name' is 'Aleksandyr', 'Second Name' is empty, and 'Last Name' is 'Donchev'. The 'Address Details' section contains the following data: 'City/Village' is 'Razgrad' and 'Address' is 'not specified'. The modal dialog box is no longer present, and the red exclamation mark icons are also gone, indicating that the record has been successfully updated.

Figure C.2.13

We can change the first name to “Peter” and click the update button afterwards - Figure C.2.14. The result is supposed to be: first name as “Peter” instead of the previous one “Aleksandyr”:

The screenshot shows the 'Employee Data' application interface. At the top, a table lists employee records. The first record is highlighted, showing 'Peter' in the 'c\_First\_Name' column, which is circled in red. Below the table, there are search filters for First Name, Last Name, and ID Number. The 'Selected Employee' section shows the current record: First Name 'Kanchev', Last Name 'Kanchev', and ID Number '8210011540'. The 'Personal Details' tab is active, showing the 'First Name' field with 'Peter' entered, circled in red. Other fields include Second Name, Last Name 'Donchev', and Home Phone. The 'Address Details' section shows 'City / Village' as 'Razgrad' and 'Address' as 'not specified'.

Figure C.2.14

The current record has been updated and the result has been immediately reflected into the data grid as well.

#### 4.1 Single Record Deletion:

The screenshot shows the 'Employee Data' application interface with a 'RECORD DELETION!' dialog box open. The dialog box contains the text 'The Current Record Has Been Deleted!' and an 'OK' button. In the background, the 'Selected Employee' section shows the current record: First Name 'Petko', Last Name 'Petkov', and ID Number '0123456789'. The 'Company / Employer Details' section shows 'Company Name' as 'National Electric Company', 'Employer Name' as 'Rousse-branch', and 'Company / Employer Address' as 'Rousse-branch'. The 'Experience and Qualification Details' section shows 'Start Date' and 'End Date' fields. The 'Records Management' section at the bottom has buttons for 'Add a Record', 'Update a Record', 'Delete a Record', and 'Save a Record'.

Figure C.2.15

After clicking upon the “OK” labeled button, we can see and the results of the performed delete-operation upon this current record - Figure C.2.16:

**Employee Data**

Personal_ID_	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birth	Year_of_Birth	Cellular_Phon	Home_Phone	Employees_D	City	Address
0123456789	Petko		Petkov	4	2	1948			202	gds	sdids

Search by First Name:  Search by Last Name:  Search by ID Number:

**Selected Employee:**

First Name:  Last Name:  ID Number:

**Personal Details** | **Working History** | **Previous Employer(s)** | **Contact Person** | **Working Time Details** | **Salaries and Taxes** | **Holiday Information**

**Company / Employer Details**

Company Name:   
Employer Name:   
Company / Employer Address:   
**Company / Employer Phone Details**  
Cellular Phone:   
Office Phone:

**Experience and Qualification Details**

Qualification:   
Experience:   
**Start Date**  
Day:  Month:  Year:   
**End Date**  
Day:  Month:  Year:

Figure C.2.16

The Employee still exists into the database, but with no any records of his Working History as the only one record there has been deleted.

This operation could be executed in quite the same way with the rest tables' records. For a kind of simplicity and convenience, the performance tests on them have been deliberately omitted.

#### 4.2 All Records Deletion:

Mr. Petkov is currently selected as an employee which data we don't need anymore and want to release the database memory of it. The only thing has to be done is selecting the current person – Figure C.2.17 and pressing “Delete All” button –Figure C.2.18

**Employee Data**

Personal_ID_	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birth	Year_of_Birth	Cellular_Phon	Home_Phone	Employee_ID	City	Address
8210011540	Kancho		Kanchev	1	10	1982			200	Rousse	not specified
0123456789	Petko		Petkov	4	2	1948			202	gds	sdids

<First> <Last> Next>> <<Previous

Search by First Name:  Search by Last Name:  Search by ID Number:

**Selected Employee:**

First Name:  Last Name:  ID Number:

Figure C.2.17

Employee Data											
Personal_ID_	First_Name	Middle_Name	Last_Name	Day_of_Birth	Month_of_Birt	Year_of_Birth	Cellular_Phon	Home_Phone	Employee_ID	City	Address
8210011540	Kancho		Kanchev	1	10	1982			200	Rousse	not specified

Search by First Name: 
 Search by Last Name: 
 Search by ID Number:

**Selected Employee:**

First Name: 
 Last Name: 
 ID Number:

Personal Details | Working History | Previous Employers | Contact Person | Working Time Details | Salaries and Taxes | Holiday Information

**Personal Information**

Personal ID Number:   
 First Name:   
 Second Name:   
 City:   
 Postal Code:

**DATA DELETION!**

All Data Related To The Current Employee Has Been Deleted!

Figure C.2.18

This employee doesn't exist into the database anymore.