Building an Automobile Management Application with Windows Forms

Introduction

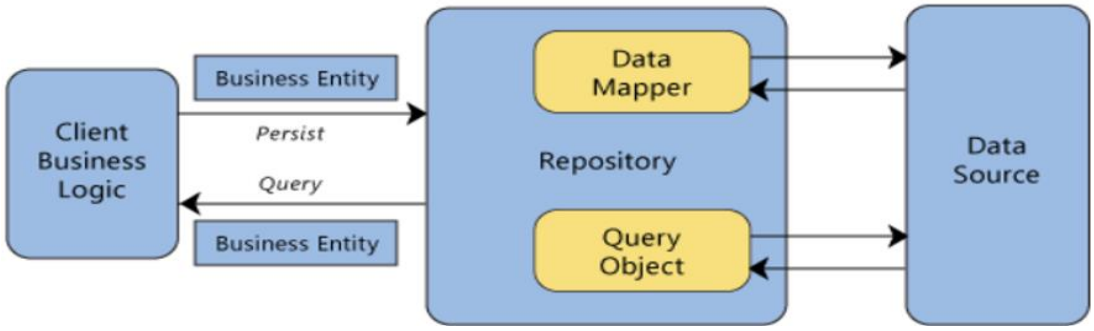
Imagine you're an employee of a car retailer named **Automobile Store**. Your manager has asked you to develop a Windows Forms application for automobile management (CarID, CarName, Manufacturer, Price, and ReleasedYear). The application has to support adding, viewing, modifying, and removing products—a standardized usage action verbs better known as Create, Read, Update, Delete (CRUD).

This lab explores creating an application using Windows Forms with .NET Core, and C#. An "in-memory database" will be created to persist the car's data, so a collection is called **List** will be used for reading and managing automobile data.

This lab is applying Repository and Singleton Pattern. A Repository in C# mediates between the domain and data mapping layers. It allows you to pull a record or number of records out of datasets, and then have those records to work on acting like an in-memory domain object collection, and you can also update or delete records within those data set, and the mapping code encapsulated by the Repository will carry out the appropriate operations behind the scenes.

Repository pattern C# is a way to implement data access by encapsulating the set of objects persisted in a data store and the operations performed over them, providing a more object-oriented view of the persistence layer.

Repository pattern C# also supports the objective of achieving a clean separation and one-way dependency between the domain and data mapping layers.



Lab Objectives

In this lab, you will:

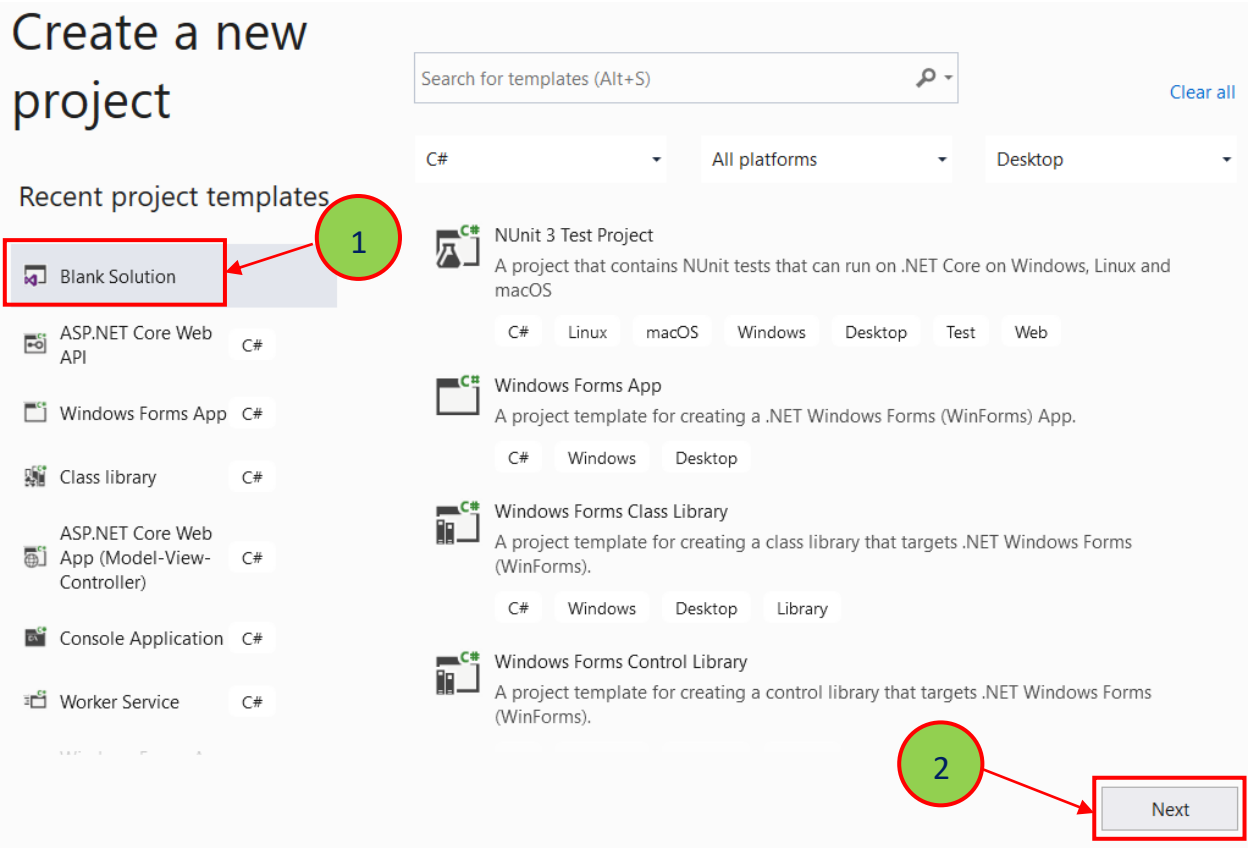
- Use the Visual Studio.NET to create Windows Forms and Class Library (.dll) project.
- Create a List of persisting cars using LinQ to Object to find cars.
- Apply passing data in WinForms application
- Apply Repository pattern and Singleton pattern in a project
- Add CRUD action methods to WinForms application.
- Run the project and test the WinForms actions.

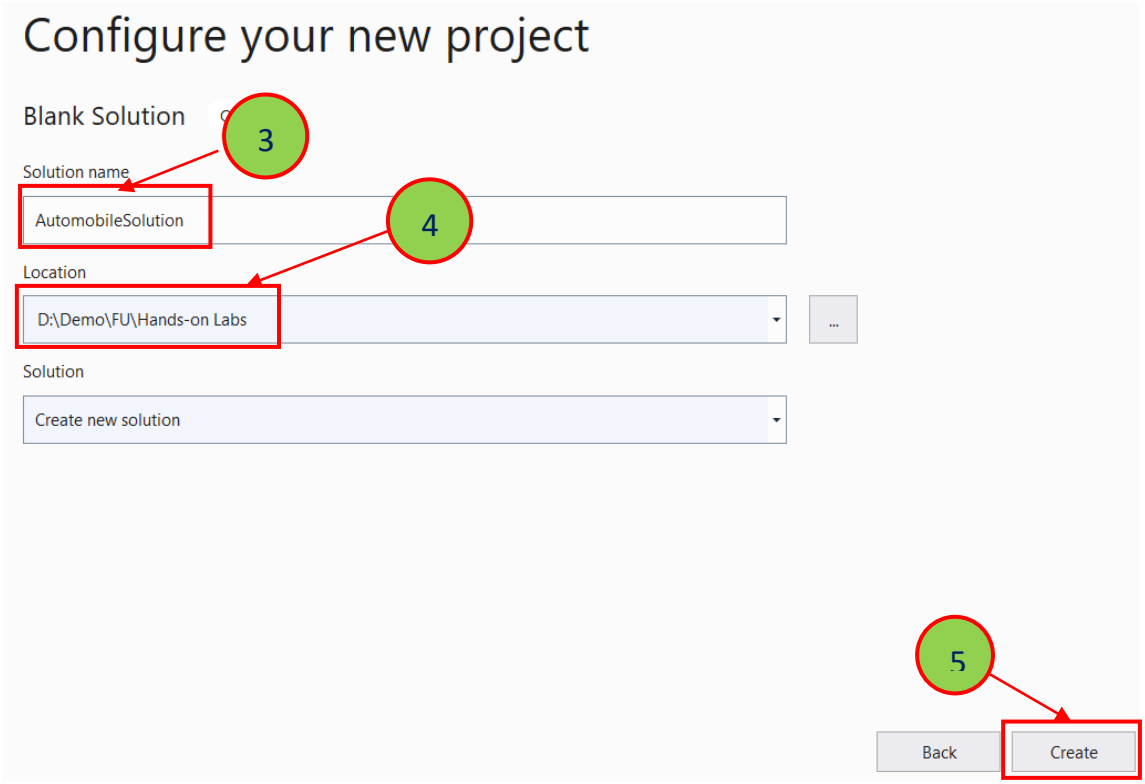
Activity 01: Build a solution by Visual Studio.NET

Create a Blank Solution named **AutomobileSolution** then add new a Class Library Project named **AutomobileLibrary** and a Windows Forms project named **AutomobileWinApp**

Step 01. Create a Blank solution.

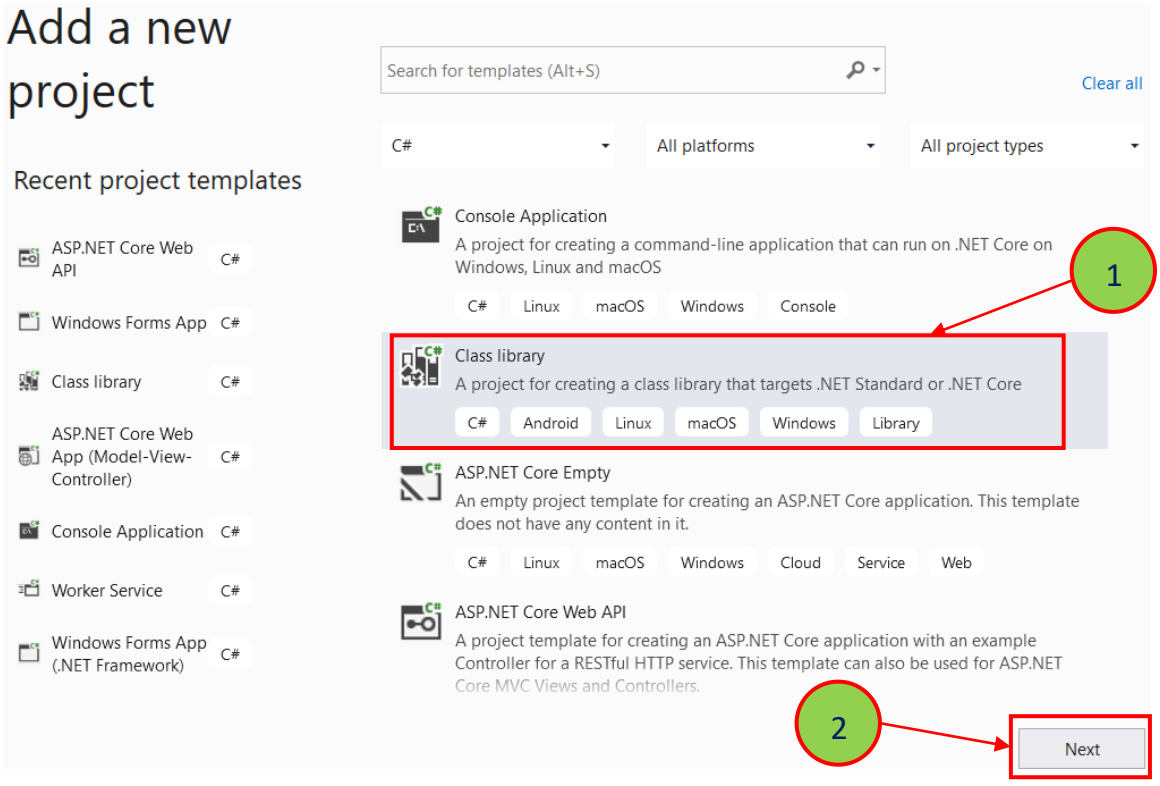
- Open the Visual Studio .NET application and performs steps as follows:

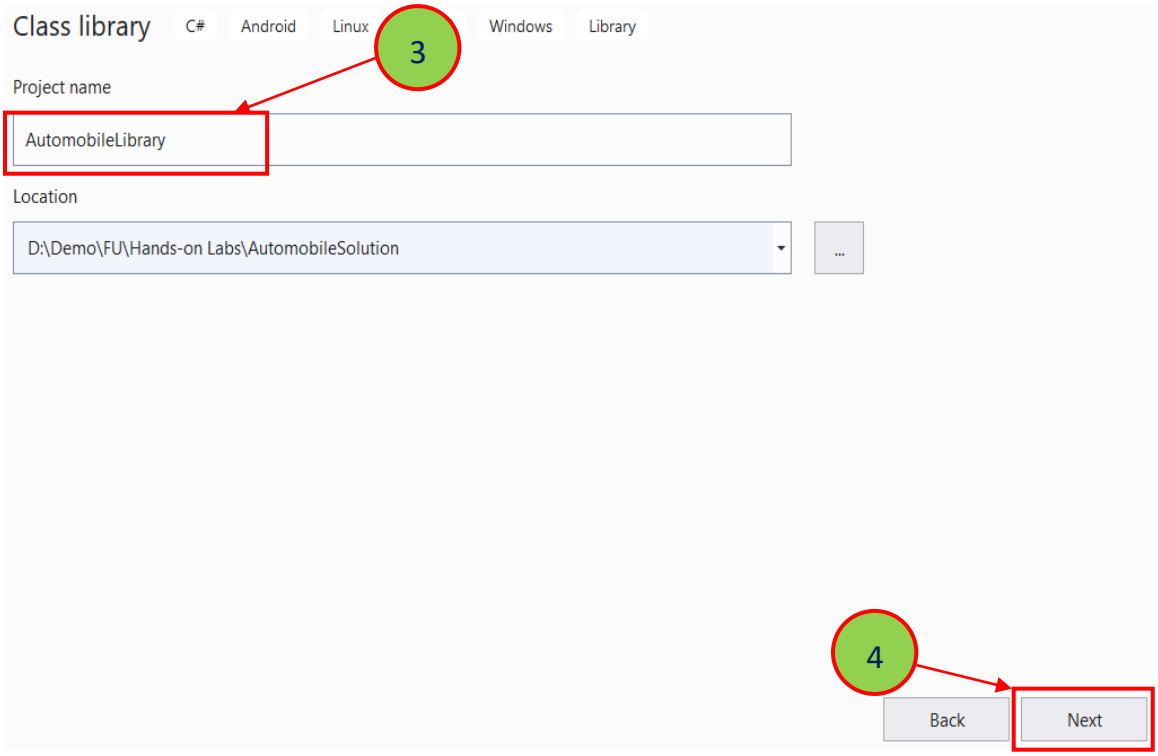


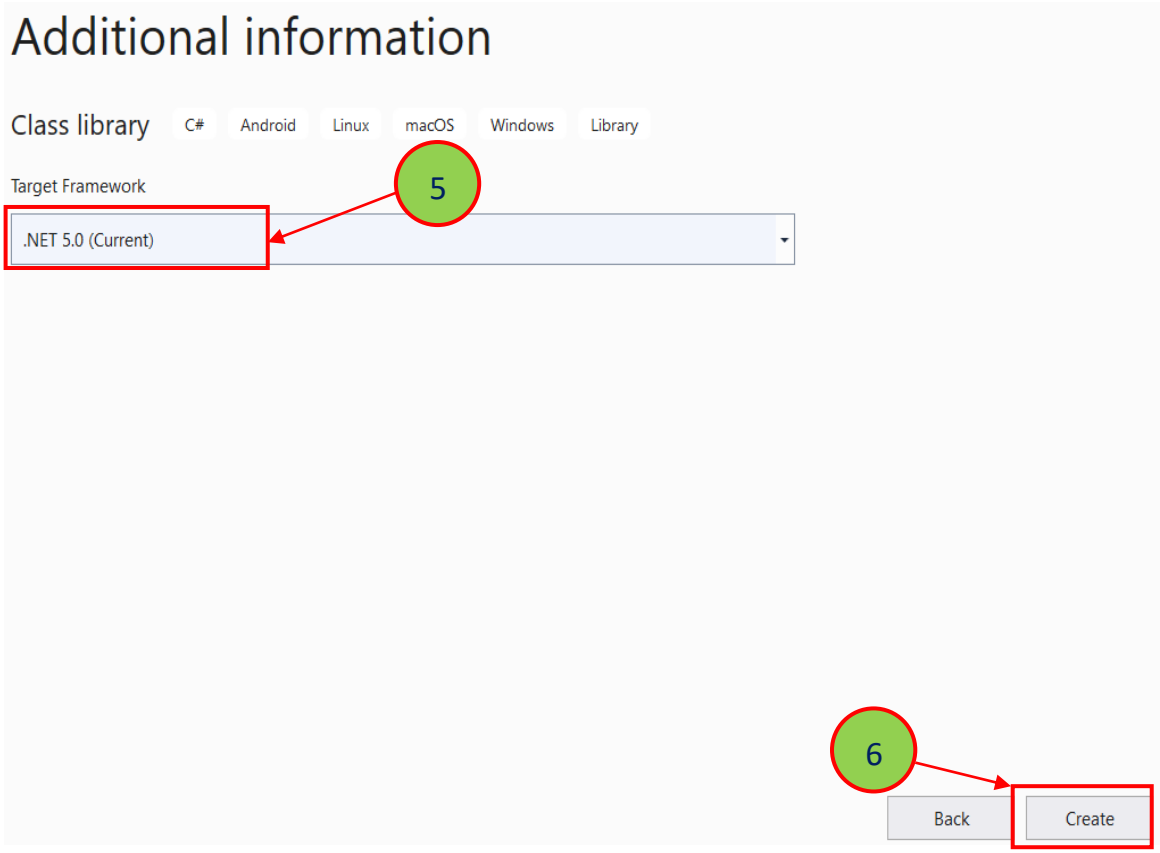


Step 02. Create a Class Library project.

- From the File menu | Add | New Project, on the Add New Project dialog, select "Class Library" and performs steps as follows:



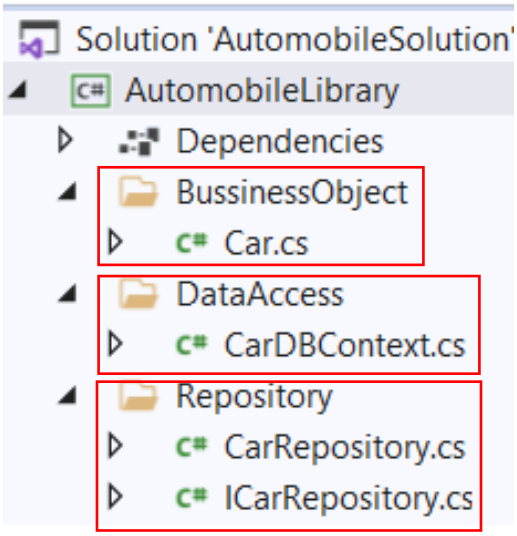




<u>Step 03</u>. Repeat **Step 02** to create a Windows Form project.

Activity 02: Write codes for the AutomobileLibrary project

Step 01. Create folders and add class to the project as follows:



Step 02. Write code for **Car.cs** as follows:

```
namespace AutomobileLibrary.BussinessObject
{
    public class Car
    {
        public int CarID { get; set; }
        public string CarName { get; set; }
        public string Manufacturer { get; set; }
        public decimal Price { get; set; }
        public int ReleaseYear { get; set; }
    }
}
```

Step 03. Write code for **CarDBContext.cs** as follows:

```
using AutomobileLibrary.BussinessObject;
namespace AutomobileLibrary.DataAccess
{
    public class CarDBContext{
        //Initialize car list
        private static List<Car> CarList = new List<Car>(){
            new Car{ CarID=1, CarName="CRV", Manufacturer="Honda",
                Price=30000, ReleaseYear=2021 },
            new Car{ CarID=2, CarName="Ford Focus", Manufacturer="Ford",
                Price=15000, ReleaseYear=2020 }
        };
        //---------------------------------------------
        //Using Singleton Pattern
        private static CarDBContext instance = null;
        private static readonly object instanceLock = new object();
        private CarDBContext() { }
        public static CarDBContext Instance
        {
            get
            {
                lock (instanceLock)
                {
                    if (instance == null)
                    {
                        instance = new CarDBContext();
                    }
                    return instance;
                }
            }
        }
        //---------------------------------------------
```

```
    public List<Car> GetCarList => CarList;
    //-----------------------------------------------
    public Car GetCarByID(int carID)  {
        //using LINQ to Object
        Car car = CarList.SingleOrDefault(pro => pro.CarID == carID);
        return car;
    }
    //-----------------------------------------------
    //Add new a car
    public void AddNew(Car car){
        Car pro = GetCarByID(car.CarID);
        if (pro == null){
            CarList.Add(car);
        }
        else{
            throw new Exception("Car is already exists.");
        }
    }
    //Update a car
    public void Update(Car car) {
        Car c = GetCarByID(car.CarID);
        if (c != null) {
            var index = CarList.IndexOf(c);
            CarList[index] = car;
        }
        else {
            throw new Exception("Car does not already exists.");
        }
    }
    //-----------------------------------------------
    //Remove a car
    public void Remove(int CarID){
        Car p = GetCarByID(CarID);
        if (p != null){
            CarList.Remove(p);
        }
        else{
            throw new Exception("Car does not already exists.");
        }
    }//end Remove
}//end class
```

Step 04. Write codes for **ICarRepository.cs** as follows:

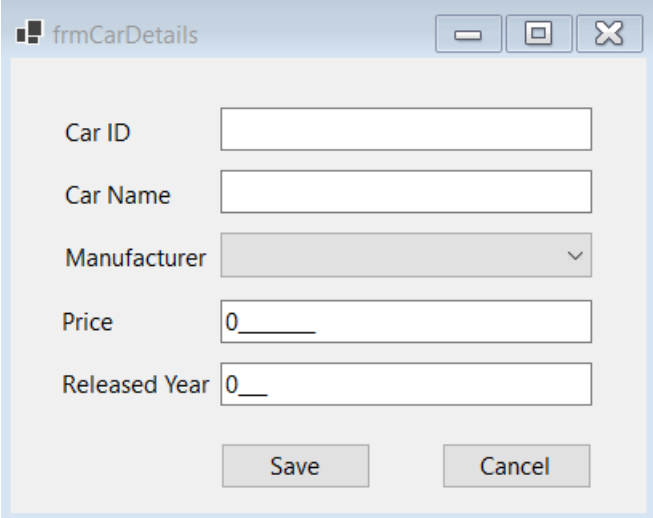
```
using System.Collections;
using AutomobileLibrary.BussinessObject;

namespace AutomobileLibrary.Repository
{
    public interface ICarRepository
    {
        IEnumerable<Car> GetCars();
        Car GetCarByID(int carId);
        void InsertCar(Car car);
        void DeleteCar(int carId);
        void UpdateCar(Car car);
    }
}
```

Step 05. Write codes for **CarRepository.cs** as follows:

```
using AutomobileLibrary.BussinessObject;
using AutomobileLibrary.DataAccess;

namespace AutomobileLibrary.Repository
{
    public class CarRepository : ICarRepository
    {
        public Car GetCarByID(int carId) => CarDBContext.Instance.GetCarByID(carId);

        public IEnumerable<Car> GetCars() => CarDBContext.Instance.GetCarList;

        public void InsertCar(Car car) => CarDBContext.Instance.AddNew(car);

        public void DeleteCar(int carId) => CarDBContext.Instance.Remove(carId);

        public void UpdateCar(Car car) => CarDBContext.Instance.Update(car);
    }
}
```

Activity 03: Design UI and write codes for WinForms project

Step 01. Right-click on the **AutomobileWinApp** project and add a new form named **frmCarDetails.cs** with UI as follows:



No.	Object Type	Object name	Properties / Events
1	Label	lbCarID	Text: Car ID
2	Label	lbCarName	Text: Car Name
3	Label	lbManufacturer	Text: Manufacturer
4	Label	lbPrice	Text: Price
5	Label	lbReleaseYear	Text: ReleaseYear
6	TextBox	txtCarID	
7	TextBox	txtCarName	
8	MaskedTextBox	txtPrice	Mask: 000000000 Text: 0
9	MaskedTextBox	txtReleaseYear	Mask: 0000 Text: 0
10	ComboBox	cboManufacturer	Items: Audi BMW Ford Honda Hyundai Kia Suzuki Toyota
11	Button	btnSave	Text: Save

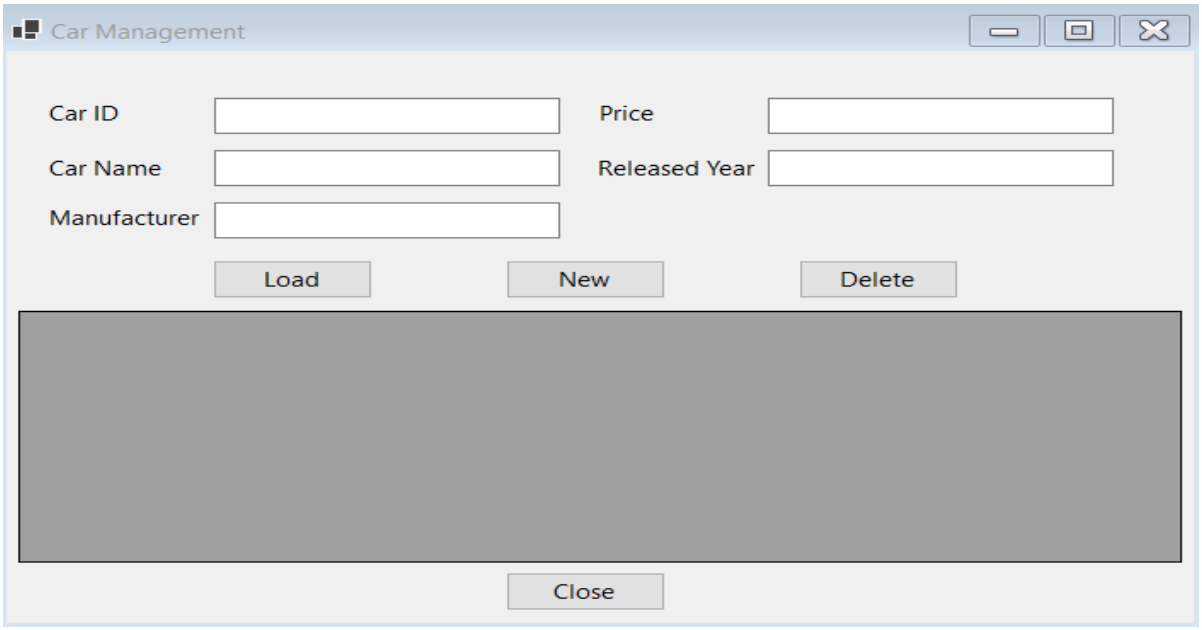
			DialogResult: OK Event Handler: Click
12	Button	btnCancel	Text: Cancel DialogResult: Cancel Event Handler: Click
13	Form	frmCarDetails	StartPosition: CenterScreen Text: frmCarDetails Event Handler: Load

Step 02. Write codes for **frmCarDetails.cs**:

```
//.....
using AutomobileLibrary.BussinessObject;
using AutomobileLibrary.Repository;
namespace AutomobileWinApp {
    public partial class frmCarDetails : Form {
        public frmCarDetails()...
        //-------------------------------------------------------
        public ICarRepository CarRepository { get; set; }
        public bool InsertOrUpdate { get; set; } //False : Insert, True : Update
        public Car CarInfo { get; set; }
        //-------------------------------------------------------
        private void frmCarDetails_Load(object sender, EventArgs e)
        {
            cboManufacturer.SelectedIndex = 0;
            txtCarID.Enabled = !InsertOrUpdate;
            if (InsertOrUpdate == true) //Update mode
            {
                //Show car to perform updating
                txtCarID.Text = CarInfo.CarID.ToString();
                txtCarName.Text = CarInfo.CarName;
                txtPrice.Text = CarInfo.Price.ToString();
                txtReleaseYear.Text = CarInfo.ReleaseYear.ToString();
                cboManufacturer.Text = CarInfo.Manufacturer.Trim();
            }
        }//end frmCarDetails_Load
        //-------------------------------------------------------
```

```
        private void btnSave_Click(object sender, EventArgs e){
            try
            {
                var car = new Car {
                    CarID = int.Parse(txtCarID.Text),
                    CarName = txtCarName.Text,
                    Manufacturer = cboManufacturer.Text,
                    Price = decimal.Parse(txtPrice.Text),
                    ReleaseYear = int.Parse(txtReleaseYear.Text)
                };
                if(InsertOrUpdate == false){
                    CarRepository.InsertCar(car);
                }
                else{
                    CarRepository.UpdateCar(car);
                }
            }
            catch (Exception ex) {
                MessageBox.Show(ex.Message,InsertOrUpdate==false?"Add a new car": "Update a car");
            }
        }//end btnSave_Click
         //---------------------------------------------------
        private void btnCancel_Click(object sender, EventArgs e) => Close();
    }// end Form
}
```

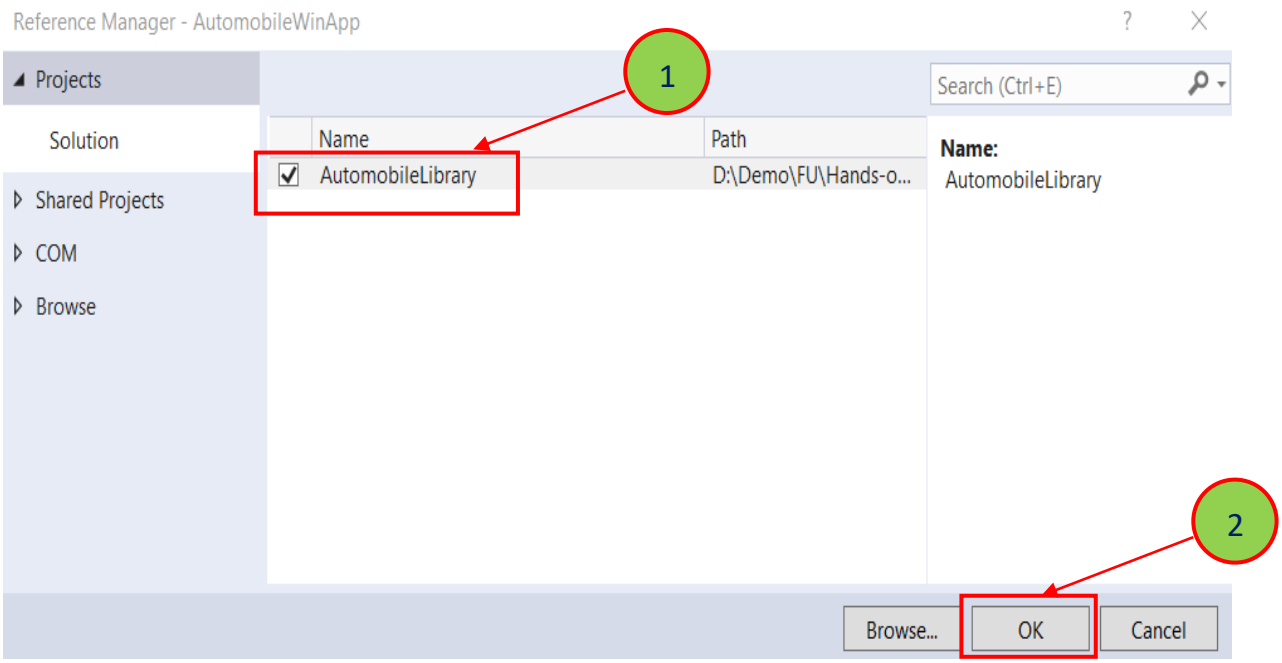
Step 03. Design UI for **frmCarManagement.cs** form:



No.	Object Type	Object name	Properties / Events
1	Label	lbCarID	Text: Car ID
2	Label	lbCarName	Text: Car Name
3	Label	lbManufacturer	Text: Manufacturer
4	Label	lbPrice	Text: Price
5	Label	lbReleaseYear	Text: ReleaseYear
6	TextBox	txtCarID	
7	TextBox	txtCarName	
8	TextBox	txtPrice	
9	TextBox	txtReleaseYear	
10	TextBox	txtManufacturer	
11	Button	btnLoad	Text: Load Event Handler: Click
12	Button	btnNew	Text: New Event Handler: Click
13	Button	btnDelete	Text: Delete Event Handler: Click
14	DataGridView	dgvCarList	ReadOnly: True SelectionMode:FullRowSelect
15	Form	frmCarManagement	StartPosition: CenterScreen Text: Car Management Event Handler: Load

Activity 04: Reference to AutomobileLibrary project and write code for WinForms project

Step 01. Right-click on **AutomobileWinApp** project, select Add | Project Reference, and perform as the below figure:



Step 02. Write codes for **frmCarManagement.cs**

```
using AutomobileLibrary.Repository;
using AutomobileLibrary.BussinessObject;
namespace AutomobileWinApp{
    public partial class frmCarManagement : Form{
        ICarRepository carRepository = new CarRepository();
        //Create a data source
        BindingSource source;
        //---------------------------------------------------
        public frmCarManagement()...
        //---------------------------------------------------
        private void frmCarManagement_Load(object sender, EventArgs e){
            btnDelete.Enabled = false;
            //Register this event to open the frmCarDetails form that performs updating
            dgvCarList.CellDoubleClick += DgvCarList_CellDoubleClick;
        }
        //---------------------------------------------------
        private void DgvCarList_CellDoubleClick(object sender, DataGridViewCellEventArgs e){
            frmCarDetails frmCarDetails = new frmCarDetails{
                Text = "Update car",
                InsertOrUpdate = true,
                CarInfo = GetCarObject(),
                CarRepository = carRepository
            };
            if (frmCarDetails.ShowDialog() == DialogResult.OK){
                LoadCarList();
                //Set focus car updated
                source.Position = source.Count - 1;
            }
        }
```

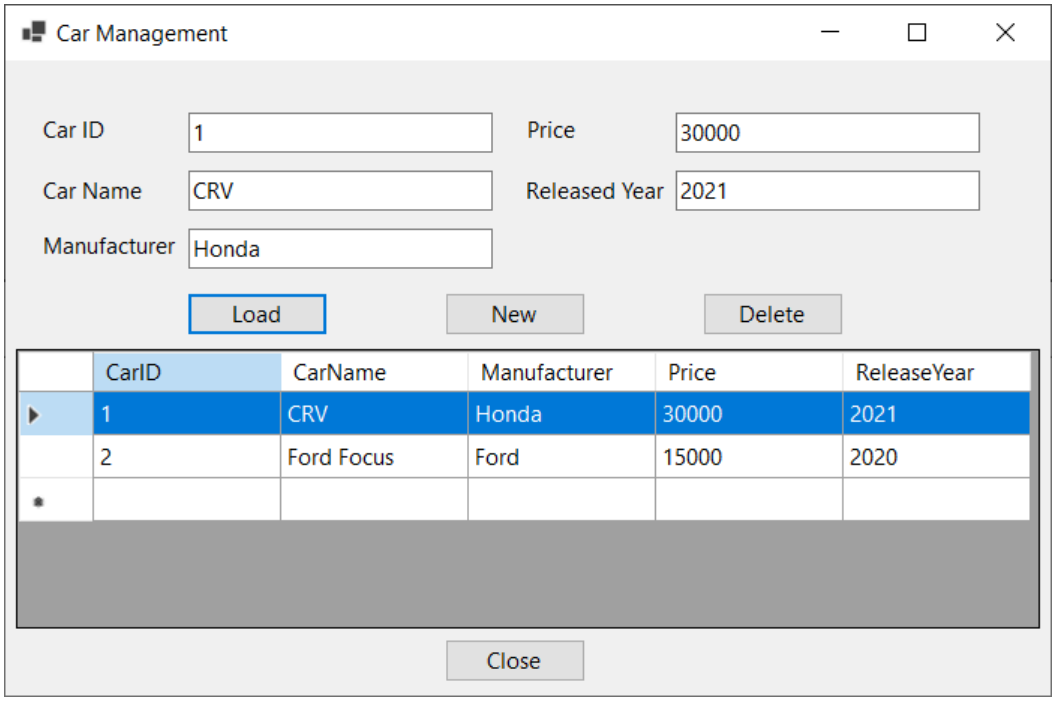
```
//Clear text on TextBoxes
private void ClearText(){
    txtCarID.Text = string.Empty;
    txtCarName.Text = string.Empty;
    txtManufacturer.Text = string.Empty;
    txtPrice.Text = string.Empty;
    txtReleaseYear.Text = string.Empty;
}
//---------------------------------------------------------
private Car GetCarObject()
{
    Car car = null;
    try
    {
        car = new Car
        {
            CarID = int.Parse(txtCarID.Text),
            CarName = txtCarName.Text,
            Manufacturer = txtManufacturer.Text,
            Price = decimal.Parse(txtPrice.Text),
            ReleaseYear = int.Parse(txtReleaseYear.Text)
        };
    }
    catch (Exception ex)
    {
        MessageBox.Show(ex.Message,"Get car");
    }
    return car;
}//end GetCarObject
//---------------------------------------------------------
```

```
public void LoadCarList(){
    var cars = carRepository.GetCars();
    try {
        //The BindingSource component is designed to simplify
        //the process of binding controls to an underlying data source
        source = new BindingSource();
        source.DataSource = cars;

        txtCarID.DataBindings.Clear();
        txtCarName.DataBindings.Clear();
        txtManufacturer.DataBindings.Clear();
        txtPrice.DataBindings.Clear();
        txtReleaseYear.DataBindings.Clear();

        txtCarID.DataBindings.Add("Text", source, "CarID");
        txtCarName.DataBindings.Add("Text", source, "CarName");
        txtManufacturer.DataBindings.Add("Text", source, "Manufacturer");
        txtPrice.DataBindings.Add("Text", source, "Price");
        txtReleaseYear.DataBindings.Add("Text", source, "ReleaseYear");

        dgvCarList.DataSource = null;
        dgvCarList.DataSource = source;
        if (cars.Count() == 0){
            ClearText();
            btnDelete.Enabled = false;
        }
        else{
            btnDelete.Enabled = true;
        }
    }
    catch (Exception ex) {
        MessageBox.Show(ex.Message,"Load car list");
    }
}//end LoadCarList
```

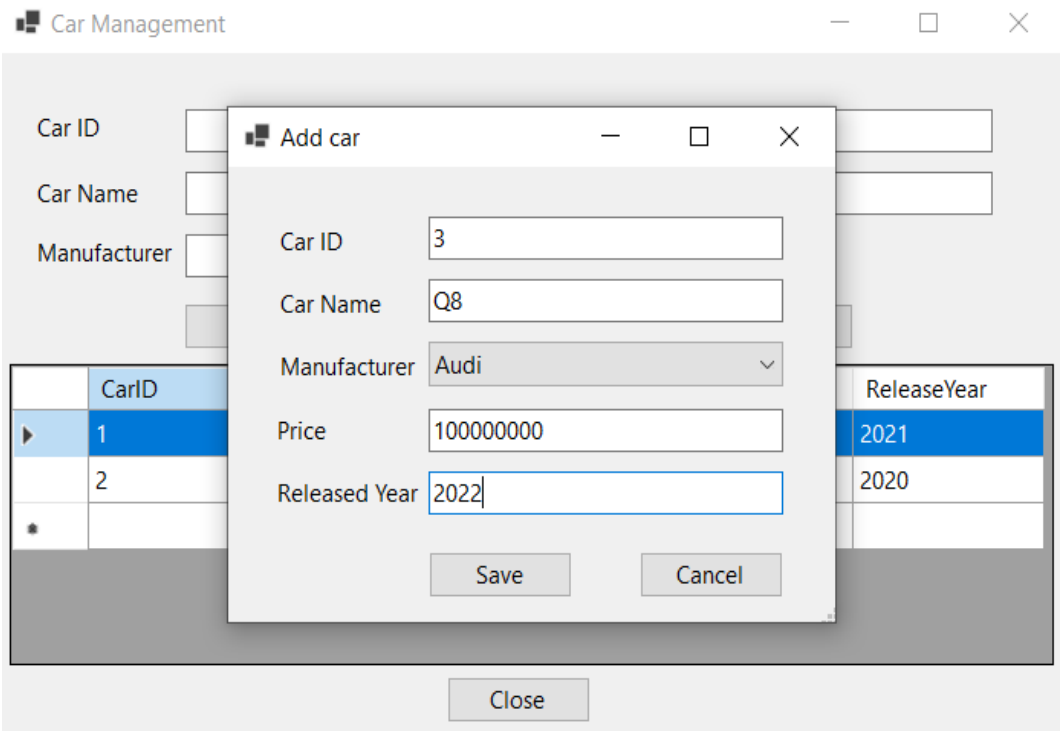
```
        //-------------------------------------------------------
        private void btnLoad_Click(object sender, EventArgs e)
        {
            LoadCarList();
        }//end btnLoad_Click
         //-------------------------------------------------------
        private void btnClose_Click(object sender, EventArgs e) => Close();
        //-------------------------------------------------------
        private void btnNew_Click(object sender, EventArgs e) {
            frmCarDetails frmCarDetails = new frmCarDetails {
                Text = "Add car",
                InsertOrUpdate = false,
                CarRepository = carRepository
            };
            if(frmCarDetails.ShowDialog() == DialogResult.OK) {
                LoadCarList();
                //Set focus car inserted
                source.Position = source.Count - 1;
            }
        }
        //-------------------------------------------------------

        private void btnDelete_Click(object sender, EventArgs e)
        {
            try
            {
                var car = GetCarObject();
                carRepository.DeleteCar(car.CarID);
                LoadCarList();
            }
            catch (Exception ex)
            {
                MessageBox.Show(ex.Message, "Delete a car");
            }
        }//end btnDelete_Click
    }//end Form
}
```

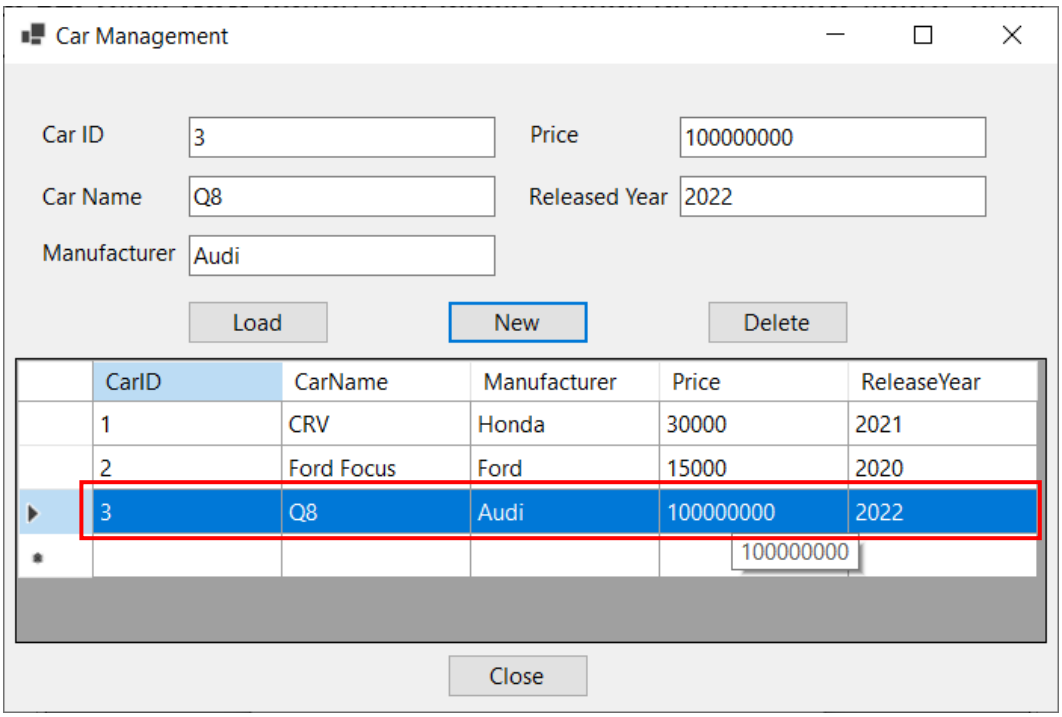
Activity 06: Press Ctrl+F5 to run the WinForms project and test all actions

Step 01. Click **Load** button and display the result as the below figure.

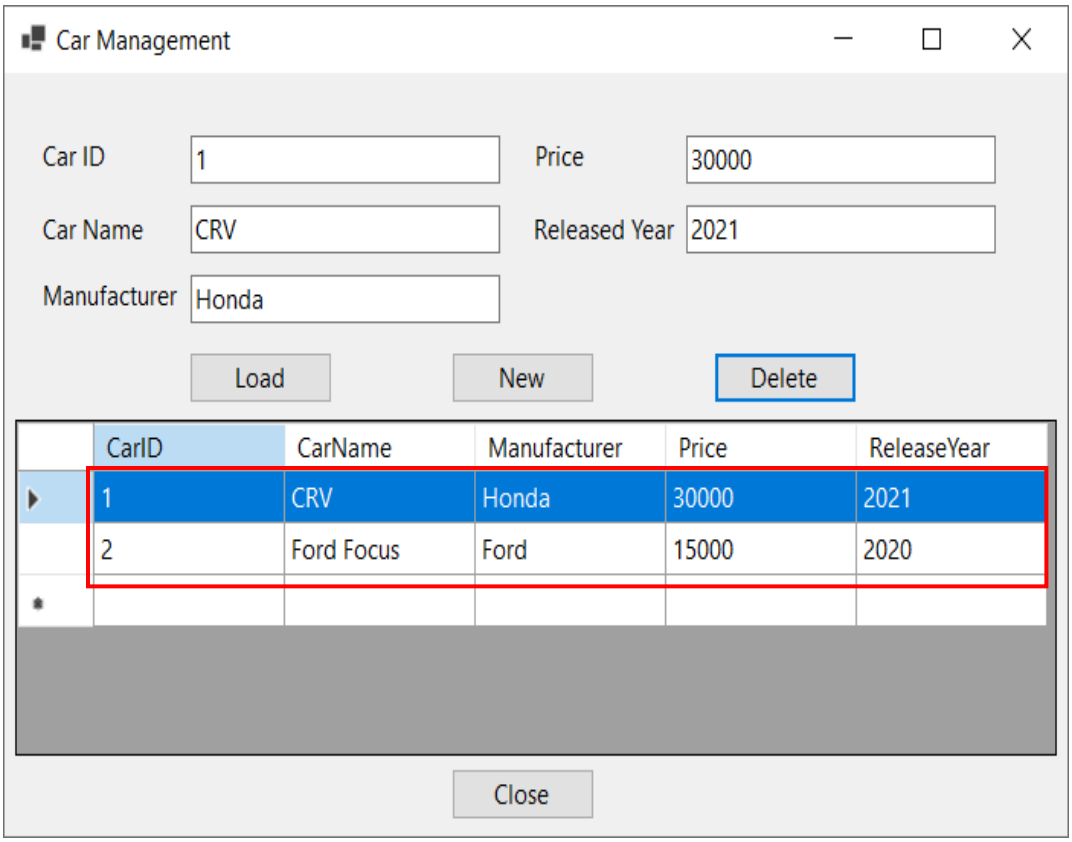


Step 02. Click **New** button and display the result as the below figure, enter the values on TextBoxes then click **Save**





Step 03. Select a row on the DataGridView then click **Delete** to remove a Car



Step 04. Double-click a row on the DataGridView to update a Car on the popup form, edit values then click **Save**