

# Problem 1: Implementation of Recommendation System using the Web Api

We did this lab using ASP.NET Web Forms and custom Web APIs implemented through ASP.NET Generic Handlers (.ashx).

**Functionality-01:** Display recommendation messages during Product Selection and Order Placement "Customers who bought this also bought..."

Order.aspx

```
<%@ Page Language="VB" AutoEventWireup="false" CodeFile="order.aspx.vb"
Inherits="order" %>
<!DOCTYPE html>
<html>
<head runat="server">
  <title>Place Order</title>
  <link href="style.css" rel="stylesheet" />
</head>
<body>
<form runat="server">

<header>
  <h1>Available Products</h1>
</header>

<asp:GridView ID="GridView1" runat="server" AutoGenerateColumns="False"
AutoGenerateSelectButton="True" Height="284px" Width="1039px">
  <Columns>
    <asp:BoundField DataField="Product_Id" HeaderText="ID" />
    <asp:BoundField DataField="Product_Description" HeaderText="Product" />
    <asp:BoundField DataField="Standard_Price" HeaderText="Standard Price"
DataFormatString="{0:N2}" />
  </Columns>
</asp:GridView>

<hr />
<asp:Label ID="lblRecHeader" runat="server" Text="Customers who bought this also bought..."
Font-Bold="True" Visible="false"></asp:Label>
<br />
<asp:GridView ID="GridViewRec" runat="server" AutoGenerateColumns="False"
```

```
Width="400px" BackColor="#f2f2f2">
  <Columns>
    <asp:BoundField DataField="Product_Description" HeaderText="Suggested Product" />
    <asp:BoundField DataField="Standard_Price" HeaderText="Price"
DataFormatString="{0:N2}" />
  </Columns>
</asp:GridView>
```

```
<br />
```

Quantity:

```
<asp:TextBox ID="txtQty" runat="server" Width="82px"></asp:TextBox>
```

```
<br />
```

```
<asp:Label ID="lblMsg" runat="server" ForeColor="Red"></asp:Label>
```

```
<br />
```

```
<asp:Button ID="btnAdd" runat="server" Text="Add To Cart" Height="78px" Width="136px" />
```

```
<br /><br />
```

```
<asp:Button ID="btnCart" runat="server" Text="View Cart"PostBackUrl="cart.aspx"
Width="188px" />
```

```
<asp:Button ID="btnBack" runat="server" Text="Back"PostBackUrl="index_cust.aspx"
Width="188px" />
```

```
<br /><br />
```

```
</form>
```

```
</body>
```

```
</html>
```

## [order.aspx.vb](#)

```
Imports System.Data
Imports System.Data.SqlClient
Imports System.Configuration
Imports System.Net
```

```
Partial Class order
```

```
    Inherits System.Web.UI.Page
```

```
Dim con As New  
SqlConnection(ConfigurationManager.ConnectionStrings("PVFCConnection").ConnectionString)
```

```
Protected Sub Page_Load(sender As Object, e As EventArgs) Handles Me.Load
```

```
    If Not IsPostBack Then  
        LoadProducts()  
    End If
```

```
End Sub
```

```
' LOAD PRODUCTS
```

```
Private Sub LoadProducts()
```

```
    Dim cmd As New SqlCommand(  
        "SELECT Product_Id, Product_Description, Standard_Price FROM PRODUCT_t",  
        con)
```

```
    Dim da As New SqlDataAdapter(cmd)
```

```
    Dim dt As New DataTable()
```

```
    da.Fill(dt)
```

```
    GridView1.DataSource = dt  
    GridView1.DataBind()
```

```
End Sub
```

```
' ADD TO CART
```

```
Protected Sub btnAdd_Click(sender As Object, e As EventArgs) Handles btnAdd.Click
```

```
    If GridView1.SelectedIndex = -1 Then
```

```
        lblMsg.Text = "No product selected"  
        Exit Sub
```

```
    End If
```

```
    Dim productId As Integer =  
        Convert.ToInt32(GridView1.SelectedRow.Cells(1).Text)
```

```
    Dim qty As Integer
```

```

If Not Integer.TryParse(txtQty.Text, qty) OrElse qty <= 0 Then

    lblMsg.Text = "Enter valid quantity"
    Exit Sub

End If

Dim productName As String = ""
Dim standardPrice As Decimal = 0D

Using con As New SqlConnection(
    ConfigurationManager.ConnectionStrings("PVFCCConnection").ConnectionString)

    Dim cmd As New SqlCommand(
        "SELECT Product_Description, Standard_Price FROM PRODUCT_t WHERE
Product_Id=@id",
        con)

    cmd.Parameters.AddWithValue("@id", productId)

    con.Open()

    Dim reader As SqlDataReader = cmd.ExecuteReader()

    If reader.Read() Then

        productName = reader("Product_Description").ToString()

        standardPrice =
            Convert.ToDecimal(reader("Standard_Price"))

    End If

End Using

Dim dt As DataTable

If Session("Cart") Is Nothing Then

    dt = New DataTable()

    dt.Columns.Add("ProductId", GetType(Integer))
    dt.Columns.Add("ProductName", GetType(String))
    dt.Columns.Add("Standard_Price", GetType(Decimal))

```

```
dt.Columns.Add("Quantity", GetType(Integer))
```

```
Else
```

```
dt = CType(Session("Cart"), DataTable)
```

```
End If
```

```
dt.Rows.Add(productId, productName, standardPrice, qty)
```

```
Session("Cart") = dt
```

```
lblMsg.ForeColor = Drawing.Color.Green
```

```
lblMsg.Text = "Product added to cart!"
```

```
txtQty.Text = ""
```

```
End Sub
```

```
' PRODUCT RECOMMENDATION USING API
```

```
Protected Sub GridView1_SelectedIndexChanged(sender As Object, e As EventArgs)  
Handles GridView1.SelectedIndexChanged
```

```
Dim selectedId As String =
```

```
GridView1.SelectedRow.Cells(1).Text
```

```
'hosted domain
```

```
Dim productId As String =
```

```
GridView1.SelectedRow.Cells(1).Text
```

```
Dim url As String =
```

```
Request.Url.GetLeftPart(UriPartial.Authority) &
```

```
ResolveUrl("~/OrderApi.ashx?action=recommend&productId=" & productId)
```

```
Dim client As New WebClient()
```

```
Dim response As String =
```

```
client.DownloadString(url)
```

```
Dim serializer As New Script.Serialization.JavaScriptSerializer()
```

```
Dim dt As New DataTable()
```

```
dt.Columns.Add("Product_Description")
```

```
dt.Columns.Add("Standard_Price")
```

```
Dim data =  
    serializer.Deserialize(Of List(Of Dictionary(Of String, Object)))(response)
```

```
For Each item In data
```

```
    dt.Rows.Add(  
        item("Product_Description"),  
        item("Standard_Price")  
    )
```

```
Next
```

```
If dt.Rows.Count > 0 Then
```

```
    GridViewRec.DataSource = dt  
    GridViewRec.DataBind()
```

```
    lblRecHeader.Visible = True
```

```
Else
```

```
    lblRecHeader.Visible = False
```

```
    GridViewRec.DataSource = Nothing  
    GridViewRec.DataBind()
```

```
End If
```

```
End Sub
```

```
End Class
```

## OrderApi.ashx

```
<%@ WebHandler Language="VB" Class="OrderApi" %>
```

```
Imports System  
Imports System.Web  
Imports System.Data  
Imports System.Data.SqlClient  
Imports System.Configuration  
Imports System.Web.Script.Serialization
```

```
Public Class OrderApi  
    Implements IHttpHandler
```

```

Public Sub ProcessRequest(context As HttpContext) _
    Implements IHttpHandler.ProcessRequest

    context.Response.ContentType = "application/json"

    Dim action As String = context.Request("action")

    Select Case action

        Case "recommend"

            Dim pid As Integer =
                Convert.ToInt32(context.Request("productId"))

            Dim conStr As String =
                ConfigurationManager.ConnectionStrings("PVFCCConnection").ConnectionString

            Dim sql As String =
                "SELECT TOP 5 P.Product_Description, P.Standard_Price " &
                "FROM Order_line_t OL " &
                "JOIN PRODUCT_t P ON OL.Product_Id = P.Product_Id " &
                "WHERE OL.Order_Id IN " &
                "(SELECT Order_Id FROM Order_line_t WHERE Product_Id = @pid) " &
                "AND OL.Product_Id <> @pid " &
                "GROUP BY P.Product_Description, P.Standard_Price"

            Dim dt As New DataTable()

            Using con As New SqlConnection(conStr)

                Dim cmd As New SqlCommand(sql, con)

                cmd.Parameters.AddWithValue("@pid", pid)

                Dim da As New SqlDataAdapter(cmd)

                da.Fill(dt)

            End Using

            Dim json As String =
                New JavaScriptSerializer().Serialize(DataTableToList(dt))

```

```
        context.Response.Write(json)

    End Select

End Sub

Private Function DataTableToList(dt As DataTable) _
    As List(Of Dictionary(Of String, Object))

    Dim list As New List(Of Dictionary(Of String, Object))

    For Each row As DataRow In dt.Rows

        Dim dict As New Dictionary(Of String, Object)

        For Each col As DataColumn In dt.Columns

            dict(col.ColumnName) = row(col)

        Next

        list.Add(dict)

    Next

    Return list

End Function

Public ReadOnly Property IsReusable As Boolean _
    Implements IHttpHandler.IsReusable

    Get
        Return False
    End Get

End Property

End Class
```

**Available Products**

	ID	Product	Standard Price
<a href="#">Select</a>	1	End Table	175.00
<a href="#">Select</a>	2	Coffee Table	200.00
<a href="#">Select</a>	3	Computer Desk	375.00
<a href="#">Select</a>	4	Entertainment Center	650.00
<a href="#">Select</a>	5	Writers Desk	325.00
<a href="#">Select</a>	6	8-Drawer Desk	750.00
<a href="#">Select</a>	7	Dining Table	800.00
<a href="#">Select</a>	8	Computer Desk	250.00

Customers who bought this also bought...

Suggested Product	Price
8-Drawer Desk	750.00
Computer Desk	375.00
End Table	175.00

Quantity:

## Functionality-02: Reordering suggestions for customers

Index\_cust.aspx

```
<%@ Page Language="VB" AutoEventWireup="false" CodeFile="index_cust.aspx.vb"
Inherits="index_cust" %>
<!DOCTYPE html>
<html>
<head runat="server">
<title>Pine Valley Furnishing</title>
<link href="style.css" rel="stylesheet" />
</head>
<body>
<form runat="server">

<header>
<h1>Pine Valley Furnishing</h1>
</header>

<div class="container">
<div class="menu">
<asp:LinkButton ID="InkSearch" runat="server" PostBackUrl="search.aspx">Search
Product</asp:LinkButton>
<asp:LinkButton ID="InkOrder" runat="server" PostBackUrl="order.aspx">Place
Order</asp:LinkButton>
<asp:LinkButton ID="InkHelp" runat="server" PostBackUrl="help.aspx">Help</asp:LinkButton>
<asp:LinkButton ID="InkLogout" runat="server" Text="Logout" OnClick="InkLogout_Click" />
```

```

</div>

<hr />
<h3>Buy It Again</h3>
<asp:GridView ID="gvReorder" runat="server" AutoGenerateColumns="False"
  DataKeyNames="Product_Id"
  OnSelectedIndexChanged="gvReorder_SelectedIndexChanged">
  <Columns>
    <asp:BoundField DataField="Product_Id" HeaderText="ID" />
    <asp:BoundField DataField="Product_Description" HeaderText="Product Name" />
    <asp:BoundField DataField="Standard_Price" HeaderText="Price" />
    <asp:CommandField ShowSelectButton="True" SelectText="Add to Cart" />
  </Columns>
</asp:GridView>
</div>

</form>
</body>
</html>

```

### index\_cust.[aspx.vb](#)

```

Imports System.Data
Imports System.Net
Imports System.Security.Policy

```

```

Partial Class index_cust
  Inherits System.Web.UI.Page

```

```

  Protected Sub Page_Load(sender As Object, e As EventArgs) Handles Me.Load

```

```

    If Not IsPostBack Then

```

```

        If Session("UserID") IsNot Nothing Then
            LoadReorder()
        End If

```

```

    End If

```

```

  End Sub

```

```

  Sub LoadReorder()

```

```

    Dim customerId As String = Session("UserID").ToString()

```

```

Dim url As String =
Request.Url.GetLeftPart(UriPartial.Authority) &
ResolveUrl("~/CustApi.ashx?action=reorder&customerId=" &
Server.UrlEncode(Session("UserID").ToString()))

Dim client As New WebClient()
Dim response As String = client.DownloadString(url)

Dim serializer As New Script.Serialization.JavaScriptSerializer()

Dim data = serializer.Deserialize(Of List(Of Dictionary(Of String, Object)))(response)

Dim dt As New DataTable()
dt.Columns.Add("Product_Id")
dt.Columns.Add("Product_Description")
dt.Columns.Add("Standard_Price")

For Each item In data
    dt.Rows.Add(item("Product_Id"),
                item("Product_Description"),
                item("Standard_Price"))
Next

gvReorder.DataSource = dt
gvReorder.DataBind()

End Sub

Protected Sub gvReorder_SelectedIndexChanged(sender As Object, e As EventArgs)

Dim pid As String = gvReorder.SelectedRow.Cells(0).Text
Dim pName As String = gvReorder.SelectedRow.Cells(1).Text
Dim pPrice As String = gvReorder.SelectedRow.Cells(2).Text

Dim dt As DataTable

If Session("Cart") Is Nothing Then

    dt = New DataTable()
    dt.Columns.Add("ProductId")
    dt.Columns.Add("ProductName")
    dt.Columns.Add("Standard_Price")
    dt.Columns.Add("Quantity")

```

```
Else
    dt = CType(Session("Cart"), DataTable)
End If
```

```
dt.Rows.Add(pid, pName, pPrice, 1)
```

```
Session("Cart") = dt
```

```
Response.Redirect("cart.aspx")
```

```
End Sub
```

```
Protected Sub InkLogout_Click(sender As Object, e As EventArgs) Handles InkLogout.Click
```

```
    Session.Abandon()
```

```
    Response.Redirect("index.aspx")
```

```
End Sub
```

```
End Class
```

## CustApi.ashx

```
<%@ WebHandler Language="VB" Class="CustApi" %>
```

```
Imports System
```

```
Imports System.Web
```

```
Imports System.Data
```

```
Imports System.Data.SqlClient
```

```
Imports System.Configuration
```

```
Imports System.Web.Script.Serialization
```

```
Imports System.Collections.Generic
```

```
Imports System.Linq
```

```
Public Class CustApi
```

```
    Implements IHttpHandler
```

```
    Public Sub ProcessRequest(context As HttpContext) _
```

```
        Implements IHttpHandler.ProcessRequest
```

```
        context.Response.ContentType = "application/json"
```

```
        Dim action As String = context.Request("action")
```

```
        If action = "reorder" Then
```

```
            Dim cid As String = context.Request("customerId")
```

```
Dim conStr As String =  
    ConfigurationManager.ConnectionStrings("PVFCCConnection").ConnectionString
```

```
Dim sql As String =  
    "SELECT TOP 3 P.Product_Id, P.Product_Description, P.Standard_Price " &  
    "FROM Order_line_t OL " &  
    "JOIN ORDER_t O ON OL.Order_Id = O.Order_Id " &  
    "JOIN PRODUCT_t P ON OL.Product_Id = P.Product_Id " &  
    "WHERE O.Customer_Id = @cid " &  
    "GROUP BY P.Product_Id, P.Product_Description, P.Standard_Price, O.Order_Id "  
&  
    "ORDER BY O.Order_Id DESC"
```

```
Dim dt As New DataTable()
```

```
Using con As New SqlConnection(conStr)
```

```
    Dim cmd As New SqlCommand(sql, con)  
    cmd.Parameters.AddWithValue("@cid", cid)
```

```
    Dim da As New SqlDataAdapter(cmd)  
    da.Fill(dt)
```

```
End Using
```

```
Dim json As String =  
    New JavaScriptSerializer().Serialize(DataTableToList(dt))
```

```
context.Response.Write(json)
```

```
End If
```

```
End Sub
```

```
Private Function DataTableToList(dt As DataTable) _  
    As List(Of Dictionary(Of String, Object))
```

```
    Dim list As New List(Of Dictionary(Of String, Object))
```

```
    For Each row As DataRow In dt.Rows
```

```
        Dim dict As New Dictionary(Of String, Object)
```

```
For Each col As DataColumn In dt.Columns
    dict(col.ColumnName) = row(col)
Next
```

```
list.Add(dict)
```

```
Next
```

```
Return list
```

```
End Function
```

```
Public ReadOnly Property IsReusable As Boolean _
    Implements IHttpHandler.IsReusable
```

```
Get
```

```
Return False
```

```
End Get
```

```
End Property
```

```
End Class
```

## Pine Valley Furnishing

Search Product

Place Order

Help

Logout

### Buy It Again

ID	Product Name	Price	
1	End Table	175.00	<a href="#">Add to Cart</a>
2	Coffee Table	200.00	<a href="#">Add to Cart</a>
3	Computer Desk	375.00	<a href="#">Add to Cart</a>

**Functionality-03:** For employees/managers of PVFC forecasting demand for secondary items when a primary item's sales increase. (Inventory Management)

Index\_emp.aspx

```
<%@ Page Language="VB" AutoEventWireup="false" CodeFile="index_emp.aspx.vb"
Inherits="index_emp" %>
<!DOCTYPE html>
<html>
<head runat="server">
<title>Employee Home</title>
<link href="style.css" rel="stylesheet" />
</head>
<body>
<form runat="server">

<header>
<h1>Pine Valley Furnishing</h1>
</header>

<div class="container">
<div class="menu">
<asp:LinkButton ID="lnkUpdate" runat="server"PostBackUrl="update.aspx">Update
Catalogue</asp:LinkButton>
<asp:LinkButton ID="LinkSegment" runat="server"PostBackUrl="SegmentationAnalysis.aspx"
Visible="false">Segmentation Analysis</asp:LinkButton>
<asp:LinkButton ID="LinkTarget" runat="server"PostBackUrl="TargetedMarketing.aspx"
Visible="false">Target Marketing</asp:LinkButton>
<asp:LinkButton ID="lnkLogout" runat="server"
PostBackUrl="index.aspx">Logout</asp:LinkButton>

</div>
<asp:Panel ID="PanelForecasting" runat="server" Visible="false">
  <hr />
  <h3>Inventory Demand Forecast</h3>
  <p>Select a product to see how much raw material is needed for future sales.</p>

  <div>
    <strong>Product:</strong> <br />
    <asp:DropDownList ID="ddlProducts" runat="server"
      DataTextField="Product_Description" DataValueField="Product_Id"
      CssClass="forecast-input">
    </asp:DropDownList>
  </div>
</form>
</body>
</html>
```

```

<div>
  <strong>Projected Sales:</strong> <br />
  <asp:TextBox ID="txtProjectedSales" runat="server" Text="10"
    CssClass="forecast-input">
  </asp:TextBox>
</div>

<asp:Button ID="btnForecast" runat="server" Text="Forecast Inventory"
  OnClick="btnForecast_Click" CssClass="btn-forecast" />

<br /><br />

<asp:GridView ID="gvForecast" runat="server" AutoGenerateColumns="True"
  Width="100%" BackColor="White" CssClass="forecast-table">
</asp:GridView>
</asp:Panel>
</div>

</form>
</body>
</html>

```

## [index\\_emp.aspx.vb](#)

```

Imports System.Net
Imports System.Data
Imports System.Configuration

```

```

Partial Class index_emp
  Inherits System.Web.UI.Page

```

```

  Protected Sub Page_Load(sender As Object, e As EventArgs) Handles Me.Load

```

```

    If Session("RoleID") Is Nothing Then
      Response.Redirect("Login_as.aspx")
    Else

```

```

      If Session("RoleID").ToString() = "1" Then

```

```

        LinkSegment.Visible = True
        LinkTarget.Visible = True
        PanelForecasting.Visible = True

```

```

      If Not IsPostBack Then

```

```

        LoadProducts()
    End If

End If

End If

End Sub

Sub LoadProducts()

    Dim conStr As String =
ConfigurationManager.ConnectionStrings("PVFCCConnection").ConnectionString
    Dim con As New SqlConnection(conStr)

    Dim da As New SqlClient.SqlDataAdapter(
        "SELECT Product_Id, Product_Description FROM PRODUCT_t", con)

    Dim dt As New DataTable()
    da.Fill(dt)

    ddlProducts.DataSource = dt
    ddlProducts.DataBind()

End Sub

Protected Sub btnForecast_Click(sender As Object, e As EventArgs) Handles
btnForecast.Click

    Dim pid As String = ddlProducts.SelectedValue
    Dim sales As String = txtProjectedSales.Text

    Dim url As String =
        Request.Url.GetLeftPart(UriPartial.Authority) &
        ResolveUrl("~/EmpApi.ashx?action=forecast&productId=" & pid & "&sales=" & sales)

    Dim client As New WebClient()
    Dim response As String = client.DownloadString(url)

    Dim serializer As New Script.Serialization.JavaScriptSerializer()

    Dim data = serializer.Deserialize(Of List(Of Dictionary(Of String, Object)))(response)

    Dim dt As New DataTable()
    dt.Columns.Add("Material_Name")

```

```
dt.Columns.Add("Stock_Needed")

For Each item In data
    dt.Rows.Add(item("Material_Name"), item("Stock_Needed"))
Next

gvForecast.DataSource = dt
gvForecast.DataBind()
```

End Sub

End Class

## EmpApi.ashx

```
<%@ WebHandler Language="VB" Class="EmpApi" %>
```

```
Imports System
Imports System.Web
Imports System.Data
Imports System.Data.SqlClient
Imports System.Configuration
Imports System.Web.Script.Serialization
Imports System.Collections.Generic
```

```
Public Class EmpApi
    Implements IHttpHandler
```

```
    Public Sub ProcessRequest(context As HttpContext) _
        Implements IHttpHandler.ProcessRequest
```

```
        context.Response.ContentType = "application/json"
```

```
    Try
```

```
        Dim action As String = context.Request("action")
```

```
        If action = "forecast" Then
```

```
            Dim pid As Integer = Convert.ToInt32(context.Request("productId"))
```

```
            Dim sales As Integer = Convert.ToInt32(context.Request("sales"))
```

```
            Dim conStr As String =
```

```
                ConfigurationManager.ConnectionStrings("PVFCCConnection").ConnectionString
```

```

Dim sql As String =
    "SELECT M.Material_Name, (U.Goes_into_Quantity * @sales) AS Stock_Needed "
&
    "FROM Uses_t U " &
    "JOIN RAW_MATERIAL_t M ON U.Material_Id = M.Material_Id " &
    "WHERE U.Product_Id = @pid"

Dim dt As New DataTable()

Using con As New SqlConnection(conStr)

    Dim cmd As New SqlCommand(sql, con)
    cmd.Parameters.AddWithValue("@pid", pid)
    cmd.Parameters.AddWithValue("@sales", sales)

    Dim da As New SqlDataAdapter(cmd)
    da.Fill(dt)

End Using

Dim json As String =
    New JavaScriptSerializer().Serialize(DataTableToList(dt))

context.Response.Write(json)

End If

Catch ex As Exception

    context.Response.Write("{""error"":"" & ex.Message.Replace("""", """) & ""}")

End Try

End Sub

Private Function DataTableToList(dt As DataTable) _
    As List(Of Dictionary(Of String, Object))

    Dim list As New List(Of Dictionary(Of String, Object))

    For Each row As DataRow In dt.Rows

        Dim dict As New Dictionary(Of String, Object)

```

```
For Each col As DataColumn In dt.Columns
    dict(col.ColumnName) = row(col)
Next
```

```
list.Add(dict)
```

```
Next
```

```
Return list
```

```
End Function
```

```
Public ReadOnly Property IsReusable As Boolean _
    Implements IHttpHandler.IsReusable
```

```
Get
```

```
Return False
```

```
End Get
```

```
End Property
```

```
End Class
```

**Pine Valley Furnishing**

Update Catalogue

Segmentation Analysis

Target Marketing

Logout

### Inventory Demand Forecast

Select a product to see how much raw material is needed for future sales.

Product:

Projected Sales:

Material_Name	Stock_Needed
Oak Wood	120
Steel Bolts	100