

Open Source Visualizations

Examples of integrated and interactive solutions

- Greg Harmelink
- University of Georgia

Background

- Desire to expand the feature set of CRM
- UGA lacked integrated visualization platform
- Inspired by previous presentation by Indiana University
- Experience with js libraries
- Vast quantity of options / community



Custom UI
Model

HTML

javascript

Data Lists

Overview

- Constituent Timeline
- DME Revenue Pivot Table
- Simple examples that involve very little SDK code
- Most coding is javascript and html
- Designed to use existing CRM Data Lists



Constituent Timeline

Goal

Display date-based constituent information from a variety of areas and present them in a singular interactive timeline.

- Recognition
- Interactions
- Communications

The screenshot displays the Blackbaud CRM interface with three overlapping panels. The top panel shows the 'Communications' section with a list of communications and filters. The middle panel shows the 'Recognition history' section with filters and a list of recognition events. The bottom panel shows the 'Interactions' section with filters and a list of interaction events.

Communications (390)

Date sent	Communication	Details	Has responses	Site	Channel
3/21/2018	Appeal Mailing	CDAG18 - CDAG - Georgia Fund E-News March 2018	No	Annual Giving	Email
3/5/2018	Appeal Mailing	AA18 - AA - Bulldog Bulletin - MARCH 2018 IN-STATE VERSION	No	All sites	Email
3/1/2018	Appeal Mailing	CDAG18 - PUBA - FY18 Georgia Magazine Spring Mailing	No	Annual Giving	Mail
2/26/2018	Appeal Mailing	CDDR18 - CDDR - Scholarship Thank You Email - 2018	No	Donor Relations	Email
2/22/2018	Event Invitation	AA - Athens UGA vs. Texas AM Basketball Game 02.28.18 #2 - AA - Athens UGA vs. Texas AM Basketball Game 02...	No	N/A	Email

Recognition history (61)

Group by: [] Type: [All] Date range: [All dates]

Revenue type: [All] Campaigns: [All campaigns] Start date: [mm/dd/yyyy] End date: [mm/dd/yyyy]

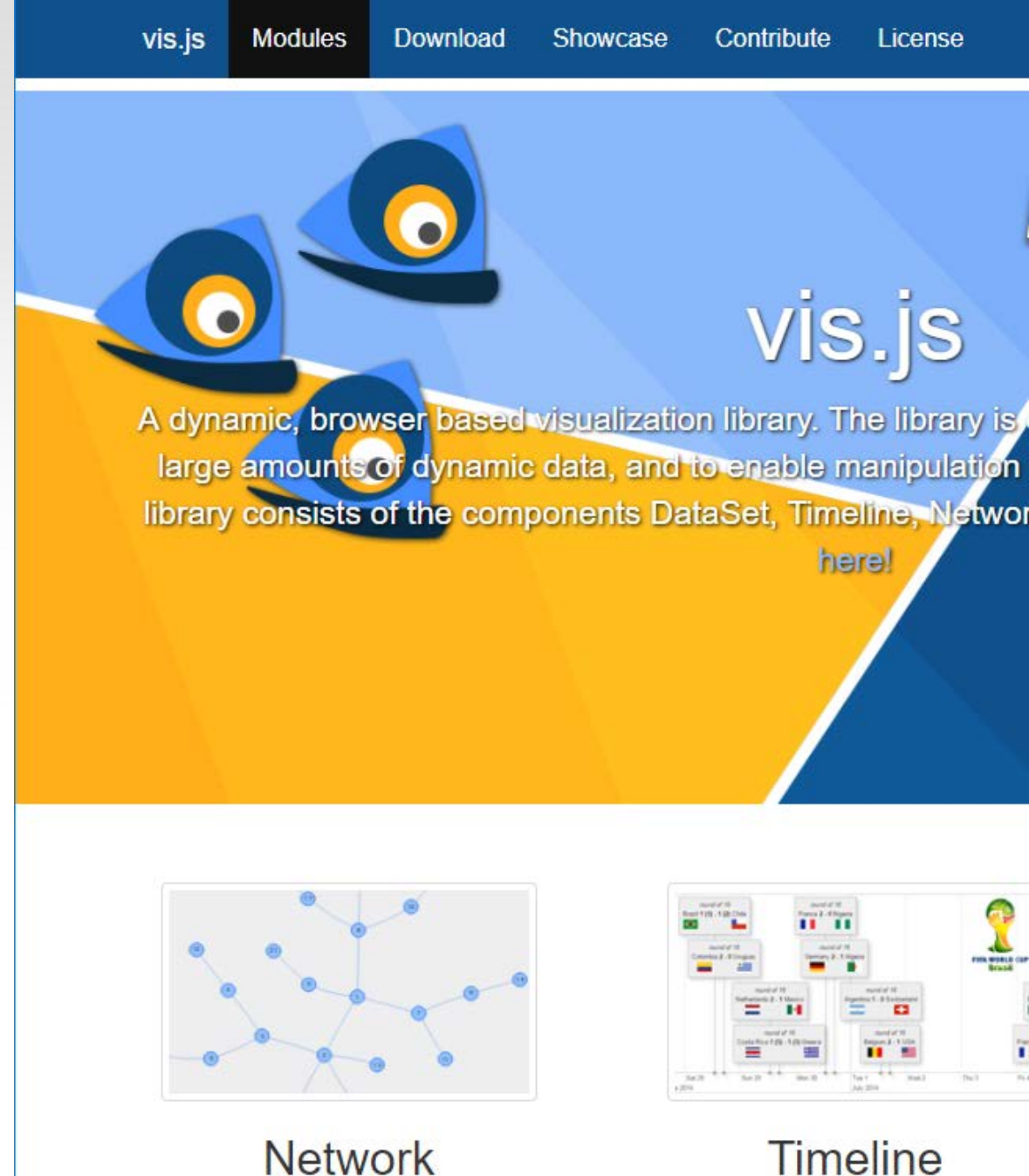
Recognition filter: [] Sites: [All sites]

Interactions (14)

Date	Status	Summary	Contact method	Sites	Owner
6/22/2009	Completed	TERRY GIFT ACKNOWLEDGEM...	Letter		
1/6/2004	Completed	THANK YOU LETTER	Letter		
3/23/2017	Completed	JWM ACK	Letter	Donor Relations	
3/1/2010	Completed	ALUMNI LUNCHEON	Other		
3/1/2018	Completed	Visit with Jerry Guyer	Return Meeting	Athletics	
1/27/2010	Completed	TERRY GIFT ACKNOWLEDGEM...	Letter		
2/15/2013	Completed	TERRY SYMPATHY CARD	Letter		
3/21/2014	Completed	Qualification	Phone Call	Libraries	
3/21/2014	Completed	Cultivation	Task	Libraries	
3/12/2014	Completed	Sending copy of Libraries' new...	Phone Call	Libraries	
3/12/2014	Completed	Identification	Phone Call	Libraries	
10/31/2017	Pending	re-visit	Return Meeting	Athletics	
4/21/2017	Completed	Stewardship lunch	Return Meeting		
4/21/2017	Completed	Visit with Greg & Lori	Initial Meeting	Athletics	

Components Used

- Custom UI Model
 - ConstituentTimeLineUIModel.html
 - ConstituentTimeLineUIModel.js
- Pre-existing Data Lists
- Vis.js
- JQuery-tree
- D3 – CSV



The image shows the header of the vis.js website. At the top is a dark blue navigation bar with links: vis.js, Modules, Download, Showcase, Contribute, and License. Below this is a large banner with a blue and yellow background. On the left, three stylized blue eyes with yellow pupils are looking towards the right. On the right, the text 'vis.js' is written in a large, white, sans-serif font. Below the text, a paragraph describes the library: 'A dynamic, browser based visualization library. The library is designed to handle large amounts of dynamic data, and to enable manipulation of this data. The library consists of the components DataSet, Timeline, Network, and ForceLayout. More information is available here!'. Below the banner, there are two examples of visualizations. On the left is a 'Network' visualization showing a complex graph with blue nodes and edges. On the right is a 'Timeline' visualization showing a series of events represented by colored rectangles with flags, set against a timeline axis.

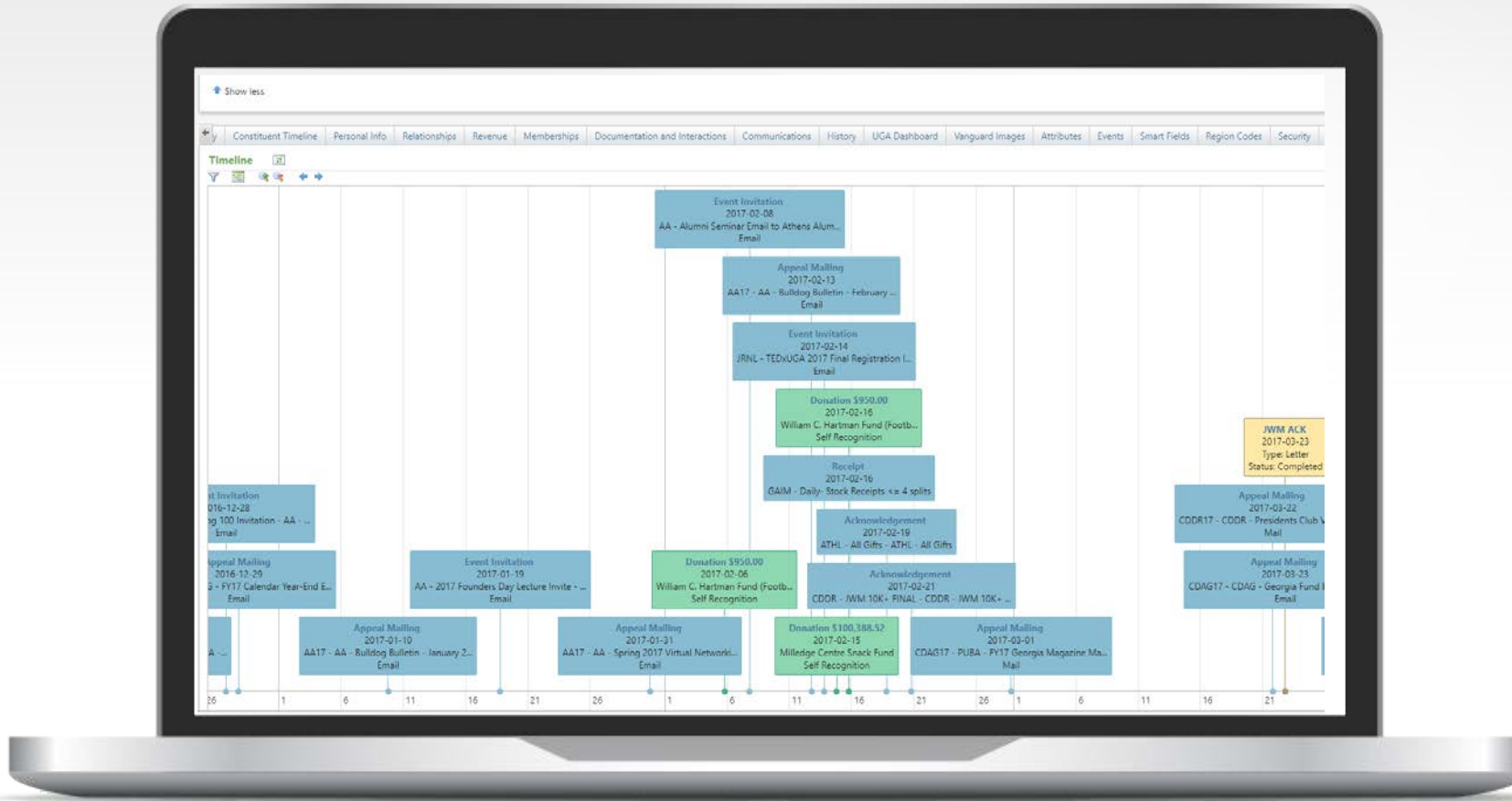
vis.js

A dynamic, browser based visualization library. The library is designed to handle large amounts of dynamic data, and to enable manipulation of this data. The library consists of the components DataSet, Timeline, Network, and ForceLayout. More information is available [here!](#)

Network

Timeline

Constituent Timeline Data Presented

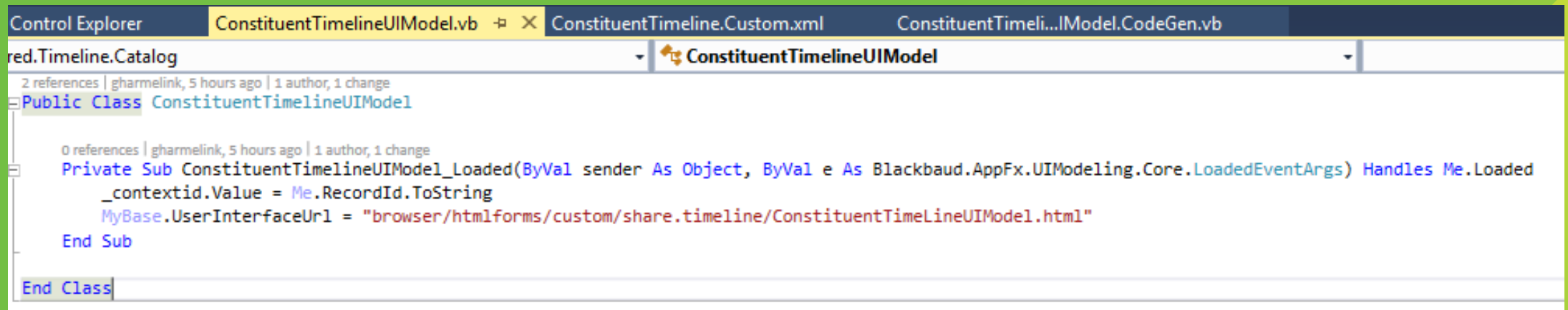


- **Recognition Credit**
 - Matching Gifts
 - Donations
 - Pledges
 - etc
- **Communications**
 - Event Invitations
 - Appeal Mailings
 - General Correspondence
 - Receipts
 - Acknowledgements
 - Online Confirmations
 - etc
- **Interactions**
 - Event Interactions
 - Letter
 - Emails
 - Visits
 - Phone Calls

Custom UI Model Metadata

```
<CustomUIModelMetadata
  xmlns="bb_appfx_customuimodelmetadata"
  xmlns:c="bb_appfx_commontypes"
  ID="31c12a45-08a4-41e9-a4cb-fb75aa2020c1"
  Name="Constituent Timeline"
  Description="Constituent Timeline Project (for sharing)"
  Author="UGA Development"
  FormHeader="Constituent Timeline">
  <FormMetaData xmlns="bb_appfx_commontypes">
    <FormFields>
      <FormField FieldID="CONTEXTID" Caption="Context ID" DataType="String" MaxLength="40" />
    </FormFields>
    <WebUIComponent>
      <UIModel AssemblyName="Shared.Timeline.Catalog.dll" ClassName="Shared.Timeline.Catalog.ConstituentTimelineUIModel" />
      <WebUI>
        <DefaultWebUI />
      </WebUI>
    </WebUIComponent>
  </FormMetaData>
</CustomUIModelMetadata>
```


Custom UI Model VB



```
Control Explorer | ConstituentTimelineUIModel.vb | ConstituentTimeline.Custom.xml | ConstituentTimeli...IModel.CodeGen.vb
red.Timeline.Catalog
2 references | gharmelink, 5 hours ago | 1 author, 1 change
Public Class ConstituentTimelineUIModel
    0 references | gharmelink, 5 hours ago | 1 author, 1 change
    Private Sub ConstituentTimelineUIModel_Loaded(ByVal sender As Object, ByVal e As Blackbaud.AppFx.UIModeling.Core.LoadedEventArgs) Handles Me.Loaded
        _contextid.Value = Me.RecordId.ToString
        MyBase.UserInterfaceUrl = "browser/htmlforms/custom/share.timeline/ConstituentTimeLineUIModel.html"
    End Sub
End Class
```

ConstituentTimeLineUIModel.html

```
<link rel="stylesheet" href="../../browser/htmlforms/custom/shared_resources/vis/vis.min.css">
<link rel="stylesheet" href="//code.jquery.com/ui/1.12.1/themes/base/jquery-ui.css">
<link rel="stylesheet" href="../../browser/htmlforms/custom/shared_resources/vis/vis-timeline-graph2d.min.css">
<link rel="stylesheet" href="../../browser/htmlforms/custom/shared_resources/treemaster/css/jquery.tree.css">
</style>
<!-- styles for activity spinner -->
</style>
<!-- styles for timeline filter modal -->
</style>
</div>
<div>
    <div class="menu">
        
        <span style="width:80px;">&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&~</span>
        <input type="hidden" id="#MAP#datepicker" >
        <span style="width:80px;">&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&~</span>
        
        
        <span style="width:80px;">&nbsp;&nbsp;&nbsp;&nbsp;&~</span>
        
        
    </div>
    <div id="#MAP#myModal">
        <div id="#MAP#treediv" >
            <div class="treemaster">
                <ul>
                    <li id="#MAP#recognitionList"><input type="checkbox" id="#MAP#recognitionCheck" ><span>Recognition Credit</span>
                    <li id="#MAP#communicationList"><input type="checkbox" id="#MAP#communicationCheck" ><span>Communication</span>
                    <li id="#MAP#interactionList"><input type="checkbox" id="#MAP#interactionCheck" ><span>Interactions</span>
                </ul>
            </div>
        </div>
    </div>
    <!--
not sure if this is needed anymore
<iframe id="txtAreal" style="display:none"></iframe>
-->
    <div id="#MAP#output" style="white-space:nowrap;width: 1488px;">
    <div style="height:350px;"></div><!--this div is so that the filters don't get cut off -->
</div>
<!--SCRIPT:/browser/htmlforms/custom/shared_resources/jqueryui/jquery-ui.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/shared_resources/treemaster/js/jquery.tree.js-->
<!--SCRIPT:/browser/htmlforms/custom/shared_resources/d3/d3.v4.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/share.timeline/ConstituentTimelineUIModel.js-->
```

[link to source code]

ConstituentTimeLineUIModel.js

```
//recognitions
d3.csv(container.fixUrl("/util/DataList.ashx?DatabaseName=BBInfinity&dataListID="+recognitionDatalistID+"&Context="),
    function(error, rows) {
        //recognitions
        d3.csv(container.fixUrl("/util/DataList.ashx?DatabaseName=BBInfinity&dataListID="+recognitionDatalistID+"&Context="),
            function(error, rows) {
                //recognitions
                convDate(d.DATE),
                d["AMOUNT"],
                d["APPLICATIONCODE"],
                truncateString(d["DETAIL"],30),
                d["RECOGNITIONCREDITTYPE"],
                d["ID"]
            }
        );
    }
);

.get(function(error, rows) {
    //interactions
    d3.csv(container.fixUrl("/util/DataList.ashx?DatabaseName=BBInfinity&dataListID="+interactionDatalistID+"&Context="),
        function(error, rows) {
            //interactions
            convDate(d.DATE),
            d["CATEGORY"],
            d["STATUS"],
            truncateString(d["OBJECTIVE"],30),
            d["OWNER"],
            d["ID"],
            d["SUBCATEGORY"],
            d["TYPE"]
        }
    );
});

.get(function(error, interactions) {
    //communications
    d3.csv(container.fixUrl("/util/DataList.ashx?DatabaseName=BBInfinity&dataListID="+communicationDatalistID+"&Context="),
        function(error, rows) {
            //communications
            convDate(d.DATESENT),
            d["CHANNEL"],
            truncateString(d["DETAILS"],40),
            d["CORRESPONDENCETYPE"],
            d["ID"],
            d["PREVIEWDATAFORMRECORDID"],
            d["CORRESPONDENCETYPECODE"],
            d["RECORDID"]
        }
    );
});

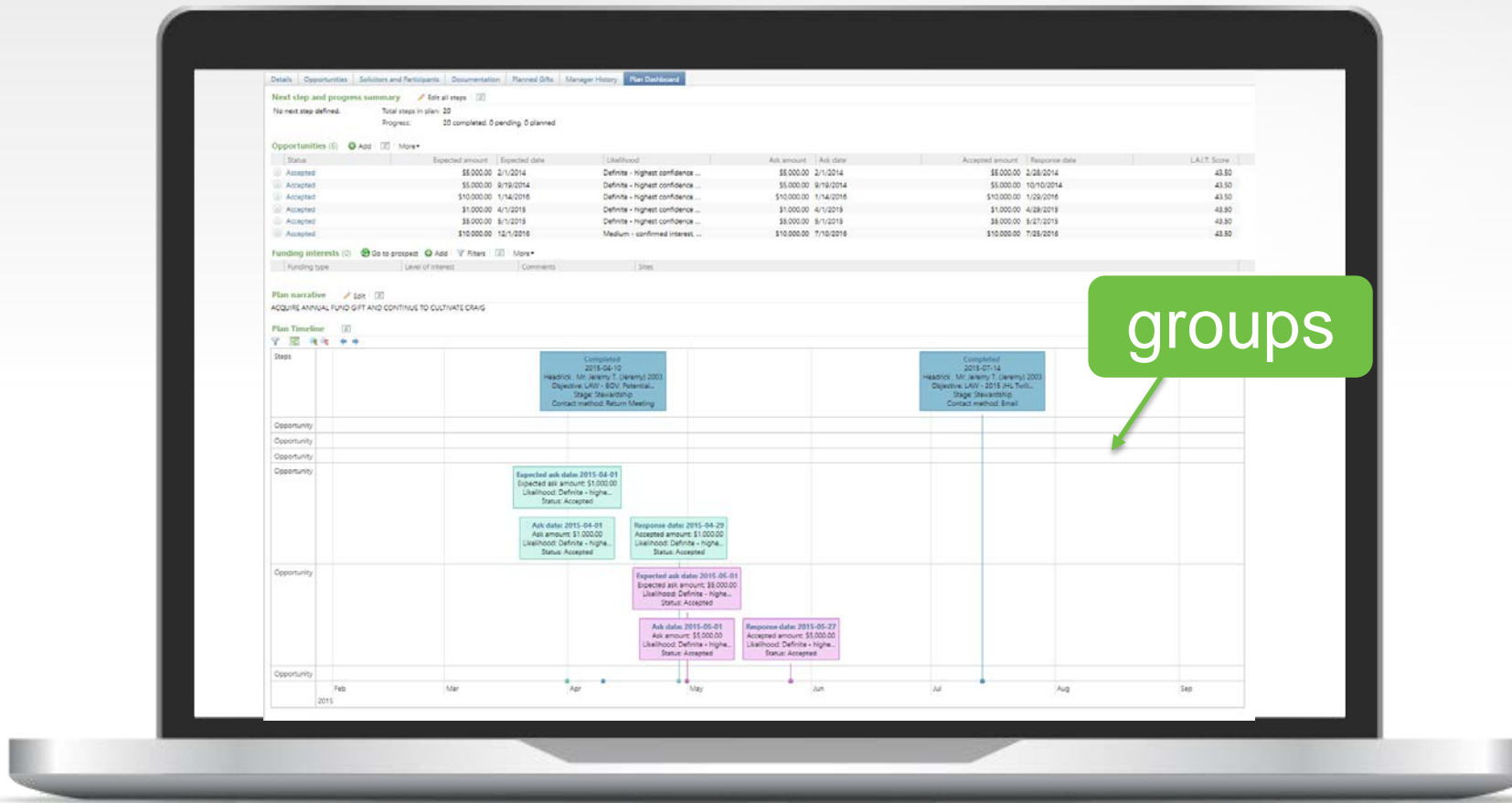
.get(function(error, communications) {
    $.getScript( "../browser/htmlforms/custom/shared_resources/vis/vis.js", function( data, text ) {
        // DOM element where the Timeline will be attached
        var container = document.getElementById(util.getMappedElId(modelInstanceId, "output"));
    });
});
```

[link to source code]



Timeline Demo

Other utilization of vis.js: Plan Dashboard



- **Steps / Interactions**
 - Pending
 - Completed
- **Opportunities**
 - Expected ask date
 - Ask date
 - Response date
 - Committed date

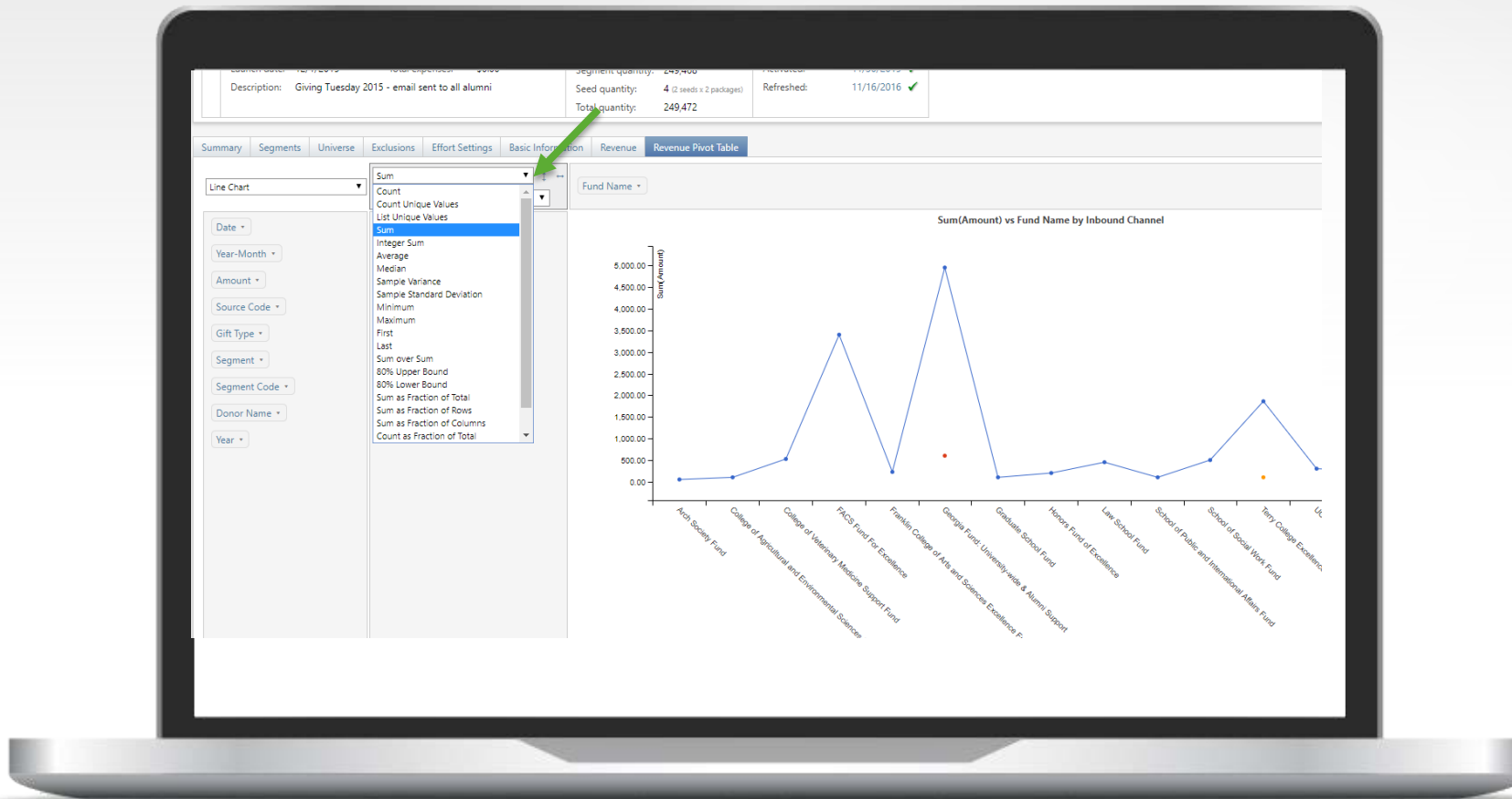
Possible Future Enhancements

- Lazy loading of data to improve performance
- Ability to work on group members
- Links to email templates of received emails
- Sticky default options
- Additional data
 - Email opens / clicks
 - Event registrations / attendances



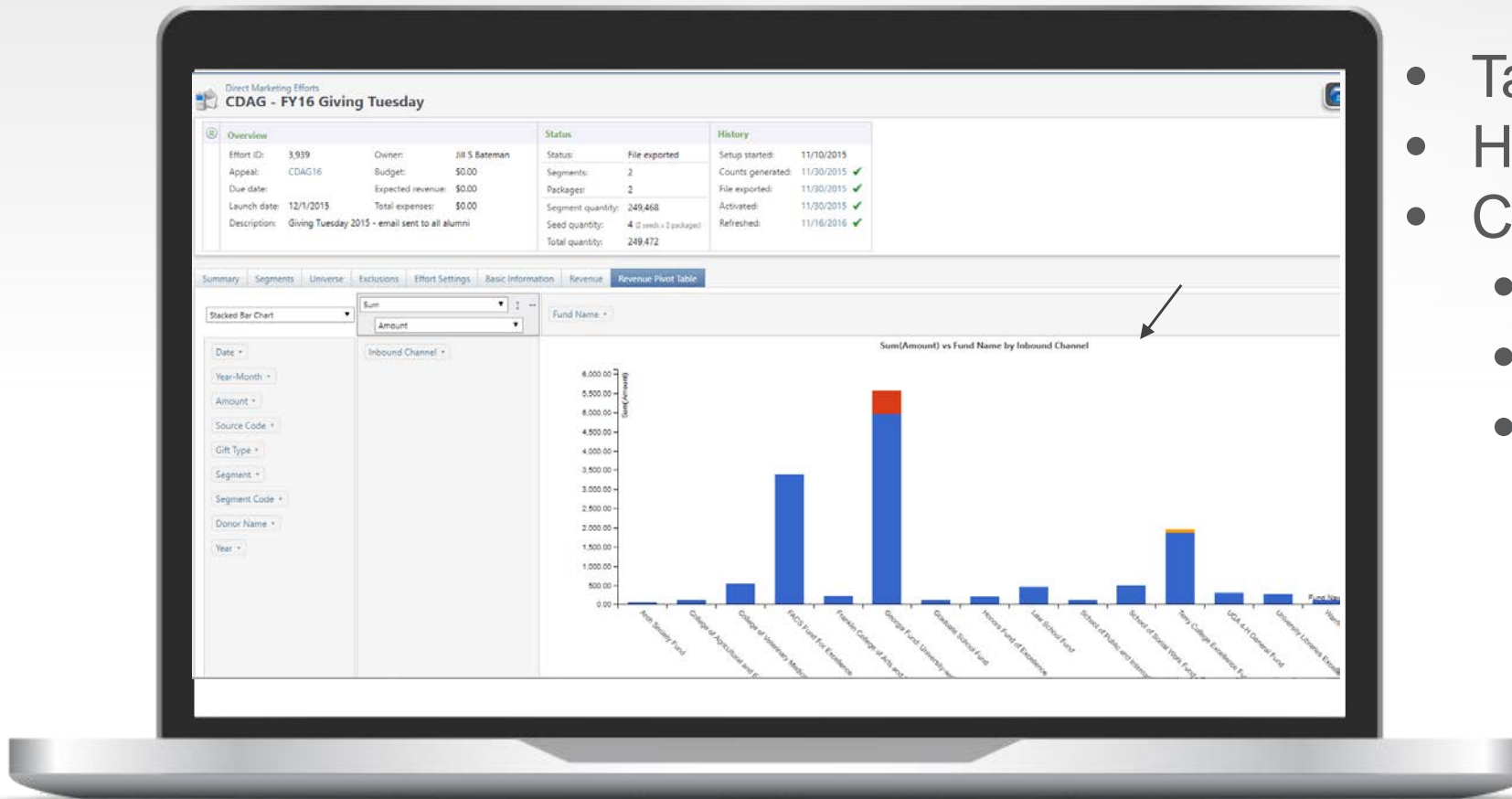
Pivot Table

Pivot Table Aggregators



- **Count**
- Count Unique Values
- List Unique Values
- **Sum**
- Integer Sum
- **Average**
- Median
- Sample Variance
- Sample Standard Deviation
- Minimum
- Maximum
- First
- Last
- ...
- Custom Aggregators

Pivot Table Renderers



- Tables
- Heatmaps
- C3 / D3
 - Bar Charts
 - Line Charts
 - Area Charts

Components Used

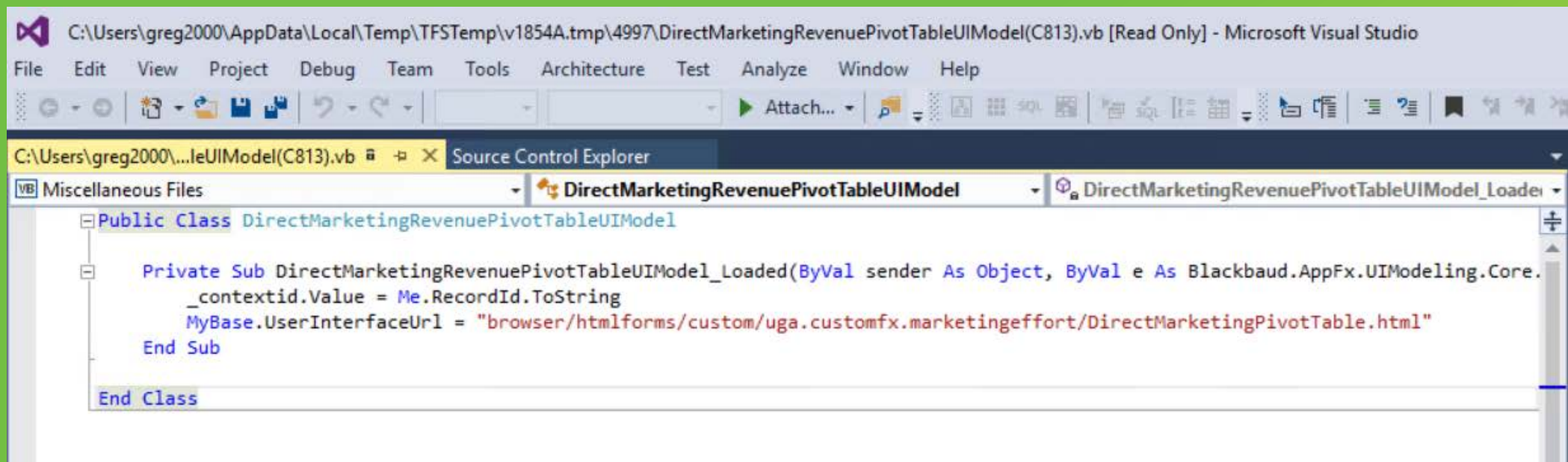
- Custom UI Model
 - DirectMarketingPivotTable.html
 - DirectMarketingPivotTable.js
- Pre-existing Data List
- [pivottable.js](#)
- [D3](#) – extensive visualization library
- [C3](#) – wrapper for D3

```
1 (function() {
2   var callWithjQuery,
3     indexOf = [].indexOf || function(item) { for (var i = 0, l =
4     slice = [].slice,
5     bind = function(fn, me){ return function(){ return fn.apply(
6     hasProp = {}.hasOwnProperty;
7
8   callWithjQuery = function(pivotModule) {
9     if (typeof exports === "object" && typeof module === "object"
10       return pivotModule(require("jquery"));
11   } else if (typeof define === "function" && define.amd) {
12     return define(["jquery"], pivotModule);
13   } else {
14     return pivotModule(jQuery);
15   }
16 };
17
18 callWithjQuery(function($) {
19
20   /*
21   Utilities
22   */
23   var PivotData, addSeparators, aggregatorTemplates, aggregator
24   addSeparators = function(nStr, thousandsSep, decimalSep) {
25     var rgx, x, x1, x2;
26     nStr += '';
27     x = nStr.split('.');
28     x1 = x[0];
29     x2 = x.length > 1 ? decimalSep + x[1] : '';
30     rgx = /(\d+)(\d{3})/;
31     while (rgx.test(x1)) {
32       x1 = x1.replace(rgx, '$1' + thousandsSep + '$2');
33     }
34     return x1 + x2;
35   };
36   numberFormat = function(opts) {
37     var defaults;
38     defaults = {
39       digitsAfterDecimal: 2,
40       scaler: 1,
```

Custom UI Model Metadata

```
<CustomUIModelMetadata
  xmlns="bb_appfx_customuimodelmetadata"
  xmlns:c="bb_appfx_commontypes"
  ID="f7bd16d3-ade0-4c64-ab41-6bc4e0f4dc37"
  Name="Direct Marketing Revenue Pivot Table"
  Description="Pivot Table for Direct Marketing Revenue"
  Author="UGA Development"
  FormHeader="Direct Marketing Revenue Pivot Table"
>
<FormMetaData xmlns="bb_appfx_commontypes">
  <FormFields>
    <FormField FieldID="CONTEXTID" Caption="Context ID" DataType="String" MaxL
  </FormFields>
  <WebUIComponent>
    <UIModel AssemblyName="UGA.CustomFx.MarketingEffort.Catalog.dll" ClassNam
    <WebUI>
      <ExternalResource Url="browser/htmlforms/custom/uga.customfx.marketing
    </WebUI>
  </WebUIComponent>
</FormMetaData>
</CustomUIModelMetadata>
```


Custom UI Model VB



The screenshot shows the Microsoft Visual Studio IDE. The title bar indicates the file path: C:\Users\greg2000\AppData\Local\Temp\TFSTemp\v1854A.tmp\4997\DirectMarketingRevenuePivotTableUIModel(C813).vb [Read Only] - Microsoft Visual Studio. The menu bar includes File, Edit, View, Project, Debug, Team, Tools, Architecture, Test, Analyze, Window, and Help. The toolbar contains various icons for file operations and development tools. The Source Control Explorer pane is visible, showing the project structure with 'Miscellaneous Files' expanded. The main code editor displays the following VB.NET code:

```
Public Class DirectMarketingRevenuePivotTableUIModel

    Private Sub DirectMarketingRevenuePivotTableUIModel_Loaded(ByVal sender As Object, ByVal e As Blackbaud.AppFx.UIModeling.Core.
        _contextid.Value = Me.RecordId.ToString
        MyBase.UserInterfaceUrl = "browser/htmlforms/custom/uga.customfx.marketingeffort/DirectMarketingPivotTable.html"
    End Sub

End Class
```


DirectMarketingPivotTable.html

```
<link rel="stylesheet" href="../../browser/htmlforms/custom/jquery/jquery-ui.1.12.1.css">
<link rel="stylesheet" href="../../browser/htmlforms/custom/pivottable/pivot.min.css">
<link rel="stylesheet" href="../../browser/htmlforms/custom/c3/c3.min.css">
<style>
  .pvtFilteredAttribute{color:red;}
  .pvtAxisContainer {background:#f5f5f5;border:1px solid #cccccc;}
  .pvtAttr {color:#477AA2;font-family: 'Lucida Grande','Segoe UI',Helvetica,Arial,sans-serif;}
  .pvtUi {color:#444;font-family: 'Lucida Grande','Segoe UI',Helvetica,Arial,sans-serif;font-size:12px!important;}
  .pvtCheckContainer {color:#444;font-family: 'Lucida Grande','Segoe UI',Helvetica,Arial,sans-serif;font-size:12px!important;}
  .pvtFilteredAttribute .pvtAttr {color:red!important;}
  .pvtUi h4 {color: #73AB60;font-family: 'Lucida Grande','Segoe UI',Helvetica,Arial,sans-serif;}
  .pvtAxisLabel, .pvtColLabel, .pvtTotalLabel {font-weight:bold;}
</style>
<div style="overflow-x:auto;">
  <div id="#MAP#output" style="white-space:nowrap;"></div>
  <div style="height:200px;"><!--this div is so that the filters don't get cut off -->
</div>
<!--SCRIPT:/browser/htmlforms/custom/pivottable/jquery-ui.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/d3/d3.v4.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/c3/c3.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/pivottable/pivot.min.js-->
<!--SCRIPT:/browser/htmlforms/custom/pivottable/c3_renderers.js-->
<!--SCRIPT:/browser/htmlforms/custom/uga.customfx.marketingeffort/DirectMarketingPivotTable.js-->
```

DirectMarketingPivotTable.js

```
});  
(function (container, modelInstanceId) {  
    var util = BBUI.forms.Utility  
    var actionhost = BBUI.pages.ActionHost;  
    CONTEXTID = container.getFieldByName("CONTEXTID", modelInstanceId).value;  
    d3.csv(container.fixUrl("/util/DataList.ashx?DatabaseName=BBInfinity&dataListID=976314ae-97be-4673-bd21-394c61609a06&ContextRecord  
    .row(function(d) { return [d.Date, +d.Amount.replace("$", "").replace(",",""),d["GiftType"],d["InboundChannel"],d["Segment"],d["Seg  
    .get(function(error, rows) {  
        rows.unshift(["Date","Amount","GiftType","InboundChannel","Segment","SegmentCode","FundName","FormattedName","SourceCode"]);  
        //recaption fields  
        rows[0][2]='Gift Type';  
        rows[0][3]='Inbound Channel';  
        rows[0][5]='Segment Code';  
        rows[0][6]='Fund Name';  
        rows[0][7]='Donor Name';  
        rows[0][8]='Source Code';  
  
        //replace empty values with 'N/A'  
        $.each(rows, function( index, value ) {  
            $.each(rows[index], function( index2, value2 ) {  
                if(rows[index][index2]== ""){  
                    rows[index][index2]="N/A";  
                }  
            } );  
        } );  
    });  
});
```

DirectMarketingPivotTable.js continued

```
var dateFormat = $.pivotUtilities.derivers.dateFormat;
var renderers = $.extend($.pivotUtilities.renderers, $.pivotUtilities.c3_renderers);
delete renderers['Scatter Chart']; //removing because this doesn't work that well

$("#" + util.getMappedElId(modelInstanceId, "output")).pivotUI(
  rows, {
    rows: ["InboundChannel", "GiftType"],
    cols: ["Year-Month"],
    vals: ["Amount"], //default aggregator field
    aggregatorName: "Sum", //default aggregator
    rendererOptions: { //default renderer
      c3: {
        size: { height: 600, width: $(".bbui-pages-pagesection").width() - $(".pvtVals").width() - $(".pvtRenderer").width() - 500 },
        padding: {
          top: 20,
          right: 100,
          bottom: 30,
          left: 100,
        }
      }
    },
    derivedAttributes: {
      "Year-Month": dateFormat("Date", "%y-%m", true),
      "Year": dateFormat("Date", "%y", true)
    },
    renderers: renderers,
    rendererName: "Stacked Bar Chart",
    onRefresh: function() {
      //there is some bug when used in gail. This removes the artifacts from that bug.
      $('th:contains("this.splice")').remove();
    }
  }
);

handles resize
window.resize(function() {
```



Pivot Table Demo

Worth consideration

- Expands toolset beyond reports, data lists, data forms, etc
- Can compliment platforms like Tableau, Power BI, Qlik
- Relatively Portable Solutions
- Low risk / investment to try
- Community
- Flexibility
- Mix and match
- Utilize organizational resources that are not that as familiar with SDK





Thank you!

Contact me



@GregHarmelink



Facebook.com/harmelink



linkedin.com/in/greg-harmelink

greg2000@uga.edu

Resources

- <http://visjs.org>
- <https://pivottable.js.org>
- <https://d3js.org>
- <http://c3js.org/>
- <https://github.com/daredev el/jquery-tree>
- [Link to Timeline Code]