How to Tell the Best Story with Your Data Using SAS® Visual Analytics Graph Builder

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ABSTRACT

How do you engage your report viewer on an emotional and intellectual level and tell the story of your data? You create a perfect graphic to tell that story using SAS® Visual Analytics Graph Builder. This paper takes you on a journey by combining and manipulating graphs to refine your data's best possible story. This paper shows how layering visualizations can create powerful and insightful viewpoints on your data. You see how to create multiple overlay graphs, single graphs with custom options, data-driven lattice graphs, and user-defined lattice graphs to vastly enhance the story-telling power of your reports and dashboards. Some examples of custom graphs covered in this paper are resource timelines combined with scatter plots and bubble plots to enhance project reporting, butterfly charts combined with bubble plots to provide a new way to show demographic data, and bubble change plots to highlight the journey your data has traveled. This paper stretches your imagination and showcase the "art of the possible" and will take your dashboard from mediocre to miraculous. You will definitely want to share your creative graph templates with your colleagues in the global SAS® community.

INTENDED AUDIENCE

This paper is aimed at SAS® Visual Analytics users who create and design reports and dashboards for their users. Managers can also use this paper to get an idea of what their teams can create and design with SAS® Visual Analytics.

INTRODUCTION

A colleague called me over one day in 2014 to talk me through the following visualization as he prepared for a modernization roadshow event in Australia's capital, Canberra. He said to me, "This is neat, and a great example of the power of SAS/GRAPH® software"
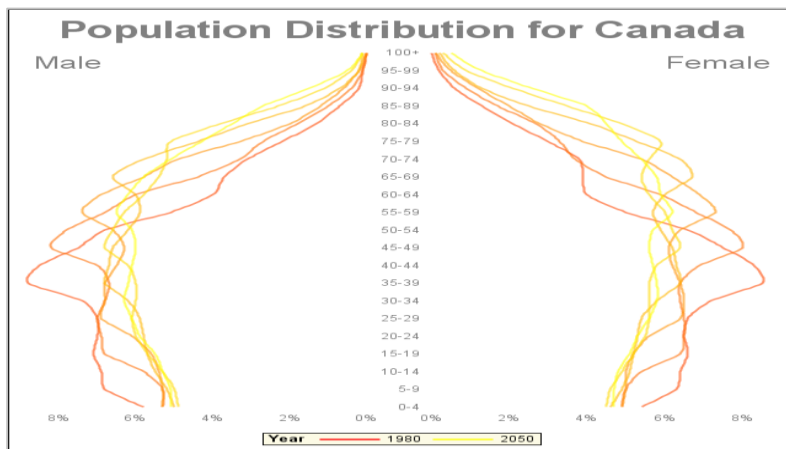

Figure 1. SAS/GRAPH® Generated Graph – Canada Population Distribution (Source: US Census, 2014)

He went on to explain to me that each selected year is represented by a line and you can see the pattern of age by gender for Canada over time and for the projected future. He had created one of these visualizations for about 10 different countries across the globe. He was showing the behavior of these populations versus the world events as part of his roadshow presentation. My response to my colleague

was, "I agree; it is a great visual. I will try to create this using the new custom graph builder in SAS® Visual Analytics." Less than an hour later, I had the following visualization:
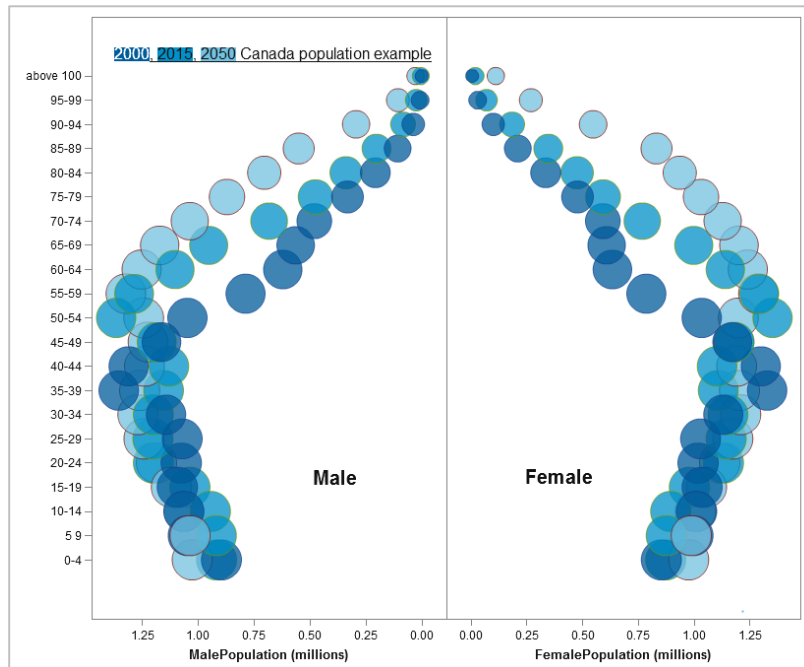

Figure 2. SAS® Visual Analytics Custom Graph Example – Canada Population Distribution (Source: US Census, 2014)

Although not a copy of the original graph, I think the graph from SAS® Visual Analytics delivers on the goal and provides a great way to look at gender information over time. Bubble size adds an additional variable to be analyzed; in this example it is the population percentage.

This use of the SAS® Visual Analytics started me on a quest to twist SAS® Visual Analytics into many shapes, colors, and styles and to tell the best story with my data. There are many quotations about data visualization (from many people smarter than I) that espouse the value in seeing patterns in your data. Looking for exceptions is easier with easy-to-consume visuals. From my experience in working with customers to implement scorecard projects, dashboard projects, and data warehouses, I believe that the true value in these projects is that the business teams and the executive get to see and interact with their data. They know the best story to tell from their data, because they know the subject matter and the primary business problems that needed to be solved or supported with this information. In this paper you get practical examples and you see that the custom graph builder in SAS® Visual Analytics provides you with more options to tell the best story with your data.

WHAT IS THE VALUE OF THE PERFECT GRAPHIC?

The famous mathematician John Tukey once said, "The greatest value of a picture is when it forces us to notice what we never expected to see." (Tukey, 1977, p. iv) This quotation captures the spirit of telling the best story your data can tell. This concept is not new, and is not just about how "flashy" something is. In fact, it is not essential that the graph be attractive; rather, the story or insight it brings to us is much more important.

Traditionally, analysts have required tabular data. However, as data volumes have become much larger, the amount of data is too large to make sense of by scanning a table of data. In recent years, data visualization software has been developed to assist with the shift to telling stories with the data and getting insight that was previously unattainable. SAS® Visual Analytics has multiple use cases that range from big data discovery to big data dashboards. It helps many organizations design and deliver information products to their business teams in record time. A cookie-cutter approach to deliver reports based on the data can take you only so far. Your visualization software needs to be flexible, yet simple, to adapt to your story. SAS® Visual Analytics provides great features to help you tell the best story with your

data, including animations to bring the data to life, analytics to gain additional insight, and the custom graph builder, which is the focus of this paper. All of these features enable the business user to craft a powerful visualization for the data and to unlock the value of the data.

There are many papers written about the best colors and the most powerful positions for graph elements to use in reports, to ensure maximum impact. I leave these topics to the experts in psychology and design. This paper targets users and managers who want to get the most from the SAS® Visual Analytics software.

AN OVERVIEW OF SAS® VISUAL ANALYTICS

SAS® Visual Analytics provides true self-service, which is the key to creating a culture of analytics. SAS® Visual Analytics enables your business teams to tell a story with their data. Users can prototype quickly, and can collaborate and share insights with easy-to-use, drag-and-drop functionality on data of any size. SAS® Visual Analytics is business intelligence software that transforms your data into insight that can be acted upon. It can be challenging for an organization to choose a reporting solution that leaves room to mature and grow into more advanced use of analytics. SAS® Visual Analytics provides users with data visualizations that are underpinned with analytics.

As business users start to solve business problems with analytics, their skills grow. Although many users are satisfied with learning to use basic analytics, others embrace the analytic and data mining capabilities available to users of a broader SAS solution such as SAS® Visual Statistics. You can enable your business to move from reactive decisions to proactive decisions with SAS® Visual Analytics.

SAS® Visual Analytics provides a complete set of tools so that anyone across your organization can derive insight from all available data, as shown in Figure 3. With easy to use, drag-and-drop features, SAS® Visual Analytics incorporates very clear and effective explanations of powerful analytic functions, including correlation analysis, forecasting, text analysis, decision trees, and more to give business users a full understanding of the relationships within their data.

Insights created using SAS® Visual Analytics can be quickly shared via the web, email, and mobile devices. SAS is enabling information sharing and deeper analysis for a wide range of information consumers including executives, business users, data scientists, managers, and analysts.
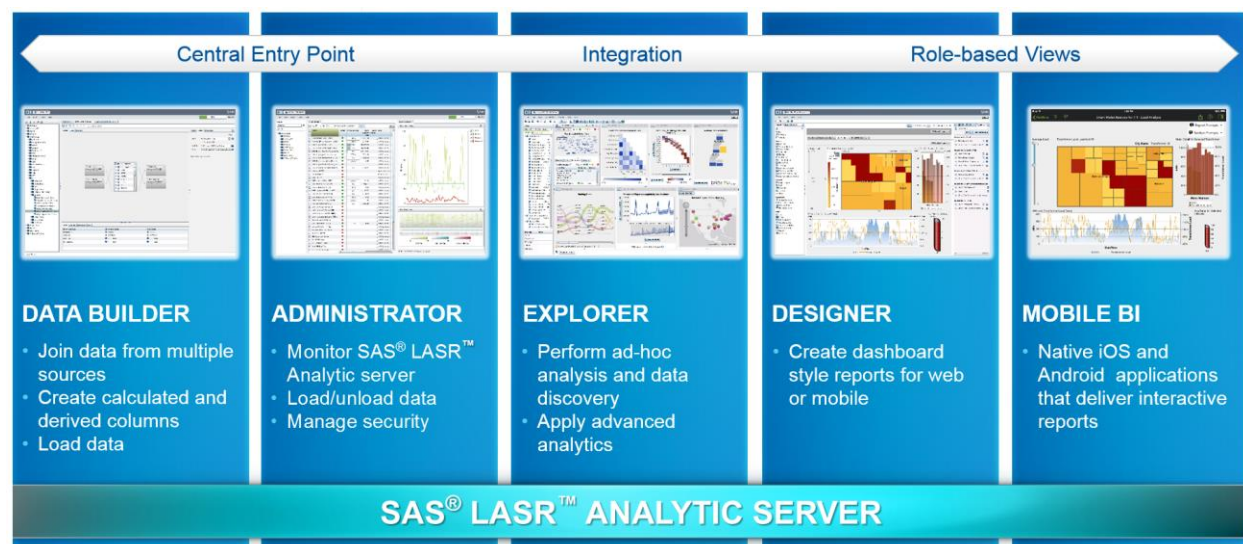

Figure 3. SAS® Visual Analytics: Capability Overview

WHAT IS THE CUSTOM GRAPH BUILDER?

The SAS® Visual Analytics Graph Builder is an application included with SAS® Visual Analytics. It enables users to create custom graph objects, which can be used when designing reports using the SAS® Visual Analytics Designer. With the report designer, you can build reports that can tell a better

story with your data. Notice that the custom graph builder is not shown in Figure 3. It is best to consider it a configuration extension to the designer. Not every user creates custom graphs, but many do use these custom graphs in creating their reports and dashboards. Users can use the custom graph builder to change the layout, modify data roles and settings, and add new graphs to an existing graph (as a layer or in a grid design), as shown in Figure 5. You do not associate real data when you design the graph in the custom graph builder. Rather, you design a template object that can be used with your real data when you are designing your report using the report designer as shown in Figure 4 below. Using the custom graph builder, the report designers can create precise graphs for the business teams to interact with and tell stories with the data.

Figure 4. SAS Visual Analytics Report Designer: Design and Build Reports and Dashboards
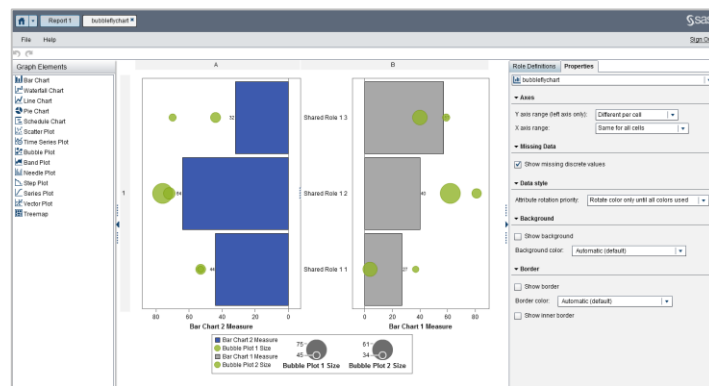
Figure 5. SAS Visual Analytics Custom Graph Builder: Design Graph Templates to Be Used as Objects in the Designer

HISTORY OF THE CUSTOM GRAPH BUILDER IN SAS® VISUAL ANALYTICS

SAS® Visual Analytics 6.2 included an undocumented shortcut to invoke the early version of a custom graph builder. Although this was preproduction, it showed where SAS was heading with this feature. SAS® Visual Analytics 6.3 included the first official release of custom graph builder. This version was a great first step to allow editing of graph objects. It included some graphs that were not included in the default list of graphs in the report designer. SAS® Visual Analytics 6.4 and 7.1 brought more graphs and properties for the user to set, and added a graph gallery for a quick start option for users. These new features make the custom graph builder more flexible and easier to access and use. Users can be more productive, faster. Other components of SAS® Visual Analytics such as the SAS® Mobile BI application and the SAS® Add-In for Microsoft Office are also ready to display custom graphs. The custom graph builder is now an integral part of SAS® Visual Analytics, and it is ready to assist you in delivering creative and informative visualizations.

Last year, Ravi Devarajan wrote a great overview of the custom graph builder in SAS® Visual Analytics 6.3. (See Recommended Reading.) This is a great reference, along with the online SAS® Visual Analytics: User's Guide, which provides a better understanding of all the elements within the custom graph builder. This paper builds on that overview by combining some of the use cases I have found for the custom graph builder in later releases.

ACCESSING THE GRAPH BUILDER

You can now access the custom graph builder from the icon at the top of the Objects tab in the SAS® Visual Analytics report designer, as seen in Figure 6 below. Access to the custom graph builder is controlled by security in SAS® Visual Analytics. The capability that controls access to the graph builder is

Build Custom Graph and can be assigned at the role level, just like many capabilities in SAS® Visual Analytics.
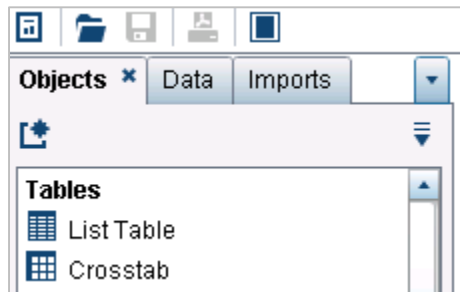

Figure 6. SAS® Visual Analytics Report Designer: Objects Tab with Icon to Create a New Custom Graph

This method is one of multiple ways to launch the custom graph builder application. When you are first opening the custom graph builder, the latest release now provides a quick-start graph gallery window, as seen in Figure 7. This graph gallery places the custom graphs into categories for easy access. These categories provide the structure for the rest of this paper, because they provide a logical way to discuss the graphs and their attributes. The graph gallery also provides a great shortcut to getting more from the custom graph builder.
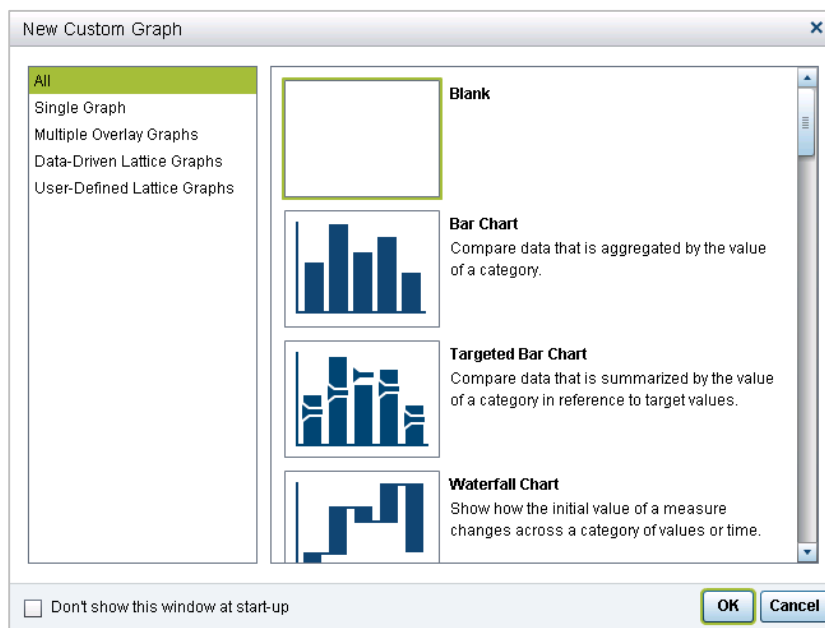
Figure 7. SAS® Visual Analytics Custom Graph Builder: Graph Gallery

The graph gallery groups common templates together and provides quick-start points to build from. The graphs in the gallery are grouped into the following types: Single Graph, Multiple Overlay Graphs, Data-Driven Lattice Graphs, and User-Defined Lattice Graphs. You can always start with a blank canvas to create your own masterpiece. In past releases, you had to create everything from a blank canvas, which meant it was harder to get started with the custom graph builder. The graph gallery is a welcome enhancement to the custom graph builder.

SHOW OR HIDE THE OBJECTS YOU HAVE CREATED

You can access any custom graphs via the show or hide objects option in the report designer. You can select or remove the required objects from the Objects tab, and add custom graphs as you need to with the *select custom* option, as seen below in Figure 8. In the latest release of SAS Visual Analytics you can

also show some default custom graphs that are available in the graph gallery, such as the vector plot, schedule chart, or the comparative time series plot.
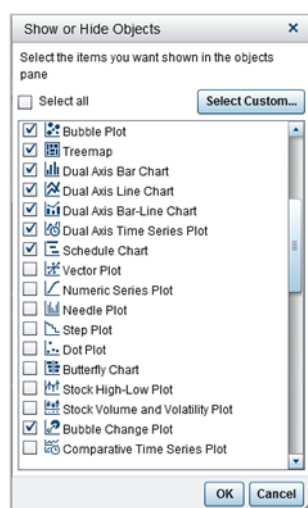

Figure 8. SAS® Visual Analytics Report Designer: Show or Hide Objects

Any custom graph template you create automatically shows in the report designer objects if it is saved to your *My Folder* location. This feature provides a really quick prototyping flow. You can develop, save, and then switch quickly to the report designer to see your data within your custom graph.

The following example steps you through adding a custom graph to use in the report designer. In this example, if you just want to accept the defaults of one of the existing graphs in the gallery, you can go to the show/hide menu and add the Bubble Change Plot, as shown in Figure 8. This bubble change plot is useful to show the data journey from beginning to end, and it tells a story about relative performance. For example, you might be interested in comparing last month's sales to this month's sales. The bubble change plot can show the sales figures for both months and the direction of the change.
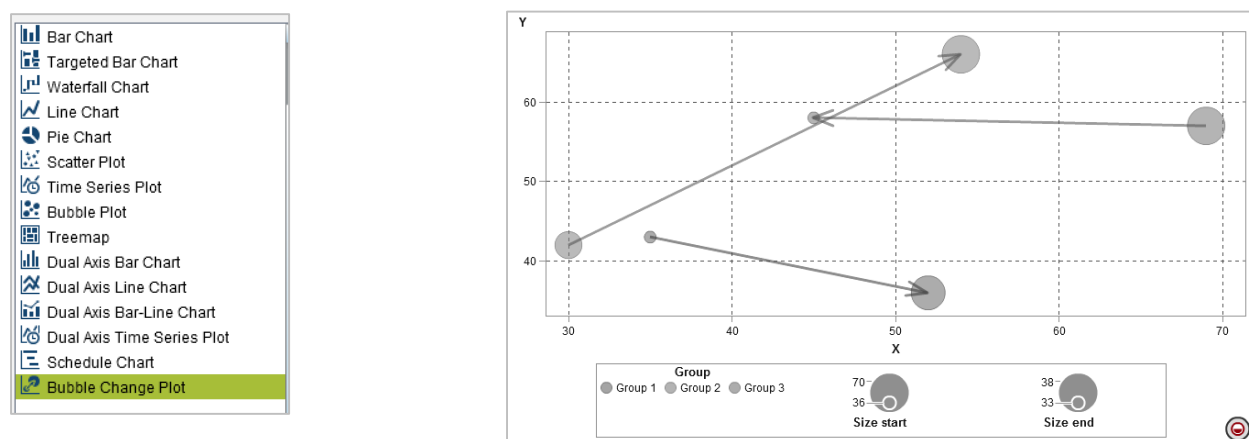
Figure 9. SAS® Visual Analytics – Report Designer – Objects Tab and Report Canvas

Even though you have not set any custom properties in this example, this graph is still leveraging the features of the custom graph builder. The bubble change plot consists of three graphs layered together: a vector plot and two bubble plots, as you can see above in Figure 9.

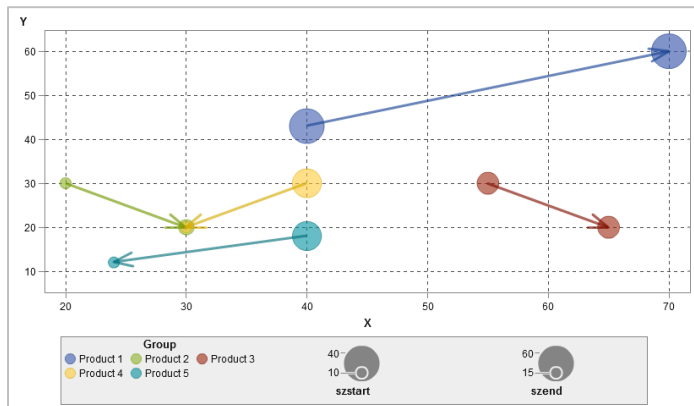Below in Figure 10 is the result when you add some sample sales data in the report designer.

Figure 10. SAS® Visual Analytics Report Designer: Bubble Change Plot with Example Data

In this sales data example, the x axis represents *number of units sold*, and Y axis represents *profit*, and the size of each bubble represents *cost per unit*. This data is showing last month's sales data compared to this month's sales data, and the direction of the change. You can quickly see that Product 1(blue bubble) increased in sales and earned more profit, whilst keeping *cost per unit* the same. Whereas, Products 4 (yellow bubble) and Product 5 (teal bubble) did poorly in sales over the same period. By having the ability to overlay graphs and use shared roles to display common data, you can now tell a very different story of your data than you could previously with a single graph object. For more on this example, see Appendix 1.

Here are some more examples of creating custom graphs to assist in telling the best story with your data using SAS® Visual Analytics.

SINGLE GRAPH

The power of the custom chart builder is not immediately obvious when creating a single graph, because you can already add single graphs using the report designer. Perhaps you need to create a new version of a graph that is already available in the designer. This could be a simple bar chart with custom properties to control how the data is displayed. The custom graph then becomes a reusable template for your broader team to leverage in their reports.

In this example we use a single schedule chart because this graph is not in the default list of objects in the report designer. The schedule chart can be used to display project data or block data that needs to be reported on. This data can include projects, marketing events, IT outages, and more. The example uses project phases as sample data, where phases of the project have a start and end date. The schedule chart is perfect to use for telling this story.

In the custom graph builder, as seen below in Figure 11, you see a preview of the graph object with sample data. The preview enables you to see the changes you make to the graph before you save your custom graph.
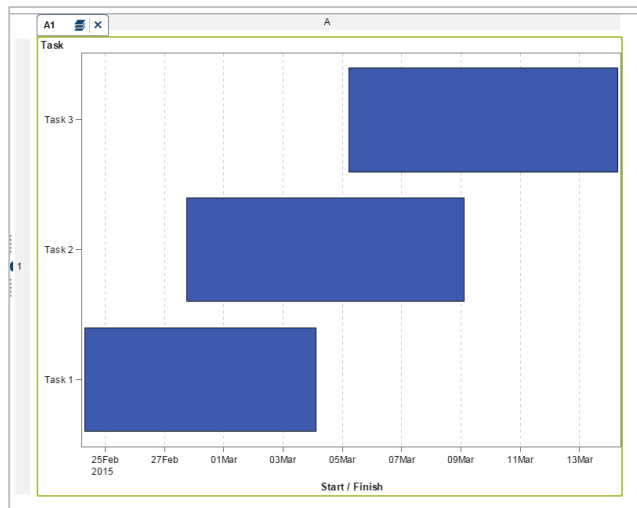
Figure 11. SAS® Visual Analytics Custom Graph Builder: Single Graph, Schedule Chart

Using the Properties and the Role Definitions tabs in the custom graph builder you can configure the graph to your preferences. You can set the display width of your schedule bars or edit and add roles that your data is to play in your graph.

Figure 12 shows what this graph looks like when you add it to your dashboard using the report designer in SAS® Visual Analytics. The schedule chart shows the project phases for your project. The chart is enhanced by using the display rules in the report designer to show which phases are on track or in need of more attention. The custom graph builder enables you to set many properties to refine the single graph even further, for example axis label behavior, or data roles such as additional data-driven tool tips. For more on how to create a single chart object, see Appendix 2.
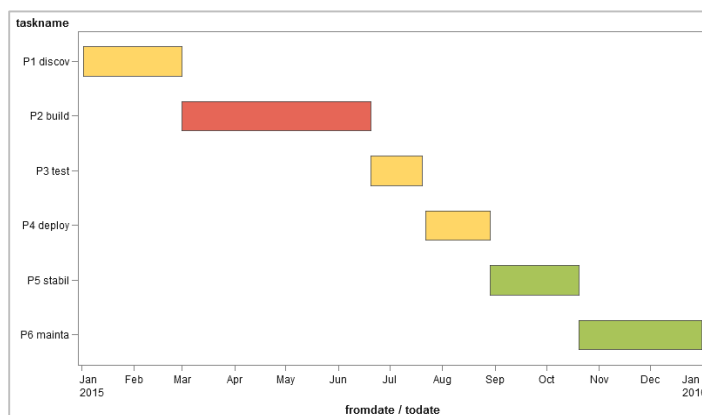
Figure 12. SAS® Visual Analytics Report Designer: Single Graph, Schedule Chart

MULTIPLE OVERLAY GRAPHS

In this example we extend the schedule chart graph created in the previous section. To enhance the schedule chart, we can add a layer such as a scatter plot or bubble plot to define more context and information about the chart regarding the projects we are working with. For example, when you overlay a bubble plot, you can gain additional insight such as the reporting date within a project phase, a key payment date where money needs to be paid or received, or any other milestone date in the project schedule. The dates can be combined with other metrics such as *headcount* or *cost*, to provide a clearer picture of the project performance or the project plan.

When you attempt to drag and drop an additional graph onto the existing graph, the report designer shows you whether the additional graph is permitted to be an overlay on the graph elements already in use. For example, we add a bubble plot over the existing schedule chart, as shown below in Figure 13.
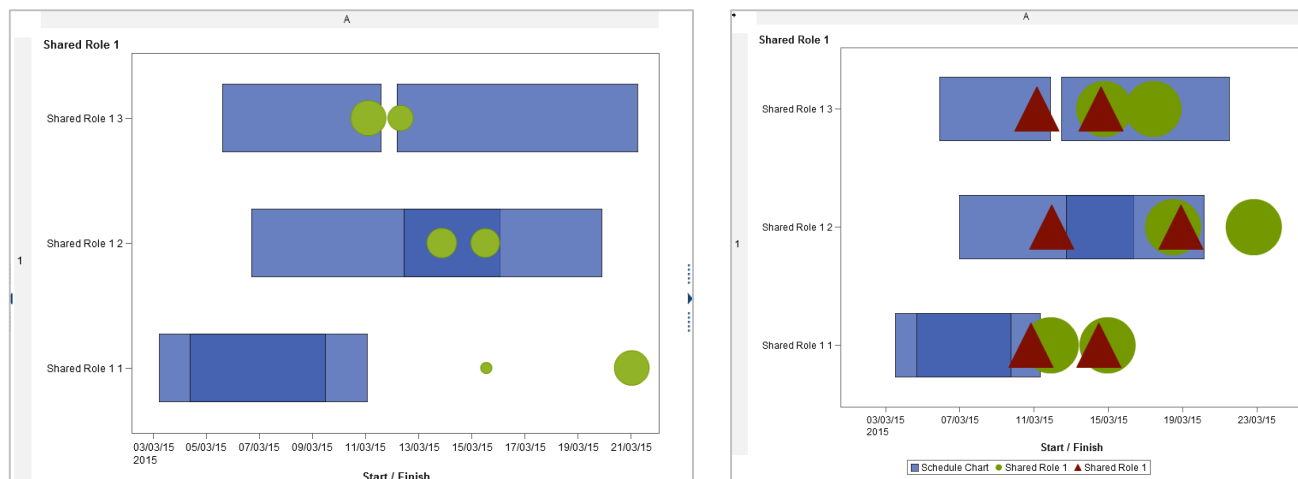

Figure 13. SAS® Visual Analytics Custom Graph Builder – Multiple Overlay Graphs – Schedule Chart with Bubble and Scatter Plot

As a result of enriching this graph with an additional overlay graph, we can add key milestones to better communicate the project data to our business stakeholders, as shown below in Figure 14.

In this example of the schedule chart with the example project data, you can now see exact project reporting dates by the placement of the bubble. The size of each bubble indicates the *number of resources allocated*, and the color in this example refers to the *costs* in the project. You can then consider other interactive options included in SAS® Visual Analytics report designer. You can add filters and hierarchies, or you can drill through to details so that the project stakeholders can get more insight into the project performance.

This custom graph can be enhanced further to tell a more precise story with your project and program data. For a guided example on how to create this custom graph, see Appendix 3.
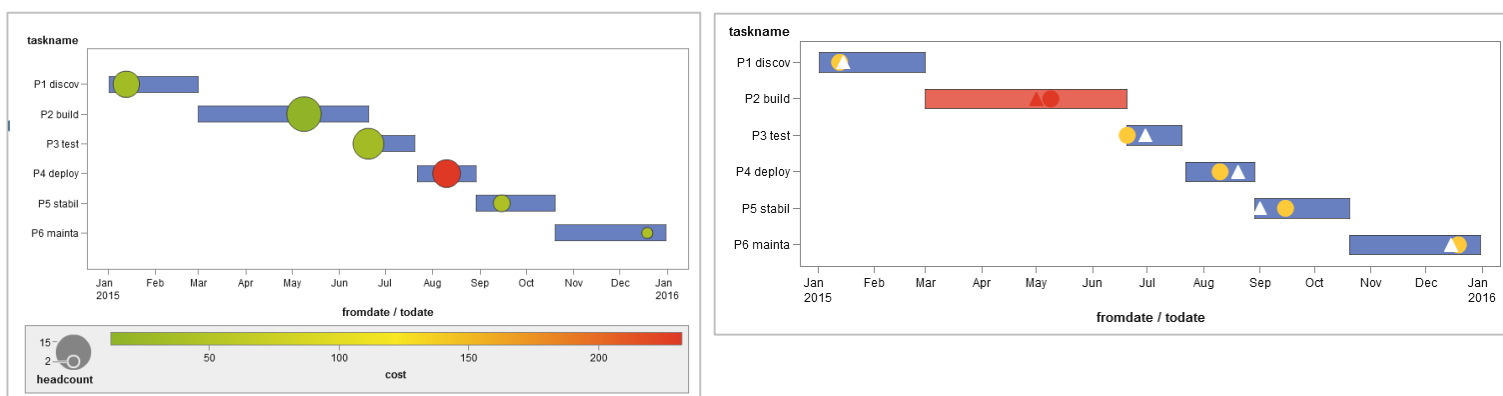
Figure 14. SAS® Visual Analytics Report Designer: Multiple Overlay Graphs (Two Examples)

DATA-DRIVEN LATTICE GRAPHS

Data-driven lattice graphs are graphs that get repeated for each row or column based on the data roles you provide to the custom graph builder. This custom graph also works as a single graph, until you provide roles for the lattice row or the lattice column. To add lattice rows to the custom schedule chart,

9

click Add Lattice Role on the Role Definitions tab in the custom graph builder. You could, for example, repeat your schedule chart for each project in the example data. This example builds on the last example, which uses the multiple overlay graph. You can now introduce a property to determine the lattice row and column of the graph.

As seen in Figure 15, the preview in the custom graph builder does not provide the lattice view preview. Therefore, to get an understanding of how it looks, you can save your custom graph and then add some data in the report designer to see if the lattice view matches your expectations.
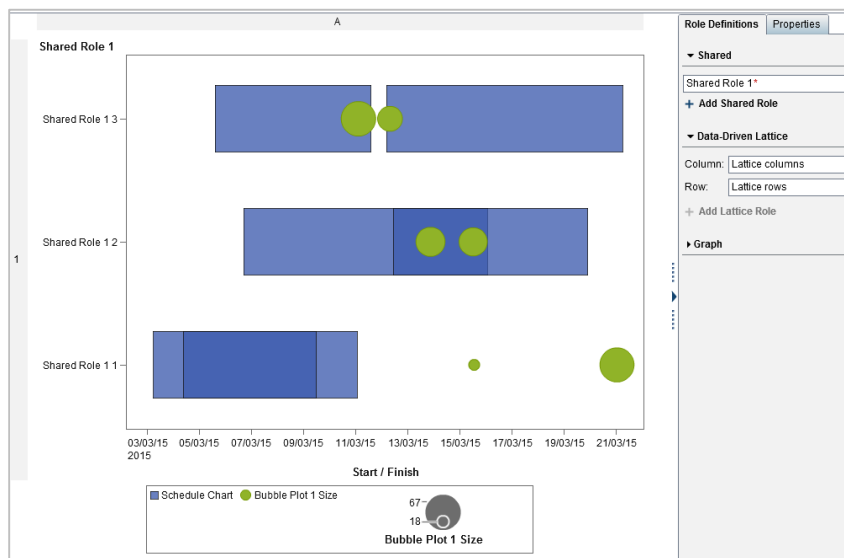
Figure 15. SAS® Visual Analytics Custom Graph Builder: Data-Driven Lattice Graphs

As seen in Figure 16 below, the graph repeats on a new row for each project in the example data set. The custom data-driven lattice graph supports the "design once and use many" principle for your organization. This option can help the report designer refine the story even further, and it can ensure that the report allows room for the data to grow and change, for example, as new projects get added to the data. For more details about how to create a data-driven lattice graph, see Appendix 4.
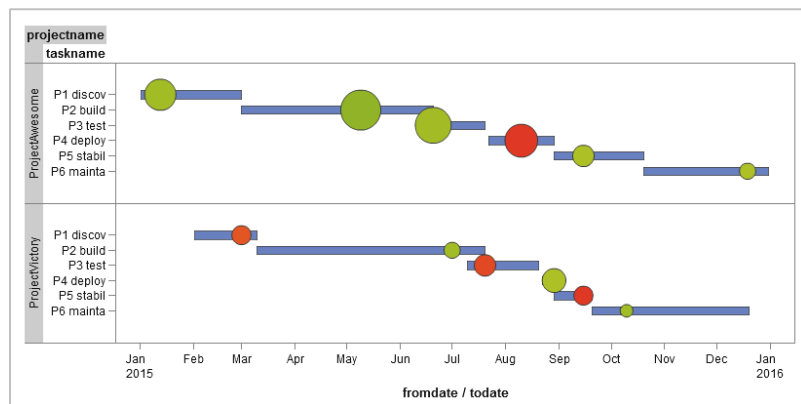
Figure 16. SAS® Visual Analytics Report Designer: Data-Driven Lattice Graphs

USER-DEFINED LATTICE GRAPHS

The user-defined lattice graphs satisfy a key use case for the custom graph builder. The need to create a unique looking graphic such as a butterfly chart is often what prompts the use of the custom graph builder. The butterfly chart is used by many SAS customers to display demographic information for a

common attribute, split by male and female metrics, to compare the population performance in a particular area.

The butterfly chart is really just two bar charts "stitched" together to perform common and unique data roles within one graph object. This chart can also be described as a user-defined lattice graph, because you configure what is on the row or column in the custom chart, rather than leaving the row and column assignments up to the data to determine.

After you understand the shared role definitions and independent role definitions in the custom graph builder, you can experiment further to see how a combination behaves and how it looks on-the-fly. This is how I came to use the butterfly charts combined with bubble plots, or as I call them, the "BubbleFly" chart, to provide an informative way to show demographic data.

The user-defined lattice takes advantage of the lattice layout in the custom graph builder application. The user can add objects in a grid, or lattice, to create very powerful custom graphs. The graph gallery includes some prebuilt graphs such as the butterfly chart. This graph gallery chart can be enhanced even further using the features discussed in this paper. As you see in Figure 17 below, you can add other graph objects such as overlay graphs to the user-defined lattice graph, including scatter plots or bubble plots.
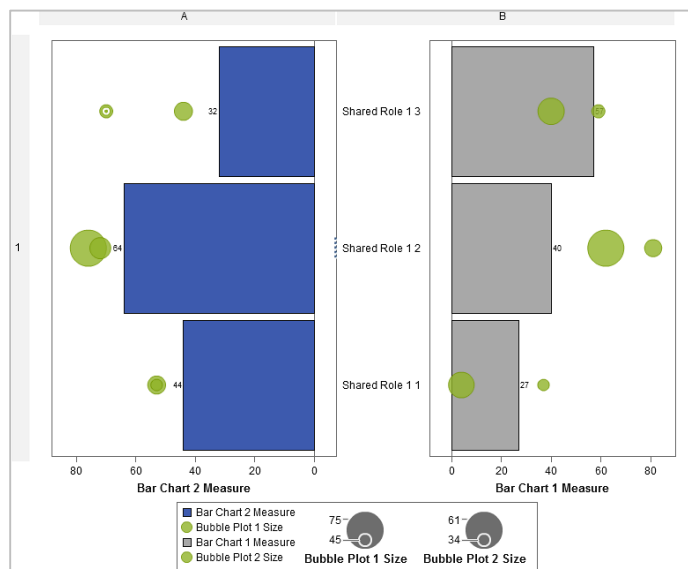
Figure 17. SAS® Visual Analytics Custom Graph Builder: Data-Driven Lattice Graphs

In this example you can see some sample data for a fictitious school district. I am interested in using my custom BubbleFly graph to show the *average grades* for all schools by *age group* and *gender*. You can enrich this view further and add an additional layer of analysis. This custom graph also displays the average grade for male and female students for the three individual schools in the fictitious school district, by using bubble color for each *school*, and bubble size for *number of students*. By using the graph builder, you can overlay each school's performance to compare it to the overall performance.

As seen below in Figure 18, you see that the red school outperforms the other schools, and the yellow school is lagging behind. By combining these graphs in a user-defined lattice and controlling how they display, you can provide a better narrative for the stakeholders of each school. When the school sees its story against the overall performance of the other schools, the school is prompted to retell the story to its own stakeholders.

By using bubbles (color and size), this custom graph provides more information than is available in the traditional butterfly chart. Gender analysis can now tell a very powerful story. In this case, you are looking

at school grades by gender. The data comes to life when you have the right graph for the story you want to tell. For a step-by-step guide to create this object, see Appendix 5.
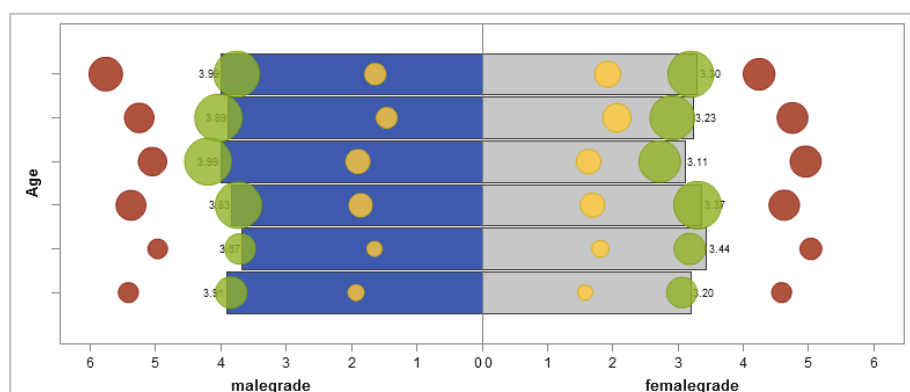

Figure 18. SAS® Visual Analytics Report Designer: User-Defined Lattice Graphs

SHARE YOUR MASTERPIECE

Creating custom graphs is only one piece of the reporting process. You need to share these with the users, including managers and executives. Combine your custom graph creations with the built-in collaboration features of SAS® Visual Analytics to enable the community of users to expand on what you have created.

As shown in Figure 19, you can access your report from the web, from Microsoft Office, via a PDF and from mobile devices such as the Apple iPad.
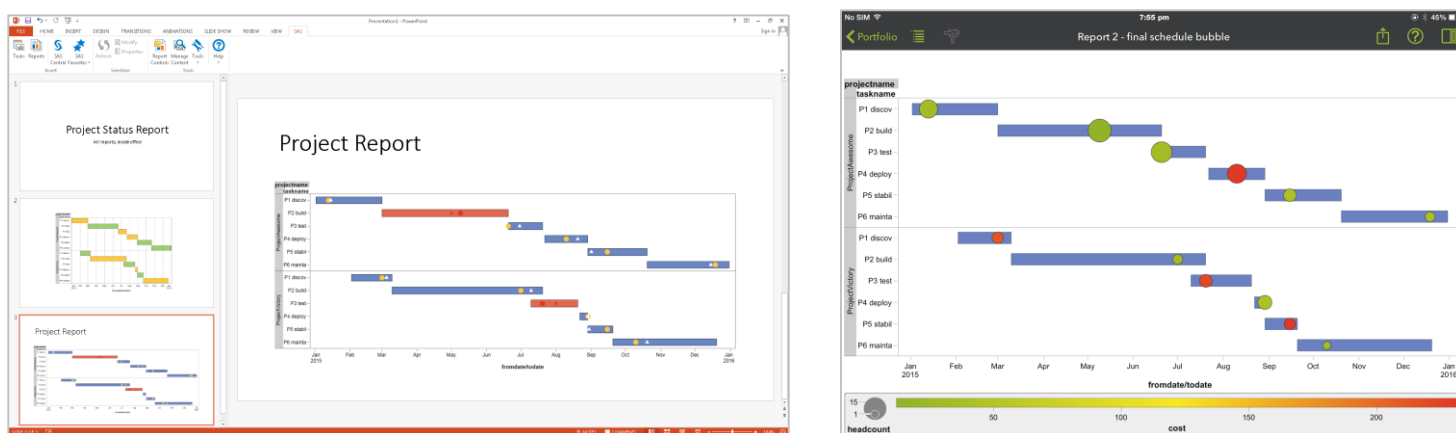
Figure 19. SAS® Visual Analytics: Output Examples (Microsoft PowerPoint and Mobile Devices)

TIPS AND TRICKS

- **Animation is not currently supported.** Remember that custom graph objects do not provide animation as a role configuration option. Instead, add a timeline slider control to the report to provide a similar user-driven, time-based effect.

- **Graphs are property-driven.** The custom graph builder is a GUI-driven tool that imposes some restrictions about which properties are available for use in each custom graph you create.

- **Whiteboard first.** Start with an idea of your data and the story that you are trying to tell. (I start with a whiteboard, pen, and paper.) You can then create a storyboard of ideas on how best to show the data.

- **Just because you can, does not mean you should.** Be creative, but remember there are users at the other end of the custom graph. Although a graph looks cool, it might not be functional or it might not clearly show your data to the end user.

- **Keep things tidy.** Use the Show and Hide Objects option in report designer to show and hide the graphs that you use rather than showing all graphs in the Objects tab.

- **Experiment and explore.** The graph builder is a great sandpit where you can create and explore with your data. You can experiment with using various role types as an axis, for example you can put a date where a category usually goes, or use a category where a number is traditionally placed. Remember this is your story to tell.

YOU ARE PART OF SOMETHING MUCH BIGGER!

As you know, SAS has a history of sharing best practices and examples with the wider SAS community. You only have to search on the Internet to find a worked SAS example, a paper to read, or even a full solution, shared as a template. SAS® Visual Analytics has a global community that is supported by a community forum and many blogs. SAS custom graphs can be shared using standard import and export functionality. Take the custom graphs to your next customer site or project team, or share it with colleagues. This means you can take your stories with you, and use existing custom graphs to help you tell the next story.

SAS is working on providing a repository for user-created custom graphs to be shared so that the broader SAS community can better collaborate and share the great work everyone is creating. Watch this space via communities.sas.com for more details about this repository.

CONCLUSION

SAS® Visual Analytics makes it possible for you to use many shapes, colors, and styles to tell the best story with your data. From dashboard projects to data warehouses, the true value in these projects is the opportunity for business teams and executives to see and interact with their data. The more personal you can make the stakeholder's first interaction with his or her data, the more engaged he or she is. This paper covers the flexibility and power of SAS® Visual Analytics to deliver your own business view to your users in record time. With the custom graph builder, you can rework an existing graph, or you can embark on controlling all available properties and settings on a custom graph. Either way, you can start to introduce the custom graph builder into your daily tasks. Ultimately, by learning what you can do with SAS® Visual Analytics today, you are determining how your business interacts with its data in the future.

APPENDIX 1: HOW TO ACCESS THE BUBBLE CHANGE PLOT USING THE GRAPH BUILDER

This example shows how to access the Bubble Change Plot from the default objects in the designer. Before opening or creating a new custom graph template, you can access some of the default graph gallery objects via the Show or Hide Objects menu in the designer.

1. You can select or remove the required objects from the **Objects** tab. Select the ⛛ from the **Objects** tab in the designer, and then select the **Bubble Change Plot** as shown below.
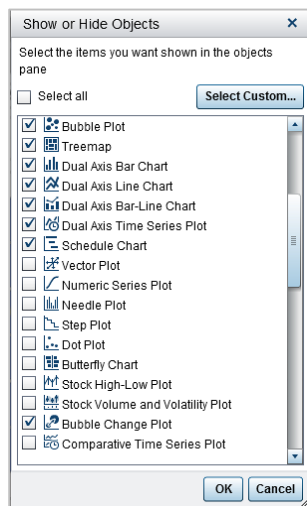
2. Click **OK** and you can access the **Bubble Change Plot** from the **Objects** tab in the designer, as below:
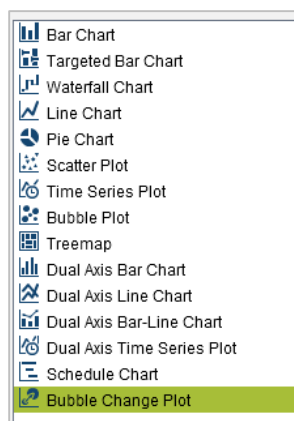
3. Click and drag the bubble change plot to your canvas, and you see a graph that consists of three graphs laid over one another: a Vector Plot and two separate Bubble Plots, as shown below:
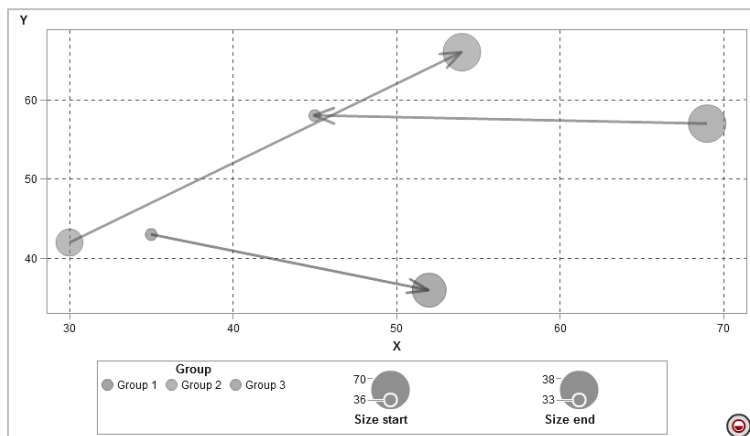
4. Select your data set (in this case, ExampleChange) using the **Data** tab in the designer.

5. Go to the **Roles** tab on the right and select ⌄ next to each role.

6. In this sales data example, as shown below, the x axis represents *number of units sold*, and Y axis represents *profit*, and the size of each bubble represents *cost per unit*. This data is showing last month's sales data compared to this month's sales data, and the direction of the change. You can quickly see that Product 1(blue bubble) increased in sales and earned more profit, whilst keeping *cost per unit* the same. Whereas, Products 4 (yellow bubble) and Product 5 (teal bubble) did poorly in sales over the same period.
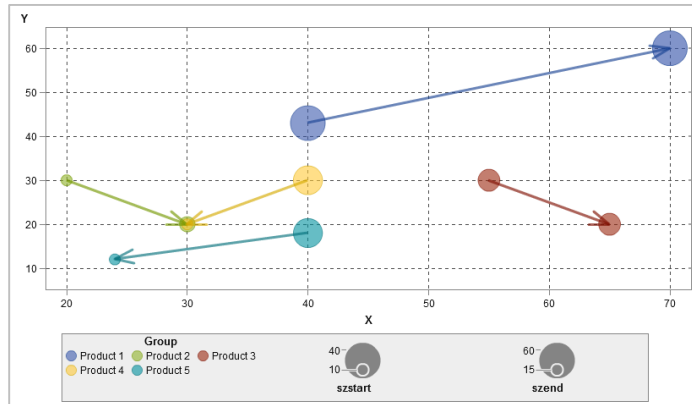
APPENDIX 2: HOW TO RECREATE THE SINGLE GRAPH, A SIMPLE SCHEDULE CHART

In this example we use a resource chart because this chart provides a visualization not available in the main list of objects in the report designer.

1. Open the Graph Builder by clicking the icon ⬚ in the **Objects** tab in the designer application as shown below.

2. Select a blank from the graph gallery.

3. Click and drag the **Schedule Chart** to the center panel.
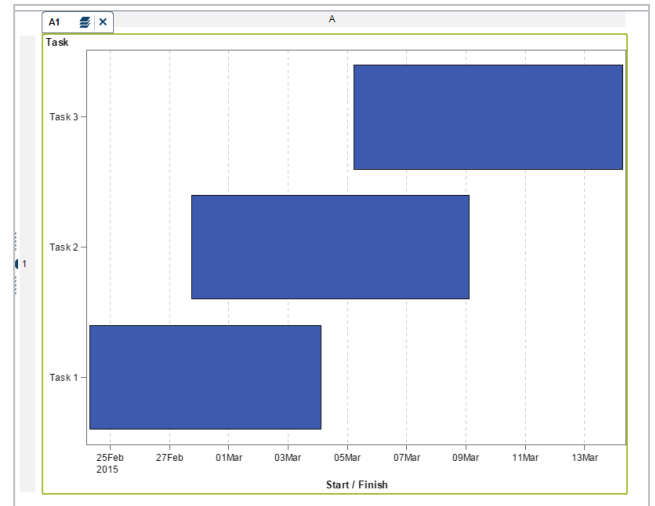
4. Select the blue schedule bar in the graph and set the **Plot Display** property to 50%.
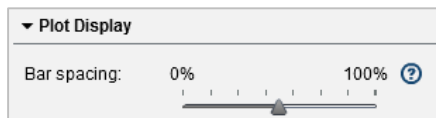
5. Save the graph to your My Folder and name it **New Schedule Chart.**

6. You can now use your **New Schedule Chart** in the designer with the bar spacing set to 50%. You can also leverage features such as the color-mapped values to conditionally color your bars in the report designer.

The result looks similar to this example below when you use the **New Schedule Graph** in the Designer.
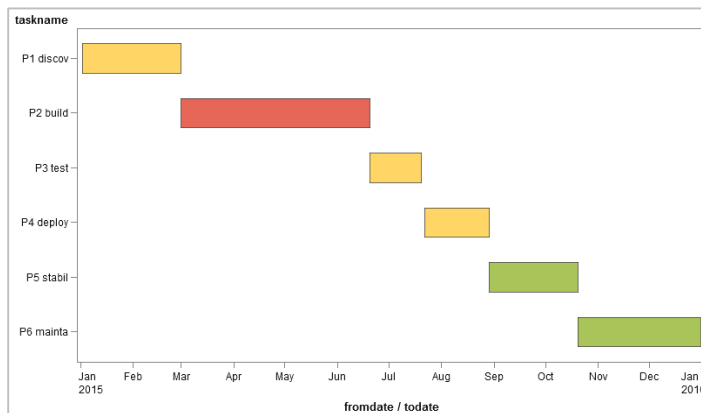
APPENDIX 3: HOW TO RECREATE THE RESOURCE CHART WITH SCATTER PLOT

Now we extend the schedule chart in appendix 2 and include an overlay graph. The graph we are overlaying is the scatter plot.

1. Drag and drop the **Scatter Plot** from the graph elements onto the canvas.
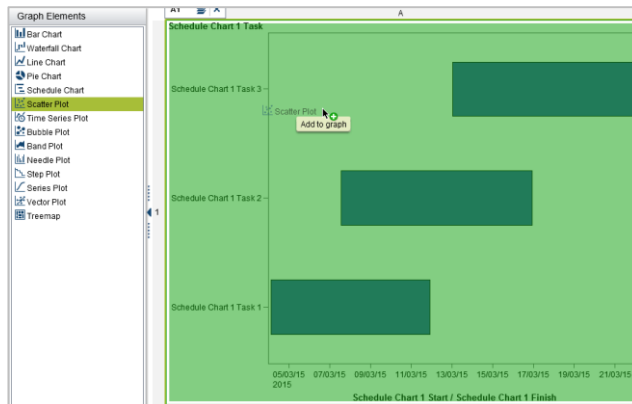
2. Drag and drop an additional **Scatter Plot** from the graph elements onto the canvas.

3. Observe the creation of automatic shared roles for all the graphs for the Y Axis: **Shared Role 1**.

This *shared role* is the common link between all the graphs in this new custom graph. Other roles remain independent.

4. On the properties tab select ▾ and select the **Scatter Plot 2** graph.

5. Set the **Marker Symbol** to a triangle.

6. Save the graph to your *My Folder* and name it **New Schedule Chart with Scatterplot.**

The result of enriching this graph with an additional overlay graph enabled us to add key milestones to better communicate the project data, as shown below.
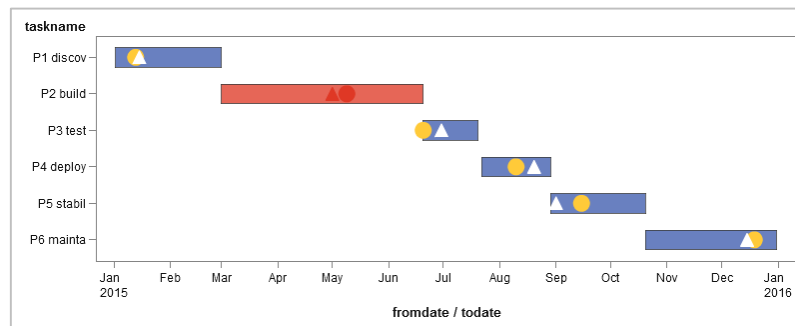
APPENDIX 4: HOW TO ADD DATA-DRIVEN LATTICE ROLE

This example builds from appendix 3. We can now introduce a property to determine the lattice row and column of the graph. Data-driven lattice graphs are graphs that repeat on the row or the column, based on the data roles you provide.

1. Select the **Add Lattice Role** option on the **Role Definitions** tab.
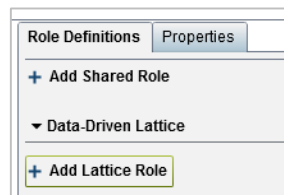
2. Select **Role Type: Row** and leave the other defaults. Then click **OK.**
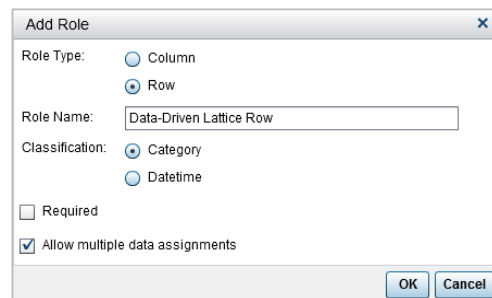
> This new role provides a location for data to repeat the graph on each row. You can repeat this for the column lattice, if required.

3. Save the graph to your *My Folder* and name it **New Schedule Chart with Scatterplot with Lattice.**

4. The preview in the builder does not provide the lattice preview. Therefore, to get an understanding of how it will look, you can save your custom graph, add some real data in the report designer, and see if it matches your expectations.
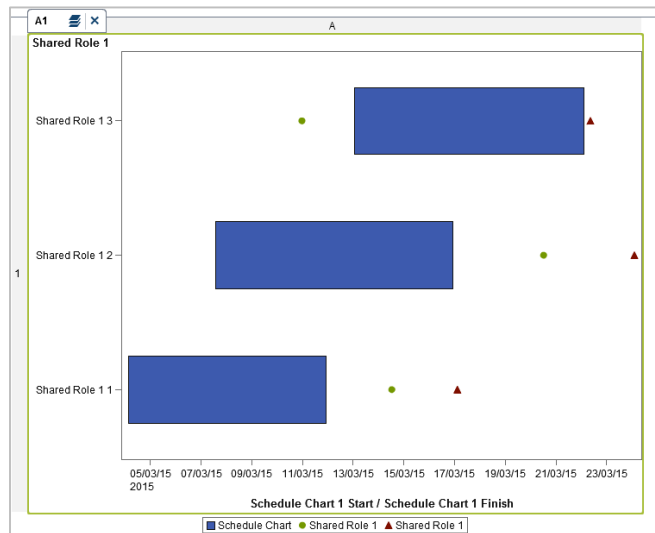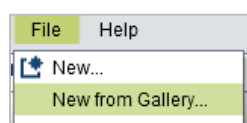

5. The graph repeats on a new row in the dataset, for example for each project in the sample data set as shown below.
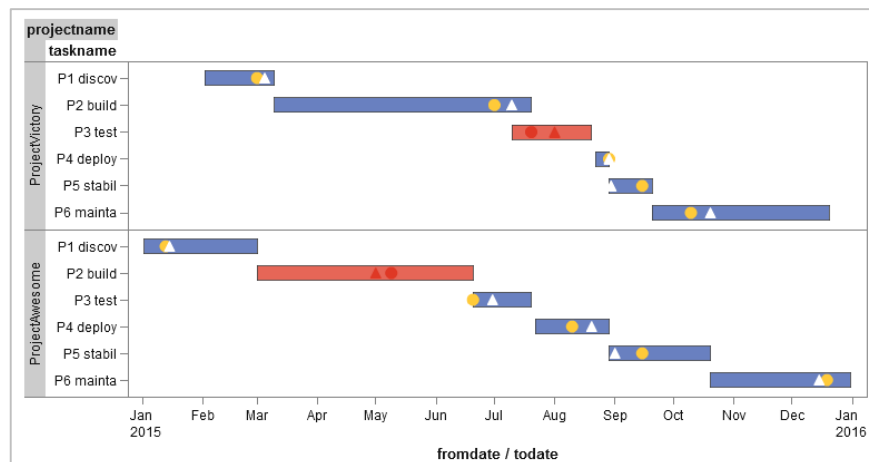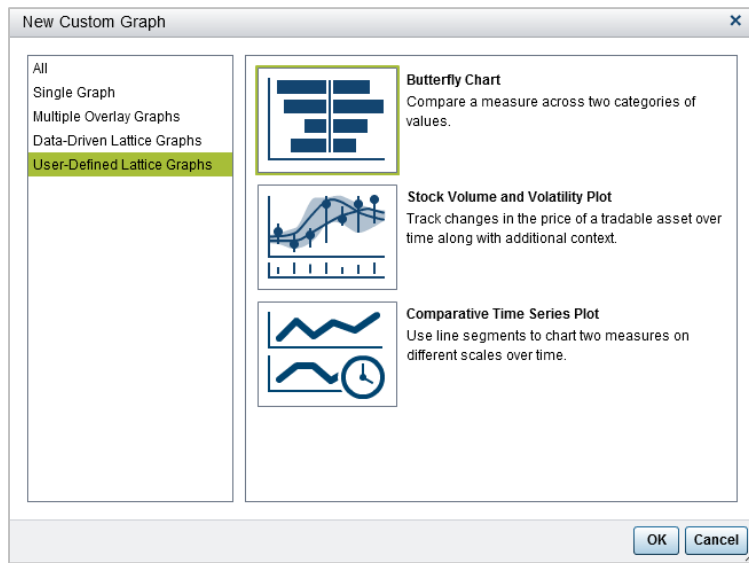

APPENDIX 5: HOW TO RECREATE THE BUBBLEFLY CHART

The user-defined lattice graphs prompted me to use the custom graph builder to design a butterfly chart combined with a bubble plot: The BubbleFly chart.
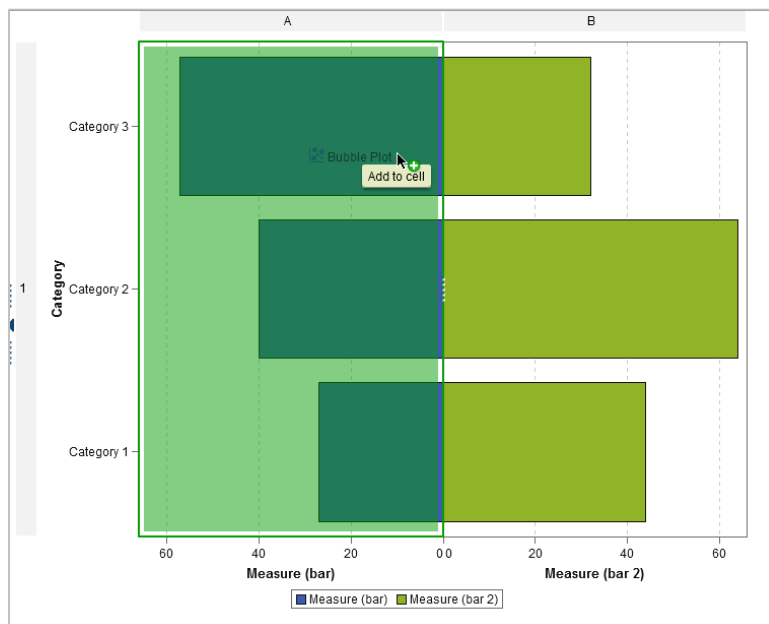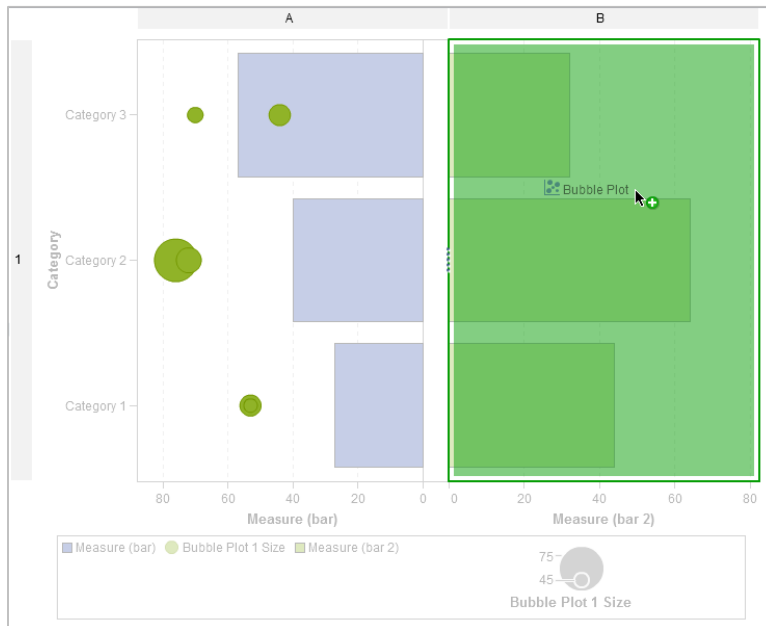
1. Select file **New from Gallery.**

2. Select **User-Defined Lattice Graphs** and then **Butterfly Chart.** Click **OK.**

3. Drag and drop the **Bubble Plot** graph to the canvas, as shown below.

4. Drag and drop the second **Bubble Plot** graph to the canvas, as shown below.

5. Add role definitions. Select the **Role Definitions** tab and **Add Role** to **Bubble Plot 1**, and then select **Group** and click **OK**.

6. Do the previous step again for **Bubble Plot 2.**

The group role enables me to add data to this role in the designer and repeat the bubbles for each value in the series. For example, I can have a new bubble for each school.

7. Create a shared role for the Group.

    a. Select ▼ next to the group role on **Bubble Plot 2** and select **Create Shared Role with Another Role** then select **Bubble Plot 1 Group**. This action creates the shared role. You use one data item to assign group data to both bubble plots.
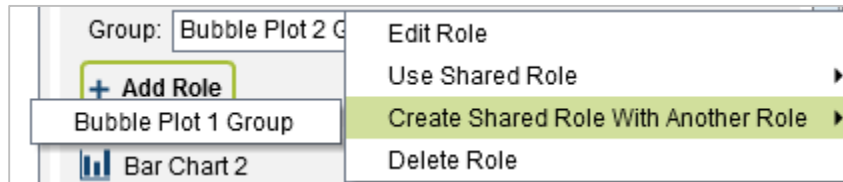
8. Consider setting these optional properties:

   o Color of the right bar chart (**Bar Chart 2**): Set the color to avoid having a data color conflict with bubble plots. You can change this allocated color using the report designer at any time.
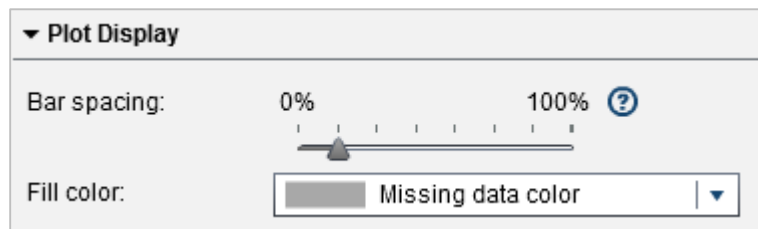

   o Bar Spacing property on each bar chart: Set the bar spacing to keep it consistent across bars and to match your desired look and feel.

   o Data Labels on the bar charts.

   o Axis labels and position.

   o Legends. Which legends to show and hide.

   Just remember, what you do to one graph you should do to the others, this keeps each set of graphs in sync.

9. Save the graph to your *My Folder* and name it **New Butterfly Chart with Bubble Plot aka BubbleFly.**

10. The graph shows overall performance compared to the individual performance, for example for each school within the district as shown below.
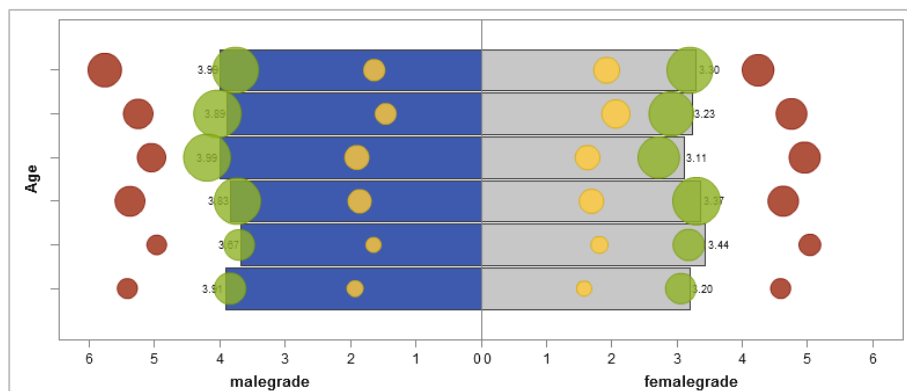
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United States Census Bureau. (2015). International Programs - Information Gateway Online. Available . http://www.census.gov/population/international/data/idb/informationGateway.php. Accessed on February 2, 2014.

SAS Institute Inc. 2015. *SAS® Visual Analytics: User's Guide*. Cary, NC: SAS Institute Inc. Available http://support.sas.com/documentation/onlinedoc/va/index.html

Recommended Reading

Devarajan, R, H. Patel, P. Berryman, and L. Everdyke. 2014. "Create Custom Graphs in SAS® Visual Analytics Using SAS® Visual Analytics Graph Builder." Proceedings of the SAS Global Forum 2014 Conference. Cary, NC: SAS Institute Inc. Available http://support.sas.com/resources/papers/proceedings14/SAS346-2014.pdf.

SAS Institute Inc. *SAS® Visual Analytics: Video Library*. Cary, NC: SAS Institute Inc. Available http://support.sas.com/training/tutorial/va71/

SAS Institute Inc. 2015. *SAS® Visual Analytics: User's Guide*. Cary, NC: SAS Institute Inc. Available http://support.sas.com/documentation/cdl/en/vaug/67500/PDF/default/vaug.pdf

SAS Institute Inc. *SAS Visual Analytics Community*. SAS Online Communities. Cary, NC: SAS Institute Inc. Available https://communities.sas.com/community/support-communities/sas-visual-analytics

Acknowledgements

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