Tips and Techniques for Designing the Perfect Layout
with SAS® Visual Analytics

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ABSTRACT

Do you want to create better reports but find it challenging to design the best layout to get your idea across to your consumers? Building the perfect layout does not have to be a rocky experience. SAS Visual Analytics provides a rich set of containers, layout types, object sizing enhancements, and options that enable you to quickly and easily build beautiful reports. Furthermore, you can design reports that work across different device sizes or that are specific to a particular device size. This paper explores how to use the layout system and demonstrates what you can accomplish.

INTRODUCTION

SAS Visual Analytics makes it easy to build reports that you can view in your web browser, on large monitors such as in a conference room, or on smaller mobile devices while on the go. Starting with SAS Visual Analytics 8.1, the layout system was redesigned to give you more control over how objects appear in your reports and how your reports appear to consumers. With further enhancements added in SAS Visual Analytics 8.2, building reports that look beautiful has never been easier or better. In this paper you will discover the available layout types, the layout options, the drag-and-drop system, reflow, and many other features. Whether you are looking to design your first layout or you are a seasoned veteran who wants to discover a new trick, this paper will provide the tips and techniques that you need.

UNDERSTANDING THE LAYOUT TYPES

The foundation of placing objects in your report is choosing a layout type. The layout type controls how objects are arranged. SAS Visual Analytics supports three layout types:

- **Standard** – arranges objects horizontally or vertically and supports reflow
- **Stacking** – stacks objects on top of one another; however, only one object is visible at a time
- **Precision** – arranges objects in specific locations and with specific sizes

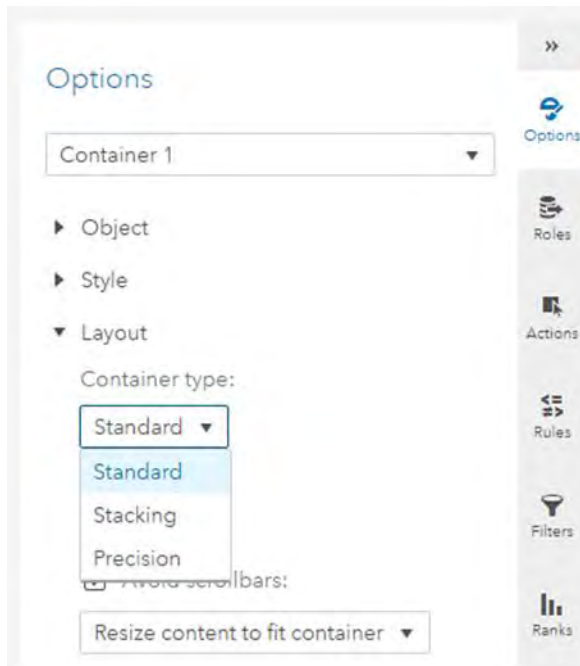Figure 1 shows the **Container type** property in the Options pane.

Figure 1. Container Type

The container type selector is not available on report pages because only the standard layout type is supported on a page. To use another layout type on a page, you first add a container to a page and then set the layout type on the container.

Containers can be nested inside of other containers, each with a potentially different layout type, which enables you to build an endless variety of report layout configurations. For example, in SAS® Visual Analytics Designer 7.4, a user might only have wanted a portion of their page to use a precision layout, but they were required to make the entire page use a precision layout because the option was only available on pages. Now, users can add a container wherever they want on a page and restrict the precision layout type to that container. This allows the rest of the objects on a page (or in a container) to use the standard layout or other layout types.

THE STANDARD CONTAINER TYPE

The standard container is the primary layout type in the layout system. It is a robust, flexible layout that gives you control over whether objects are arranged in a tile-like fashion or are scrollable in their container. In addition, this layout provides support for predictable reflowing of objects when the canvas size is small, and the objects don't have enough space to be displayed in the location where they were originally placed. To support the tile-like arrangement, the system does its best to fit all objects into the container by growing or shrinking them as needed. Object-specific options are available that influence how the system sizes the objects. To support the scrolling arrangement of objects, the system will size the objects to a specific size or to their preferred size if no size is specified. Further, if the object does not have a preferred size, then it will be sized to a portion of the canvas as space allows. If necessary, a scroll bar appears and additional objects scroll out of view.

Figure 2 shows various options for the standard layout, which control the direction that objects are laid out, whether the layout should try to make all the objects fit, and how the container calculates it size.
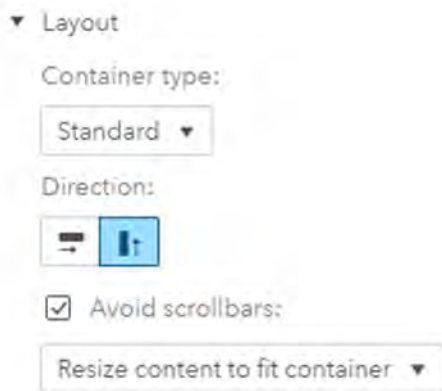
Figure 2. Standard Layout Options

The Direction Option

The standard layout's direction option specifies whether objects that are added to a container are laid out horizontally or vertically. For example, as shown in Figure 3, when the direction is horizontal, new objects will be arranged in a row.
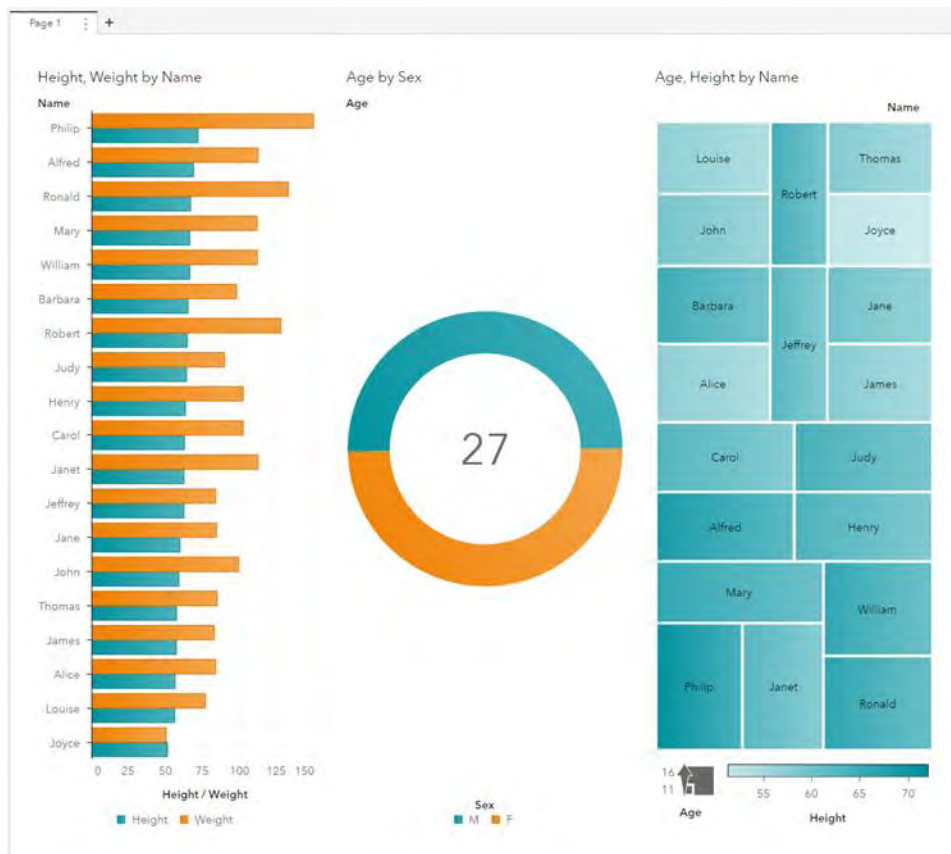

Figure 3. Standard Layout Horizontal Direction

If there are too many objects to fit into the available space, the objects that don't fit are reflowed in the opposite direction. For example, the right-most object in Figure 3 above would reflow vertically and below the other two objects, if necessary.

The Avoid Scroll Bars Option

The standard layout's avoid scroll bar option specifies whether the layout should try to fit all of the objects on the canvas to avoid the need for scroll bars. When this option is turned on, the layout appears in a tile-like fashion. The layout system tries to avoid scroll bars by shrinking objects to fit in the available space. Objects can be made smaller until they reach the absolute minimum size.

When the avoid scroll bars option is enabled, the layout system must be told how to avoid scroll bars. There are two ways the layout system can accomplish this:

1. Resize the objects to fit inside the container using the **Resize content to fit container** option. This option specifies the container will maintain its size and the objects within it are made to fit by shrinking or extending to fit the space.

2. Resize the container to fit the objects using the **Resize container to fit content** option. This option specifies that the container's size will be adjusted to fit the objects. Depending on your layout needs either option can be a useful.

Pages do not support an option to avoid scrolling; however, they do attempt to avoid scroll bars. The standard layout is the only layout that is supported on a page. Because the page's size is bounded by the viewing application, the only option is to resize the content to fit the container.

When the avoid scroll bars option is turned off and no size is specified for an object, the layout system sizes the objects to fit the canvas. As you add more objects, a scroll bar appear to enable you to navigate to those objects.

STACKING CONTAINER TYPE

The stacking container layout type enables you to arrange objects on top of one another, like a deck of cards. Since only one object is visible at a time, the stacking container layout enables you to add multiple objects in a smaller amount of space. As shown in Figure 4, a variety of navigation options let you control the navigation presentation and location.
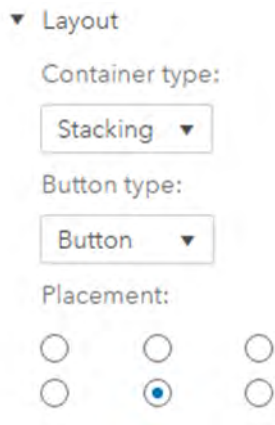

Figure 4. Stacking Layout Options

Button Type

To navigate between objects in a stacking container, you can either go directly to the objects by clicking a button for the object of interest or you can navigate using arrows. The arrows move between the objects sequentially, in the order in which they were added. You can choose between three button styles: button, dot, or link.

Placement

To further configure the stacking container, you can choose where to locate the buttons by setting the placement option. This option allows the buttons to be located either above or below the objects. For each of these locations, you can choose between left, center, and right locations.

THE PRECISION CONTAINER TYPE

The precision container layout type gives you complete control over where your objects are located. You specify the location, size, and alignment of the objects. You can even choose to have the objects overlap. To control which objects are above or below when they overlap, you can set the object's depth. To set the object's depth you right-click an object and select **Bring to top** or **Send to back** from the pop-up menu.

While the precision layout container provides more control over the placement of objects, it does not respond well to dramatic changes in page size. A precision layout container should be used only in instances where other containers could not achieve the desired result.

USING THE OBJECT LAYOUT OPTIONS

This section covers the layout options that are specific to objects in the standard and precision layout types. (There are no object-specific options for the stacking layout type.) These options give you fine-grained control over how the layout system arranges the objects.

STANDARD LAYOUT OBJECT-SPECIFIC OPTIONS

Objects in a standard layout have options that control their size, and whether they can extend to use any extra space or shrink to give up space. Figure 5 shows these layout options.
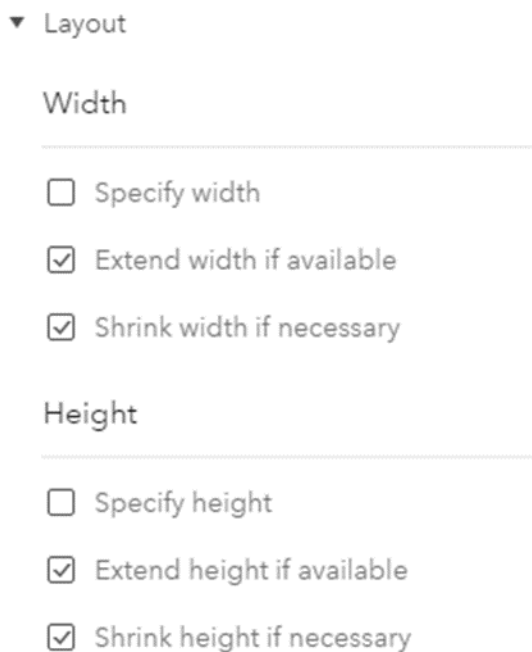
▼ Layout

Width

☐ Specify width

☑ Extend width if available

☑ Shrink width if necessary

Height

☐ Specify height

☑ Extend height if available

☑ Shrink height if necessary

Figure 5. Object Options in Standard Layout

Width

Specifying the width option tells the layout system the percentage of the width of the canvas or the container that an object should occupy. The layout system tries to allocate that percentage of space to the object.

Height

Specifying the height option tells the layout system the percentage of the height of the canvas or the container that an object should occupy. The layout system tries to allocate that percentage of space to the object.

Extend

When there is more space available than objects need, the layout system tries to allocate the extra space to any objects that are unconstrained or that have the extend option turned on. You can choose to turn off the extend option if an object has a preferred size or a specific size and you don't want it to grow. The extend option has no impact on unconstrained objects because they automatically claim any available space.

Shrink

When there is less space available than objects need, the layout system tries to take away space from any objects that are unconstrained or that have the shrink option turned on. You can choose to turn off the shrink option if an object has a preferred size or a specific size and you don't want it to get smaller. The shrink option has no impact on unconstrained objects.
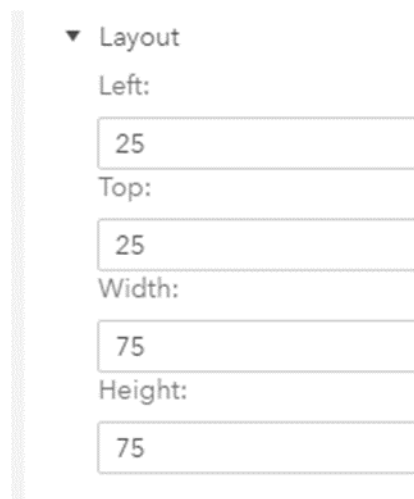
Unconstrained Objects

When neither width nor height options are specified and an object does not have a preferred size, the object is considered unconstrained. Since an object does not have a size to provide to the layout system, the layout system gives the object all of the available space in the dimension that is unconstrained. If multiple unconstrained objects are arranged next to each other, then they will share the space equally. For example, if four unconstrained objects are arranged horizontally they each will be given 25% of the space.

Minimum Size

Regardless of the width and height settings for objects, all objects have an absolute minimum size. The layout system will not reduce the size of an object below its minimum size. If needed, objects reflow and worst-case scroll bars might appear even if avoid scroll bars is enabled. The minimum size for most objects is 100 pixels (not including the border, padding, or title).

PRECISION LAYOUT OBJECT-SPECIFIC OPTIONS

Objects in a precision layout have a set of options, which are shown in Figure 6, that control their location and size.

Figure 6. Object Options in Precision Layout

Left

The left option specifies the left-most coordinate for an object as a percentage of the canvas size. For example, if left is set to 25, the left coordinate will be at the 25% point of the canvas size. Adjusting the size of the canvas changes where the object appears.

Top

The top option specifies the top-most coordinate for an object as a percentage of the canvas size. For example, if top is set to 25, the top coordinate will be at the 25% point of the canvas. Adjusting the size of the canvas changes where the object appears.

Width

The width option specifies the object's width from the left position as a percentage of the canvas size. For example, if the left is set to 25 and the width is set to 75, the left coordinate will be at the 25% point of the canvas and the object fills the rest of the available width of the canvas.

Height

The height option specifies the height of the object from the top position as a percentage of the canvas size. For example, if the top is set to 25 and the height is set to 75, the top coordinate will be at the 25% point of the canvas size and the object fills the rest of the available height of the canvas.

DESIGNING FOR REFLOW

Now that both the layout options and the object-specific layout options have been described for the standard layout type, it's time to take a deeper dive into reflow to understand what it is and how you can control when objects reflow.

What exactly is reflow? Simply put, reflow occurs when there is not enough room for objects to fit in their original locations, and they are moved to another location to improve the presentation. Objects might not fit for a variety of reasons. There might not be enough overall space available to the fit the objects. The objects can be restricted by a minimum size. The objects can have properties set instructing them not to shrink. When objects cannot fit into their locations, another row or column is created and the objects are moved to that new row or column. A new row is created if the layout direction is horizontal and a new column is created if the layout direction is vertical. The row or column is not an actual column as one might think with a grid layout but instead is a virtual one allowing the object to be positioned in the layout. Objects that are laid out ahead of the objects that reflow might adjust size depending on their layout properties to occupy the vacated space.

Let's look at a simple example of a page layout, which is illustrated in Figure 7.
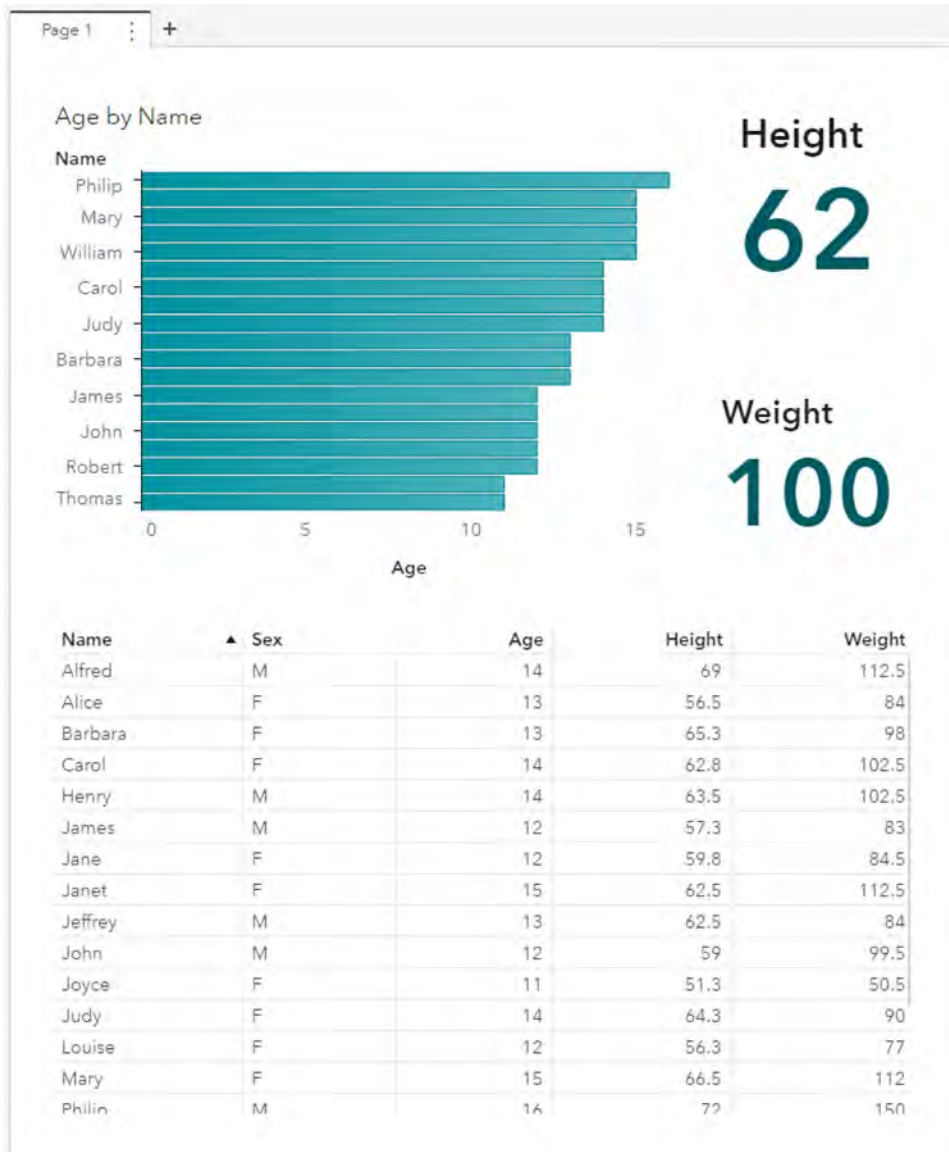
Figure 7. Example Layout

In this example, there is a bar chart with a width of 75%, two unconstrained key value objects laid out vertically to the right of the bar chart, and an unconstrained list table at the bottom of the page.

OBJECT ORDER

Objects are added to the layout in a specific order, and if they need to reflow they reflow in the order in which they occur in the layout. Consider the layout from Figure 7 overlaid with an object order indicator, which is shown in Figure 8.
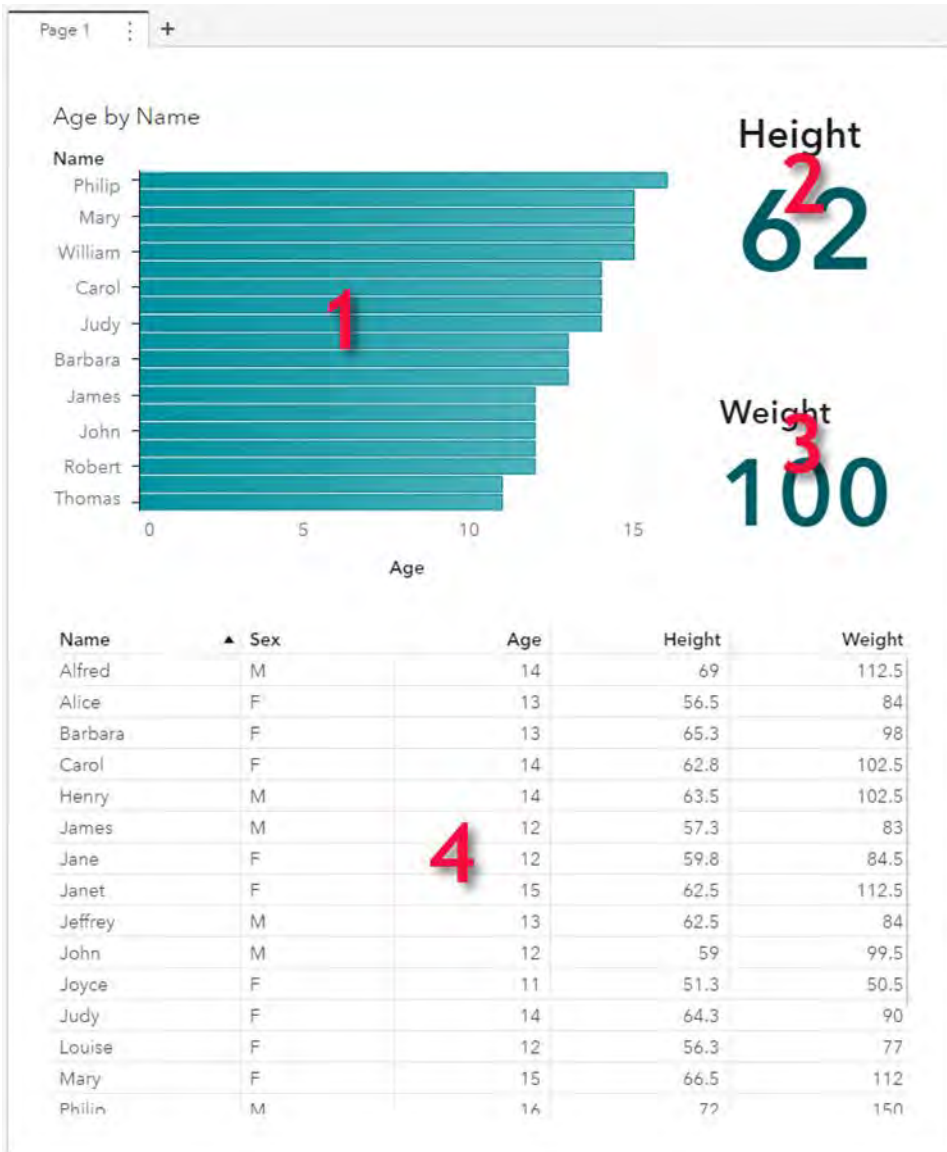
Figure 8. Object Order in Example Layout

When reflow occurs, objects move to a new row or column preserving their object order. For example, in Figure 8 if reflow needed to occur such that all objects are arranged in a single column, the order will be the bar chart, the top key value, the bottom key value, and then the list table. This is illustrated in Figure 9.
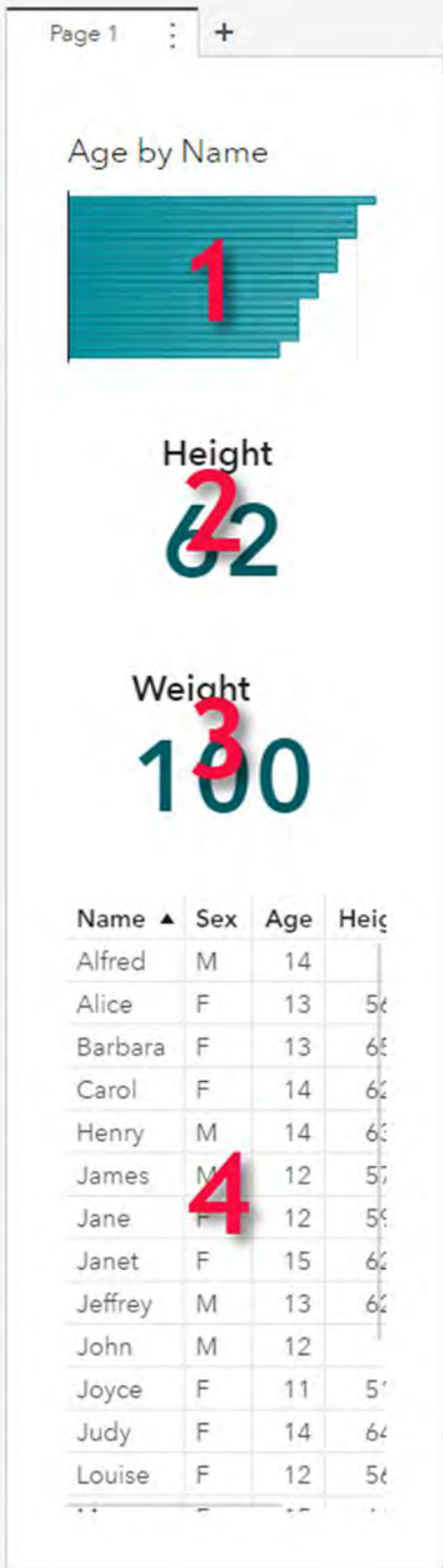
Page 1

Age by Name

1

Height
62
2

Weight
100
3

Name ▲	Sex	Age	Heig
Alfred	M	14	
Alice	F	13	56
Barbara	F	13	65
Carol	F	14	62
Henry	M	14	63
James	M	12	57
Jane	F	12	59
Janet	F	15	62
Jeffrey	M	13	62
John	M	12	
Joyce	F	11	51
Judy	F	14	64
Louise	F	12	56

4

Figure 9. Reflow to a Single Column in Example Layout

INFLUENCING REFLOW

When building your layout, you can influence how your objects appear when the space is constrained and when reflow will occur. In the example presented in Figure 7, the bar chart's size was set to 75. With a large enough canvas size, the layout system will give the bar chart 75% of the available width. However, once space is constrained the system will try to shrink the objects down to their minimum size to avoid reflow. If you really want your bar chart to be at least 75% of the width and never shrink below this percentage, you can turn off the **Shrink width if necessary** option on the bar chart. With this option turned off, the layout system shrinks the bar chart if it still can have 75% of the width. Once the size gets small enough if the bar chart can't get 75% and the key values are at their minimum width, the layout system reflows the key value objects to the next row. You can independently control the ability of the layout system to shrink the width and height to achieve a variety of layout combinations. Figure 9 shows an example of the layout where the bar chart was a width of 75, has the **Shrink width if necessary** option turned on, and is given less than 75% of the space.
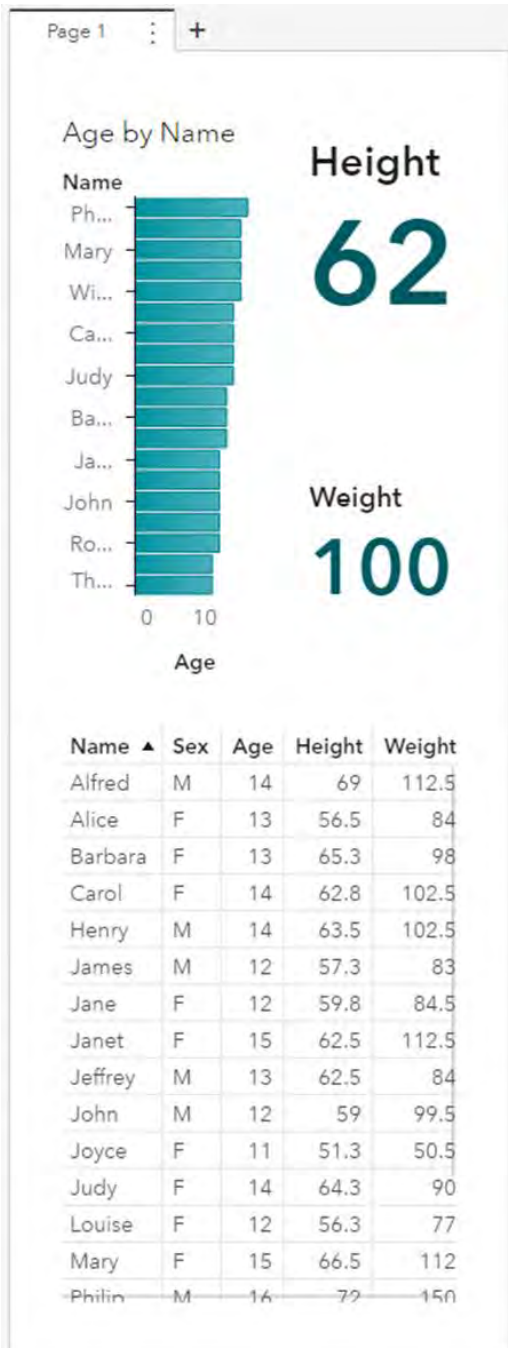
Figure 10. Bar Chart with Shrink Enabled in Example Layout

LAYOUT CONTAINERS

As objects are interactively added to a report, the layout system can create hidden containers to achieve the desired layout. This occurs when objects are arranged in different directions. For example, in Figure 7 if the layout were created interactively to arrange the key value objects vertically to the right of the bar chart, SAS Visual Analytics creates a layout container to allow the key values to be arranged vertically while the bar chart, and the set of key value objects are laid out horizontally. To avoid requiring you to explicitly add containers for layouts with objects arranged in different directions, the layout system creates these hidden containers for you. Objects that are in containers, including hidden containers, are grouped together in layout order for reflow.

USING THE DRAG-AND-DROP SYSTEM

SAS Visual Analytics provides feedback when you add objects to your report or move objects within your report. As you drag data items or objects, a visual indicator displays to illustrate what will happen when you drop the items. There are several types of indicators provided by the application. Once you learn what they mean, you will be able to quickly and efficiently build the desired layout. When you drag a data item, the system either creates a new object using the auto-charting logic or it assigns the data item to the object. The types of indicators are described below.

INSERT INDICATOR

If you drag an object or a data item between objects, SAS Visual Analytics displays an insert indicator. The indicator is a thin blue line that shows you an object will be placed in the same row or column as the other objects at the location indicated. If the objects are laid out horizontally, you will see a thin vertical indicator. If the objects are laid out vertically, you will see a thin horizontal indicator.

The one exception to the thin line insert indicator is when a page is empty, which is shown in Figure 11. In this case, the entire page is shaded blue to indicate that the object will be placed on the page.

NESTED CONTAINER INDICATOR

If there are multiple objects laid out in a single direction, and you drag an object or a data item over one of the objects, SAS Visual Analytics displays a nested container indicator. (This is shown in Figures 12 and 13.) The nested container indicator is blue shading that covers half of the object. This indicator shows you if you drop the object, then the new object will split the space with the current object in the opposite direction that the object is laid out. For example, if there are three objects laid out horizontally and you drag over one of them to get the nested container indicator and then drop the object, the new object will be laid out vertically with the object that was dropped on. Under the covers the layout system creates a hidden container and places both objects in that container. The size of the hidden container will be the same size as the object before you dropped it. This occurs so that the sizes of the other objects in the layout prior to the drop are not impacted. The new object and the object that was dropped split the space in the hidden container.

PAGE INDICATOR

If you drag an object or data item to one of the edges of the page, SAS Visual Analytics displays a page indicator. (This is shown in Figure 14.) The page indicator is a thin blue line of shading that extends from one edge to the other edge of the page. This indicates that if you drop the object, it will be placed in the location that spans the entire page. If necessary, the layout system places the other objects on the page in a hidden container. The layout system supports dropping an object on the top, left, bottom, or right side of the page.

ASSIGNMENT INDICATOR

If you drag a data item over an object on the page, SAS Visual Analytics displays an assignment indicator. The assignment indicator is blue shading of the entire object. This means that the data item will be assigned to one of the data roles for the object. If the layout system cannot determine which data role to assign the data item to, a role disambiguation dialog box asks you for more information. Otherwise, the data item is assigned to the next available data role.

EXAMPLES OF INDICATORS

The following series of figures demonstrate building a report layout and show the various types of indicators that are used by the layout system.

In Figure 11, a bar chart is dragged from the Objects pane on the left over an empty page. An insert indicator is displayed. Since the page is empty, the entire page is shaded blue.
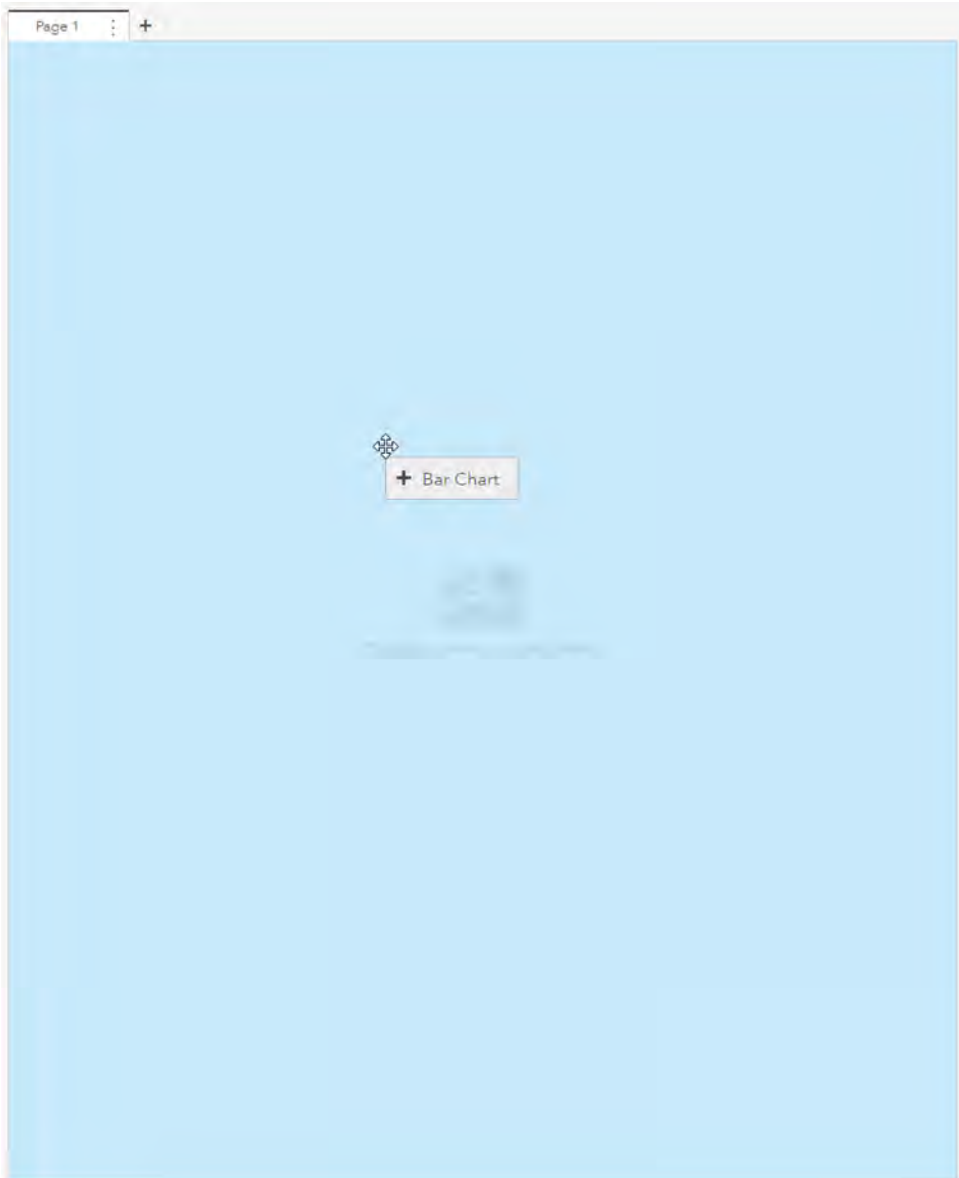
Figure 11. An Empty Page Indicator

In Figure 12, a key value object is dragged from the Objects pane on the left over the right edge of the bar chart on the page. A nested container indicator is displayed. By default, a page is using standard layout with a vertical direction and the key value is placed horizontally relative to the bar chart.
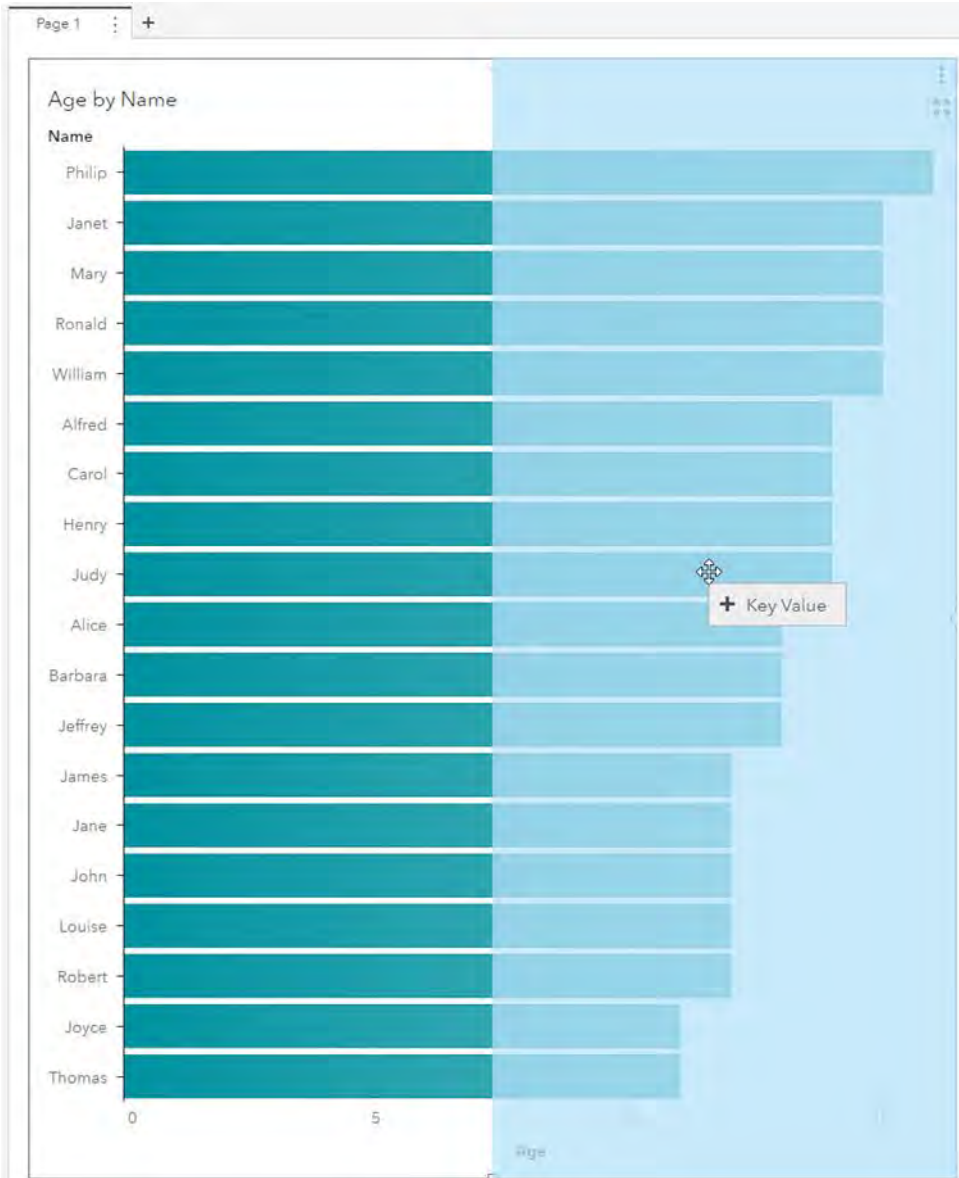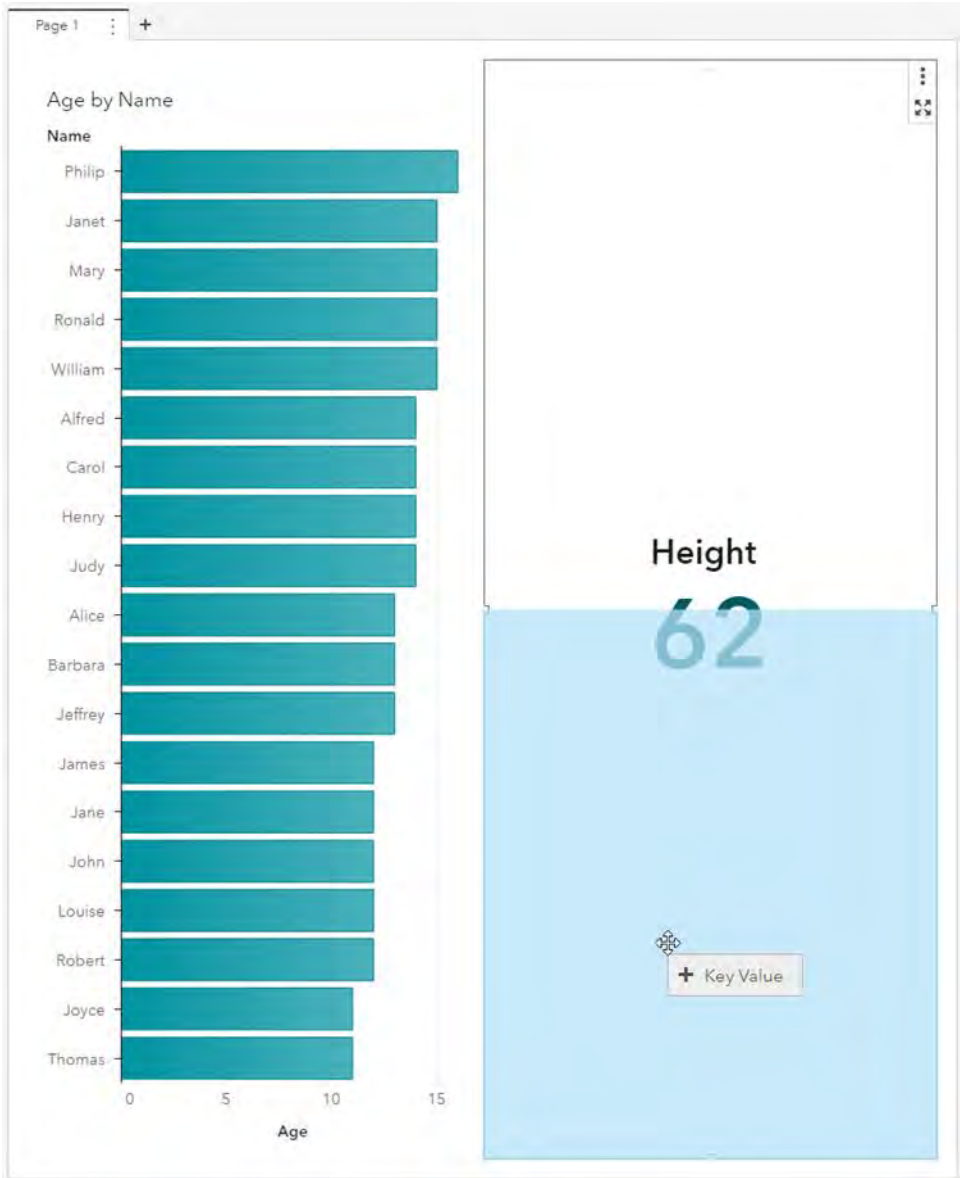
Figure 12. A Nested Container Indicator

In Figure 13 a second key value object is dragged from the Objects pane on the left over the bottom edge of the first key value in the page. A nested container indicator is displayed. The bar chart and first key value are laid out horizontally. After the drop the first and second key value will be laid out vertically. They will be placed in a hidden container that will be sized based on the original size of the key value. The bar chart size will not be impacted.

Figure 13. A Nested Container Indicator

In Figure 14, a list table object is dragged from the Objects pane on the left over the bottom edge of the page. A page indicator is displayed.
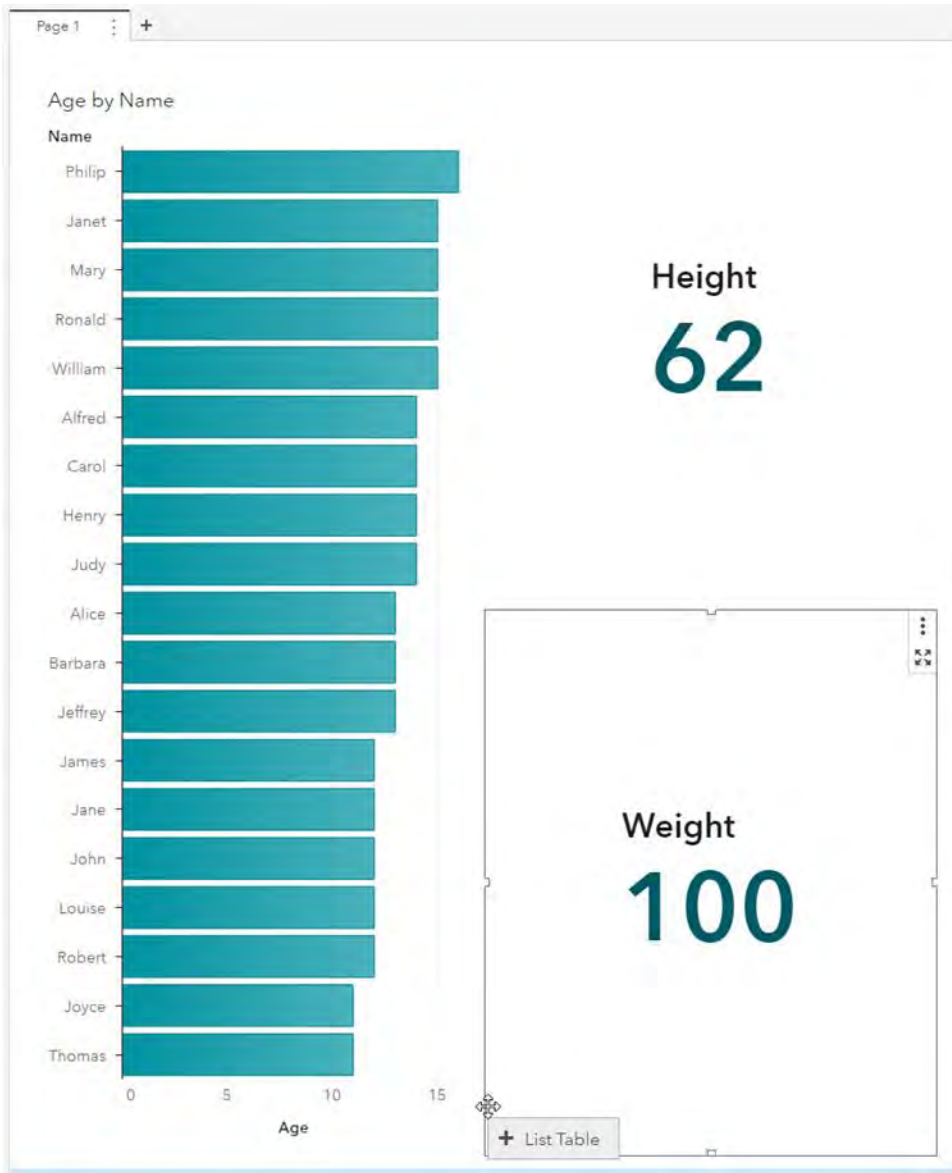
Figure 14. A Page Indicator Displayed at the Bottom of a Page

Figure 15 shows the result of dropping the list table on the page. The objects already on the page are placed in a hidden container that occupies 50% of the vertical space because all of the objects are unconstrained. The list table is displayed below the existing objects and occupies the remaining 50% of the space.
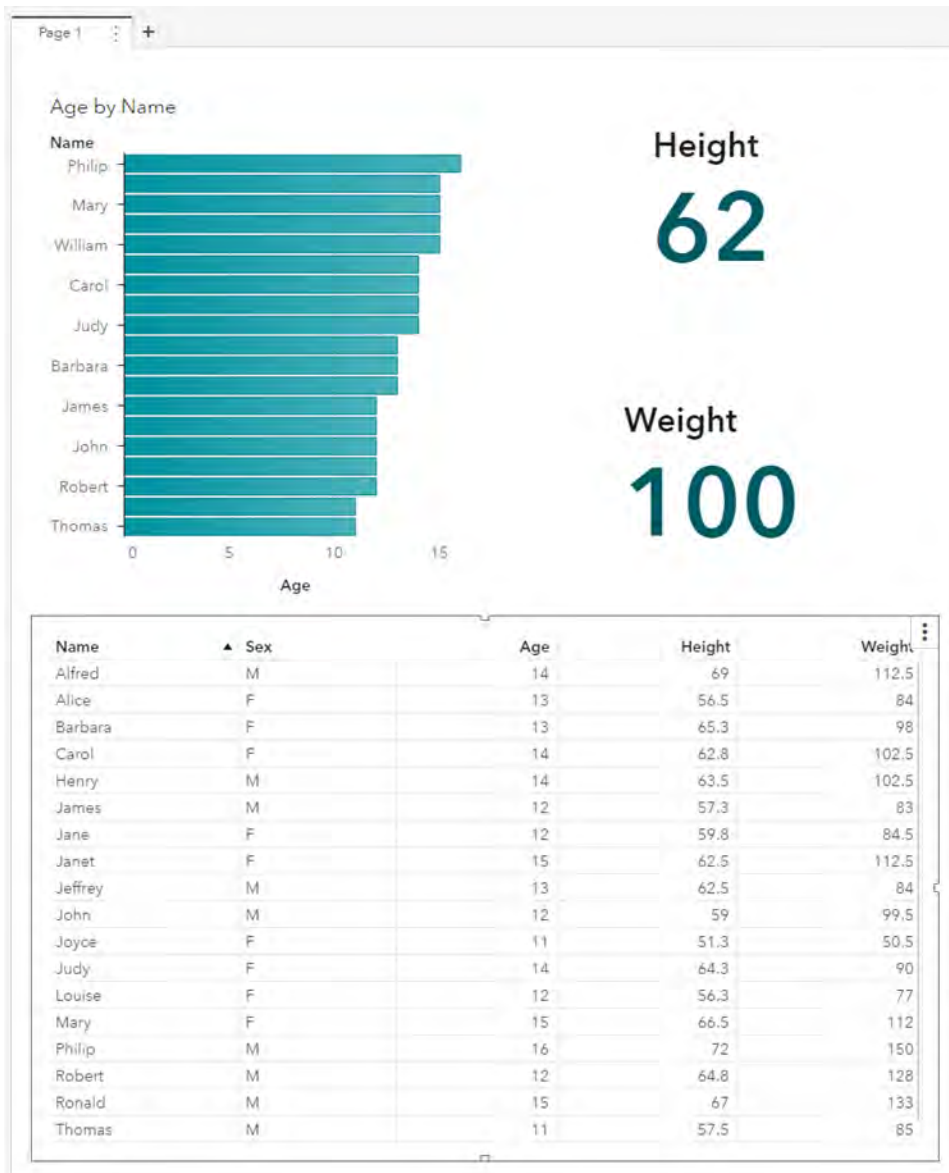
Figure 15. The Result of Dropping a Data Item at the Bottom of a Page

In Figure 16, a data item is dragged from the Data pane on the left over the bottom edge of the second key value object. An insert indicator is displayed. SAS Visual Analytics creates an object using its auto-charting logic and inserts the automatic chart as the third vertical object below the key value objects.

Figure 16. An Insert Indicator for an Automatic Chart Object

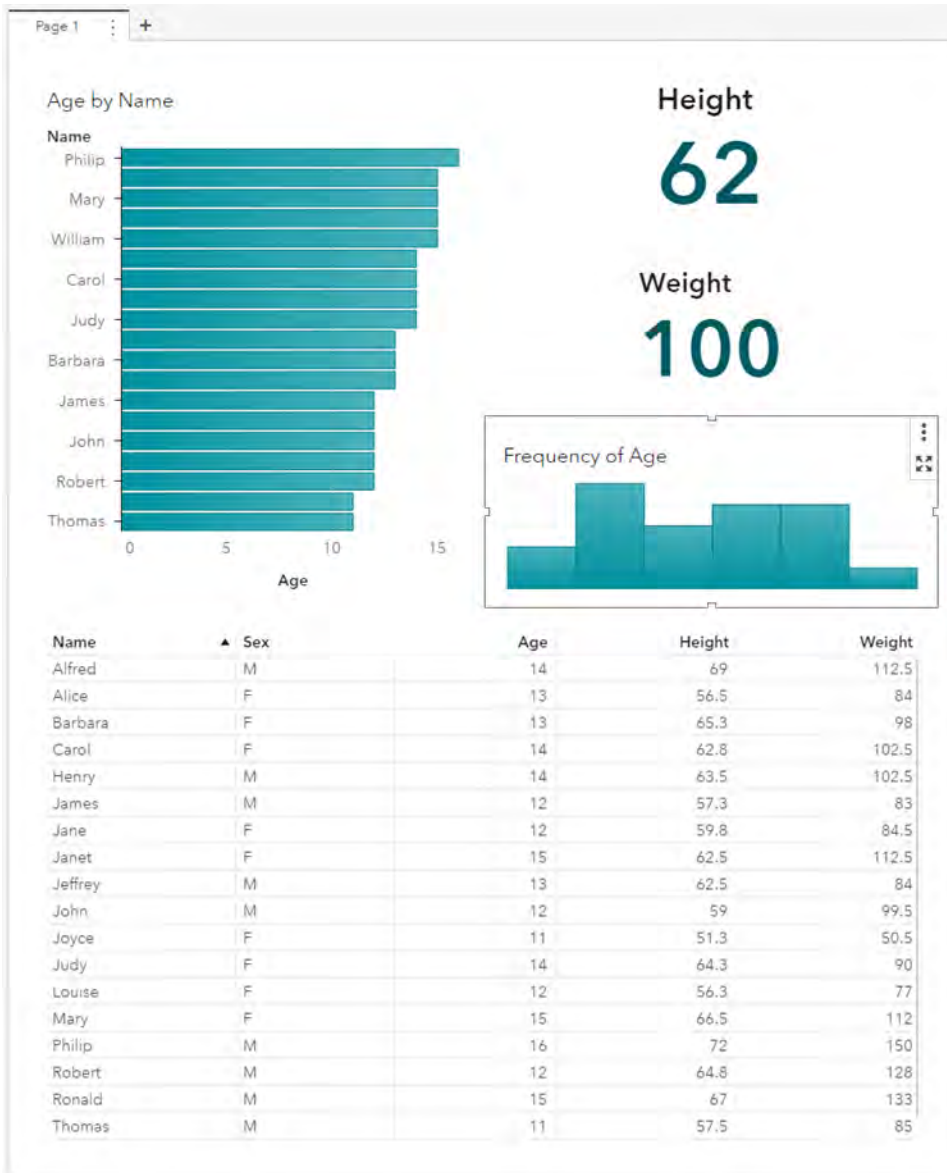A measure data item was dragged onto the report and a histogram object was inserted as shown in Figure 17.

Figure 17. The Result of Dropping a Measure Data Item at the Bottom of a Page

SPECIFYING A FIXED SIZE FOR A REPORT

If you know the size of your target device or if you just want to constrain the size of your report, you can set a fixed size for your report. This enables you to control the report size regardless of where the report is viewed. Figure 18 shows the fixed size settings, in the Options pane for a report.
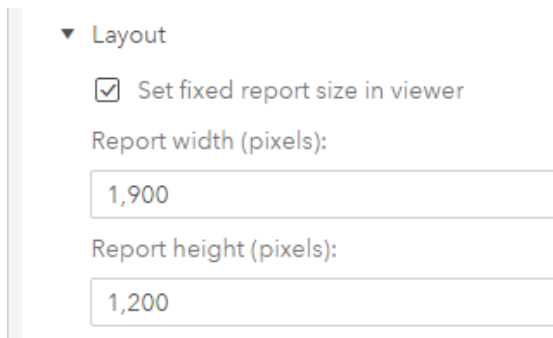
Figure 18. The Fixed Report Size Options

For example, if you are designing a report for a kiosk and you know that the size of the target display is 1900 x 1200, you can set this size on your report to make sure the report will look correct.

To test your report, you will need to view it in SAS Report Viewer (the report viewer). In SAS Visual Analytics, you can use the menu bar options above the canvas to access the report viewer.

REPORT DESIGN CONSIDERATIONS FOR CONTROLS, CONTAINERS, AND RIGHT-TO-LEFT SUPPORT

PREFERRED SIZE FOR CONTROLS

In SAS Visual Analytics Designer 7.4 (and earlier), when you added controls to a report, the controls were given a size based on the layout in the canvas. In some cases, this could impact the display of the controls in the web and mobile viewers. Starting with SAS Visual Analytics 8.1, the layout system no longer sets sizes for the controls. Instead, the layout system uses the preferred size for the controls in each viewer. This gives the controls a more natural look by using the native size for each platform. As a result, this feature enables you to build better reports. As with other objects, you can set an explicit size for a control; however, the layout system calculates the preferred size if you do not specify an explicit size.

CONTAINERS WITHIN CONTAINERS

In SAS Visual Analytics 7.4 (and earlier) you could set the layout for the section (page), and then you could add stack, horizontal, or vertical containers. Starting in SAS Visual Analytics 8.1, you can choose the layout type for each container. The layout system treats containers as objects, so you can add containers inside of other containers giving each container a different layout. The possibilities are endless.

RIGHT-TO-LEFT SUPPORT

By default, SAS Visual Analytics supports reports being rendered in both left-to-right and right-to-left locales. You do not need to make any special enhancements to the report to support either. If you design your report in a left-to-right locale and then view (or continue designing) it in a right-to-left locale, the report "flip" and display as expected.

CONCLUSION

As you can see, SAS Visual Analytics provides a rich set of containers, layout types, object sizing enhancements, and options to help you build the perfect report layout. Whether it's knowing how to position objects, understanding how objects respond to size changes, or setting a fixed size for your report, building the perfect report layout no longer needs to be a mystery.

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