# Designing SAS® Visual Analytics Reports: Write Once, View Anywhere

Karen L. Mobley, Rich Hogan, and Pratik Phadke, SAS Institute Inc.

## ABSTRACT

When you create reports in SAS Visual Analytics, you automatically have reports that work on mobile devices. How do you ensure that the reports are easy to use and understand on all of your desktops, tablets, and phones? This paper describes how you can design powerful reports that your users can easily view on all their devices. You'll also learn how to deliver reports to users effortlessly, ensuring that they always have the latest reports. Examples will show you tips and techniques to use that create the best possible reports for all devices. The paper provides sample reports that you can download and interactively view on your own devices. These reports include before and after examples that illustrate why the recommended best practices are important. By using these tips and techniques you'll learn how to design a report once and have confidence that it can be viewed anywhere.

## INTRODUCTION

SAS Visual Analytics is the only product that enables you to create reports that *automatically* work on both desktop displays and mobile devices. The support is already there. You can write a report in SAS Visual Analytics and view that report in SAS® Mobile BI on either Apple or Android devices. To create *successful* multiple-device reports, you do need to rethink how you have designed reports in the past and embrace modern techniques and guidelines. In this paper we presume that you already know how to create a basic report in SAS Visual Analytics. While you do know how to use the software, we will show you a modern way to design reports in the software. The result will be reports that your audience can view effortlessly on any device: large screen, desktop, tablet, or phone.

First, we will review how reports have been designed in the past and why these designs fail modern audiences and their devices. Then, we will show you modern mobile design techniques and how they produce reports that you can write once and view anywhere.

## DESKTOP-ONLY DESIGN DOWNFALLS

We've spent decades in a business environment where everyone in an organization had the same desktop computer. For ease of maintenance, IT typically bought the same hardware and installed the same operating system for an organization's business users. That meant that report designers could design a report on their computer and have confidence that the report looked the same on everyone else's computer. It was consistent. There were no deviations.

### PRECISION LAYOUT: CONTROL CREATES CHAOS

In this environment, report designers used precision layout to achieve the best possible looking report. And designers also showed off their skills. They tweaked the layout and overlaid text on images. They added report objects to a dashboard again and again. When they learned a new bell or whistle, designers found a way to use them. They could control the report layout with utmost precision. Why not? The canvas was consistent: everyone had a desktop computer with reasonable memory and a monitor with the same resolution; the Internet connection was always on and, for many companies, the connection was always fast. Display 1 is an example of a report that uses precision layout as seen on a desktop screen.

**Display 1. A Report Designed with Precision Layout as Seen on a Desktop**

Years of desktop-only design have made report designers accustomed to the control of precision layout. Precision layout demands that all users be on the same operating system, have the same size and type of device, and the same screen resolution.

Then mobile devices arrived.

While mobile devices have been around for a while, it's only been the last few years that the devices have become so powerful and ubiquitous that enterprise software has become available for them. While we're used to doing the same things on mobile devices that we do on desktops (reading, writing, shopping, and so on), report designers have yet to understand that we don't do these things the same way (Cerejo). Not only do we have different goals when we're using mobile devices, but the devices can't display content the same way. Display 2 shows the same report from the desktop in Display 1, but on a phone.



**Display 2. The Same Report as Seen on a Phone**

Because the screen size is smaller, the precise layout of the following features fails when viewed on mobile devices:

- background image with text overlays (See Display 2.)
- report object size and layout within a section (See Display 4.)
- the location of prompts within report sections and objects

There is no way to "fix" precision layout itself. In design this problem is called "static units" or "static" (Brownlee and Ruluks). To create multi-device reports, report designers have two choices:

- Design a precision layout based on the lowest common denominator. That means use the smallest pixel count of any screen that you are going to deploy to and that is the size of your layout. In other words: really small web browsers and really ugly design.
- Forego the rigid control of precision layout and use a design that flows based on screen size. This is called responsive design.

## SCREEN SIZE VARIATIONS: UNREALISTIC REAL ESTATE

Obviously, precision layout falls apart because of the variations in screen size. However, even if a report doesn't use precision layout, the report can fall apart due to the smaller screens on mobile devices (Brownlee and Ruluks). When report sections and dashboards contain too much content, the report audience cannot understand what to look at first. This is challenging enough on a desktop-sized screen. See Display 3 for a report with a lot of content on a desktop screen.



**Display 3. A Lot of Content on a Desktop Screen**

When the report retains that density of information on a mobile screen, the report audience cannot see anything at all. Display 4 shows the report content from the desktop, but as seen on a phone.
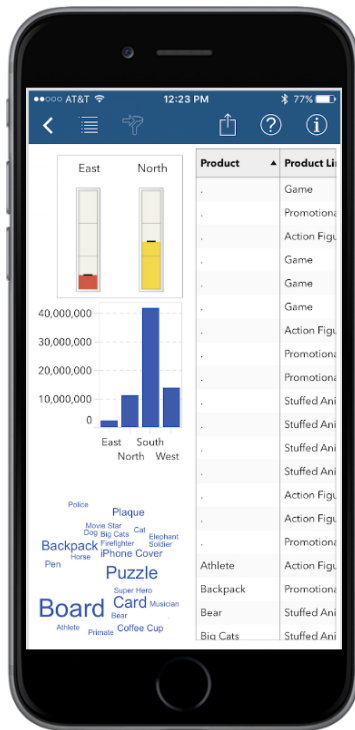


**Display 4. The Same Content Density on a Phone**

To put it simply, you can't fit a gallon of water in a 6-ounce cup (Walter and Frost).

## MOBILE DESIGN: REPORTS THAT MOVE AMONG DEVICES EFFORTLESSLY

You must approach the problem, and the design, differently. Ask "where should my eye go?" and "What story am I trying to tell?"

### PRIORITIZE THE ANSWERS

Some report designers have solved the mobile problem by designing a version of the report for each device supported by their organization. That's a lot of work! Even after the reports are created, the maintenance is multiplied by the number of devices. Instead, consider the suggestions in this section before you design your next report. With some careful thought, you can create one version of the report. When you don't have to maintain multiple versions of the report, you'll save time and effort that you can use for other important tasks.

Think about the story you need to tell and what information you need to present to your users. Then, prioritize information. Many report designers want to show every possible answer the user might want to know in one section. This impulse leads to reports that are difficult to understand and are not mobile. If you are a designer that creates a report for each type of device, you have to start paring down the information that you see in each section. While the desktop report has 12 objects in the first section, for the tablet version of the report you might include 6 objects. In the phone version of the report, you might include three. For each version of the report, you're solving the problem by prioritizing the information (Strelchenko). You're already identifying the most important visuals. That's how you decide which objects are displayed on the tablet or the phone. Why not use these decisions to design a report that works across all devices?

## CREATE LOGICAL FLOW

Now that you've prioritized the information, consider the logical ordering of the report objects in your section. On mobile devices, the objects in a section are reordered in response to the size or orientation of the screen. This behavior is called responsive design (Brownlee and Mellers). Because of this behavior, make sure your audience can logically follow the story in a section. Resist the temptation to drop objects any place in the section. You want the story that you are telling to be clear. Display 5 shows a section viewed on a desktop.



**Display 5. A Section as Seen on a Desktop**

Display 6 shows the same section using responsive design to reflow on the phone.

**Display 6. The Logical Flow of the Section as Seen on a Phone**

## LAYER INFORMATION WITH LINKS

You've prioritized your information. The objects that made the final cut for the first section of your report are now logically ordered. Where are all the other objects supposed to go? The solution is to layer the objects and their information. By using layered design, your users can discover the information that is important to them and not be overwhelmed by information required by others.

You can add a link in a report object that opens another section of the report, opens another report altogether, opens an Info window, or opens a web page. Each of these potential destinations is a powerful tool for layering.

For example, one of the most common challenges with reports on mobile devices is displaying tables (Strelchenko). Often a complex table is located in a small report object among many other report objects in the same section. The user can't comprehend the table data in such a small location. Display 7 shows a table object that is compressed to the right of the bar chart. Only threes columns can be seen.
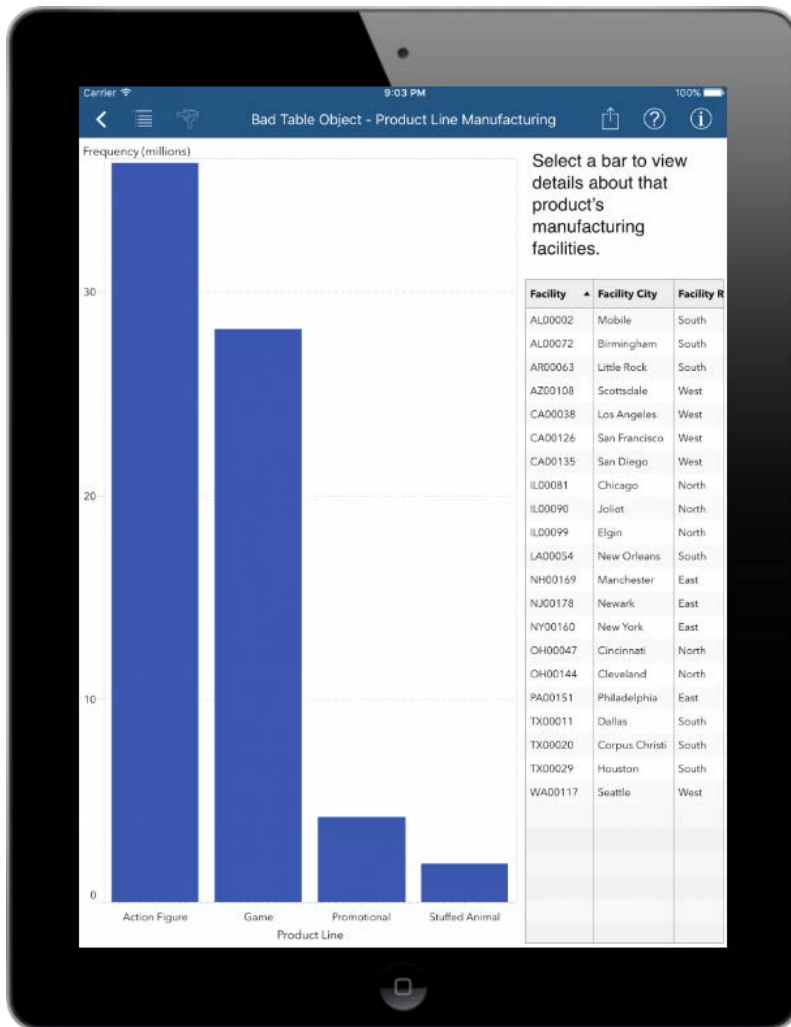
**Display 7. A Table That Is Difficult to Read**

Instead, identify the section location that makes the best story and provide a link in that location. When the user taps the link, the table appears in an Info window. The window overlays the report section and enables the user to focus on the table. Display 8 shows a bar chart object with a bar selected. The context menu for the bar provides a button (View Facility Details) that opens an Info window with the table. Notice that all of the columns can be seen. The Info window provides a full-screen option that is useful for information that is more complex.

**Display 8. An Easy-to-read Table in an Info Window**

Depending on the story the report must tell, you can also link to another section that includes only one report object: the table. You could also specify a filter on the link that subsequently filters the data loaded into the table. In Display 9, the link in the bar chart opens another section with the table. The table data has been filtered by the bar selected in the originating bar chart.
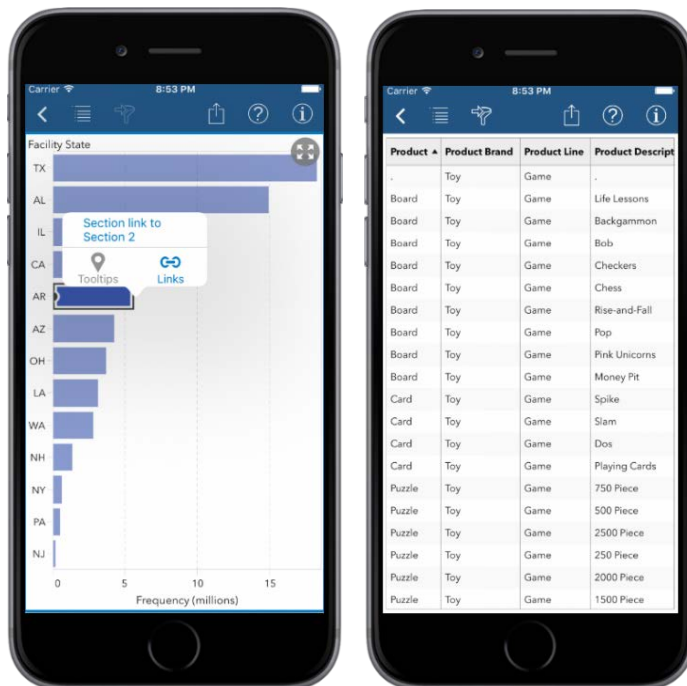


**Display 9. A Bar Chart Opens Another Section. The Table Is Filtered by the Value of the Selected Bar.**

8

To link to another section and filter its table, complete the following steps in SAS Visual Analytics Designer:

1. Create a section with a chart object, such as a bar chart.

2. Create another section with a table object, using the same data.

3. In the section with the chart object, right-click the chart object and select **Add Link > Section Link**.

4. In the Create Section Link window, select the section with the table object. Click **OK**.

Another great way to layer is linking from one report to another report. This is sometimes called daisy-chaining. By using this technique, you can reduce the size of the mobile report. If a report contains all of the information that all of your audiences want, then the size of the report) becomes very large and the amount of data it must download increases. Large reports are less mobile:

- They take longer to download, especially over slower Wi-Fi networks used when traveling.

- They use more storage space on mobile devices that have limited storage.

By breaking the information into multiple, smaller reports, you can layer the information such that one audience (such as Marketing) links to report A and another audience (such as Sales) links to report B. That means the size of the main report has been reduced by a significant amount (Strelchenko).

By using the link types provided by SAS Visual Analytics, you can design reports with layers of information that also make it easier for reports to be mobile. As long as you provide a way for your audience to easily navigate to a section or a report, they can interpret the section without distraction. For more information about links and Info windows, see the *SAS Visual Analytics: User's Guide* for your version of SAS Visual Analytics.

## INCLUDE SIGNPOSTS TO AID DISCOVERY

To help your audience adapt to layered information, consider providing signposts that can nudge them to discover their path through the report. After all, you know how the report works. You designed it. But how will your audience know? Your audience might not discover links or interactions if they don't have a tip-off (Cerejo).

Consider making your first section a table of contents. A *table of contents* should be quick to scan and make the audience immediately confident that they know what's in the report. Each table of contents item can be a link to a subsequent section. In Display 10 the table of contents is easy to read and understand in both portrait and landscape orientations.
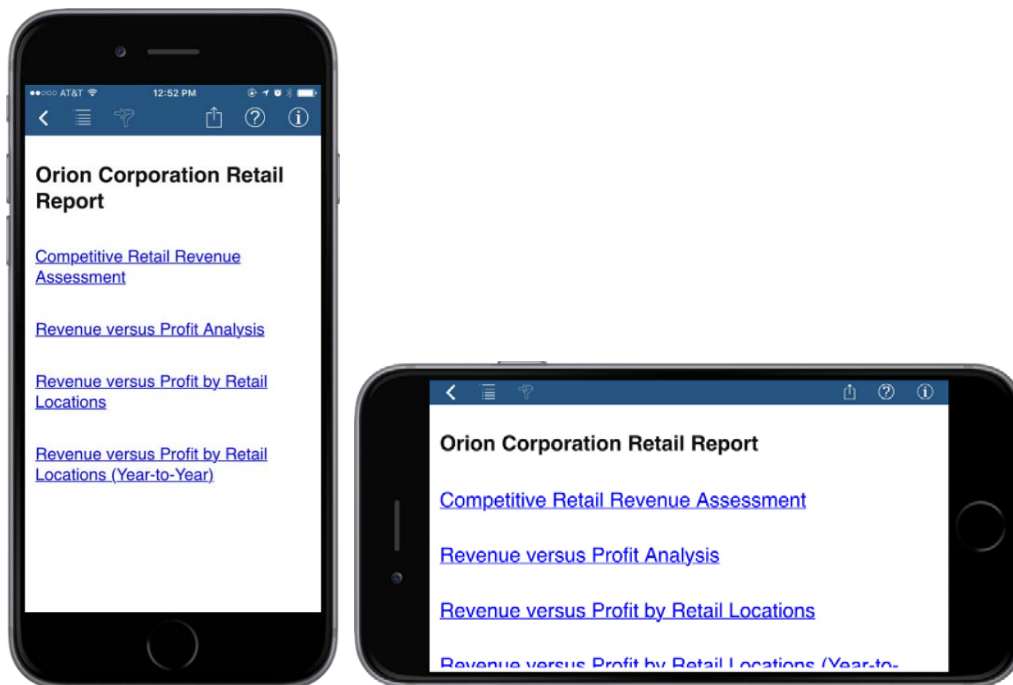
**Display 10. Table of Contents for a Report**

To create a table of contents, complete the following steps in SAS Visual Analytics Designer:

1. Create a section at the beginning of the report.

2. Add a text object to the section.

3. In the text object, add the report title and the title for each section in the report.

4. For each section title:

    a. Highlight the section title. The floating toolbar appears. You can adjust the font for the title.

    b. Click the **Links** button on the floating toolbar and select **Hyperlink**.

    c. In the Link Setup window, select **Section Link** from the **Type** list.

    d. In the **Target section**, select the section for the link to open. Click **OK**.

Similarly, you can embed brief tips in the report section or report object itself. Doing so should be done with restraint. You want to avoid distracting clutter that your audience cannot ignore. However, a brief tip can make it so much easier for users to learn (or remember) how to interact with an object. In Display 11, this technique is used for an interactive chart.
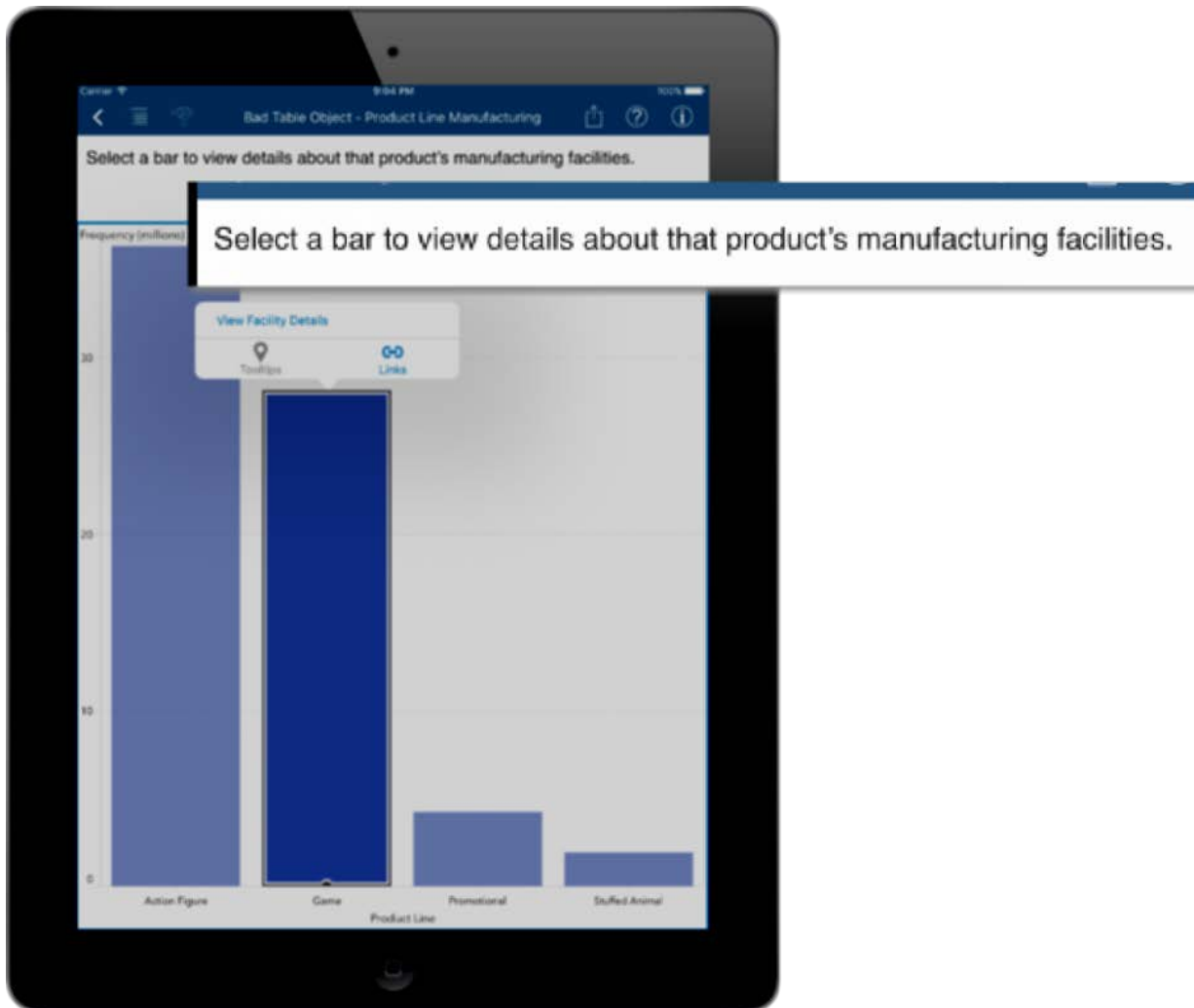
**Display 11. A Brief Tip That Teaches (or Reminds) Your Audience How to Use the Report**

To create an embedded tip, complete the following steps in SAS Visual Analytics Designer:

1. In the applicable section, add a text object.

2. In the text object, add the tip text. Make sure it is large enough to easily view on a mobile device. Do not use all capital letters. Write using the active voice and keep the tip brief.

You can also provide hints, tips, or instructions for a report or a report section by linking to an Info window. Your audience has guidance when they need it, but the information doesn't clutter up the report itself. Display 12 shows a link at the top of a section that opens an Info window with pertinent information for the user.
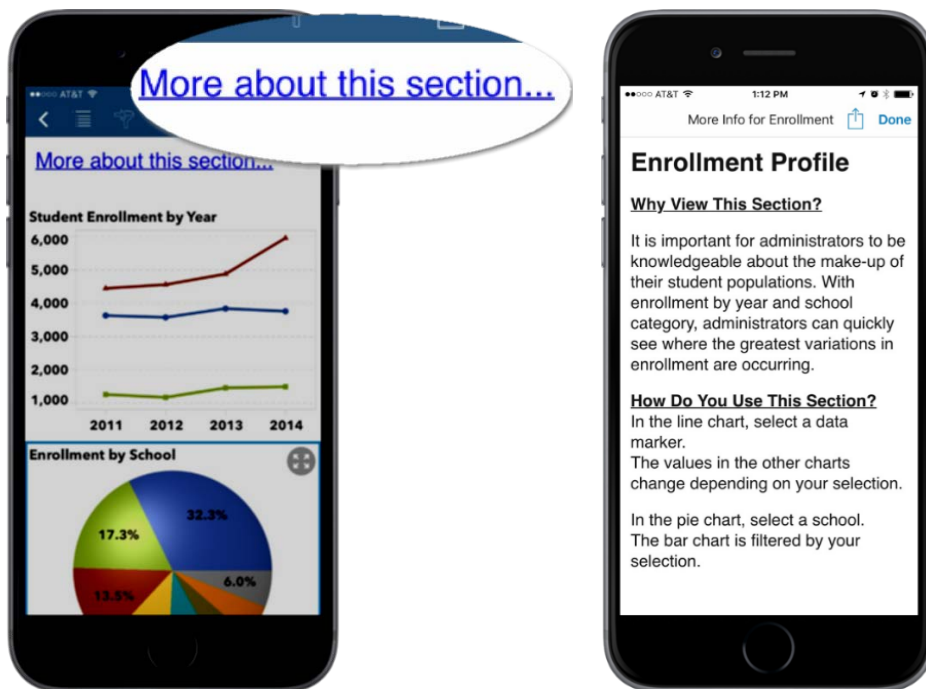
**Display 12. Helpful Information Located in an Info Window**

To create an Info Window and its link, complete the following steps in SAS Visual Analytics Designer:

1. Add a new section to the report. In its tab, click the menu and select **Display as Info window**.

2. Add a text object to the section. In this section, add the assistive content for your audience. Be sure to make it easy to read on smaller devices. Use larger fonts and lots of white space.

3. In the section that requires a link to the Info window, add a text object. Typically, the object is located at the top of the section.

4. In the text object, add the text for the link. Do not use all capital letters. Instead, use a larger font. Make sure the text object is tall enough to display the larger font on mobile devices.

5. Highlight the section title. The floating toolbar appears.

6. Click the **Links** button on the floating toolbar and select **Hyperlink**.

7. In the Link Setup window, select **Info Window Link** from the **Type** list.

8. In the **Target section**, select the Info window section for the link to open. Click **OK**.

For more information about text objects, links, and Info windows, see the *SAS Visual Analytics: User's Guide* for your version of SAS Visual Analytics.

**KEEP IT CLEAN**

You want to make your reports clean and uncluttered. Remember that less is more when it comes to telling a clear story. Resist using too many fonts and colors. Their overuse can confuse the eye and cause some people to misunderstand what they're looking at. Typically, you should use no more than three fonts. When counting the number of fonts used in a report, remember that a font is distinguished by its type face, point size, and whether bold, italics, underscore, or other stylings have been applied (Isherwood; Knight).

You can also use a SAS Visual Analytics feature called containers to create a clean look. When used wisely, you can contain multiple report objects or multiple prompts in one section. Display 13 shows a report with many prompts across the top of a section. A user cannot see all of the prompts in either portrait or landscape orientation.

**Display 13. Too Many Prompts and Not Enough Space across the Top of the Report**

However, if you design the prompts inside of a container, the prompts are easy to view and use on all devices and in both orientations. Display 14 shows a prompt container on a phone. The container opens to a full-screen view and all of the prompts are easy to see and use.



**Display 14. A Container Makes All of the Prompts Easy to See and Use**

For this example, the prompt container is created for the report as a whole. The prompts that are in a report-level container affect all of the report objects in the report that use the applicable data. You can also create a prompt container for a section. The prompts that are in a section-level container affect the

report objects in that section only. To locate your prompts in a report-level container, complete the following steps in SAS Visual Analytics Designer:

1. Create the report-level prompts for your report. See "Using Controls to Display Results" in **SAS Visual Analytics: User's Guide.**

2. On the **Objects** tab in the left pane, drag **Prompt Container** and drop it onto the area above the tabs on the canvas. (Look for the hint text that says, "Drop controls here to create a report prompt.") The container appears above the tabs on the canvas. The container is automatically labeled "Prompts."

3. Drag each of the report-level prompts onto the prompt container window.

4. To make the prompt container easier to see and use, you might want to adjust the styling applied to the container. See "Specify Container Styles" in **SAS Visual Analytics: User's Guide.**

5. Click **Close**.

For more ways to use containers, see "Carry-On Suitcases and Mobile Devices: Using SAS® Visual Analytics Designer for Creating Optimally Designed Reports for SAS® Mobile BI (SAS3802-2016)."

## GUIDELINES TO DESIGN BY

What are the guidelines you should remember when designing a report that is mobile and usable on all devices?

1. Know your audience. This means being honest about your audience skills and needs.
   Consider asking your audience what they need from the report and how they want to use the report. This feedback could be critical if the report has been in use for a while. Audience needs might have changed.

2. Identify the question that this report must answer.
   Why does someone want to read this report?

3. Determine whether all of the people reading this report are asking the same question.
   If not, the different questions determine how to layer and branch the information from the executive summary.

4. Provide a big picture answer (an executive summary).
   Make it something the audience can glance at and get it. When they want more details, they can navigate to the details without being overwhelmed.

5. Within each section, determine where the eye should go to first.
   What is the logical order of that section?

6. Make sure your audience knows how to use the report.
   How do they detect, let alone navigate, the layers and interactions?

7. Design a clean report that doesn't distract or get in the way of your audience's goals.
   Less is more.

## CONCLUSION

By following these guidelines and techniques, you can be confident that your audience will be able to effortlessly view your reports on any device. You will be able to create reports that are mobile and modern. By using SAS Visual Analytics, you will ultimately spend less time creating reports, too.

## REFERENCES

Brownlee, John, and Sandijs Ruluks. "9 GIFs That Explain Responsive Design Brilliantly." Co.Design. November 12, 2014. Accessed December 1, 2015. Available http://www.fastcodesign.com/3038367/9-gifs-that-explain-responsive-design-brilliantly.

Cerejo, Lyndon. "The Elements Of The Mobile User Experience." Smashing Magazine. July 11, 2012. Accessed December 16, 2015. Available http://www.smashingmagazine.com/2012/07/elements-mobile-user-experience/.

Isherwood, Matt. "Mobile Usability 5: Aesthetic and Minimalist Design." Matt Isherwood. October 6, 2015. Accessed December 1, 2015. Available http://mattish.com/blog/post/mobile-usability-5-aesthetic-and-minimalist-design.

Knight, Kayla. "Minimalist Web Design: When Less Is More." WebdesignerDepot. December 3, 2009. Accessed December 1, 2015. Available http://www.webdesignerdepot.com/2009/12/minimalist-web-design-when-less-is-more/.

SAS Institute Inc. *SAS® Visual Analytics 7.3: User's Guide.* Cary, NC: SAS Institute, 2015.

Strelchenko, Kirill. "10 Responsive Design Problems and Fixes." UX Magazine. November 13, 2014. Accessed December 3, 2015. Available http://uxmag.com/articles/10-responsive-design-problems-and-fixes.

Walter, Stéphanie, and Brad Frost. "Responsive Retrofitting vs. Mobile First." Stephanie Walter. December 17, 2015. Accessed February 26, 2016. Available http://blog.stephaniewalter.fr/en/freebies-responsive-retrofitting-vs-mobile-first-responsive-strategy-illustration/.

## RECOMMENDED READING

- Brownlee, John, and Sandijs Ruluks. "9 GIFs That Explain Responsive Design Brilliantly." Co.Design. November 12, 2014. Accessed December 1, 2015. Available http://www.fastcodesign.com/3038367/9-gifs-that-explain-responsive-design-brilliantly.
  Understanding terminology is an important step to understanding responsive design. Because many of the applicable terms describe a changing state, it can be difficult to understand what some terms mean. This citation is a series of nine animated images (GIFs) that elegantly define important terminology that is used in responsive design.

- Cerejo, Lyndon. "The Elements Of The Mobile User Experience." Smashing Magazine. July 11, 2012. Accessed December 16, 2015. Available http://www.smashingmagazine.com/2012/07/elements-mobile-user-experience/.
  Breaks down the elements that a designer must consider when creating a mobile experience as opposed to a desktop-only experience. Each element has a section that includes detailed guidelines for designing a mobile experience. Each section also provides references for further learning and exploration. Many of the guidelines are applicable to mobile report design.

- Dansey, Claire. "44 Responsive Web Design Resources: The Ultimate List." User Testing. February 3, 2015. Accessed December 1, 2015. Available https://www.usertesting.com/blog/2015/02/03/responsive-web-design-resources/.
  This is a blog for a company that provides user testing services. This blog entry is a well-curated annotated list of resources about responsive design. An excellent source for the person that likes to do deep dives on a topic.

- Henderson, Chelsei. "3 Awesome Tips for Powerful Mobile UX Design." Flight Media Blog. September 14, 2015. Accessed December 1, 2015. Available http://blog.flightmedia.co/mobile-ux-design/.
  A concise overview about some fundamental principles of mobile user experience design.

- Isherwood, Matt. "Mobile Usability 5: Aesthetic and Minimalist Design." Matt Isherwood. October 6, 2015. Accessed December 1, 2015. Available http://mattish.com/blog/post/mobile-usability-5-aesthetic-and-minimalist-design.
  This article provides clear and to-the-point descriptions and examples about minimalist app design. Unlike the articles written about minimalist web design, this article focuses on the design of interactive user interfaces. This article is part of a series of blog articles that restate Jakob Nielsen's 10 web usability heuristics in terms of mobile app design.

- Knight, Kayla. "Minimalist Web Design: When Less Is More." WebdesignerDepot. December 3, 2009. Accessed December 1, 2015. Available http://www.webdesignerdepot.com/2009/12/minimalist-web-design-when-less-is-more/.
  A clear explanation of the principles that lead to good minimalist web design. Some of the explanations are a little more technical when describing design implementation, but not enough to alienate a layperson.

- Mandavilli, Lavanya. "Carry-On Suitcases and Mobile Devices: Using SAS® Visual Analytics Designer for Creating Optimally Designed Reports for SAS® Mobile BI." In *Proceedings of the SAS Global Forum 2016 Conference.* Cary, NC: SAS Institute Inc. April 2016. Available http://support.sas.com/resources/papers/proceedings16.
  This paper demonstrates how smaller real estate on mobile devices, as well as device orientation in portrait or landscape mode, influences best practices for designing reports. The use of containers, layouts, filters, information windows, and carefully selected objects enable you to design and guide user interaction effectively. The appropriate selection of font styles, font sizes, and colors reduce distraction and enhance quick comprehension. By incorporating these recommendations into your report design, you can produce reports that display seamlessly on mobile devices and browsers.

- Patel, Jayneel. "Why You Should Opt for Minimal UI Design & 15 Best Examples of Minimal UI." Appsee Blog. July 7, 2014. Accessed December 1, 2015. Available http://blog.appsee.com/blog/2014/07/07/why-you-should-opt-for-minimal-ui-design-15-best-examples/.
  A short and to-the-point explanation of what minimalist user interface (UI) design is and why it makes good business sense to use it. The article includes a gallery of 15 UIs for reference. The article would be better if it explicitly stated why each UI in the gallery is considered a good example of minimalist UI design.

- Pavlus, John, and James Mellers. "Hey Dummy: This Is What "Responsive Design" Means." Co.Design. January 4, 2012. Accessed December 1, 2015. Available http://www.fastcodesign.com/1665748/hey-dummy-this-is-what-responsive-design-means.
  What is responsive design and why is it important? This brief article explains both answers and provides an interactive image that you can resize. The image's response acts as an animated demonstration of responsive design. The explanation is intended for lay people and clients of designers.

- Snell, Steven. "The Anatomy of a Minimalistic Web Design." Vandelay Design. January 16, 2008. Accessed December 1, 2015. Available http://www.vandelaydesign.com/how-to-make-minimalistic-design/.
  A short and straightforward article that clearly describes the principles that lead to good minimalist web design. The article avoids design superlatives and provides a well-chosen example for each principle without becoming an endless gallery of screen captures. The principles easily translate to report design.

- Soonke, Jesse, Ed Summers, Julianna Langston, and Karen Mobley. "If You Build It, Will They Understand? Designing Reports for the General Public in SAS® Visual Analytics." In *Proceedings of the SAS Global Forum 2016 Conference.* Cary, NC: SAS Institute Inc. April 2016. Available http://support.sas.com/resources/papers/proceedings16.
  This paper defines best practices for designing reports that are universally accessible to the broadest audience. You learn tips and techniques for designing reports that the general public can easily understand and use to gain insight. You also learn how to leverage features that help you comply with your legal obligations regarding users with disabilities. The paper includes recommendations and examples that you can apply to your own reports.

- Strelchenko, Kirill. "10 Responsive Design Problems and Fixes." UX Magazine. November 13, 2014. Accessed December 3, 2015. Available http://uxmag.com/articles/10-responsive-design-problems-and-fixes.
  While written from a web design viewpoint, nine out of the ten problems included also apply to report

design. Each problem is described and then one or more fixes are proposed. Insightful and clear, just the section about tables makes the article worth reading!

- Walter, Stéphanie, and Josh Clark. "Content Is like Water." Stéphanie Walter. Accessed February 26, 2016. Available http://www.stephaniewalter.fr/portfolio/content-is-like-water-illustration/.
  An image that elegantly illustrates a fundamental concept in mobile design.

- Walter, Stéphanie, and Brad Frost. "Responsive Retrofitting vs Mobile First." Stéphanie Walter. December 17, 2015. Accessed February 26, 2016. Available http://blog.stephaniewalter.fr/en/freebies-responsive-retrofitting-vs-mobile-first-responsive-strategy-illustration/.
  An image that illustrates the downfall of designing for the desktop first and the benefits of designing mobile first.

- Williamson, James. "Responsive Design Fundamentals." Lynda.com. October 31, 2012. Accessed December 1, 2015. Available http://www.lynda.com/Web-Responsive-Design-tutorials/Responsive-Design-Fundamentals/104969-6.html.
  If you have access to this training website and are interested in a deeper dive into responsive design, this is a great tutorial. Not only does it describe responsive design, but it also shows you techniques that designers use to create and test responsive design. The course is only 2 hours and 15 minutes, so it doesn't require a lot of commitment.

## CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the authors at:

| Karen L. Mobley | Rich Hogan | Pratik Phadke |
| --- | --- | --- |
| Karen.Mobley@sas.com | Rich.Hogan@sas.com | Pratik.Phadke@sas.com |