Paper 177-26

The New User Interface of V9 Graphing Tools: A Usability Case Study

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ABSTRACT

SAS® software has long been known to be incredibly powerful. Through user-centered design and usability testing, usability engineers at SAS Institute are working to make that power more accessible than ever. This paper provides a case study of improvements that have been made, and are continuing to be made on an ongoing basis, to a core staple of many SAS products – our data visualization tools.

INTRODUCTION

Usability is not the polar opposite of functionality. Although rare, there still exists the occasional archaic notion that anything that is easy-to-use cannot be powerful. Of course, if that were the case, Ferrari would have positioned the steering wheels of all their automobiles in the middle of the floorboard and put the stick-shift in the glove compartment. After all, the reasoning goes, if driving were a bit more difficult, you might actually get there faster.

On the contrary, increasing the usability of any tool enhances the tool's potential, increases the user's productivity, and makes the hours spent using that tool more enjoyable. SAS products have always provided powerful tools for understanding data. Over the past few years, SAS has placed greater emphasis upon continuing to provide the most powerful data analysis software on the market, but with a greatly improved and easier to use graphical user interface (GUI). As a result of this emphasis, the SAS product line is reaching a wider variety of users than ever; SAS software is no longer used by only the "power users."

THE VERSION 8.1 USER INTERFACE FOR GRAPHING

Two major graphing components are commonly used in SAS products for client-side data visualization. Those components are the ActiveX Graph Control for Windows and the Java Graph Applet. Although the user interfaces for the Graph Applet and Graph Control differed in structure in version 8.1, they both used a similar approach with their emphasis on cascading menus. Rather than providing dialog boxes and property sheets for making graph modifications, the components provided a series of cascading submenus. Although this approach resulted in a "lighter weight" component that required less resources from your system, this light-weight approach also had some drawbacks.
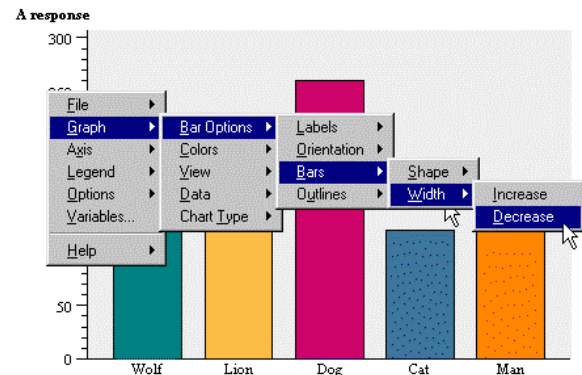

Figure 1

The example above (Figure 1) shows the layers of submenus that were occasionally encountered when making modifications to a graph. For instance, if you wanted to make the bars of your bar chart a bit more narrow, the following steps were required:

- Right-click to access the pop-up menu;
- Select "Graph" from the menu;
- Select "Bar Options" from the submenu;
- Select "Bars" from the submenu;
- Select "Width" from the submenu;
- Select "Decrease" from the submenu.

Unfortunately, this sequence did not necessarily yield the results you wanted, since it resulted in the bars being only slightly more narrow than before. If the bars were still not quite as narrow as you had intended, the above sequence had to be repeated until you obtained the necessary results. This had the potential to be somewhat frustrating.

Navigating these submenus could also test the limits of your manual dexterity. When using extensive cascading menus, you could easily select the first menu. Then, you carefully maneuver to the right to select an item in the submenu, then cautiously move into the next submenu to select a third item, then into the fourth for another. On occasions, however, as you balanced the pointer precariously along to its fifth and final destination, you would as the pointer slipped off of the menu. As it did, the entire menu would fold up around itself, requiring you to begin the sequence all over again.

The cascading menus presented navigation problems that needed to be addressed. In addition, there was another area we felt could be improved. In version 8.1, manipulating the graph (such as rotating, scaling, or positioning it) required the use of keyboard modifiers. Furthermore, unless you happened to already know the correct keys, they had to be looked up under the "Mouse Help" submenu (from the "Help" menu). This meant that new users had to rely on the online help until they had learned the proper commands.

From a usability perspective, the good news about the version 8.1 GUI was that the actual organization of the information was

quite good. In general, items were located in logical places within menus. For version 9, we wanted to reduce the number of cascading menus, improve access to graph manipulations, and establish consistency between the Graph Control and Graph Applet.

IMPROVEMENTS TO THE VERSION 8.2 USER INTERFACE

During 8.2 development, plans were announced to open a new SAS Usability Lab. This lab would give us the chance to make some GUI modifications in 8.2, do usability testing with actual users, then make improvements for version 9 that were based upon actually watching people use the Graph Control.

One of our first goals was to by provide more direct access to component features. This meant decreasing submenus, increasing the number of option dialogs, and providing tools that enabled the graph manipulation capabilities.

In order to reduce the excessive number of submenus, controls were moved off of menus and onto dialogs. As a result, there is never more than a single submenu, so that you never need to search more than one level down.

Figure 2

Figure 2 above, shows the version 8.2 menu. The first entry in the menu (in this case, "Graph Options") varies depending upon context. If the mouse pointer is over a bar when the right mouse button is clicked, "Bar Options" would appear as the first item in the menu. If the pointer is over an axis when the context menu is produced, "Axis Options" would appear as the first entry, and so on.

A further modification was to provide users with even faster access to the relevant options dialogs: double-clicking on a particular graph element. For example, double-clicking on a bar opens the bar options dialog; double-clicking on an axis produces the axis options dialog. As a result, you can bypass the menu altogether by simply double-clicking on a given part of the graph.
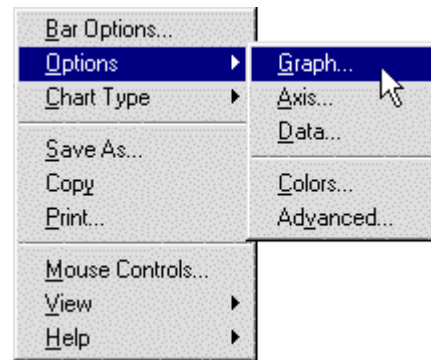
Figure 3

Access to all other possible "Options" dialogs is now provided as a submenu under the generic "Options" entry. As shown in Figure 3, if Bar Options is the first menu entry, but need access to Graph Options, you can simply select "Graph Options" from the Options submenu.

In the earlier example for adjusting bar width in version 8.1, you will recall that it was necessary to navigate through 5 selections to narrow bar width. The following example shows the improvements to the same task with the version 8.2 interface, resulting in only 2 steps.
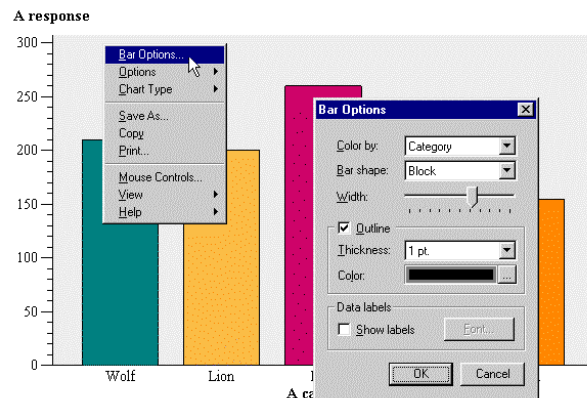
Figure 4

A Bar Options dialog can now be accessed by simply selecting "Bar Options" from the menu. By simply moving the "Width" slider on the Bar Options dialog, the user can interactively modify the width of bars and see the effects of those changes immediately. By sliding the slider to the right, the width is increased, while sliding it to the left decreases bar width.
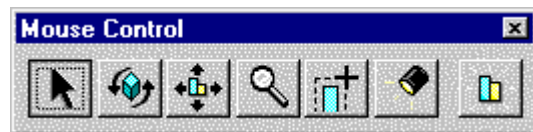
Figure 5

In order to address the problem of manipulating the graph, a "Mouse Controls" toolbar (shown in Figure 5) was introduced in the version 8.2 Graph Control GUI. By using this toolbar, keyboard modifiers are no longer necessary (but are still optional) for rotating, scaling, or positioning the graph.

USABILITY TESTING THE V8.2 GRAPH CONTROL

Six users were selected for the usability test. In the test, the subjects were presented with a series of typical graphing tasks. Those tasks included items such as changing between a 3D and 2D chart, changing chart types, modifying chart colors, displaying grid lines, showing data values, etc. Subjects performed sets of graphing tasks with the v8.1 cascading menus and the v8.2 revised GUI and with the previous cascading menu approach.

Users were instructed to "think aloud" as much as possible while trying to complete these tasks. This technique was essential for understanding why users were looking in certain areas for the controls.

Results of the usability test showed that subjects made fewer errors with the new, revised GUI and preferred it over the previous menu-driven approach. Nonetheless, according to the results, there were still several areas where the user interface could be improved.

In particular, users encountered the following difficulties:
- displaying the legend of a graph;
- displaying data labels for a graph;
- displaying grid lines;
- understanding the term "Mouse Controls";
- assigning variables properly.

These usability problems, and the feedback provided by the subjects, were all taken into account for the redesign of the version 9 user interface.

DESIGN OF THE V9 USER INTERFACE

Based upon the results of the test, the menu was further reorganized to reduce some of the problems encountered. First of all, the "Options" entry (and corresponding dialogs) were renamed "Properties" (Figure 5), since the dialogs presented to the user are actually property sheets – that is, the dialog can remain open on the screen as the user modifies the chart.
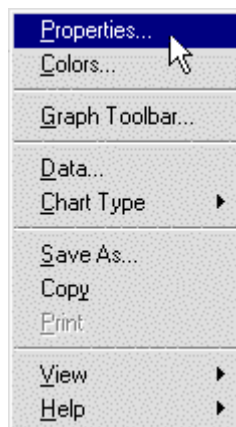

Figure 6

Some users had difficulty locating the tools necessary to rotate, move, or scale the graph. In discussions, they indicated that they were confused by the use of the term "Mouse Controls"; they had no idea what was meant by the term, so they hesitated to select it. When asked, they suggested that a reference to tools or a toolbar would have been more obvious, so the item was renamed "Graph Toolbar" for version 9.
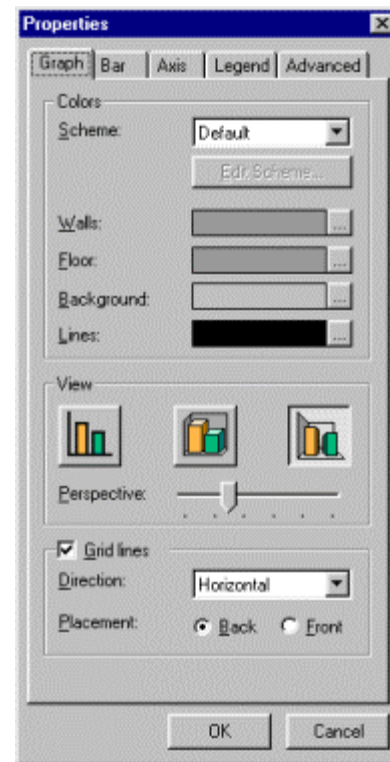

Figure 7

As shown in Figure 6 above, the property sheets have been redesigned as a single tabbed dialog. Although we already planned to incorporate a tabbed format in version 9, the usability test emphasized the importance of that modification. During testing, if subjects were unable to locate a control on a dialog, they had to close down the dialog, then open another. It is inevitable that a control is not always going to be where *every* user expects. In that case, allowing the user to simply click a tab to change property sheets is a great convenience.
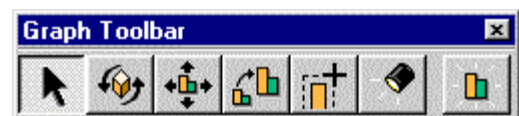

Figure 8

Figure 7 shows the new toolbar, which allows you to manipulate the graph in various ways. Other than the name change (from "Mouse Controls" to "Graph Toolbar"), the usability tests revealed that this toolbar required one other modification. In the previous incarnation, the toolbar presented graph scaling as a zoom metaphor, with a magnifying glass icon. This suggested that the graph was made smaller by zooming out, or larger by zooming in. The test results suggested that this metaphor was less clear to users than simply resizing the graph. Figure 7 shows the change, with the fourth button from the left indicating the altered "resize" icon.

In addition to the changes mentioned here, a few additional minor changes were made to the interface. Those changes address the remaining usability problems found during testing by simply relocating a few items.

Unlike the Graph Control user interface, you will find that the version 8.2 Graph Applet has not changed significantly from its version 8.1 counterpart. In version 9, however, you will find the

Graph Applet to be much improved. In addition, you will find the user interface of the applet to be consistent with the version 9 Graph Control GUI. That means that, in addition to finding both of the graphing controls easier to use, you will no longer need to learn a new interface when you change from one component to the other.

CONCLUSIONS

Design modifications to the GUI of SAS graphing software have resulted in notable gains in ease of use. A usability test comparing the 8.1 and 8.2 versions of the ActiveX Graph Control indicated that subjects made fewer errors when using the v8.2 graphing GUI. Furthermore, subjective measures also revealed that users prefer the v8.2 GUI to the previous menu-oriented GUI. In addition to the usability improvements found in the v8.2 Graphing Control, however, the test suggested issues for further improvement. These issues have since been incorporated into the design of both the ActiveX-based and Java-based version 9 graphing components.

AFTERWORD

Coincidentally, the very day this paper is submitted for publication marks the day that the graphing interface goes into another round of usability testing. That means that by the time you actually use the version 9 Graph Applet or Graph Control, it may have a few additional improvements to the version you see here.

Fortunately for our users, every time the user interface is tested and the design iterated, it gets better. Based upon the previous usability testing, there is no doubt that users are going to appreciate the enhancements to the version 9 interface.

By necessity, user interface design is an ongoing, iterative process. It is never right the first time. In order to get the best possible user interface, one that reveals its full power to the greatest number of users, a design must be tried and tested, redesigned, then tested again. But the process is well worth the effort. After all, after purchasing a new Ferrari, would you rather drive it or just sit around and read the owners' manual?

ACKNOWLEDGMENTS

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