

Paper SAS4323-2020

## Designing Dashboards for Multiple Target Audiences with SAS® Visual Analytics Kunal Shah, SAS Institute Inc.

### ABSTRACT

There is no doubt that organizations have a vast amount of data available at their disposal. Yet, they often fall into the trap of creating a single dashboard for a wide variety of audiences to derive meaningful insights from the available data. Different audiences expect different insights from the data. Even the dashboard design thinking differs based on the target audience. This presentation focuses on three key audiences (executives, middle management, and individual contributors) and how to use SAS® Visual Analytics to create dashboards that generate powerful insights for each of these. The presentation also covers dashboard design best practices and recommendations from field consultants to help you weave a compelling story from your organizational data.

### INTRODUCTION

Dashboards have become a popular tool **in today's business world**. They are designed and implemented by nearly every industry, non-governmental organization (NGO), and even educational institution to enable data-driven decision making. There are literally hundreds of solutions that incorporate some kind of dashboard building capability. Yet, very little attention has been paid to the design and usability of these dashboards. Deriving value out **of data isn't just about defining a laundry list of success metrics but rather communicating a story and compelling the user to take action**.

Traditionally, dashboards are designed with data in mind - the amount of data, the kind of data, and the type of graph/chart to visualize the data. Users end up cramming a bunch of charts and gauges into a single dashboard and would eventually find themselves trying to fit in a large amount of organizational data into limited screen space. Subsequently, users would start adding a list of filters, drill-downs, and a variety of user controls to navigate the vast amount of information on that single dashboard. Such a design approach typically leads to a one-size-fits-all dashboard and usually ends up being an underused report with overcrowded information.

The ultimate value of a dashboard is to provide the right information to the right audience. This paper will help you design dashboards in a holistic way with a focus on identifying the target audience, understanding user requirements, and how to use SAS Visual Analytics to create impactful visualizations and dashboards.

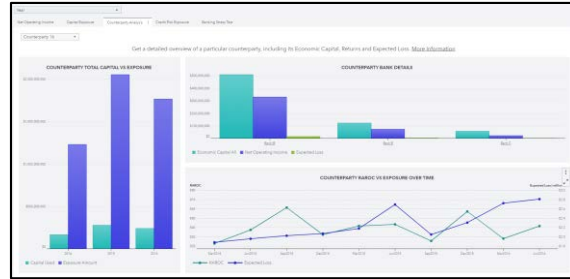
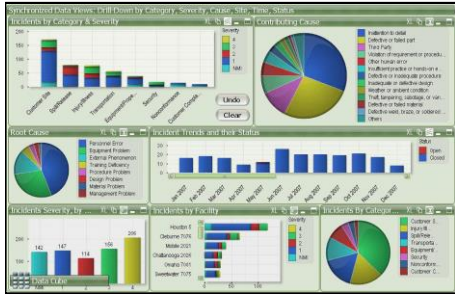


Figure 1: Traditional Dashboard vs. User-Focused Dashboard

## DESIGNING WITH PURPOSE

It is a common understanding in the business world that “what we measure we improve” and dashboards are a great tool to enable a shared understanding of the state of an organization and how it is performing. However, it is important to find the specific reasons for how the dashboard will be useful to your organization and this can only be achieved by understanding how the decision-makers in your organization interact with the data. So, in order to design a purpose-filled dashboard, start with defining the right audience

### DEFINE YOUR AUDIENCE

A dashboard is only as good as its design and that design should be influenced by the needs of your users. The best dashboards are often the ones that are intended for a specific target audience. Hence, defining your audience is an essential first step. Before you start your work on the dashboard, evaluating the goals and objectives of the dashboard consumers will help you design a product that ensures high user adoption and engagement across the organization. To fully connect with your audience, you have to identify the context in which the data is used and how it can be translated into meaningful insights through visualization. The table below lists a few factors to consider while designing a dashboard.

Key factors	Design considerations
Based on the role, identify the strategic decisions and key questions that need to be answered	Make the information for high priority questions easy to find
Identify the context in which the dashboard will be used, whether it will be used on a daily basis.	Consider the display size and build a dashboard based on a user's preferred device. For example, Display Monitor vs. Mobile Phone
Assess the user sophistication with using data; evaluate the analysis skills of your user	<b>Try to match the dashboard's level of detail with the audience's analytical capabilities</b>
Evaluate KPIs, data source knowledge, and business expertise of target audiences	This will help in identifying the amount of text used for embedded explanations.

Table 1. Key factors to Consider while Designing a Dashboard

Rather than creating one dashboard to be a single source of truth within your organization, focus on creating multiple views of data to meet the specific needs of different audiences. Designing multiple dashboards may look like a lot of effort. However, **it's much easier** than

trying to fit KPIs **for everyone on a single dashboard**. With this approach, you'll minimize the need for adding a variety of filters, tabs, sections, and drill-downs.

### THREE KEY AUDIENCES FOR YOUR DATA

Different analytic users have different needs. Some users are information consumers who prefer prebuilt reporting dashboards while others are analytical gurus who need unrestricted access to the visual analytics platform. Satisfying the needs of the end user means customizing the analytical capabilities according for your audience. To that extent, almost all analytic users fall in one of these 3 audience categories.

1. Strategic
2. Tactical
3. Operational

Let's take a look into each of the three audience categories.

#### STRATEGIC AUDIENCE

Also known as executives, the C-suite, and the top-level VPs, the strategic audience is a primary consumer of executive dashboards. Executive dashboards are one of the most essential tools for top-level managers to keep a check on the pulse of their business. Most of ten, the strategic audiences are also classified as information consumers since executives are interested in **obtaining a bird's-eye** view of their organization on a daily basis. Executive dashboards allow business leaders to keep track of the organizational performance, save time from the traditional bottleneck of manual reporting and gain instant insights.

For example, here are some of the executive KPIs based on the organization.

Sales	Marketing	Finance
YTD Sales Growth	Customer Acquisition Cost (CAC)	Working Capital
Gross Margin ROI	Customer Lifetime Value (LTV)	Operating Cashflow
Sales Avg Purchase Value	Marketing Originated Customer %	Earnings before Interest and Taxes

Table 2. Strategic Dashboard KPIs

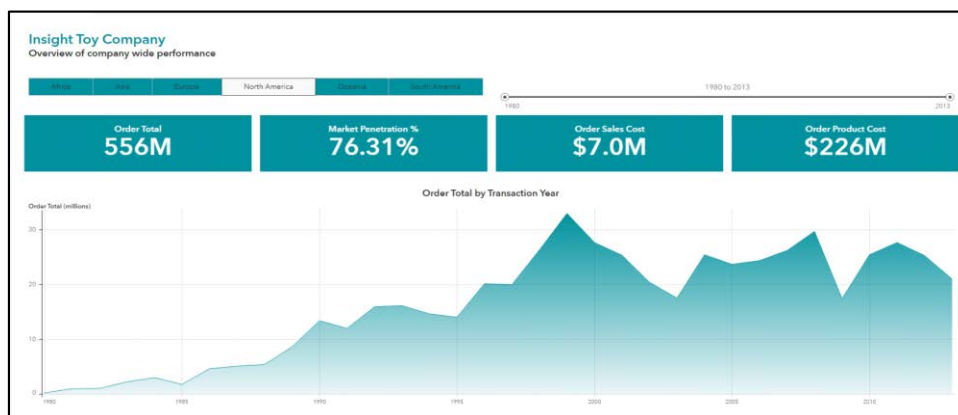


Figure 2. Executive Dashboard Example

#### TACTICAL AUDIENCE

Tactical audiences are front-line managers, in charge of analyzing the organizational processes and ongoing performance supporting the strategic objectives. The main objectives of tactical dashboards are to support what-if scenario analysis, to uncover trends and to optimize business processes in various departments such as sales, marketing, finance, information technology, and human resources. Often referred to as analytical dashboards, tactical dashboards help mid-level management in their decision-making process. Much of the emphasis is put on analysis rather than monitoring or strategic management.

The following table shows examples of mid-level KPIs based on the organization.

Sales	Marketing	Finance
Sales Target	Product Sales Trend	Relative Income per customer
Sales Conversion Rate	Revenue by Channel	Burn Rate
Sales per Rep	Attribution Rates	Budget Variance

Table 3. Tactical Dashboard KPIs

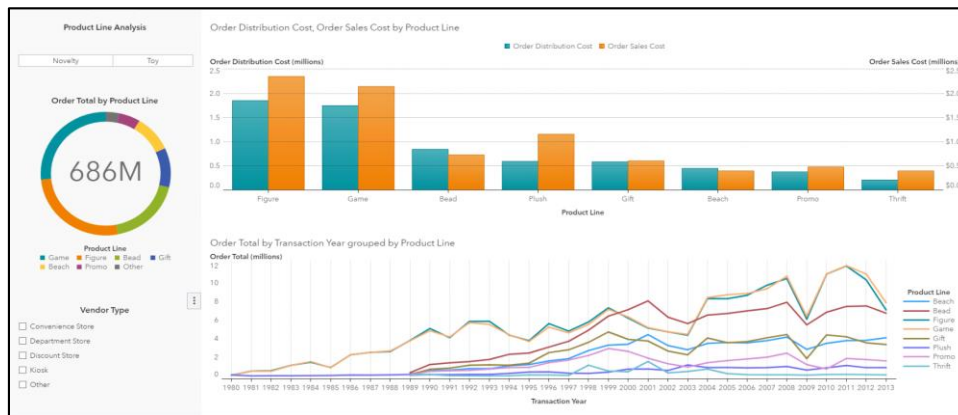


Figure 3. Tactical Dashboard Example

### OPERATIONAL AUDIENCE

Operational audiences are front-line personnel that monitor everyday business events as they occur. The dashboards built for this type of audience controls the functional activity and ensures that processes are within the threshold of prescribed limits. The operational dashboard's primary focus is to display ongoing events in the business processes and invoke action from the dashboard consumer to address any process bottlenecks or issues in real time.

The following table shows examples of low-level KPIs based on the organization.

Sales	Marketing	Finance
Meetings Booked	Click thru rate	Accounts Receivable
Open Opportunities	Web traffic sources	Accounts Payable
Deals in Pipeline	Bounce Rate	Creditor and Debtor Days

Table 4. Operational Dashboard KPIs

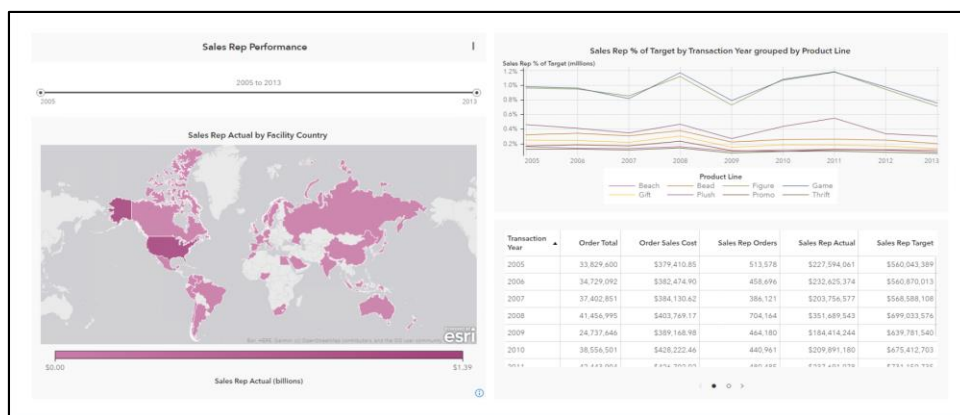


Figure 4. Operational Dashboard Example

## USING SAS VISUAL ANALYTICS TO PRESENT YOUR DATA

SAS Visual Analytics is one of the flagship offerings provided by SAS for self-service data preparation, visual discovery, interactive reporting, and dashboards, all of which is integrated with easy-to-use analytics and governance embedded. SAS Visual Analytics allows non-technical users to create, share, and implement analytical workflow for interactive reporting and free-form exploration. The following are the primary functional components supported by SAS Visual Analytics:

- Content Creation
- Self-service Data Preparation
- Augmented Analytics
- Interactive Reporting
- Location Analytics

From a collaboration standpoint, SAS Visual Analytics supports the sharing and distribution of insights to key decision-makers who are in charge of taking collective organizational decisions – offline or online.

## DATA PREPARATION

Fast, parallel data loading into the in-memory environment is provided for many relational and Hadoop data sources. Data set compression is available so that you can load data that is larger than the available memory. The demand for self-service data preparation will **increase as more users create interactive content, whether it's reports, dashboards or explorations.** With SAS Visual Analytics, users can perform the following tasks:

- Import data from a variety of sources: databases, Hadoop, Excel, social media, etc.
- View lineage with network diagrams.
- Use basic data quality functions like change case; convert, rename, remove, and split columns; and create calculated columns and transformations using custom code.
- New table and column profiling to understand data immediately.
- Prepare data using append, join, filter, and transpose functions.
- Reuse, schedule, and monitor jobs.

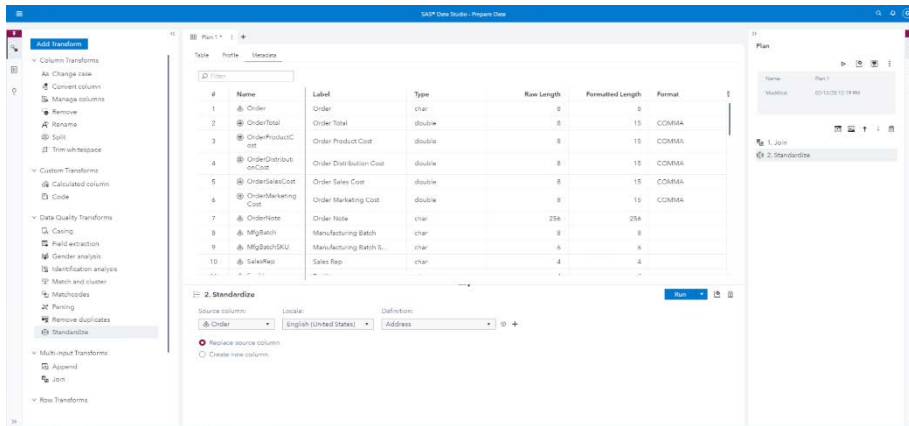


Figure 5. Self-service Data Preparation

## VISUAL EXPLORATION

Non-technical users can create and modify queries by selecting items from a sidebar or by dynamically filtering and grouping data. Analytically savvy users can use visualization techniques to spot trends and derive deep insights faster. This eliminates many of the everyday trial-and-error processes currently used to identify areas that need further analysis.

SAS Visual Analytics includes a variety of native visualization or data exploration objects to support the needs of descriptive, diagnostic, or predictive analytical scenarios. Visual data exploration is critical for model building and also to visualize the results. Any niche visualizations, which are not available out-of-the-box, have to be handled differently. You can use a 3<sup>rd</sup> party (e.g. Google Chart) or open-source visualization library (e.g. D3, C3) to interactively drive analysis on the same data in SAS Visual Analytics.

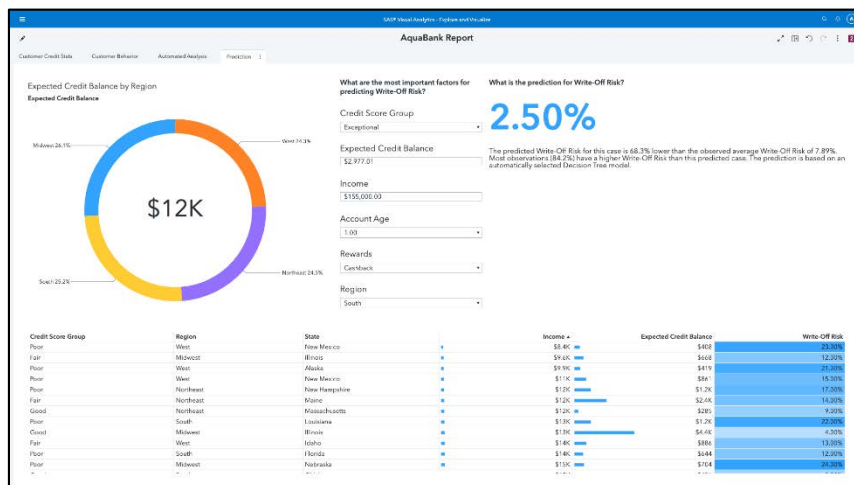


Figure 6. Data Exploration

## AUGMENTED ANALYTICS

SAS Visual Analytics uses built-in machine learning and artificial intelligence techniques to automate tasks within the analytics workflow. By democratizing advanced analytics to a wide variety of users and use-cases, non-technical users can address business problems with quantitative insights.

SAS Visual Analytics comes with these pre-built capabilities designed for augmented analytics:

- Auto-charting chooses the best visualization for the data selected. Using a simple drag and drop method, SAS Visual Analytics will produce the best chart for the selected variable.
- The suggestions pane offers pre-built visualizations based on the available data. It is a quick way to explore and visualize the data without figuring out the best visualization for the given dataset.
- Related measures enable a user to automatically see potential relationships between the data measures within the data pane. A subtle indicator highlights measures that may show a strong degree of correlation to the selected measure.
- Automated explanation objects tell the analytical story buried in your data within seconds that would otherwise take hours to create. Automated explanation uses machine learning to analyze all the available data to discover the factors influencing your variable of interest. Using natural language generation, it generates easy to understand descriptions and provides transparency to see how the results are derived.

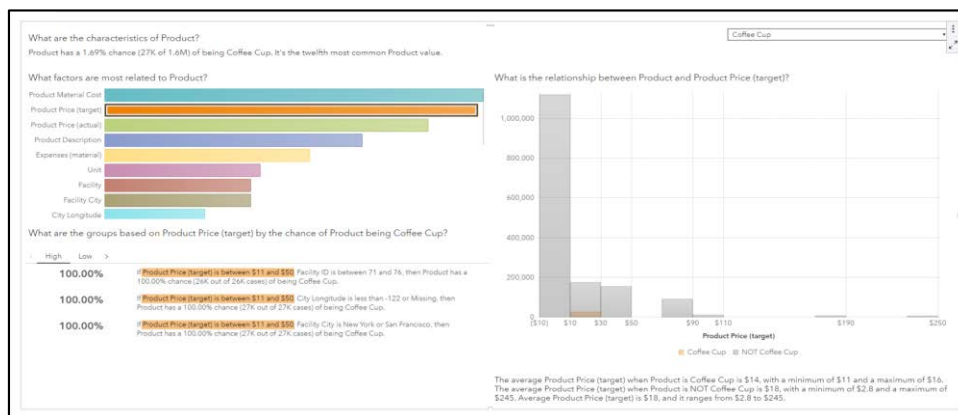


Figure 7. Augmented Analytics

## INTERACTIVE REPORTING

With SAS Visual Analytics, you can move directly from reporting and exploration to analysis and sharing information – all from the same user interface.

**As more people have access to data and to analytics applied to the data, it's increasingly important for people to have conversations about their business intelligence (BI) dashboards and reports.** These conversations are critical for understanding and interpretation, for alignment and decision making. One way to facilitate conversations around the data is to put information where people can easily get to it, including the web, Microsoft Office applications, and mobile devices. Here are some ideas that can generate conversations using the reporting and dashboard point of view:

- A variety of graph objects or charts are included: bar chart with multiple lines, pie, donut, line, scatter, heat map, bubble, animated bubble, treemap, dot, needle, numeric series, schedule chart, vector, etc.
- Add content from the web (e.g., YouTube videos, web apps) and images (e.g., logos) to your report.

- Precision and responsive layout capabilities provide flexibility in report layout and design.

By telling your story, sharing and collaborating, you enhance the value and credibility of your results. These are more than just static reports. Report designers can even give report consumers permission to make simple edits, more comprehensive edits, or even give them the power to gain completely new perspectives from the existing report. SAS Visual Analytics allows you to build reports that enable collaborative and engaging discussions that can drive deeper insights – and better decisions.

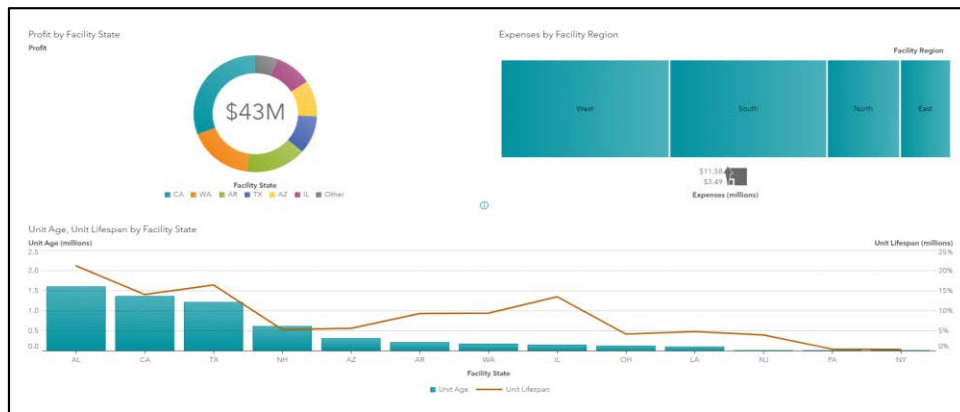


Figure 8. Interactive Reporting

## LOCATION ANALYTICS

**Location analytics adds the “where” dimension** so that you can analyze data in new ways, understand location factors, and identify location-specific opportunities.

Geographical maps are enabled through Esri ArcGIS Online or OpenStreetMap. You can lasso data points on geographical maps to select specific data for further analysis.

Geographical maps make it easy to visualize measurement variances over a geographical area.

Custom polygons (e.g., sales territories, voting districts, floor plans, seating charts) let you see the world just as your business demands for it. These polygons can be animated to show how key metrics change over time. Geographic point clustering makes it easier to visualize high-volume location data and identify areas of interest.

Add map pins to mark points of interest and insights on a map. With an Esri ArcGIS Online license, you can enrich your data with Esri demographics data.

- Starting from a pin, select the area that can be traveled based on travel distance or provided travel time.
- Create travel routes between points.
- Add latitude and longitude columns to your data based on location information in your data (country, state, ZIP code, city, and street)



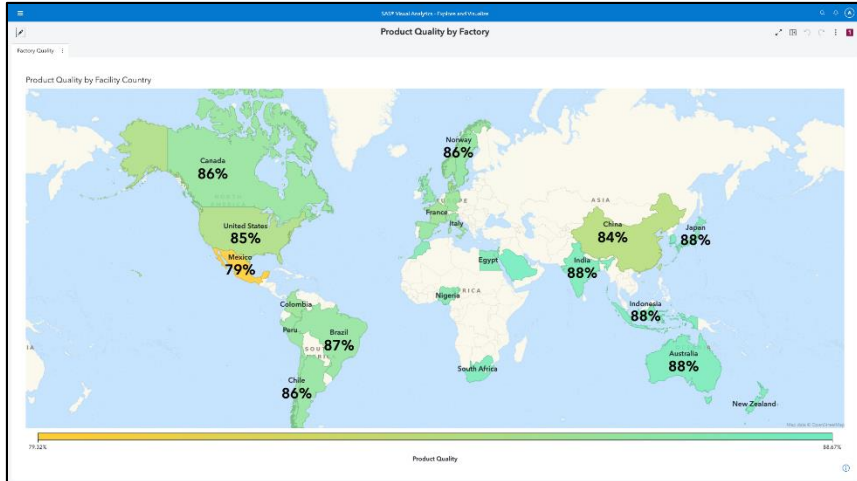


Figure 9. Location Analytics

## COLLABORATION AND INFORMATION SHARING

SAS® Drive allows users to share objects and content (e.g. reports, visualizations, projects) in a simplified manner. It provides an easy way for users to view, collaborate, and manage their **team's work**.

Microsoft Office integration encourages collaboration and sharing through live, dynamic visualizations delivered through familiar Microsoft applications. Users can collaborate using dynamic reports shared with others through their Outlook email inbox. And they can document discoveries in Microsoft Word using the same dynamically updated reports.

Sharing and collaboration rely on reaching decision-makers no matter where they are. With SAS Visual Analytics, you can use native apps for Windows 10, iOS, and Android to quickly view dynamic reports and dashboards on tablets and smartphones. Users can annotate, add comments and email reports to others. Email alerts can be sent to notify users when reports are updated or data is changed. The SAS Visual Analytics app is available for free from the Microsoft Store, Apple App Store®, and Google Play. In addition, you can create your own custom mobile apps using the SAS SDK for iOS and SAS SDK for Android.

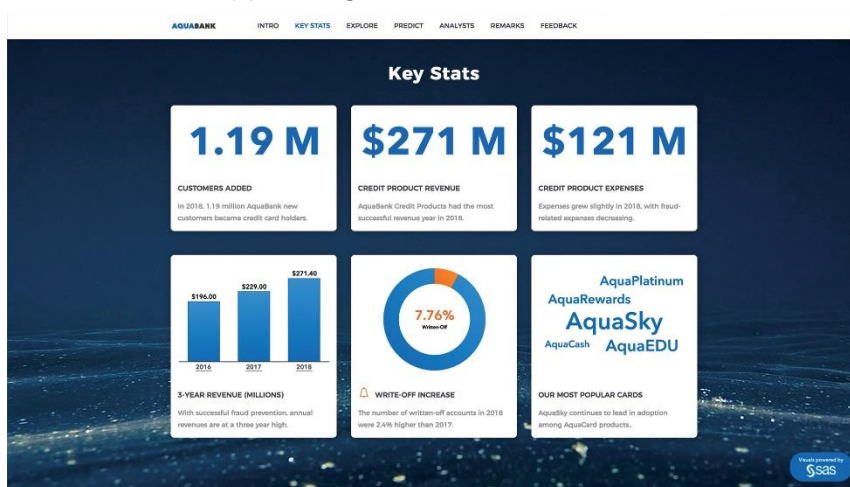


Figure 10. Embedded Analytics

## GOVERNANCE

The SAS® Platform provides all the necessary capabilities for managing, maintaining, and governing SAS Visual Analytics as an out of the box capability. With privacy regulations becoming core to every organization, governance is now a mandatory requirement and SAS delivers it at the core of its platform.

SAS Visual Analytics provides capabilities ranging from identity management, authorization, performance monitoring, environment diagnosis, and complete auditing. The SAS Viya administration environment includes audit and usage reports so that administrators have direct access to monitoring and management capabilities. Data is automatically collected for all SAS Visual Analytics components and administrative reports are created based on this data.

SAS® Environment Manager provides easy-to-use, web-based centralized administration and monitoring of your BI and analytics environment, including users, data, content, servers, services, and security.

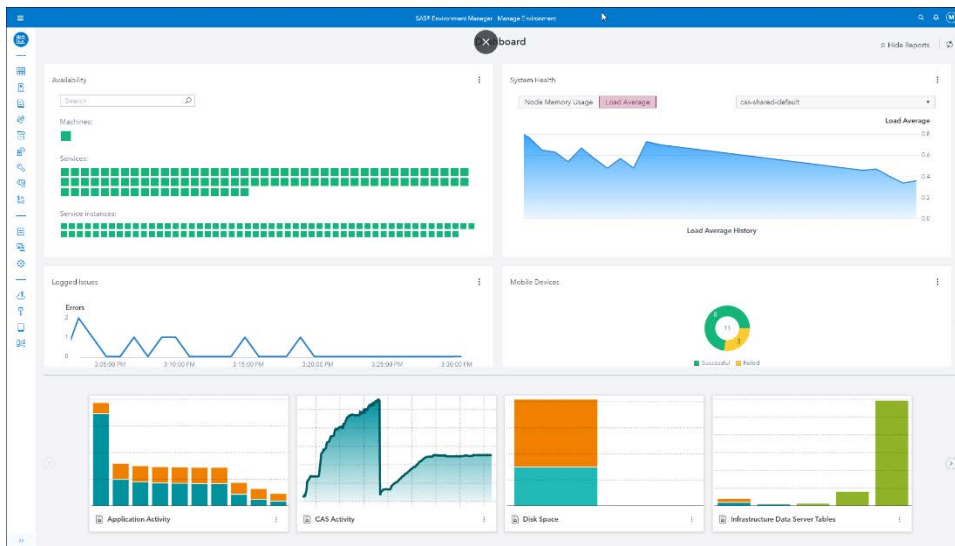


Figure 11. SAS Environment Manager Dashboard

## DASHBOARD DESIGN BEST PRACTICES

As with any user interface, the key to building a great dashboard is whether you clearly communicate the goals and metrics through the dashboard. A well-designed dashboard can serve as a primary analysis and collaboration tool across organizational functions. Having worked with a wide variety of customers across industries, these best practices will help you design a great dashboard, whether you are just getting started or re-designing.

### CREATE A MOCK-UP

Before you start designing the dashboard, create a wireframe prototype of the proposed dashboard and show it to the end user. It is important for the end user to be on board with the metrics you choose, how you label them, and how you arrange them on the dashboard. Plus, it will save you from a lot of rework once the dashboard is in the development phase.

### DE-CLUTTER YOUR DASHBOARD

**It is essential to view the dashboard from the user's perspective.** This means each and every object on the dashboard should serve a purpose. Avoid using a lot of colors as it ends

up creating a visual overload for your end user. Remove low-value graphics such as flashy widgets or gauges. These are unnecessary objects that distract from the primary purpose of the dashboard – to analyze and to make informed decisions.

## GROUP RELATED METRICS

Logically positioning the metrics and graphs on your dashboard adds a visual flair and helps the end user in navigating the dashboard easily. You can group the visual elements on your dashboard by metrics, organizational function, product type, or even time period. Grouping related metrics makes your dashboard more attractive.

## CONSISTENCY IS ESSENTIAL

While making interactive dashboards, make sure you follow through on the design of the drill-down reports. If your dashboard and drill-down report have a completely different layout, it can be confusing for your audience. It is essential to be consistent throughout your entire visualization assets. Intuitive workflow and a consistent color scheme enable the end-users to use the dashboard in an effective way.

## EVOLVE YOUR DASHBOARDS

Designing a dashboard is an agile process. Get regular feedback on what elements are working or not working, and iterate the dashboard design to keep it current. Follow-up with your audiences on the metrics, whether anything has changed or a new metric needs to be added. Creating a dashboard is not a one-time exercise. As you receive more feedback on the dashboard, you can enhance and update it.

## CONCLUSION

Dashboards are intended to serve a variety of purposes. It is essential to prioritize the reasons why you are designing the dashboard and the value addition that the dashboard will bring to the existing business processes. SAS Visual Analytics is a powerful tool to help you tell a story with your data. With careful planning, effective design, and regular feedback, you will be able to deliver a well-designed dashboard that will engage both the business and technical users to analyze, visualize, and share information.

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