A Journey from data to dashboard: Visualizing the university instructional classroom utilization and diversity trends with SAS® Visual Analytics

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ABSTRACT
Transforming data into intelligence for effective decision-making support is critically based on the Office of Institutional Research’s role and capacity in managing the institution’s data. Presenters will share their journey from providing spreadsheet data into developing SAS® programs and dashboards using SAS® Visual Analytics. Experience gained and lessons learned will also be shared at this session.

The presenters will:
1. demonstrate two dashboards the IR office developed, one for classroom utilization and one for the University’s diversity initiatives;
2. describe the process the office took in getting the stakeholders involved in determining the KPI and evaluating and providing feedback regarding the dashboard; and
3. share their experience gained and lessons learned in building the dashboard.

INTRODUCTION
In this paper we will discuss the process our office went through in building dashboards using SAS Visual Analytics. The audience for this is SAS business users and business analysts. Team leaders and executives may find it useful as well.

CURRENT STATUS
Prior to developing dashboards to present data to the campus, the data was primarily provided in an excel spreadsheet (Figure 1) and/or through our web interface (Figure 2). Presenting the data in this way is manageable for power users, but often proved overwhelming for casual users. Additionally, these reports are canned, so users do not have much flexibility to find the data they need without reading over multiple pages.

Figure 1. Example of Classroom Utilization data provided in an excel spreadsheet
NEED FOR DATA VISUALIZATION

A picture is worth a thousand words and the advent of various data visualization tools has made it easier and affordable for business users to create dashboards in a very short amount of time.

A dashboard is a function that helps us turn data into information and send a message to the users. After careful selection, our office chose SAS Visual Analytics as our data visualization tool.

DEVELOPING OUR FIRST DASHBOARD - CLASSROOM UTILIZATION

We chose Classroom Utilization as our first dashboard project by applying the following approach:

- **Scope**: We wanted to keep the scope within reach and make sure it was achievable;
- **Strategy**: our strategy was to target the low hanging fruit, i.e.
  - easily available data, and
  - areas with broad impact.
We used the following guidelines for dashboard development. The dashboard should:

- convey a message,
- be a visual presentation of performance measures,
- provide quick identification of trends and correlations,
- be a measure of efficiencies/inefficiencies,
- provide optional detailed numbers besides the graphs, and
- include Key Performance Indicators (KPIs) bought-in by the users.

**STEPS TO CREATE CLASSROOM UTILIZATION DASHBOARD:**

1. **Start from the End:** We looked at various classroom utilization dashboards and developed one that fit our needs.

2. **Need for Key Performance Indicators (KPIs) buy-in:** We reviewed University of Minnesota’s Classroom Utilization dashboard and adopted their KPIs. We met with our stakeholders and received their approval on the various KPIs.

3. **Data preparation is the key:** We found that we get the best results when we prepare the data at the onset. We created a SAS program to deliver a SAS dataset that has comprehensive and calculated data with fields that we require in our dashboard.

4. **Loading data in SAS Visual Analytics:** We loaded the SAS dataset prepared in step 3 in SAS Visual Analytics using the local import feature.

5. **Creating a Dashboard:** We used SAS Visual Analytics’s Report Designer module and created various charts and tables based on step 1 above. We went through multiple iterations of steps 3, 4, and 5 to reach a stage where we were confident to provide a demo to our stakeholders and receive their feedback.

**CLASSROOM UTILIZATION DASHBOARD EXAMPLE:**

![Figure 3. Various KPIs in Classroom Utilization Dashboard](image-url)
Figure 4. Classroom Utilization Summary (all calculations are based on 8am-5pm Monday-Friday time period)

<table>
<thead>
<tr>
<th>Room Count</th>
<th>Smallest</th>
<th>Average</th>
<th>Largest</th>
</tr>
</thead>
<tbody>
<tr>
<td>349</td>
<td>10</td>
<td>62</td>
<td>409</td>
</tr>
</tbody>
</table>

Figure 5. Rooms Used; SAS VA object: List Table

Figure 6. Centrally Scheduled and Department Classroom; SAS Visual Analytics object: List Table with Display rules

Figure 7. Time Utilization by Clock hour; SAS Visual Analytics object: Bar Chart with Target line showing the KPI Goal
Figure 8. Time Utilization by Day; SAS Visual Analytics object: Bar Chart with Target line showing the KPI Goal

Figure 9. Day-Hour Time Utilization Grid; SAS Visual Analytics object: Crosstab with Display rules

Figure 10. Room Utilization Summary; SAS Visual Analytics object: List table with Display rules
DIVERSITY DASHBOARD

STEPS TO CREATE THE DIVERSITY DASHBOARD:

1. **Begin at the End:** Before beginning work on the Diversity Dashboard we wanted to understand what types of visualizations were needed by the users. We looked at prior requests for data, reports previously generated, and current web reports which include a diversity component. We did not want to duplicate work already published in the Fact Book or our online FACTS reporting site, however, we did look at ways to make already available reports more easily read by the casual user. We then decided on three major areas for the dashboard: Student Enrollment, Degrees Conferred, and Faculty and Staff.

2. **Data preparation is the key:** With the end in mind, we then turned back to the beginning. Before starting a data visualization project you need a good data source. We found that while we could pull components from multiple tables and quickly tabulate within SAS® Enterprise Guide® to create quick visualizations in Excel, we could not join tables within Visual Analytics and therefore, needed to have all the data together in one dataset before loading into SAS Visual Analytics. Using SAS Enterprise Guide, we created separate datasets for each separate area of our dashboard and then loaded those into SAS Visual Analytics.

3. **Creating a Dashboard:** After the end was visualized, and the data was prepared, we began the process of actually creating the dashboard within SAS Visual Analytics. We found as we went that there were many times we needed an additional piece of data which was not included in our dataset. When this would happen we would return to the SAS program, add the missing piece, and reload the dataset to SAS Visual Analytics. This was a long process of back and forth, but in the end we were able to achieve our goal and have a diversity dashboard which displays the components we visualized at the beginning.

DIVERSITY DASHBOARD EXAMPLE:

![Diversity at UGA Dashboard](Image)

The University of Georgia values diversity and inclusion. This dashboard presents the status of diversity in terms of student enrollment, degrees awarded, completion, and faculty and staff composition. You may visit UGA's Diversity Office or read the Diversity Strategic Plan to know more about UGA's commitment to diversity. Your feedback concerning this dashboard can be sent to the Office of Institutional Research.

**Items to Note & Tips on Navigating the Dashboard:**

- All data are from Fall term unless otherwise noted.
- Selecting "clear filter" for a dropdown box results in "select all" for the included items.
- The category of Non-Resident Alien refers to students or employees who are not a citizen, a naturalized citizen, or a permanent resident of the U.S. These students and employees are excluded from their respective race/ethnicity categories to avoid "double-counting."
- The category of All Others includes: American Indian / Alaska Native, Native Hawaiian / Pacific Islander, Two or More Races, and Not Reported.
- Students whose state residency at time of application was Georgia are considered In-State students; otherwise, they are considered Out-of-State students. State residency is not applicable to international students.
- Completion rate is the percentage of the cohort of students who graduated with a bachelor’s degree or matriculated into a professional program at UGA (e.g. Pharmacy & Veterinary Medicine).

**Figure 11. Cover Page for the Diversity at UGA Dashboard**
Figure 12. Student Enrollment tab from the Diversity at UGA Dashboard

Figure 13. Expanded view of Enrollment by Ethnicity Group
ABOUT SAS VISUAL ANALYTICS

The dashboards demonstrated in this paper were developed using SAS Visual Analytics version 6.4. In April 2015, we upgraded to version 7.1, released March, 2015.

In our experience, developing a dashboard in SAS Visual Analytics has the following benefits and limitations:

BENEFITS

- SAS Visual Analytics has drag and drop functionality and is very easy to use.
- Once data is prepared and loaded in the SAS LASR Server, it is very easy to navigate and create reports.
- It is very easy for analysts to develop the reports themselves and hence limited IT expertise is required for developing the reports.
- It is web enabled and therefore, easy to share insights with anyone, anywhere.
- SAS has an excellent customer support team and we have taken advantage of their support many times with an average turnaround time of 1 to 3 business days.
- SAS provides “QuickStart” services which were helpful during our development phase.

FRINGE BENEFITS

- SAS Visual Analytics is quick and easy to use and we are planning to use it for creating ad-hoc reports requested by our users. This helps us answer complex questions faster and is able to enhance the productivity of our analysts.
- With a click of a button, the detailed data can easily be exported in excel format.

LIMITATIONS

- We had some of the following difficulties with set-up:
  - Single Sign on: We have had some challenges in getting SAS Visual Analytics to work with our Lightweight Directory Access Protocol (LDAP) authentication and Central Authentication System (CAS).
  - The current version uses Adobe Flash which is not available on i-Devices and the newer Android devices. As a solution to this limitation, SAS has a mobile app for both platforms which can be downloaded from the app store and configured for use.
  - Mobile app and computer screen do not match. The view needs to be tweaked in design mode so that it will render on the desktop, laptop, and the mobile app in a desirable manner.
- Some simple features are unavailable:
  - Sorting days of the week as Monday, Tuesday, Wednesday, etc. rather than alphabetically was not available in version 6.4. To resolve this, we created a user defined format in SAS to allow for weekday and hour sorting, which was a time consuming process. This issue has been resolved in version 7.1, where there is a feature to define custom sorting.
  - We are unable to change or hide labels and this sometimes causes clutter on the dashboard.
  - When maximizing a chart, the text size does not change proportionately, resulting in a chart that covers the screen with a disproportionately small title at the top (see Figure 13).
  - The data used in an object must be available in a single table in SAS LASR. We took the approach of preparing a comprehensive dataset prior to loading it to SAS LASR and hence a lot of data preparation is needed prior to the table being available for use in SAS Visual Analytics. Another approach is to use SAS Visual Data Builder to join datasets.
CONCLUSION

These are some of the lessons that we learned from our journey of data to dashboard. We hope that this will help you in building a dashboard using SAS Visual Analytics.

LESSONS LEARNED

1. **Data preparation is the key:** Initially we loaded raw data and used SAS Visual analytics calculations in most places. With this approach, we found that we don’t always get the desired results. Hence, we took the approach of preparing a SAS dataset that has comprehensive and calculated data with fields that we require in our dashboard. We have reaped many benefits with this method.

2. **Involve the clients and stakeholders at an early stage:** We work very closely with our clients and/or stakeholders to identify their needs and then keep them engaged and involved in the development process. This has helped us get buy-in from our clients and stakeholders and there are no last minute surprises.

3. **Setting a goal and target is essential:** Defining a clear goal and target for our dashboard has been extremely beneficial in keeping the scope limited and within reach.

4. **Sending a Clear Message:** Our aim is to send a clear message with our dashboard so that there is clear understanding of data and charts and there is no room for ambiguity.

REFERENCES

1. University of Minnesota’s Classroom Utilization dashboard:
   http://www.classroom.umn.edu/scheduling/dashboard.html

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