Developing a Dashboard to Aid in Effective Project Management
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ABSTRACT
Accurately tracking programming support activities as a team manager can be a complex task. The overall coordination of the programming resources, testing support and production moves was hampered by the crude reporting functionality available to the change management system. This management challenge was solved by the development of the CMS IR Technical Support Dashboard utilizing SAS® Enterprise Guide and SAS/GRAPH functionality. Working together with the management team, the dashboard was created to provide quick access in an easy to read graphical display of numerous key performance indicators. There is also functionality providing multiple alerts as defined by the management team (e.g. an application that stays in “user test” for more than 72 hours). The CMS IR Technical Support Dashboard has provided an improved management tool to effectively and efficiently coordinate the multiple projects and constituencies. This presentation will detail the development, testing and release of the dashboard, while providing coding details and end-user requirements.

WHO WE ARE
Mission
The mission of the Office of Institutional Research is to provide information of the highest quality and which is both timely and easily accessible, and to facilitate and enhance decision-making, strategic planning, and assessment at the University of Central Florida.

Purpose
Institutional Research (IR) provides electronic and web-based dissemination of official information to the University community (including the Board of Trustees, the various colleges, departments and other academic and administrative units), external agencies, and the Florida Board of Governors (BOG). IR generates, supervises or develops all official University data reports and state-required reports, as well as providing end-user data solutions and training to facilitate decision-making processes. The director and staff serve on numerous university-wide committees and workgroups and assist with the collection and interpretation of institutional data, assist in planning academic programs, and participate in the implementation of evaluative procedures. The functions of the office support the entire university enterprise.

Background
Institutional Research has, as one of its primary objectives, the task of developing and implementing a university data warehouse. This enterprise-wide data system will facilitate the creation, access, and dissemination, by internal and external stakeholders, of institutional knowledge pertinent to the university. In collaboration with the data warehouse project stakeholder group, which represents a cross-section of key data users, the IR staff has established a data source of twelve years’ worth of student reporting data. This warehouse of information serves as the foundation for the development of a wide variety of reporting applications using SAS Business Intelligence software.

INTRODUCTION
The university developed a change management system to coordinate our ERP implementation and maintenance. Within the past year, Institutional Research was granted access to the system to track the implementation and maintenance of our own reporting files, data warehouse development and on-line transactional web systems. Although this access greatly improved our tracking capabilities for our local project manager, the ability to create useful reports was not included in the system functionality. Dashboard functionality was evaluated and implemented to provide a better management tool for the overall project management.

The production version of the CMS IR Technical Support Dashboard was still under development at the time of this paper. Also, the initial design utilizes SAS Enterprise Guide, SAS/GRAPH and PROC GREPLAY functionality and was completed prior to the release of the SAS BI Dashboard 3.1 software. The authors intend to include the final output and a demonstration of the new SAS BI Dashboard 3.1 design at the conference.
FUNCTIONAL REQUIREMENTS

Overview of Functionality
Functional team members identified the data tables and data values that would need to be included to support the dashboard. In addition, several key performance indicators (KPI) were identified as items that needed detailed views to assist with project management. A mix of dials, graphs and/or gauges was desired, along with specific positive and negative alerts to identify specific successes or challenges. Additional requirements included a daily refresh and drill-down options for certain views.

The functional specifications identified 6 project team areas (Institutional Research, Data Warehouse, Reporting Database Service, University Analysis and Planning Support, Operational Excellence and Assessment Support and SACS) to include for the dashboard. These are the core project areas managed by IR personnel. Additionally, rules were specified regarding the amount of data to include on the dashboard using calendar guidelines for each status value (i.e. Development, User Test, Completed). A suggestion was made to the technical staff to limit the data selected for the dashboard rather than use the entire data set from the original tables. The limits were to be based on the project team areas and status fields.

The functional specifications also provided guidelines for field descriptions, such as displaying a 4-letter code versus providing a full name for developers.

Requested KPI Details
Multiple KPIs were identified as crucial views to manage the project teams. The method of providing the information – whether dial, graph or gauge – was left up to the technical team. KPIs included a) number of jobs by status, b) number of jobs by area, c) number of jobs by area by status, and d) number of jobs by developer. Some of the indicators (a and b) are aggregate graphs, whereas the KPIs included in both c) and d) are multiple graphs, providing details for each status or developer.

Requested Alerts
Both positive and negative alerts were identified as valuable reviews to quickly identify the successes and challenges of the current project. Positive alerts include e) completion status exceeds more than 25% of total jobs during the last 7 days, and f) no jobs in user test status older than 7 days. Negative alerts include g) jobs in user test older than 7 days, h) jobs in waiting for input status for more than 7 days, and i) more than 25% of jobs are still in assigned to developer status.

TECHNICAL DEVELOPMENT

Overview
After receiving the functional specifications, two programmers began the development process. Although working independently, the steps of development were the same. The first step in the technical development was to identify the data source and develop the underlying database tables that were needed for the dashboard implementation. Once the database tables were determined, it was essential to carefully examine the structure of the table fields that were required to produce the KPI details and the calculated alerts. Upon creating all the intermediate data sets, multiple graphs were produced that displayed KPI details, as well as text alerts.

Dashboard Table Development and Structure
The first step to creating the dashboard table involved the development of a single de-normalized dataset that included all the required fields. There were a minimum of 5 tables that were accessed to create this dashboard. The source table structures and the relationships are shown in Figure 1.
The second step was to create 5 different datasets from the single de-normalized dataset to feed the dashboard graphs (Table 1).

### Table 1: Dashboard graphs and its associated datasets

<table>
<thead>
<tr>
<th>SAS Graph</th>
<th>Chart Type</th>
<th>Dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs by Status</td>
<td>Vertical bar</td>
<td>MODS_STATUS</td>
</tr>
<tr>
<td>Jobs by Area</td>
<td>Vertical bar</td>
<td>MODS_AREA</td>
</tr>
<tr>
<td>Jobs by Developer</td>
<td>Horizontal bar</td>
<td>MODS_DEVELOPER</td>
</tr>
<tr>
<td>Jobs by Status by Area</td>
<td>Pie charts</td>
<td>MODS_AREA_STATUS</td>
</tr>
<tr>
<td>User Test Status</td>
<td>Pie chart</td>
<td>MODS_USER_TEST</td>
</tr>
</tbody>
</table>

### Computed Fields for Alerts

The functional specifications called for text-based “Alerts” for specific areas. Table 2 summarizes the computed alerts detailing the associated fields, formulas and format types.

### Table 2: Computed fields

<table>
<thead>
<tr>
<th>Computed Alert</th>
<th>Formula</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed status of all jobs</td>
<td>CF_STATUS(COMP) / CF_STATUS(TOTAL)</td>
<td>Percentage</td>
</tr>
<tr>
<td>Assigned to developer of all jobs</td>
<td>CF_STATUS(ASGN) / CF_STATUS(TOTAL)</td>
<td>Percentage</td>
</tr>
<tr>
<td>User test status older than 7 days</td>
<td>CF_STATUS(UTST) and CF_STAT_CHNG_DT &lt; DATETIME()-7</td>
<td>Sum</td>
</tr>
<tr>
<td>Wait for input status older than 7 days</td>
<td>CF_STATUS(WAIT) and CF_STAT_CHNG_DT &lt; DATETIME()-7</td>
<td>Sum</td>
</tr>
</tbody>
</table>

The following code creates an annotation that displays the “Completed status of all jobs” alert as designed by Programmer 1. If the percentage is less than 25%, the text alert is displayed in red; otherwise the text is displayed in green.

```plaintext
data data1_ann03;
  set work.MODS_STATUS;
  where cf_status="COMP";
  length function $8 color $12 style $20 text $50 title $50 styl $20;
  hsys='3'; when='a';
  function='label';
```
SAS/GRAPH Development

The graphs for this dashboard were created in SAS Enterprise Guide 4. In cases where EG4 was not capable of executing certain functionalities, the graph code was altered in order to take full advantage of the capabilities of the SAS code. Vertical and horizontal bar charts, as well as pie charts, are used to display information for this dashboard. Since the dashboard output file is a .gif file, the developer needs to change the graph format from ActiveX to .gif during the initial graph development phase. This can be done by navigating to Graph menu item under ToolsÆOptionsÆResults in EG4. Failure to make this alteration will cause alignment issues on the resulting dashboard page since the output styles for ActiveX are different than the .gif output styles. The annotation functionality was used to display text alerts and was integrated with the graph code. An example of a graph code that was used with two annotations (as developed by Programmer 1) is listed below:

```sas
PROC GCHART DATA=WORK.MODS_STATUS anno=data1_anno3;
   VBAR CF_STATUS / SUMVAR=COUNT
   FRAME TYPE=SUM
       OUTSIDE=sum
       noframe
       COUTLINE=BLACK
       width=7
       RAXIS=AXIS1
       MAXIS=AXIS2
       GAXIS=AXIS3
       GAXIS=AXIS3
       name="plot1"
   PATTERNID=MIDPOINT
run;
```
PROC GREPLAY Procedure
The last step in graph development was to display all graphs in one dashboard page by using PROC GREPLAY procedure. The code used by Programmer 1 is detailed below.

```plaintext
PROC GREPLAY tc=tempcat nofs igout=work.gseg;
/* Define the areas of a custom dashboard template. */
tdef ucf des='UCF'
/* First n-chart row (various metrics) */
  0/llx = 0 lly = 0
    ulx = 0 uly =100
    urx =100 ury =100
    lrx =100 lry = 0
  1/llx =30 lly = 60
    ulx =30 uly = 95
    urx =80 ury = 95
    lrx =80 lry = 60
  2/llx =60 lly = 60
    ulx =60 uly = 95
    urx =105 ury = 95
    lrx =105 lry = 60
  3/llx =0 lly = 15
    ulx =0 uly = 75
    urx =60 ury = 75
    lrx =60 lry =15
  4/llx =60 lly = 0
    ulx =60 uly = 60
    urx =100 ury = 60
    lrx =100 lry = 0
  5/llx =0 lly =0
    ulx =0 uly =40
    urx =45 ury =40
    lrx =45 lry =0
  6/llx =1 lly =60
    ulx =1 uly =85
    urx =31 ury =85
    lrx =31 lry =60

; /* Replay the individual indicators into the appropriate areas in the custom dashboard template. */
template = ucf;
treplay
  0:titles 1:plot1 2:plot2 3:plot3 4:plot4 5:plot5 6:plot6;
run;
quit;
```

Dashboard Output Designs
The two competing dashboard designs were very similar in output. Programmer 1 created the output in Figure 2, while Programmer 2 created the Figure 3 output.

Figure 2: Programmer 1 dashboard display

Figure 3: Programmer 2 dashboard display
On-going Development
Neither of the designs in Figure 2 or 3 are production-ready. Following a functional review, several design alterations were requested and pieces of both Programmer 1 and Programmer 2 designs were incorporated into a second generation output.

Maintenance and Future Enhancements
The initial design of the CMS IR Technical Support Dashboard and its easily manageable data structure enables efficient maintenance by the developers. KPIs, alerts or all other data structure changes on any object on the dashboard can easily be implemented without affecting other objects in the same environment. One enhancement that has already been identified is the incorporation of “Due Date” alerts (i.e. Jobs with today’s due date, Jobs that are past due).

Subsequent to our initial designs, the SAS BI Dashboard 3.1 functionality was released. We are currently evaluating the new product and plan to convert to pre-existing technology to the new drag-and-drop tool.

Conclusion
The CMS IR Technical Support Dashboard joined together functional project managers and technical developers to provide a solution for more efficient resource allocations. The dueling output options provided by two independent developers allowed for maximum presentation flexibility and a training opportunity for both programmers. The current designs of the dashboard provide graphical displays with quick-look views to identify successes, challenges and overburdened technical staff, teams or offices. The final product increased the ease of overall project management and specific-project-level oversight.

References

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