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Using SAS® Programming, SAS® Enterprise Guide®, and SAS® Visual Analytics to Generate and Disseminate National Postgraduate Programs Data in a Mobile Computing Environment

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ABSTRACT

The Coordination for the Improvement of Higher Education Personnel (CAPES) is a foundation within the Ministry of Education in Brazil whose central purpose is to coordinate efforts to promote high standards for postgraduate programs inside the country. Structured in a SAS® data warehouse, vast amounts of information about the National Postgraduate System (SNPG) is collected and analyzed daily. This data must be accessed by different operational and managerial profiles, on desktops and mobile devices (in this case, using SAS® Mobile BI). Therefore, accurate and fresh data must be maintained so that is possible to calculate statistics and indicators about programs, courses, teachers, students, and intellectual productions. By using SAS programming within SAS® Enterprise Guide all statistical calculations are performed and the results become available for exploration and presentation in SAS Visual Analytics. Using the report designing tool, an excellent user experience is created by integrating the reports into Sucupira Platform, an online tool designed to provide greater data transparency for the academic community and the general public. This integration is made possible through the creation of public access reports with automatic authentication of guest users, presented within iframes inside the Foundation's platform. The content of the reports is grouped by scope, which makes possible to view the indicators in different forms of presentation, to apply filters (including from URL GET parameters), and to execute stored processes.

INTRODUCTION

Sucupira Platform is an online application built to collect and analyze data from the Postgraduate Nacional System. It also provides real-time detailed information for the academic community about the system in order to improve transparency and reduce time and efforts on the evaluation of the SNPG.

The storage of information submitted by postgraduate programs makes feasible the establishment of a series of analytical processes including data cleansing, data handling, data processing and reports creation and distribution. These processes are developed internally with the help of SAS Enterprise Guide and SAS Visual Analytics, which raises new insights and understanding about Brazil's postgraduate education.

This paper illustrates the steps associated with the process of collection, analysis and dissemination of information under the reality of the Coordination for the Improvement of Higher Education Personnel in Brazil and shows the roles of SAS throughout the process.

DATA COLLECTION, STORAGE AND ACCESS

Postgraduate Programs send through Sucupira Platform information about the programs, courses, teachers, students, scientific productions, and others. The transactional data is stored inside an Oracle Database and integrated with SAS Enterprise Guide, so that is possible to generate statistics about the Postgraduate Nacional System. After going through validation and analysis, the date are presented for different types of users who consume this information: the programs themselves, the evaluation areas and the country's population as a whole. The entire process is shown in Figure 1.

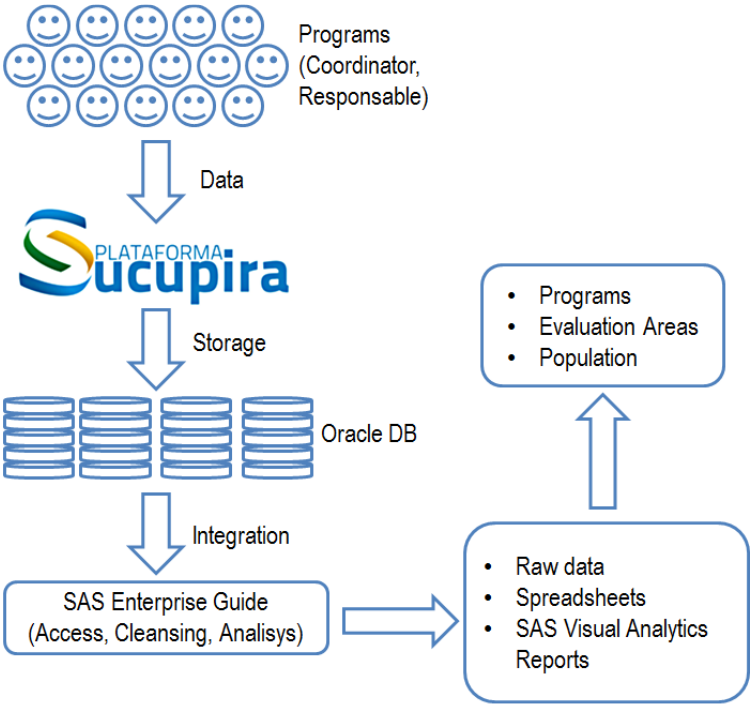


Figure 1. Data Collection and Storage

So, despite having been simplified in the flowchart, the process involves different profiles of professionals (IT professionals, front-end and back-end developers, statisticians, managerial profiles) and users.

DATA PRESENTATION WITH SAS VISUAL ANALYTICS REPORTS

After performing the data validation, data analysis and constructing the auxiliary tables, it's time to start talking about data presentation and distribution.

IMPORTING DATA INTO SAS VISUAL ANALYTICS

Importing data into SAS Visual Analytics is a quite simple task. With a couple of clicks the analyst takes care of it. Although, in a multi-user system, it's important to guarantee an internal organization of files (tables, reports, explorations). Otherwise, things can get messy with time. Apart from that, importing data is a straightforward task. What makes this job a little more complicated is the need to maintain the data up to date. In other words, the necessity on automate all the process. One way to accomplish this step is to schedule the process inside Linux using Cron.

CREATING REPORTS

SAS Visual Analytics is definitely a user friendly module. So, now that the data is available, we are ready to take our next steps on creating reports just by dragging and dropping objects. Therefore, it's not strictly necessary to make a formal planning on your dashboard layout. Yet, to make the work more efficient, it is important to have in mind at least a draft of your ideas. At this point, assume that we've already started to build the report. The first and second report screens are shown at Figure 2 and Figure 3.

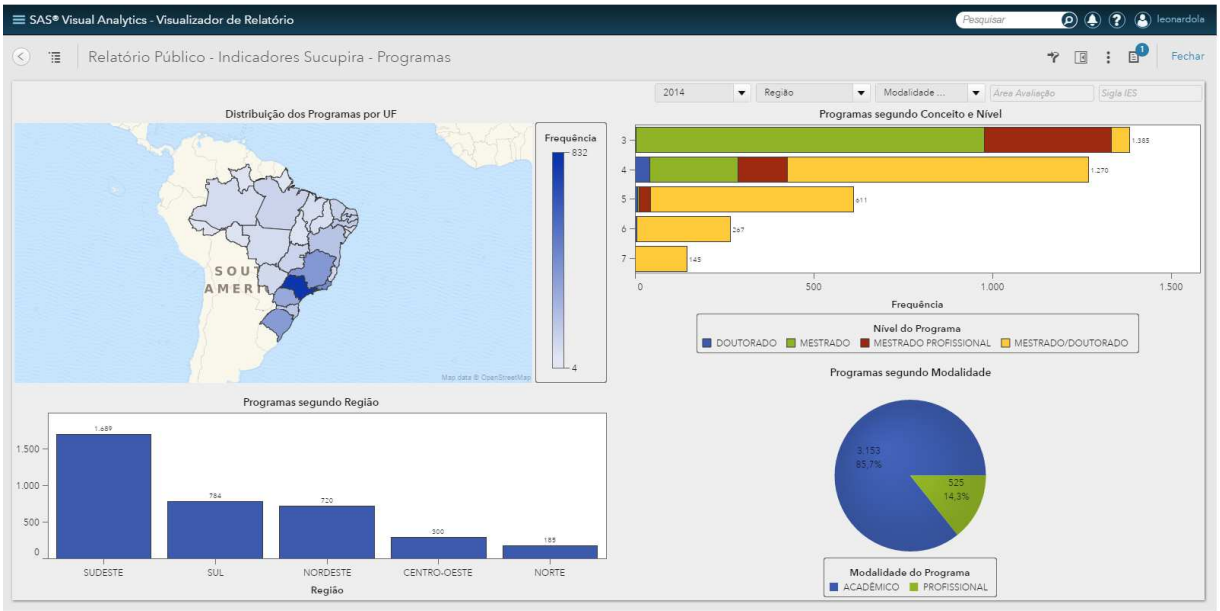
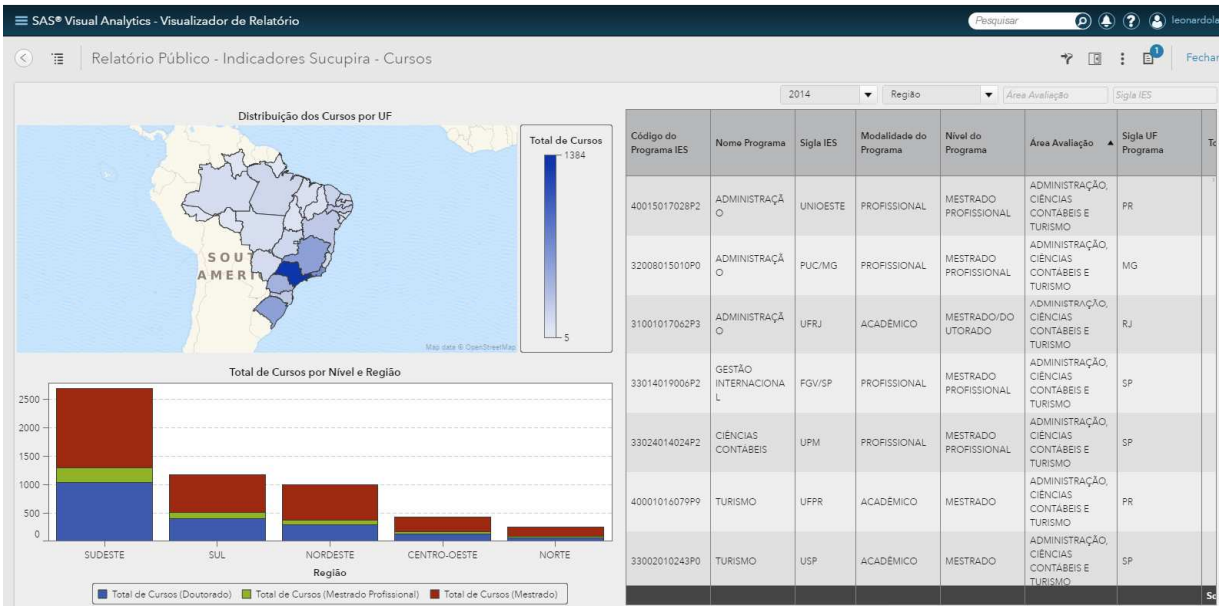


Figure 2. Report - Programs Session



Código do Programa IES	Nome Programa	Sigla IES	Modalidade do Programa	Nível do Programa	Área Avaliação	Sigla UF Programa
40015017028P2	ADMINISTRAÇÃO	UNIOESTE	PROFISSIONAL	MESTRADO PROFISSIONAL	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	PR
32008015010P0	ADMINISTRAÇÃO	PUC/MG	PROFISSIONAL	MESTRADO PROFISSIONAL	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	MG
31001017062P3	ADMINISTRAÇÃO	UFRJ	ACADÊMICO	MESTRADO/DOUTORADO	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	RJ
33014019006P2	GESTÃO INTERNACIONAL	FGV/SP	PROFISSIONAL	MESTRADO PROFISSIONAL	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	SP
33024014024P2	CIÊNCIAS CONTÁBEIS	UPM	PROFISSIONAL	MESTRADO PROFISSIONAL	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	SP
40001016079P9	TURISMO	UFPR	ACADÊMICO	MESTRADO	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	PR
33002010243P0	TURISMO	USP	ACADÊMICO	MESTRADO	ADMINISTRAÇÃO, CIÊNCIAS CONTÁBEIS E TURISMO	SP

Figure 3. Report - Courses Session

The Report URL

Now that we've started to build the report, we might want to access it from a URL. It is possible to get the report URL just by clicking on File -> E-mail and then copy the URL from the e-mail body, like shown in Figure 4.

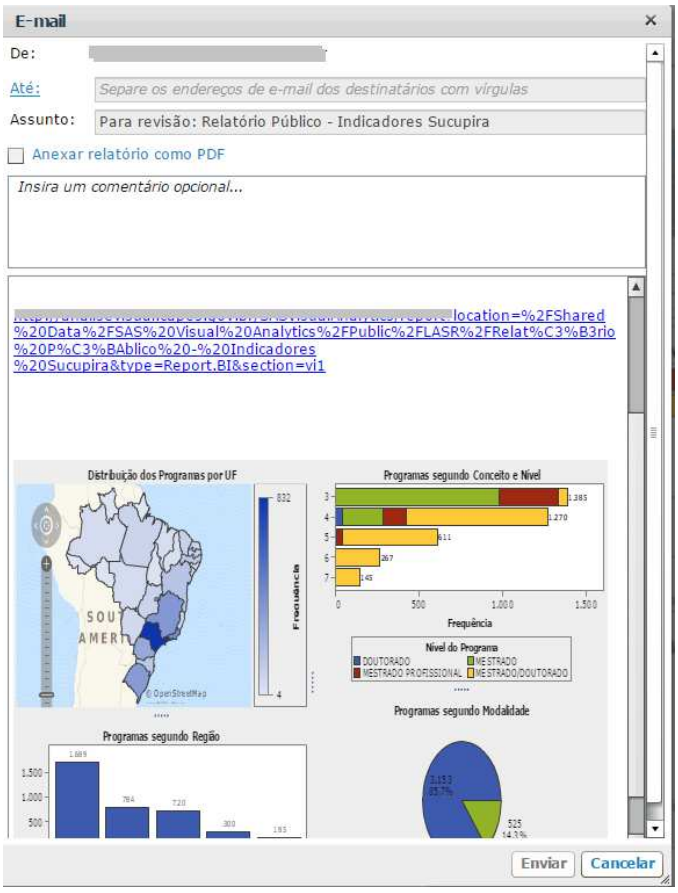


Figure 4. Getting your Report URL

Perform Filtering with URL GET Parameters

It is also possible to filter the report results only by adding a "&parameter=VALUE" to its URL. For instance, if you want to filter the report for the year of 2016, you can create a parameter YEAR, apply it to a controller object and call the URL shown in Figure 4 adding "&YEAR=2016" to it. So, the expected URL would be *http://your-report-url&YEAR=2016*. In our case, it was necessary to add other parameters, like region, program level, and others.

Using Stored Process to Export Data in Modern Version

One of the features that it's no longer available in Modern (HTML5) version of SAS Visual Analytics is the data exportation. In the Classic version, it is possible to export the data to an Excel spreadsheet by right clicking the object and selecting "Export to Excel". To make use of the Modern version, we've decided to create a stored process which prints the table into HTML and creates a button which exports the data to CSV. We also needed to add a little bit of Javascript to the code, as shown next.

```
libname lib sasiola host="myhost.com.br" port=10031 tag="hps";
%global _ODSSTYLE;

proc template;
 define style styles.test;
 parent=styles.default;
 style table from output /

    prehtml="<script src='https://code.jquery.com/jquery-
    1.11.3.min.js'></script><script src='http://server-
    repository/ExportTable_js.js'></script><div align='center'><input
    type='button' disabled='disabled' value=' Loading table... '
    id='target' style='background-color:#FFEDA0'></div><br>"

    posthtml='<script type="text/javascript">$( document ).ready(function()
    {if($("#target").attr("disabled")) {$("#target").attr("disabled",
    false);$("#target").val(" Export to Excel
    ");$("#target").css("background-color", "#7fcdbb");};$( "#target"
    ).click(function() {$("table.table").tableExport({type:"excel",
    escape:"false"});});});</script>';

end;

%let _ODSSTYLE=styles.test;
%STPBEGIN;

proc print data=lib.ADD_INDICADORES(keep=an_base cd_programa_ies
nm_modalidade_programa nm_nivel_programa cd_conceito_programa
sg_uf_programa nm_regiao sg_entidade_ensino qt_discentes qt_docentes
qt_prod_art_A1 qt_prod_art_A2 qt_prod_art_B1 qt_prod_art_B2) noobs;
run;
```

As a final result, the stored process is executed in a specific report session and the user exports the data to CSV on the click of a button.

INTEGRATING THE REPORTS BACK INTO SUCUPIRA PLATFORM

Finally it's time to go back to Sucupira Platform and present the reports to the final user. To access the report, the user must be logged in, at least anonymously. So, the first step is to change the report URL to automatically log an anonymous user into SAS Visual Analytics. The guest access will be available at URL "*http://host/SASVisualAnalyticsHub/guest.jsp".*

After making some changes in URL Parameters to view the Report like described here, the final URL has the form *"http://host/SASVisualAnalyticsViewer/VisualAnalyticsViewer_guest.jsp?reportName=report-name&reportPath=/path/to/report&reportViewOnly=true&appSwitcherDisabled=true&YEAR=year&otherFilter=value"* and is presented within iframes inside Sucupira Platform. The users in a mobile environment are redirected to SAS® Mobile BI before accessing the reports.

CONCLUSION

According to the reality of CAPES, this paper presented some of the steps associated with the process of collecting, analyzing, presenting and distributing information of the Postgraduate Nacional System using SAS Enterprise Guide and SAS Visual Analytics. It was also shown a way to integrate SAS Visual Analytics reports with a web application by using iframes. One of the main findings was the possibility of using a stored process with Javascript code to export the data source to the final user and meet this need without losing the advantages of Modern View.

CONTACT INFORMATION

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

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