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BI Development for Education by Our Institutional Research Department OR How BI Tools Made Our Motto "IR Is Data" a Fact

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ABSTRACT

In response to the demand for more sophisticated information collection, analysis, and reporting, the Office of Institutional Research (IR) at the University of Central Florida implemented the SAS® Enterprise BI platform. The different components of the SAS® BI toolset have aided us in meeting the challenge of delivering accessible data and reports to administrators, decision makers, strategic planners, and the general university user community. This paper chronicles the implementation and evolution of the SAS® Enterprise BI platform at a large university, including the development of our Data Warehouse using the SAS® Data Integration Studio and SAS® Enterprise Guide® client-based tools, and the evolution of the SAS® Information Delivery Portal as IR's common gateway for user access to the university's official data warehouse data, reports, processes, and reporting tools. In addition, examples of reports/data visualizations developed from the data warehouse tables and OLAP cubes using SAS® Web Report Studio are presented

INTRODUCTION

Prior to the implementation of the university data warehouse, our primary tools for information delivery were SAS Intr/Net ® and a reporting database service (RDS), a component of the university's student administration transactional system. As the demand for more sophisticated information collection, analysis, and reporting grew, the decision was made to expand and enhance university reporting capabilities through the creation of a SAS® Data Warehouse and the use of SAS® BI software. The initial setup of the data warehouse focused on official state reporting data utilizing SAS® Data Integration Studio and SAS® Enterprise Guide client-based tools. The challenge then became how to deliver accessible data to administrators, decision-makers, strategic planners and the general user community. The SAS ® Information Delivery Portal was determined to be the optimum solution to this problem and provided access to stored processes and links to legacy SAS Intr/Net ® websites. Following initial establishment of the data warehouse we began exploring the capabilities of SAS® Web Report Studio to replace the legacy SAS Intr/Net ® applications.

IMPLEMENTATION OF SAS® ENTERPRISE BI PLATFORM

DATA WAREHOUSE CORE TABLES DEVELOPMENT

The core tables of the data warehouse are the university's official state census reported data. Prior to the establishment of the data warehouse this data was stored in silo environments such as shared folders which limited the user access to the data. The integration of the main official reporting data to improve general data accessibility and our ability to convert data into information quickly and accurately for university wide users formed the foundation of our development of the data warehouse.

The first version of the data warehouse consisted of the following state reporting tables:

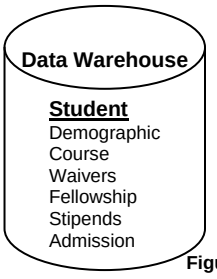

Figure 1. Data Warehouse Tables

The initial building of these tables relied heavily on the use of the SAS® Data Integration (DI) Studio BI tool. The source data for the initial data warehouse build consisted of the historical official state reported data stored by terms in MS Access databases. DI Studio provides a platform allowing access to varied data sources such as these MS Access tables and our Student Administration transactional system's RDBMS tables. This tool was used to combine the term based historical tables and create the respective SAS® data warehouse (DW) table. The SAS® BI Enterprise Guide tool and Base SAS were employed in the data cleansing required for transactional data that were loaded to enhance the ten years of historical official reporting data.

Currently, all the state reported data developed within the student administration system is archived into the data warehouse using DI Studio jobs which append the current data to the historical DW data. This enables access to the official state reporting data by our user community. Other SAS® BI tools (Enterprise Guide, MS Add-In and Web Report Studio) enhance data usability by aiding DW access to varied levels of users from the highly technical to the casual user.

In an attempt to broaden the scope of the data warehouse, an Enrollment Fact table, a Student Credit Hours Fact table and a Degree Fact table have been designed and certified for use in the data warehouse. DI Studio and/or Enterprise Guide were used for the technical development and maintenance of these tables.

For example, the Degree Fact table was initially created using SAS® Enterprise Guide and DI Studio, which are both client-based SAS® development tools. The Degree Fact table's initial design was comprised of a series of queries, data transformations and SAS code objects developed using Enterprise Guide (Figure 2). The data sources for the Degree Fact table are several RDBMS tables from the Student Administration system. Enterprise Guide provides a platform that allows access to RDBMS tables and SAS tables. Also, this client tool has an import feature which allows access to text files, and Excel spreadsheets.

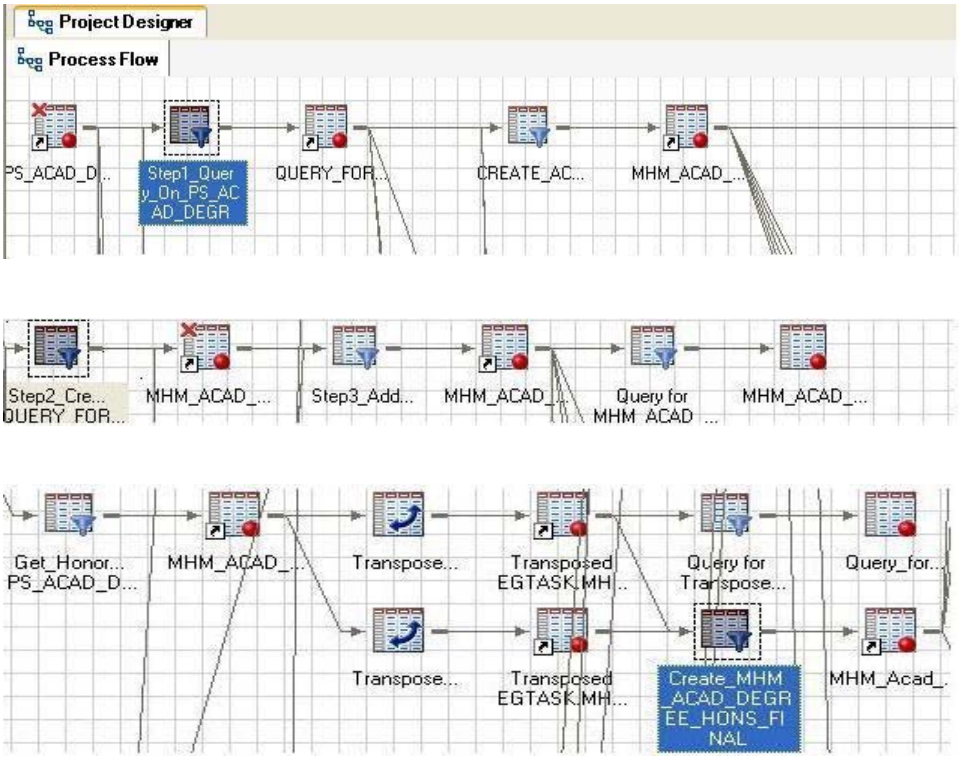

Figure 2. View of parts of the SAS® Enterprise Guide Project for the Degree Fact Build

After business analysts refined the requirements of the Degree Fact table it was redeveloped using SAS® DI Studio and is now refreshed on a weekly basis by running one DI Studio Job (Figure 3).

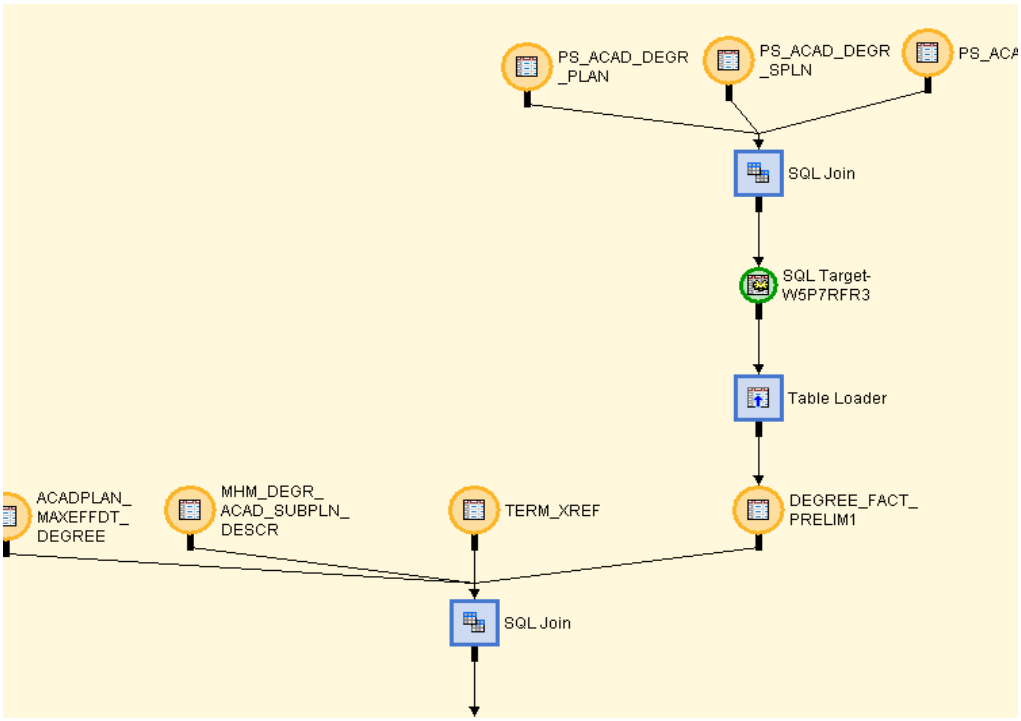

Figure 3. View of part of the SAS® DI Studio job for the Degree Fact Build

An Enterprise Guide project was developed to create the DW Enrollment Fact table and support enrollment reporting development. The data warehouse Enrollment Fact table provides the source data for the creation of several Enrollment SAS tables which are used to support a series of multidimensional Enrollment reports developed in Web Report Studio (Figure 4).

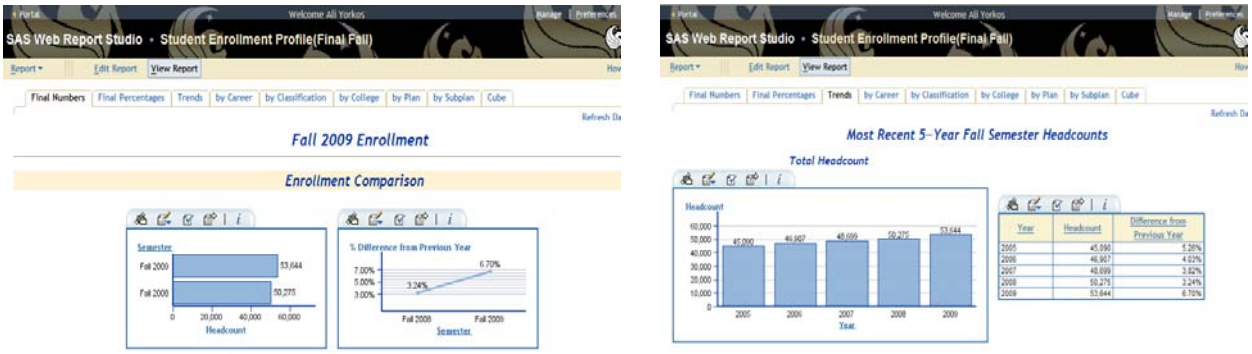

Figure 4. SAS® Web Report Studio Multidimensional Enrollment Report

Due to the widespread and varied use of enrollment data an OLAP Cube was developed in order to present the historical enrollment profile data. Using an OLAP cube allows the user to view the data according to their current requirements (Figure 5).

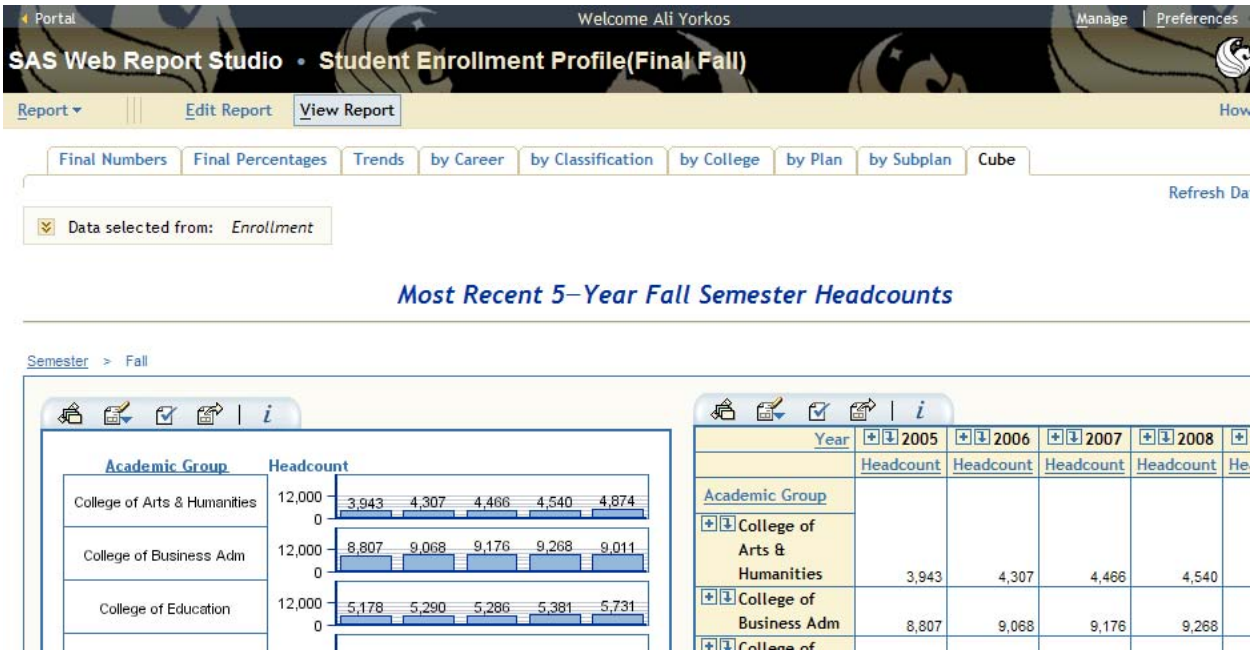

Figure 5. OLAP Cube for Multidimensional Enrollment Report

UCF'S IMPLEMENTATION OF THE SAS® INFORMATION DELIVERY PORTAL

When the data warehouse development was well underway we began to investigate different methods of information delivery. The SAS® Information Delivery Portal's capability to provide access to SAS® Web Report Studio (WRS) reports and generation tool, newly developed stored processes and legacy websites encompassed the features we envisioned for a one stop IR reporting center. The SAS® security architecture of user groups and folders, combined with Access Control Templates (ACTs) and permission assignments provides the Information Delivery Portal with the flexibility to support general university wide faculty and staff access but also allows security restrictions to be enforced in the case of information requiring limited access. However, some customizations of the Information Delivery Portal were required.

As delivered the SAS® Information Delivery Portal did not conform to UCF's web page design guidelines. Therefore, the banner design and page colors were adapted to the UCF guidelines. Although this was a challenging part of the implementation, one of our very talented developers was successful in creating a 'UCF look' for our implementation of the SAS® Information Delivery Portal (see Figure 4).

UCF's security policy requires that applications such as the SAS® Information Delivery Portal be accessed via the UCF Portal. In order to facilitate easy access we have a custom single sign-on procedure built onto the front end of the SAS® Information Delivery Portal where the front end process automatically passes the user's security information from the UCF Portal to the SAS BI security system for verification. Therefore, once our users have signed on to the UCF Portal they do not have to sign-on again to the SAS Portal. Our user audience is comprised of all full-time university faculty and staff, which are approximately five thousand individuals. The SAS Bulk Load security utility successfully loaded the majority of the users with data derived from our transactional human resources system.

The initial design of the Information Delivery Portal presented one main page, the "IR HOME" tab, containing several portlets which provided access to new stored processes, links to legacy SAS Intr/Net® websites and links to other UCF or IR websites. We also provided access to Web Report Studio for users on this tab. The Web Report Studio access allows report viewing access or report view and generation access, depending on the individual's SAS security setup.

As the number of converted SAS Intr/Net® sites, other IR websites and newly developed reports increased, the 'IR HOME' page was redesigned. Currently, the Information Delivery Portal is now organized by subject/functional Tabs or Pages (Figure 6).

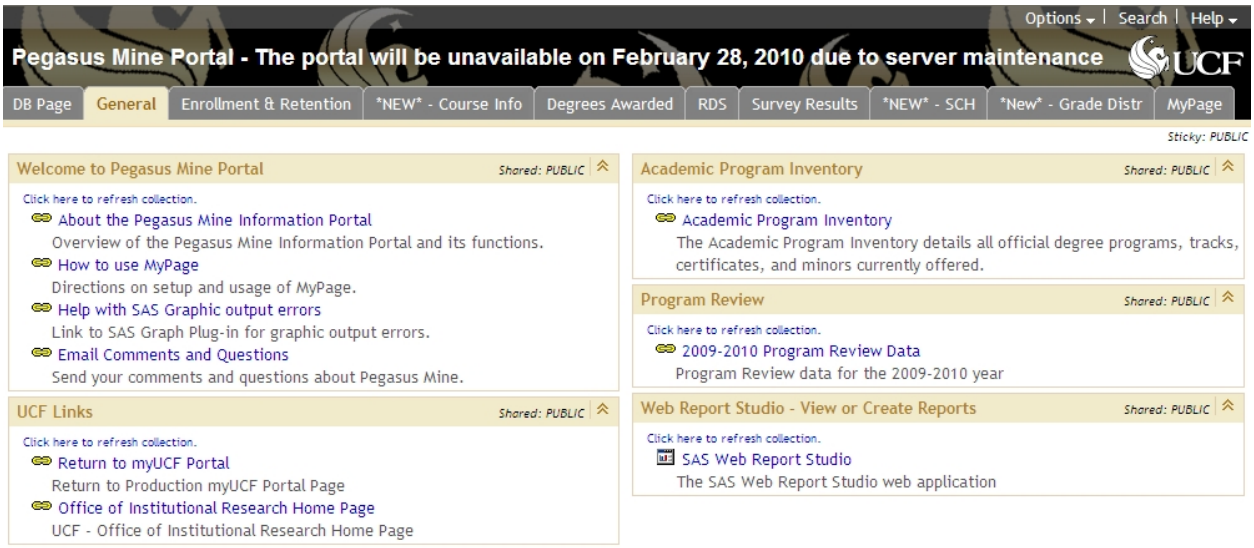

Figure 6. UCF's Implementation of SAS® Information Delivery Portal

WEB REPORT STUDIO® DEVELOPMENT

The selection of Web Report Studio as a primary reporting mechanism was based on several factors. Our management was concerned with minimizing programming effort in order to allow the development staff to increase their focus on strategic issues including further development of the data warehouse, data quality and data cleansing. We also required a tool that would allow quick creation of data visualizations and tabular reports with minimal maintenance. For business users this reporting tool is user friendly with a click and drag interface.

CONVERSION OF THE SAS INTR/NET ® ECHO SNAPSHOT (ENROLLMENT CREDIT HOUR OVERVIEW)

The SAS/IntrNet® conversion effort included the conversion of various SAS/IntrNet® applications utilizing some of the SAS® Business Intelligence Tools. The main objective of the conversion effort was to use the new SAS® BI Platform in order to replicate what was being reported previously. ECHO Snapshot was one of the most important report converted using SAS® Web Report Studio, SAS® Information Map Studio, and SAS® Data Integration Studio. This specific report provided users with a quick snapshot of on-going enrollment and student credit hour activity.

The underlying datasets needed to be refreshed on a daily basis to provide upper level management a quick overview of ongoing enrollment. The overall architecture of the conversion of this report is outlined in the following figure.

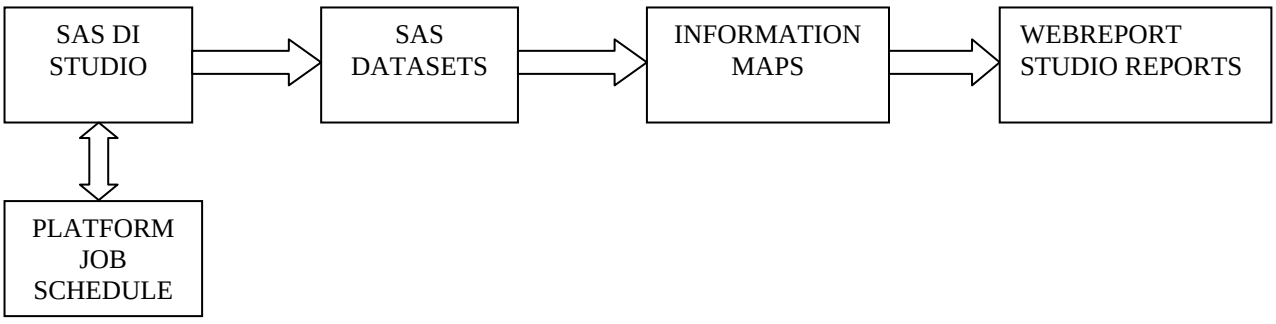

Figure 7. ECHO Snapshot Conversion Process

The database that supported the previous application was designed in Microsoft Access. After careful analysis of all queries and macros, the data gathering process was implemented in a SAS® Data Integration Studio environment (Figure 8 and Figure 9).

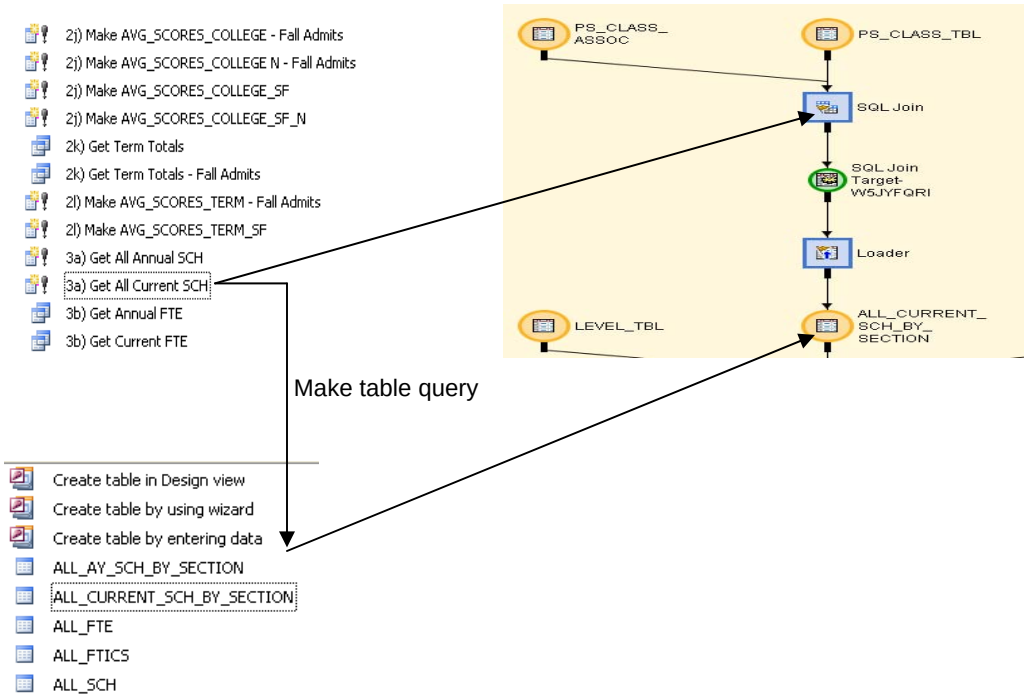

Figure 8. Microsoft Access query conversion into a SAS® Data Integration Studio Job

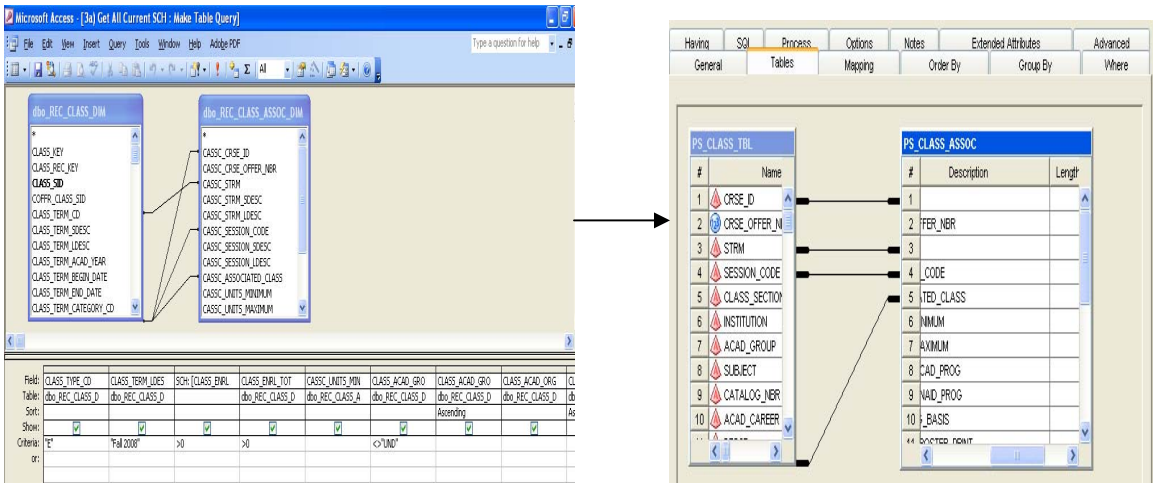

Figure 9. Detail views for query and SAS® Data Integration Studio data transform (SQL Join)

SAS® Data Integration Studio jobs were scheduled using Platform Job Scheduler to run every morning to refresh the underlying datasets. Once the desired SAS® datasets were created, the next step in the overall architecture was to use SAS Information Map Studio so the data fields could be presented in easily interpretable business terms for the newly created SAS ® datasets (Figure 10).

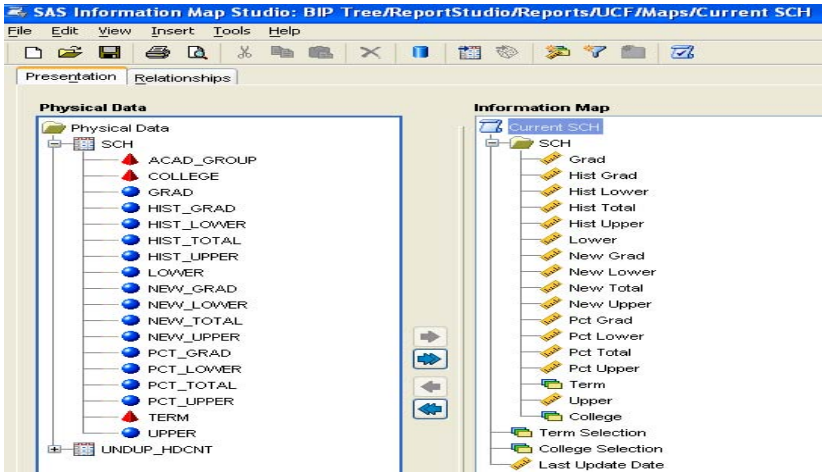

Figure 10. SAS® Information Map Studio

The final step in the design process was to use SAS® Web Report Studio to surface the desired reports (Figure 11).

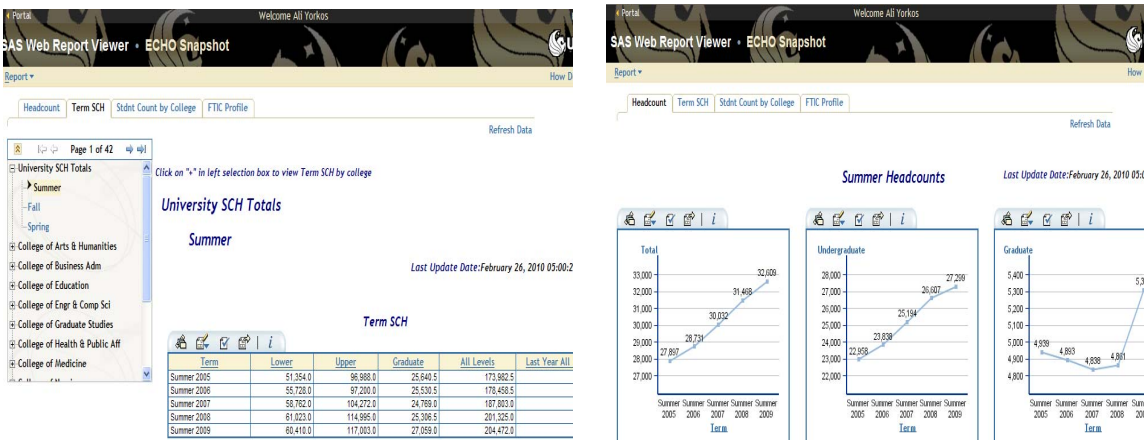

Figure 11. SAS® Web Report Studio

Conversion of the SAS Intr/Net® Course Registration Profile Website

The Course Registration Profile website provides term based data on course enrollment totals and trends for past, current and future term registration periods. The data which supports this site is derived from the student administration transaction system and is refreshed every two hours during an active registration period. This site over the years has become a crucial support mechanism for the university's academic departments to prepare for a registration period and adjust the academic schedule of classes during an on-going registration period. During the initial analysis performed for the conversion of this SAS Intr/Net® website it became apparent that a graceful introduction to a different way of presenting this data was imperative to the new system's success. We decided to convert this system in stages.

The first stage entailed converting the SAS Intr/Net® programs into a series of stored processes which retained the exact look and functionality of the converted system (Figure 12 and Figure 13). Guidelines to convert a SAS Intr/Net® website to a stored process are available on the SAS support website.

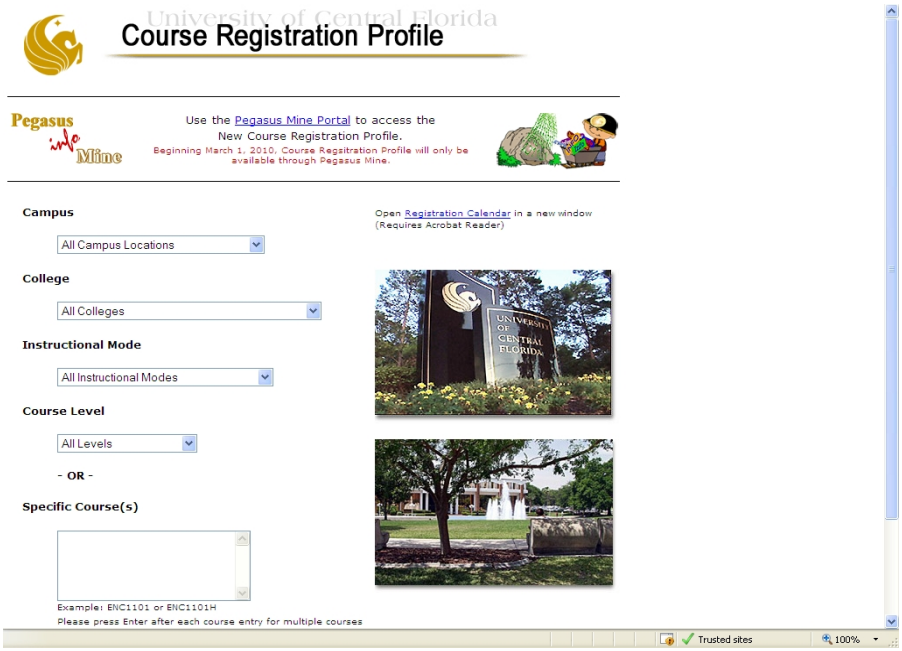

Figure 12. SAS Intr/Net® website

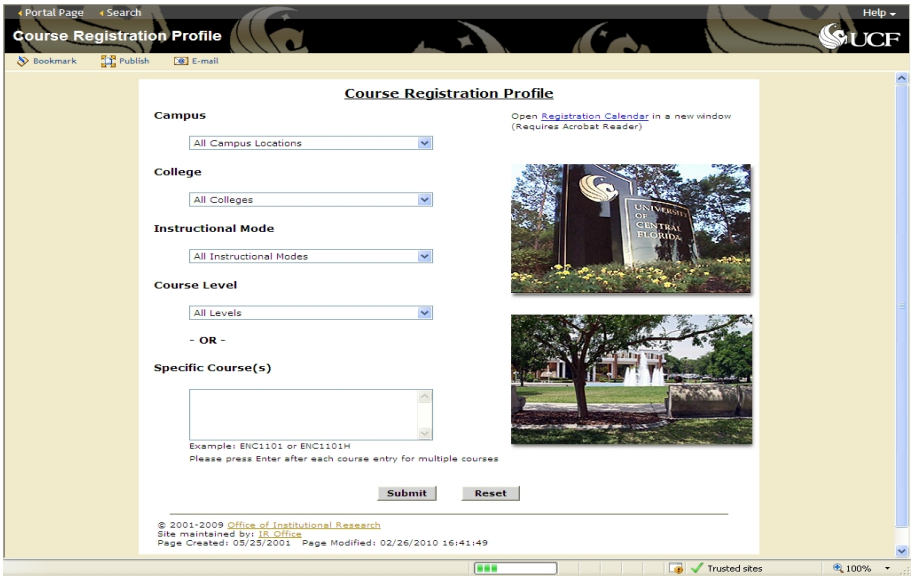

Figure 13. Stored Process Version

As an enhancement to the Course Registration system, we developed a new series of stored processes where the source data is real time current student administration data. Therefore, this data is up to date on a 24/7 basis. Each stored process provides a function found in the old system (Figure 14). The next stage will be to present the trend information required using Web Report Studio data visualizations.

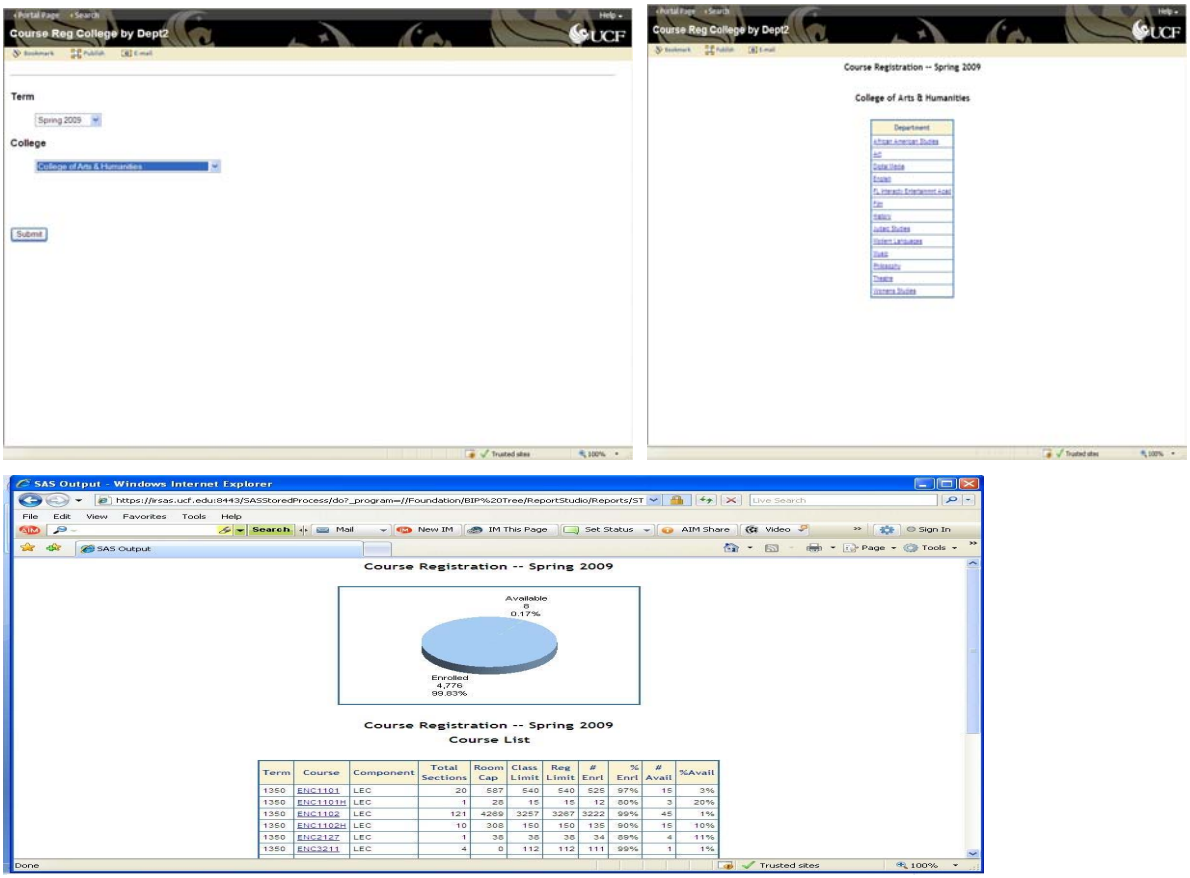

Figure 14. New Stored Process Real Time Data Version

CONCLUSION

CONCLUSION / FUTURE PROJECT DEVELOPMENT PLAN

The IR development team in collaboration with university stakeholders will continue with the development and enhancement of the data warehouse and its reporting functionality. The implementation of the SAS® Enterprise BI Platform has enhanced the data warehouse development and enabled UCF's Office of Institutional Research to better meet the challenge of providing easily accessible data and dynamic reporting to the university community.

ACKNOWLEDGMENTS

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