

Paper 049-2013

From Factbook to Dashboard in T-Minus No Time and Counting!

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ABSTRACT

The University of Texas (UT) System has been publishing detailed data on institutional performance for years using static PDFs and Microsoft Excel documents. With requests for more data increasing, this approach was unsustainable. The Office of Strategic Initiatives (OSI) was spending too much time collecting and processing data for The Chancellor, Board of Regents, and media - there was no time for in-depth research or analysis. Instead of us using the data to help support better management, the data was managing us.

What grew from an internal office need morphed into a larger UT System need for a Business Intelligence (BI) System which would support the Chancellor's Framework by providing an accessible, customizable tool for monitoring institutional performance and progress towards transparency and accountability goals.

INTRODUCTION

The Office of Strategic Initiatives (OSI) at The University of Texas System had previously been two separate offices, Institutional Studies and Policy Analysis (ISPA) and Strategic Management (OSM). ISPA was charged with the creation of the System's annual "factbook" known as Facts and Trends and Strategic Management, with ISPA's assistance, created the annual Accountability report. When these two offices merged in 2010 under new leadership, it was determined that these annual hard copy reports would need to be revamped for online consumption in a more interactive way – rather than merely PDFs posted for download. At the time of consolidation, ISPA had five full-time employees and OSM had three.

Under new leadership by the Vice Chancellor and the appointment of data-intensive Regents to the UT System Board of Regents, our role at the System began to evolve and change. In many cases, data requests were no longer easily pulled tables and figures from Facts and Trends or Accountability reports. They were detailed longitudinal studies across multiple content areas with increased policy implications.

In addition to this increased need for data internally, the call for transparency and accountability across the nation, and most notably in Texas, reached a fevered pitch. In August of 2011, the Chancellor presented his Framework for Advancing Excellence which the Board of Regents embraced. Built on four core values—opportunity, economic impact, quality of life, and stewardship—the framework's 9-part action plan included an investment in strategic information technology infrastructure.

Therefore, it was decided that we needed to invest in a data warehouse and a Business Intelligence solution to address the changing landscape. Fortunately, the Chancellor and Board of Regents devoted substantial funding toward the endeavor. We were tasked with investigating solutions to address 1) the Chancellor and Board of Regent's requirements, and 2) internal OSI office needs.

Once the Productivity Dashboard was approved, the search for a vendor began under a highly compressed timeline — Phase I to be up publicly by November 2011 (3-4 months) with limited in-house IT resources and SAS® Business Intelligence (BI) expertise.

REQUIREMENTS

The project goal was to create an interactive, integrated system that would store and display data and metrics. The project needed to decrease the burden for the nine academic and six health campuses comprising UT System through standardized definitions and data feeds to the new BI system, and at the same time ensure data integrity and streamline office processes. Since the previous data structure within our office was not well-suited for the new environment, the office needed a set of tools that would allow for:

External requirements:

- Public-facing online data reporting tool (BI/dashboard) (no log-in required)
- User-friendly navigation to multiple levels and breakdowns of the data
- Ability to view graphs and data online with an option to save to computer by exporting the data and graphs to Excel or PDF
- Web-based custom reporting

Internal requirements:

- o Data warehouse that is integrated with BI tools and is scalable
- o Streamline current and future data management processes with use of data automation of extract, transform, and load (ETL) process
- o Analyze multiple large datasets and generate tables & graphs for ad-hoc querying, time-series analysis
- o Conduct simple and/or robust statistical analyses for research briefs and reports
- o Tool that integrates with Microsoft Office products to streamline production of written reports

PRODUCT AND VENDOR SELECTION

We identified a number of candidates we felt might fit our requirements:

- **Cognos 8**– Existing UT and/or State of Texas contracts can be used which would not require the extensive RFP Process. No staff experience would mean greater reliance on consultants and a longer time to get up and running.
- **Oracle** – No existing contracts with UT and/or State of Texas would mean extensive Request for Proposal (RFP) and contracting process (would not meet timelines). No staff experience would mean greater reliance on consultants and a longer time to get up and running.
- **Tableau** - great analytics features but expense exceeded its usability and limitations on what and how the data could be made public at a reasonable cost.
- **SAS® Business Intelligence 9.1.3** - Existing UT and/or State contracts can be used and will not require the extensive RFP Process. Current office setup is Base SAS®

	SAS	Cognos	Oracle	Tableau
Features:				
Data warehouse	+	+	+	-
Analytics	+	-	-	+
Reporting	+	+	+	+
Dashboard	+	+		
Cost	+	-	-	-
Contracts/ Licensing	Existing State	Existing State	-	Limited Existing OSI License
OSI staff expertise	+	-	-	+

Table 1: Vendor Selection: Pros and Cons

In the end, SAS met all requirements for less cost.

- Integrated data management and reporting system with user-friendly public interface and ability to export
- Staff expertise in SAS will reduce the timeline for launch
- Data already processed in SAS can be seamlessly brought into the SAS BI environment and published to the web (e.g., Facts and Trends, Accountability Report, Research Briefs)
- The proposed cost of the entire SAS system is significantly lower than other estimates
- SAS can easily communicate with external entities (e.g., MyEdu, THECB, other databases, etc.)
- Current SAS clients we contacted indicated a high level of satisfaction with both the product (software) and support services

The following **SAS® Enterprise BI Server** Solutions were part of the original proposal and purchase and continue to be used:

Web-based

SAS® BI Dashboard: SAS BI Dashboard enables users to use dashboards to monitor key performance indicators that convey how well an organization is performing. Dashboards can include graphics, text, colors, and hyperlinks. Dashboards are created, maintained, and viewed through an easy-to-use Web-based interface. All content is displayed in a role-based, secure, customizable, and extensible environment.

SAS® Information Delivery Portal: SAS Information Delivery Portal provides a common front end for SAS intelligence, Web-based SAS solutions and analytics, and other digital content in a role-based, secure, customizable and extensible environment. Users can easily personalize their portal environments, reducing both information overload and IT workload.

SAS® Web Report Studio and Viewer: SAS Web Report Studio is a thin client interface that leverages Information Maps. SAS Web Report Studio is a purely Web-based solution that gives end users a flexible interface for designing, distributing, and viewing Web-based reports.

Client-based

SAS® Management Console: The SAS Management Console offers a standardized, common management tool that enables enterprises to support technologies across the SAS Intelligence Value Chain from a single point of administration. This client application utilizes an extensible plug-in architecture, allowing you to customize the console to support a wide range of administrative capabilities.

SAS® Add-In for Microsoft Office: The SAS Add-In for Microsoft Office enables Microsoft Excel, Word, and PowerPoint users to harness the power of SAS through the familiar Microsoft interfaces.

SAS® Data Integration Studio: Data integration is the process of consolidating data from a variety of sources in order to produce a unified view of the data. SAS supports data integration through connectivity and metadata, extraction, transformation, and loading, migration and synchronization, data federation, and master data management.

SAS® OLAP Server/Cubes: The SAS OLAP Server is a multidimensional data store designed from the outset to provide quick access to pre-summarized data, generated from vast amounts of detailed data.

SAS® Information Map Studio: SAS Information Map Studio is a desktop Java-based application that enables information architects or query designers to build information maps (a business metadata layer that describes the physical data warehouse).

SAS® Enterprise Guide: This is a simple-to-use, wizard-driven Windows application that is designed to enable quick and easy access to SAS. SAS Enterprise Guide enables users to access, manage, transform, analyze, summarize, and report, all utilizing the highest-quality SAS graphics, and then easily publish the results.

INITIAL PROJECT PLANNING

The kick-off meeting for the project was held in late August 2011 and it was decided that all efforts would be concentrated on getting an initial dashboard operational by November and subsequent phases would involve the creation of the data warehouse and additional dashboards.

Two full-time OSI staff and two SAS consultants were assigned to this first phase of the project. One of the SAS consultants served as our system administrator as we began the search for a systems analyst to handle such duties in the future. Table 2 highlights the purpose, structure, and access of the three server environments our SAS consultant helped set-up during this initial phase.

Server Environments					
	Purpose	Server Structure	Behind Firewall	Access	Unit Record Level Data
DEV	Extraction, Transformation and Load (ETL) processes; De-identification of datasets for promotion; initial staging ground for developing reports, dashboards, and portals; work promoted to TEST for review	1 virtual server	Yes	Strictly Limited – small number of analysts in the office	Yes. ID information only available to a very limited subset of staff
TEST	Cleaned datasets; place to develop and run reports & analysis; review reports & dashboards for promotion to PROD	1 virtual server	Yes	Limited – office staff and internal users only	Yes. De-identified
PROD	Cleaned datasets; finalized reports & dashboards	3 dedicated virtual servers: Mid-tier server (JBOSS), metadata server, application server	No	Open – public access Login (single sign on) – authenticated secure access for authorized users w/ role-based permissions	Yes. De-identified

Table 2: Overview of OSI's SAS® Business Intelligence architecture

The decision was made to utilize data that had been previously reported in Facts and Trends since, in most cases, 10 years' worth of data was available. Hence, all efforts were zeroed in on preparing summary SAS datasets for the Core Indicators dashboard which included multiple years of data on:

- Enrollment
- Degrees
- Graduation Rates
- Post-Baccalaureate Success
- Faculty Teaching Load Credits
- Research Expenditures
- Technology Transfer
- Patient Care Net Revenues
- Cost per Degree
- Endowments

The main requirement and what proved to be the most difficult portion of this phase was the need for public access – in other words a public user. SAS had vast experience in setting up these systems behind a log-in but not situations where no log-in was required. In the end, the need for secure public access, specifically difficulties with SSL implementation caused a delay of the November roll-out. The dashboard launched publicly on December 14, 2011 as many of us were attending a SAS Graph training course at the Austin facility.

CONTINUED PLANNING AND IMPLEMENTATION

After the December launch, the really hard work began – construction of a data warehouse using data collected from various sources over the last 10 years. Phase 2 launched in January 2012 and continued smoothly through the first quarter of the year; however, the creation of a strategic roadmap of the dashboard (see Figure 1) resulted in less “phased” work and more of a piece meal approach contingent upon ever-changing priorities in the dashboard expansion.

The OSI dashboard team now consists of three full-time employees, with additional assistance from two to three OSI research analysts, as needed, and four (to five) SAS consultants who assist with the SAS® Data Integration Studio work and other application development issues.

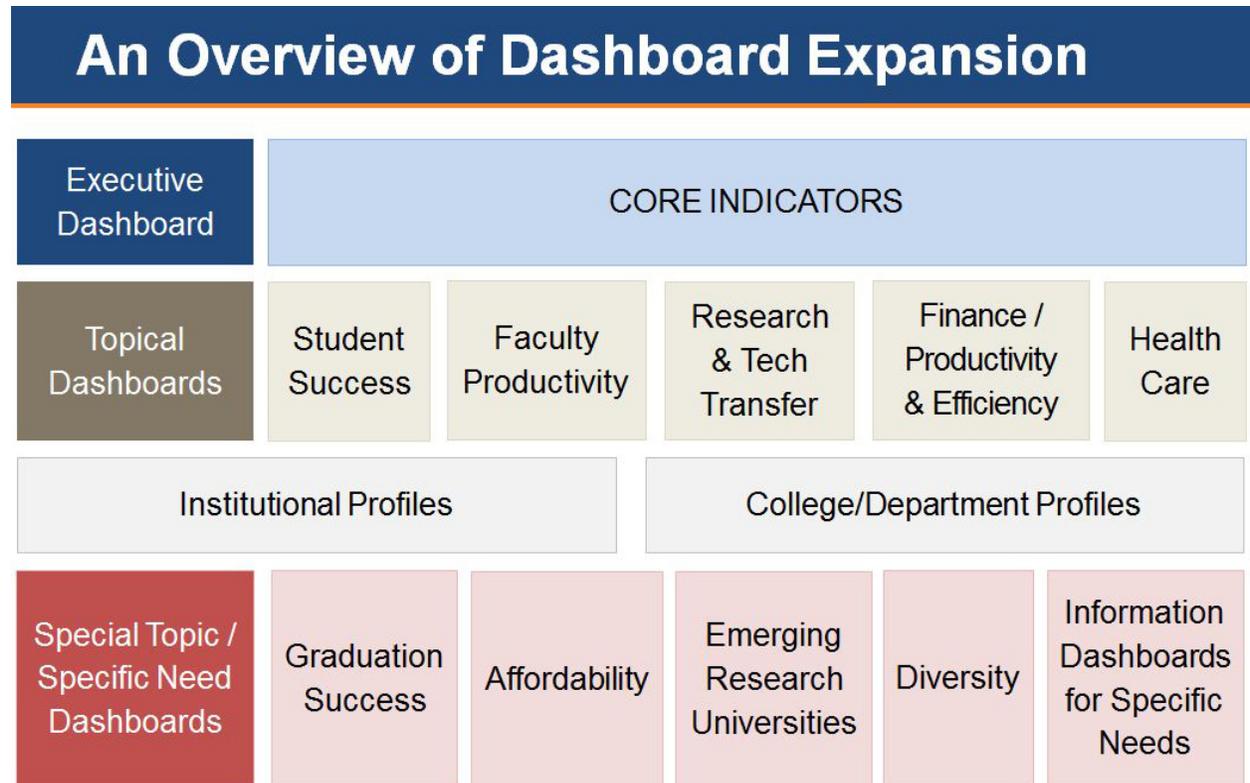


Figure 1: Dashboard Expansion

The expansion added SAS® Visual Analytics 6.1 in December of 2012 which enhances the data and reports already contained within the SAS® Business Intelligence environment.

- SAS® Visual Analytics:** Produces blazingly fast insights while letting you interactively explore all relevant data – no sub setting or sampling required. The self-service, ad hoc data visualization environment lets you explore data on your own, without burdening IT.

We created a series of reports that allow users to interact with the data, select what they want to see, and easily share it with others. In keeping with our efforts to support increased transparency, the data and reports are available to the public user from their desktop or iPad

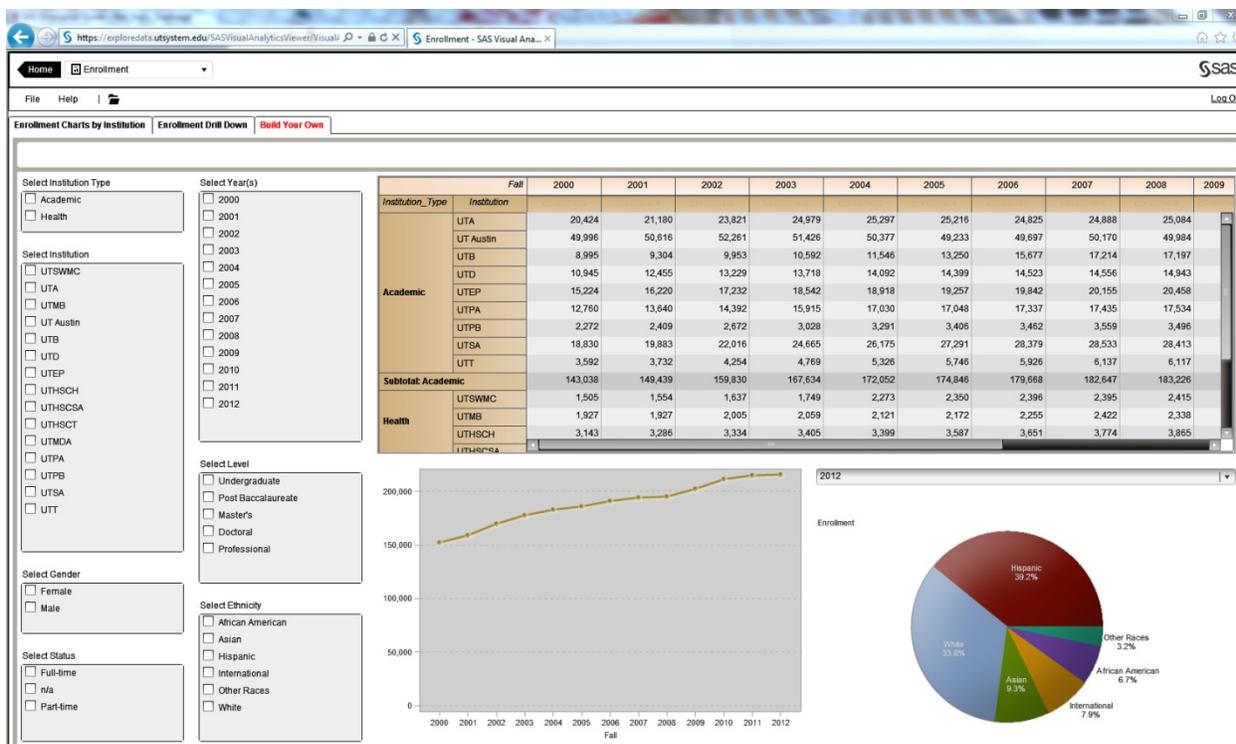


Figure 2: Example Visual Analytics report

BENEFITS AND ACCOMPLISHMENTS

- Phase 1 allowed the office to quickly highlight the power of the SAS® Business Intelligence environment to important stakeholders such as the Chancellor and Regents.
- Phase 2 enabled the office to begin the detailed work necessary for building the data warehouse since Phase 1 was run off of summary SAS datasets rather than being powered by a warehouse.
- The dashboard has become a national model in higher education and is used frequently by SAS® in demos and presentations.

DESIGN AND IMPLEMENTATION CHALLENGES

1. Stringent timelines necessitated the use of a cadre of SAS consultants
2. Although we had been a SAS Base programming office which helped, the new set of tools required a tremendous amount of training for staff
3. The file naming convention used by the U.S. Department's National Center for Education Statistics, specifically the Integrated Postsecondary Education Data System (IPEDS) caused confusion and delay on multiple occasions, most notably with our Institution DIM table that served as the basis for much of the data warehouse build. Specifically, the Institutional Characteristics (a.k.a. HD) survey file had a calendar year (e.g., 2009) attached to the name which we thought translated into the 2008-09 academic year. Unfortunately, it was the 2009-10 academic year so we had to revamp a number of data warehouse tables after the error was discovered.
4. Virtual servers and promotion issues between Development, Test, and Production environments. Before, our migration from 9.2 to 9.3, our Development, and Test environments consisted of one virtual server each and Production was three dedicated virtual servers, mid-tier server (JBOSS), metadata server, and application server. There were numerous difficulties promoting content and dashboards from the one server to three server environment.
5. The migration from 9.2 to 9.3 in August of 2012 did not go as smoothly as anticipated. We once again ran into security and certificate issues related to the public user.

Lessons Learned

- Do not take training classes too early – in most cases, as the consultants worked on Phase 1 tasks, we were taking training classes but we did not use the tools soon enough and most times had forgotten the training by the time the tool was used.
- Documentation, documentation, documentation – because there is a small army of SAS consultants on the project, there have been a number of times when issues arose and everyone realized that documentation was lacking, or non-existent!
- Build time for the intermediate steps needed between your data warehouse and analyst end users, who are perhaps less technical users.
- When you are on the leading edge of technology in your arena, be ready for certain items to work while others break.

CONCLUSION

In just over a year OSI has created an interactive Productivity Dashboard driven off multiple higher education data points, streamlined office processes, met multiple goals and been highlighted in various arenas. In addition to meeting UT System goals, it has opened discussions and brought to light new targets and possibilities. The time and effort invested has paid off by creating web-based reports that contain easy to access multiple years of historical data for public consumption. This transparency allows the ability to answer complex questions resulting in better outcomes.

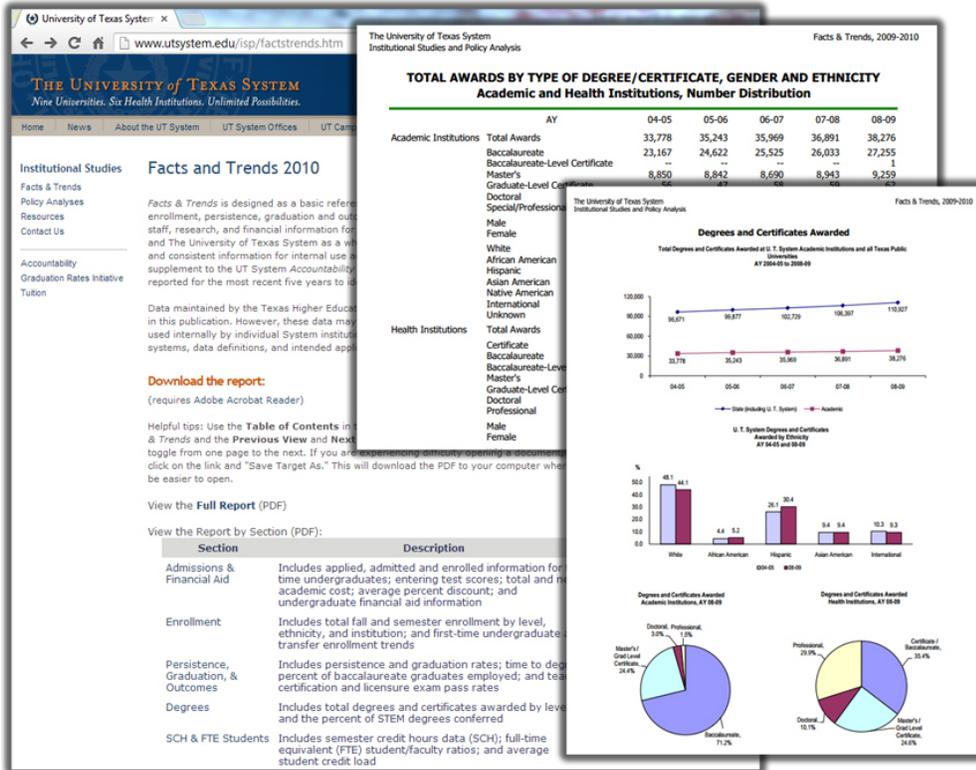


Figure 3: "Before" Factbook

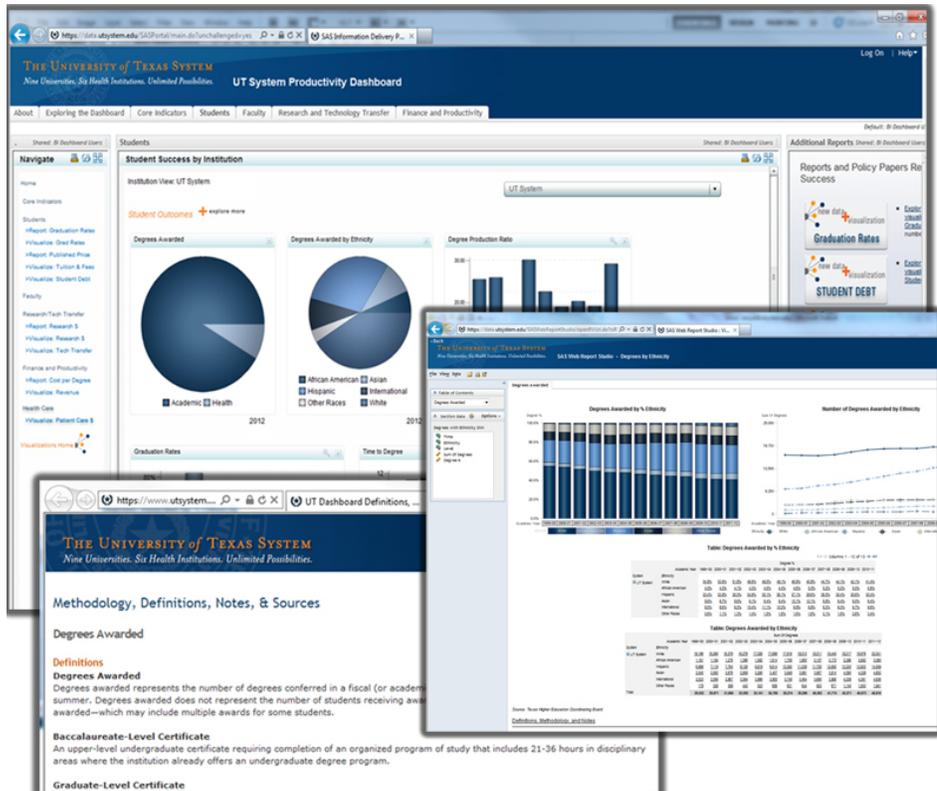


Figure 4: "After" Dashboard

ACKNOWLEDGMENTS

Thanks must go to OSI staff in addition to a number of SAS consultants that contributed to the success of adopting, supporting, and championing the SAS® Business Intelligence infrastructure since the fall of 2011.

CONTACT INFORMATION

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