Dynamic, Self-Service Institutional Reporting

Western Kentucky University uses SAS® to give faculty and administrators self-service access to data about students, faculty, programs and courses – when they want it, the way they want it

Insights from presentations at the Association for Institutional Research (AIR) Forum, Toronto – May 2011

Featuring:

Tuesdi Helbig, Director of Institutional Research, Western Kentucky University

Christopher James, Applications Programmer Analyst, Western Kentucky University

Gina Huff, Senior Applications Programmer Analyst, Western Kentucky University

If a student is struggling only a few weeks into the semester – missing classes or getting failing grades – you'd want to know. You wouldn't want to find out after next week's report comes in. You'd want to know today, so you could identify at-risk students in time to reach out, offer help and keep them on track.

The fastest-growing university in the state for 13 years in a row, Western Kentucky University serves nearly 21,000 students on four campuses. Originally chartered in 1906 as a teacher's training college, the school moved to its main campus on "the Hill," 135 feet above downtown Bowling Green, more than 100 years ago.

Growing far beyond its roots, WKU now encompasses six colleges and offers more than 170 choices for undergraduate areas of study and more than 80 graduate-level degrees and certificates.

The university's Office of Institutional Research (IR) is the hub for data management, analysis and reporting for all these students, faculty, programs and courses. This information is essential for decision support. For example, current and historical enrollment data is used for planning, recruitment, staffing and scheduling decisions. Attendance and grade data is core to demonstrating that students and the university are successfully meeting their respective academic missions.

For more than 16 years, the IR office has used Base SAS and SAS/STAT® software to collect, analyze and report this type of information. "We felt we were very responsive to the needs of our decision makers and constituents," said Gina Huff, Senior Applications Programmer Analyst. "We were able to respond to data requests and answer questions that decision makers had on a pretty timely basis."

However, data requests could spiral in never-ending loops, whereby one answer leads to a new question, or a need to look at the data from another angle, or the desire to look more closely at a certain aspect or to figure out why something is happening.

"Data requests could continue to expand and grow," said Huff. "With time and resource constraints, we found ourselves sometimes being more reactive than proactive. As a team, we had a strong desire to shift that, to enable decision makers to get their questions answered quickly and accurately – and furthermore, for them to be able to get rapid answers to questions they didn't even know were there when they initially made the request."

From Static to Self-Service:
Redefining Institutional Reporting

In August 2010, the IR team unveiled a dynamic and interactive reporting portal that gave faculty and administrators unprecedented power to explore the data on their own. "Implementing a SAS Business Intelligence framework was the next logical step to help us provide our users with on-demand access to dynamic reports," said Tuesdi Helbig, Director of Institutional Research. Users now can answer many of their own questions, which greatly reduces the number of ad hoc data requests the IR office must respond to each day.

"We have found that users have used the self-service report portal to address more needs than we even imagined that they would use it for," said Huff. "The deans and VPs use this to really start looking at the supply and demand of their courses. Our diversity committee uses it to complete their diversity plan. These are fantastic uses of this particular facility. It became very valuable to them, and they have a wealth of information right at their fingertips that they just didn't have before.

"These were things that probably would have come through our office as data requests, but now these individuals and committees are able to do this pretty much on their own – and to dive deeper into the data than what we could have provided with the former static reports."

In addition, the system has advanced the team's research agenda. As business intelligence uncovered significant and persistent trends, administrators began asking IR to determine why these trends were occurring. By automating some of the descriptive questions – how many or which ones – IR has been able to focus more time on the research component of its mission.

The new reporting environment delivers a host of benefits to the university, the IR department and users:

Self-service reporting. "Traditionally, people would call in a data request, we'd put it out to a programmer, the programmer would write the report," said Helbig. "Then the user would say, 'Oh I really need it by gender or by ethnicity' – so then you go through the whole process again." By giving users self-service access to the data and the flexibility to look at it in many different ways, the BI platform eliminates a lot of those data requests."

Instead of waiting days or weeks, the school's executive offices, college deans, department heads and administration staff can get information much faster. In most cases, they can get what they need immediately from a report in the university's institutional research portal, which is available to authorized users on demand, all the time, via the Internet.

■ Western Kentucky University's Institutional Research (IR) Office relies on SAS Business Analytics for data integration, analytical power and Web-based reporting capabilities – giving university decision makers timely access to deep insight into the affairs of the institution.

■ "The self-service reporting environment takes some of the daily pressure off us and, more importantly, provides better service to our clients."

Gina Huff,
Senior Applications Programmer Analyst,
Western Kentucky University

Role-based authorization enables the IR team to restrict access to sensitive reports while granting broader access to other users, who have all agreed to abide by Family Educational Rights and Privacy Act (FERPA) guidelines.

Flexible data views. Because information is needed for a variety of reasons, school officials request data to be formatted in different ways – which previously required modification of Base SAS programs, said Helbig. "For example, our fact book has always showed the last five years of fall data, but if someone needed spring data or summer data or if they needed annual year data, they'd have to call and request that. Now users just log on to interactive tables, drop those terms in there, and get reports exactly the way they want to see them.

"I used to be the one who programmed all the requests for persistence information. If someone wanted to know the graduation rates, one-year persistence, or three-year persistence, broken down by semester for their particular group of students, that's what I'd do. If you have to program these reports over and over again, it takes a lot of time. Now a lot of those questions are very quickly answered in the OLAP [online analytical processing] cube."

More efficient reporting. "Deans can access one report, and with just a few clicks they can answer many different questions," said Chris James, Applications Programmer Analyst. "It is faster and more flexible. When you're answering multiple questions with one interactive report, it is clearly much more efficient."

A broader view. The IR office is one of the few departments on campus that incorporates different data sources, such as combining human resource data with course information. Integrating outside data is leading to a better understanding of what it takes for a student to be successful at the university.

Up-to-date summaries anytime. "Users can look at dashboards every day if they want to, and see how the metrics change," said Helbig. "For example, our enrollment people and our provost can see exactly where we stand today on enrollment and how it compares to this day last year and for the last three years."

> "Users can manipulate the way data is presented, so they can produce the reports that they need instead of asking us to change the data for them."
>
> Tuesdi Helbig,
> Director of Institutional Research,
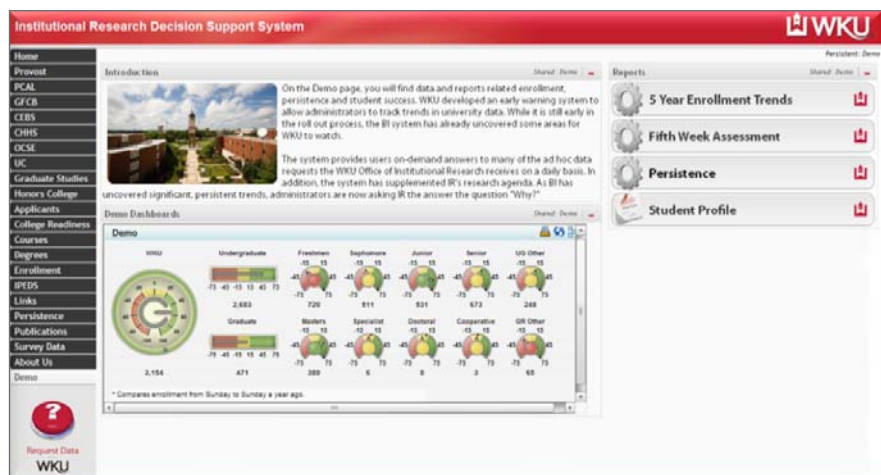> Western Kentucky University

Figure 1. An enrollment dashboard provides an at-a-glance view of how a college, department or the university overall is doing, compared to the same time last year.

Green: Enrollment has risen. Amber: Enrollment is flat. Red: Enrollment is down from last year.

Keeping Students on Track to Succeed

Using the new BI framework, the IR team developed an early-warning system to enable administrators to track trends in enrollment, persistence and student success. The mission was to identify at-risk students early, so interventions could be made in time to help.

Tracking Enrollment and Persistence

"Before we established our business intelligence solution, persistence was difficult to conquer," said James. "We would get data requests, and requesters never seemed to ask the same question the same way. We would take the time to write the program in SAS and give them the report, hoping they would be satisfied. But inevitably they would want to see the data a slightly different way or add in another variable. If you've ever written code for persistence, well it's not easy, so we would spend a lot of time rewriting and editing our code."

Benefits of the Business Intelligence Framework

- Timely access to insight about the university's people and programs.

- Immediate data and reports instead of waiting days or weeks for a request.

- Access to current data for planning purposes.

- Significant time savings in analysis and report generation.

- Ability to identify enrollment trends and modify course offerings.

- Monitoring of student performance to support effective retention efforts.

■ Western Kentucky University's business intelligence framework initially focuses on three aspects – enrollment, persistence and student success – to better track enrollment, develop strategies to increase that enrollment, and design program decisions and interventions to ensure that students continue in their educational tracks and realize their final goal of graduating.

That was then. Now an OLAP cube – a "persistence matrix" – records every student from the year 2000 forward and tracks them over six years to show one-term retention rates, one-year retention rates, and graduation/retention rates for two, three, four, five or six years. "You can see normal, cookie-cutter graduation/retention rates, but with the power of OLAP technology, you can actually drill into the atomic level of this report – not just the cohort and how many were retained, but who those people are," said James.

Click the "plus" button to expand the view. Click the arrow to drill down, layer by layer. At the most granular level of detail you'll see 87 different columns of data on students, such as test scores, contact information, major – and if they didn't retain, where they went. Click the magic box to export the report to Word or Excel. It's that easy.

Tracking Student Success

At the fifth week of the semester, faculty members fill out Web forms to indicate whether freshmen students are attending and passing their courses. This data goes into OLAP cubes, where deans, department heads and advisors can look at the data in two key ways:

- **By courses**, so (for instance), the department head for sociology can look at the performance of students in all sociology 100-level courses.

- **By major,** so the head of the sociology department can find all sociology majors and see how they're tracking.

"With the models we've developed with SAS® Enterprise Miner™ software, we can pretty well predict which students are not going to be retained until next fall, based on a combination of their grades and attendance," said Helbig. Color-coding in the report makes it easy to identify at-risk students, along with the factors that contributed to their score. Advisors can immediately see which students are having difficulty in specific classes and provide outreach to those who are underperforming.

Given the critical role fifth-week evaluations play in getting students back on track and staying in school, the system also tracks faculty completion of the assessments. Since the online form is easy to fill out – just hit drop-down boxes, click "submit," and it's done – "faculty participation has been impressive," Helbig said.

■ Users can dig deep into the data to better understand the progress of underprepared and at-risk students, and save valuable time looking at the university's performance on statewide strategic agenda goals.

Twelve Best Practices for Implementing Business Intelligence

The IR team at Western Kentucky University had 50 years of programming experience, collectively – including programmers with advanced SAS Certification – but this was still a big endeavor, Helbig recalled. At the 2011 AIR Forum, Helbig, Huff and James shared their tips for a smooth implementation.

1. Identify and involve your stakeholders from the start.

"Obviously the first stakeholder group is our management; they were essential in just being able to purchase the system," said Huff. "That includes the provost and members of the academic affairs team, such as enrollment management, graduate studies and our college deans.

"Getting their support and understanding of what the system can do really eased its acceptance into the university as a whole. As the deans got excited about it, that trickled down to the department heads, administrative heads and support staff."

The next question was, who will have access to the data and at what level? To begin with, the IR reporting solution is available only to authorized users with passwords linked to their Active Directory identities. Later, the solution will provide public data without drill-down to the level of individual student data.

2. Determine what information the BI solution will provide.

"That sounds like a really easy question, but it is actually difficult to figure out what you want to put out there, and all the ramifications for what you do," said Helbig.

"More is definitely not better," said James. "Don't just start building reports and dumping them out there, because before you know it, you're going to have 500 different reports and 100 directories. People will have to ask you where everything is, versus having a portal that is user-friendly where things are easy to find."

The WKU information portal has about four reports on a page, so users don't have to scroll through endless lists of reports and try to figure out the content of each.

"A business intelligence system should not try to answer every ad hoc question people will have. You want to put things out there that a lot of people would get something out of. If you have a special request, a one-time need, we'll still write a special report for you."

Tuesdi Helbig,
Director of Institutional Research,
Western Kentucky University

3. Determine the best way to process the report.

Stored process or OLAP cube? It depends on how much flexibility and eye appeal you need, said James. "We use cubes more than stored process reports, because at any point you can have an aggregated report at the university level or at any level of granularity: college level, major and so on. It's not just a report with the cube. You can actually click the numbers and drill down to the detail – down to individual faculty members, courses and students."

On the other hand, a stored process is the ticket for creating print-ready reports. Users can select variables from pull-down menus or tabs, such as college, department and a certain cohort of students, then hit the "run" button and the system creates a printed report, ready to go. A stored process report doesn't offer the same degree of investigative flexibility as an OLAP cube, but for standard information needs, such as a presentation to the media or Rotary Club, it provides an attractive, formatted view of the data.
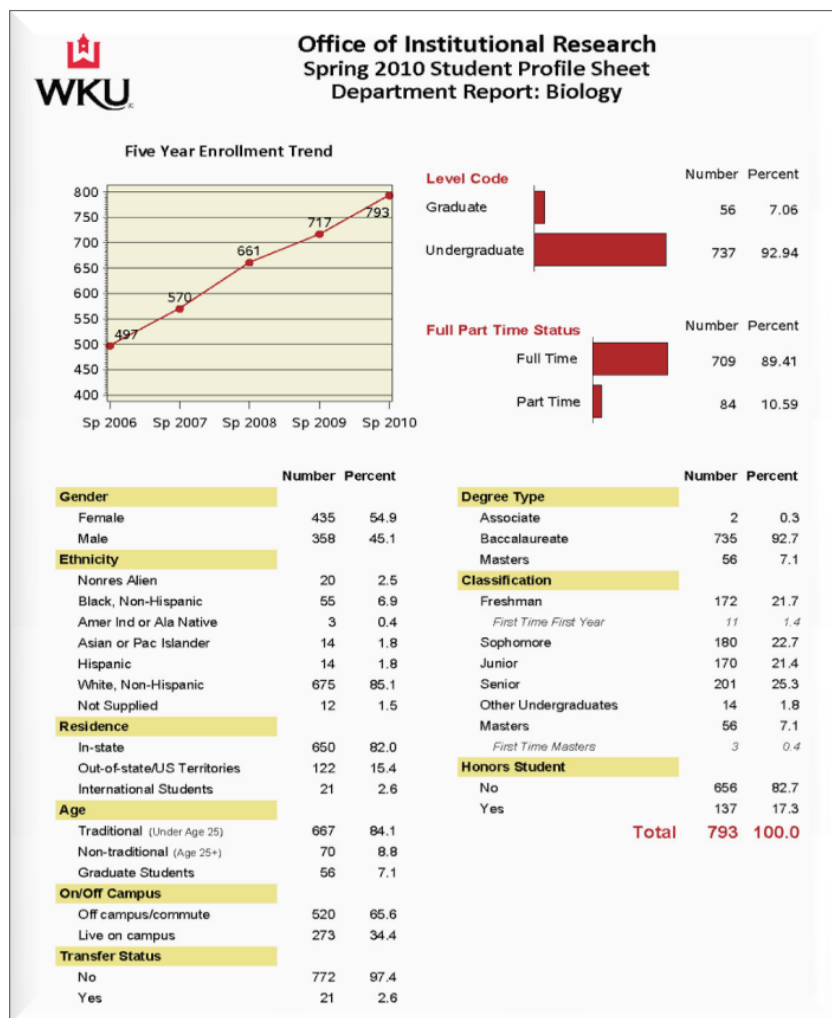

Office of Institutional Research
Spring 2010 Student Profile Sheet
Department Report: Biology

Five Year Enrollment Trend

	Number	Percent
Level Code		
Graduate	56	7.06
Undergraduate	737	92.94

	Number	Percent
Full Part Time Status		
Full Time	709	89.41
Part Time	84	10.59

	Number	Percent			Number	Percent
Gender				**Degree Type**		
Female	435	54.9		Associate	2	0.3
Male	358	45.1		Baccalaureate	735	92.7
Ethnicity				Masters	56	7.1
Nonres Alien	20	2.5		**Classification**		
Black, Non-Hispanic	55	6.9		Freshman	172	21.7
Amer Ind or Ala Native	3	0.4		*First Time First Year*	*11*	*1.4*
Asian or Pac Islander	14	1.8		Sophomore	180	22.7
Hispanic	14	1.8		Junior	170	21.4
White, Non-Hispanic	675	85.1		Senior	201	25.3
Not Supplied	12	1.5		Other Undergraduates	14	1.8
Residence				Masters	56	7.1
In-state	650	82.0		*First Time Masters*	*3*	*0.4*
Out-of-state/US Territories	122	15.4		**Honors Student**		
International Students	21	2.6		No	656	82.7
Age				Yes	137	17.3
Traditional (Under Age 25)	667	84.1		**Total**	**793**	**100.0**
Non-traditional (Age 25+)	70	8.8				
Graduate Students	56	7.1				
On/Off Campus						
Off campus/commute	520	65.6				
Live on campus	273	34.4				
Transfer Status						
No	772	97.4				
Yes	21	2.6				

Figure 2. Stored process reports satisfy the need for publication-ready materials.

Drop-down menus and selection boxes enable users to define the scope and view of the report.

4. Design an intuitive, user-friendly interface.

The self-service reporting environment uses familiar, intuitive conventions for navigation, drill-down, data selection and more. For example:

- Tabs down the left side of the home page take the user to information for a specific area, such as dashboards for the provost, for a college, or to look at applicants, degrees or enrollment.

- Access popular publications, such as the fact book, quick facts or the data dictionary with one click from the home page.

- Zoom and pan to see aggregate information for the university or to drill down to a specific college, department, degree, program or even the individual student.

- Get an at-a-glance view in a graphic visualization for some reports.

Thoughtfully designed screens and easy navigation and selection tools encourage users to explore the data in more ways, leading to unexpected discoveries and better decisions.

5. Get user feedback, and act on it.

Immediately after the launch, the IR team started gathering feedback from users about how they were using the system and how to improve it. "In many instances, we found that we were on target delivering what they wanted, but there were tweaks to be made, such as an honors flag or some additional information tags tacked on," said Huff. "In other cases, things that we thought were grand ideas weren't really that useful to users at all. Involving our users early on was very helpful."

User feedback came in through two channels, Helbig said. "We had many focus group sessions with users, where we recorded all the comments and suggestions that people offered. Then we came back to the office and, if it was at all possible, we implemented those ideas pretty quickly. Others are still on our prioritized 'to do' list." Users can also click a "comments" button and provide feedback directly from the report portal.

"What's so fantastic about this system is that it provides you the ability to go as far back or as close in as you need to. You can view the data from a very high summary level or down to that individual level of detail. This is incredibly powerful for our users, who did not have that before."

Gina Huff,
Senior Applications Programmer Analyst,
Western Kentucky University

6. Anticipate and resolve potential conflicts.

Where's the IT group in all this? Will that team be threatened by the idea of an IR office creating its own self-service reporting portal?

"We considered IT as another stakeholder, because IT support was essential to getting this up and running," said Huff. "We have a good relationship with IT, but sometimes there's a little bit of confusion about who to go to for what. We sat down with IT and jointly clarified those lines. It was really a win-win, because we were interested in the longitudinal, decision-making type of data, and they were more on the operational side. They no more want to do our stuff than we want to do theirs, so it was nice to iron that out."

7. Develop in-house expertise.

Early on, the project leaders got training in the different elements of the solution: Huff on data integration and data warehousing, Helbig on data mining, and James on how to administer the solution. "We went to several different training sessions, and that really helped us, because then we had a good foundation and a good understanding of the product, so we could hit the ground running and also know to whom to pass the baton," said Helbig.

8. Take advantage of consultants.

Although the project leaders had considerable SAS expertise, they had a consultant develop two of the first OLAP cubes: one for the admissions office to track applications and enrollment, and another for the academic budget office to track revenues and expenditures.

Consultants offer two advantages, said James. "It is not just the actual product that they give you; it's the knowledge you can obtain from them. When you get a business intelligence system, you get a huge set of tools, and it can seem a little overwhelming at first. But a consultant can show you how to do it, and then you can tackle your own more complex problems. A consultant has seen how other people have done it and can give you a new angle and approach."

9. Support users with training and self-help materials.

"We made it a requirement for users to go through training and agree to terms of use before they entered the system," said Huff. "Training is something that you cannot stress enough, because you have to make sure that users not only understand how the system works, but also the data aspects of it. Because we had the deans' offices on board from the get-go, they were very cooperative about letting us do training in their department head meetings."

Training is offered in one-on-one sessions at a computer, or self-directed, using hands-on examples in the user manual that show how to use the interactive tables and how stored processes work. For the user who doesn't need much instruction, there's also a quick, brochure-style navigation guide. A demo page on the site enables users to explore system features with simulated student data.

In addition to the detailed user manual, users are always a click away from online documentation, said James. "The last tab on all of our cubes is a documentation tab, which presents a summary of what you can do with the OLAP cube and describes all your numerical variables and categories. A data dictionary lists all the value hierarchies, the definitions of terms and when certain data elements or metrics are updated or saved. We have tried to explain everything we can to users, so they don't have to call us and ask us what stuff means."

10. Keep it simple.

"Within the IR office, we toss out technical terms such as OLAP cubes and stored processes without really thinking about it," said Huff. "When we presented what we were doing to IT, they were quick to tell us to pay heed to three words: simplify, simplify and simplify. They emphasized that we could help our end users and make the system less intimidating by replacing some of that terminology."

OLAP cubes became "interactive tables" you can click on and drill into. Icons make it clear which type of report you're getting into: an interactive table, a stored process report for which you can pick and choose parameters, or a static PDF report.

11. Dare to be creative.

Western Kentucky University's IR reporting system doesn't have a pet name yet, but it ought to, said Helbig. "Pick a catchy, easy-to-remember name that enables people to talk about your system, because it helps generate excitement."

If you want to further remove the intimidation factor, consider infusing creativity and fun into the user interface. James used Flash to create a home page that looks like a desktop – a real desktop. For example, click on a photo in the album on the desk to get to a staff member. Click on the red bobble-head to go to the WKU home page. Click on the binders to go to key reporting areas, such as applicants, courses or degrees. If you can't find the information you need from a self-service report, click the "easy" button to go straight to the data request system. While some have quipped that the programmer had too much time on his hands, the reality is that a friendly, approachable interface promotes greater acceptance and use of the system.

12. Plan to be popular.

"We planned this process thinking it was for a small group of people, but the more that we started thinking about who the end users were going to be, the bigger our pool became," Huff recalled. "We started to wonder, did we order a big enough server? We had space concerns, so we went ahead and upgraded from SAS 9.13 to SAS 9.2 and to larger servers before the launch. We felt that was going to be in our best interests, and in hindsight, we are glad we did that. Our advice is to go ahead and plan for that larger user group."

Closing Thoughts

The result of all this effort is a widely used system that delivers on its promise, said Helbig. "With the product we have developed, an individual can go in there and now has the power and flexibility to explore questions much further than is possible with a static paper report."

The business intelligence solution is very well-used by deans, department heads, and key support staff from Enrollment Management – as well as the IR team itself.

"Not only do users get answers to their questions, but they are also finding answers to questions they didn't even know existed," said Helbig. "For example, one of our deans, who makes it a priority to explore the system's data, noticed that one department had very few part-time students, although it was a pretty large department. This prompted him to look at the program's course offerings on the system and find that the majority of courses were scheduled in the middle of the day – not convenient for students with jobs. So he approached the department head and said, 'If you want to grow, you might want to look into that.' He wasn't looking for this specific answer, but he found an answer that really benefited the university."

With powerful, flexible, self-service access to current information for decision support, Western Kentucky University is on track to continue its streak as the fastest-growing university in the state.

■ "We're a SAS shop. We have always programmed in Base SAS, so SAS was an easy choice for us as we moved to a business intelligence environment. But SAS is also an awesome company, and they really made it easy for us to move from programming in a window to going through the Web and getting into these new technologies. It was really a no-brainer for us to choose SAS."

Christopher James,
Applications Programmer Analyst,
Western Kentucky University

■ "We specifically chose SAS because of the analytical power. Most BI platforms don't have the analytics behind it, and we really thought that was important. SAS does an incredible job integrating analytics with their business intelligence solution."

Tuesdi Helbig,
Director of Institutional Research,
Western Kentucky University