Improving the Student Experience with Analytics and Big Data
About Me
About Arizona State University
one of the top 100 universities in the world

Watch this video to hear what current students and faculty say about ASU

one of America's ‘best college buys’

Forbes

Watch this video to hear more about the excellence at ASU

top 5 in the U.S. for corporate recruitment

The Wall Street Journal

Watch this video to hear what industry has to say about ASU

ASU Total Student Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>57,543</td>
</tr>
<tr>
<td>2004</td>
<td>58,156</td>
</tr>
<tr>
<td>2005</td>
<td>61,033</td>
</tr>
<tr>
<td>2006</td>
<td>63,278</td>
</tr>
<tr>
<td>2007</td>
<td>64,394</td>
</tr>
<tr>
<td>2008</td>
<td>67,082</td>
</tr>
<tr>
<td>2009</td>
<td>68,064</td>
</tr>
<tr>
<td>2010</td>
<td>70,440</td>
</tr>
<tr>
<td>2011</td>
<td>72,254</td>
</tr>
<tr>
<td>2012</td>
<td>73,378</td>
</tr>
<tr>
<td>2013</td>
<td>76,771</td>
</tr>
</tbody>
</table>
The New American University is ASU’s vision for transforming higher education
ASU's Core Values

ASU is committed to excellence, access and impact. We measure ourselves by those we include, not by those we exclude.

ASU is committed to excellence, access and impact in everything we do. We measure ourselves by the outcomes our students achieve, the accomplishments of our graduates, the research we contribute to the public good and by the economic, social and cultural vitality of the communities that surround us.

The Design Aspirations

Eight design aspirations guide ASU's transformation.

01. Leverage Our Place
ASU embraces its cultural, socioeconomic and physical setting.

02. Transform Society
ASU catalyzes social change by being connected to social needs.

03. Value Entrepreneurship
ASU uses its knowledge and encourages innovation.

04. Conduct Use-Inspired Research
ASU research has purpose and impact.

05. Enable Student Success
ASU is committed to the success of each unique student.

06. Fuse Intellectual Disciplines
ASU creates knowledge by transcending academic disciplines.

07. Be Socially Embedded
ASU connects with communities through mutually beneficial partnerships.

08. Engage Globally
ASU engages with people and issues locally, nationally and internationally.
“One of America’s Top 25 Thinkers”
Michael Crow, President of ASU (10+ year tenure)
ASU Trivia

Who Created Sparky, the Official Mascot of ASU?

1) ASU Fine Arts Student
2) Walt Disney
3) Disgruntled Disney Employee
4) Andy Warhol
5) None of the Above
Agenda

• Vocabulary
• ASU’s Analytics
  – Enterprise Data Warehouse
  – Reporting Environment
  – Dashboards
• Where Big Data Fits In
• Improving Student Success with Analytics
• Demonstration
• Best Practices/Smart Strategies
• Questions

Vocabulary
4 Words to Remember

• Data Warehouse
• Dashboard
• Business Intelligence
• Analytics

Data Warehouse

• What is Data Warehouse?
  • “Single Source of the Truth”
  • Central Repository of an Organization’s Data
  • Can Pull Data from Multiple Transactional Systems
  • Allows Standardization of Data Structure
  • Consolidates and Optimizes Data for Reporting and Analysis
Dashboard

A dashboard is a report interface that, somewhat resembling an automobile's dashboard, organizes and presents information in a way that is easy to read and understand.

Dashboard

IT Dashboard for D. Smith (CIO) As of: 20-Nov-05

Key Non-Sys Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year-To-Date</th>
<th>Year</th>
<th>Var %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense</td>
<td>1.7%</td>
<td>6.3%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Revenue</td>
<td>3.5%</td>
<td>2.8%</td>
<td>-3.0%</td>
</tr>
</tbody>
</table>

Majr Project Milestones

<table>
<thead>
<tr>
<th>Project</th>
<th>Milestone</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP Upgrade</td>
<td>PM Sociology</td>
<td>01/09/07</td>
</tr>
<tr>
<td>Add service desk to CTOs</td>
<td>PM, CTO</td>
<td>01/09/07</td>
</tr>
<tr>
<td>Upgrade Hardware 01</td>
<td>PM, CTO</td>
<td>01/09/07</td>
</tr>
<tr>
<td>DK Site Upgrade</td>
<td>PM, CTO</td>
<td>01/09/07</td>
</tr>
<tr>
<td>BOSS System</td>
<td>PM, CTO</td>
<td>01/09/07</td>
</tr>
<tr>
<td>Web site redesign</td>
<td>QA, CTO</td>
<td>01/09/07</td>
</tr>
</tbody>
</table>

Top 5 Projects in the Queue (sorted by priority)

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Released</th>
<th>Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Time and Expense System</td>
<td>Project Manager involved</td>
<td>X</td>
<td>01/09/07</td>
</tr>
<tr>
<td>2. License Office 2007</td>
<td>Cost benefit analysis</td>
<td></td>
<td>01/09/07</td>
</tr>
<tr>
<td>3. Holme for ERP</td>
<td>Cost analysis</td>
<td></td>
<td>01/09/07</td>
</tr>
<tr>
<td>4. Upgrade OSP Hardware</td>
<td>Executive approval</td>
<td></td>
<td>01/09/07</td>
</tr>
<tr>
<td>5. Executive Dashboard</td>
<td>Vendor selected</td>
<td>X</td>
<td>01/09/07</td>
</tr>
</tbody>
</table>

Critical Events (last 30 Days)

<table>
<thead>
<tr>
<th>Event</th>
<th>Manager</th>
<th>Responsible</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Last system maintenance outage</td>
<td>CTO</td>
<td>01/09/07</td>
<td></td>
</tr>
<tr>
<td>2. Present hardware upgrade proposal to CEO</td>
<td>Self</td>
<td>01/09/07</td>
<td></td>
</tr>
<tr>
<td>3. Ask IT Management Team using CIO</td>
<td>Self</td>
<td>01/09/07</td>
<td></td>
</tr>
<tr>
<td>4. Request R&amp;D process upgrade for CTO</td>
<td>CTO</td>
<td>01/09/07</td>
<td></td>
</tr>
<tr>
<td>5. Done: TDSI Dashboard Rebuild Process</td>
<td>PM</td>
<td>01/09/07</td>
<td></td>
</tr>
</tbody>
</table>
Business Intelligence (BI)

• Definition I Like
  “Is a set of technologies and processes that allow people at all levels of an organization to access and analyze data”

• Gartner
  “An interactive process for exploring and analyzing structured and domain-specific information to discern trends or patterns, thereby deriving insights and drawing conclusions. The business intelligence process includes communicating findings and effecting change”

Analytics

From Wikipedia, the free encyclopedia

Analytics is the discovery and communication of meaningful patterns in data. Especially valuable in areas rich with recorded information, analytics relies on the simultaneous application of statistics, computer programming and operations research to quantify performance. Analytics often favors data visualization to communicate insight.
### ASU’s Analytics

#### CIO technology priorities for 2014

<table>
<thead>
<tr>
<th>Investment priority</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>BVA/Analytics</td>
<td>1</td>
</tr>
<tr>
<td>Infrastructure and data center</td>
<td>2</td>
</tr>
<tr>
<td>Mobile</td>
<td>3</td>
</tr>
<tr>
<td>ERP</td>
<td>4</td>
</tr>
<tr>
<td>Cloud</td>
<td>5</td>
</tr>
<tr>
<td>Networking, voice and data communications</td>
<td>8</td>
</tr>
<tr>
<td>Digitalization/digital marketing</td>
<td>7</td>
</tr>
<tr>
<td>Security</td>
<td>8</td>
</tr>
<tr>
<td>Industry-specific applications</td>
<td>9</td>
</tr>
<tr>
<td>Customer relationship management</td>
<td>10</td>
</tr>
<tr>
<td>Legacy modernization</td>
<td>11</td>
</tr>
<tr>
<td>Collaboration</td>
<td>12</td>
</tr>
</tbody>
</table>

Ranking based on how many CIOs cited each as a top 3 new spending priority for 2014.
ASU Pioneers in BI/Analytics

ASU Data Warehouse Team Circa 1992
Contributors to Analytics

ASU’s Analytic Products

- Enterprise Data Warehouse
- Reporting Environment
- Dashboards
#1 - Enterprise Data Warehouse (EDW)

(Simplified)

Operational (Transactional) → ETL → EDW → Reports
**What Goes in EDW?**

<table>
<thead>
<tr>
<th>Students</th>
<th>Financial</th>
<th>Human Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumni</td>
<td>Facility</td>
<td>Course</td>
</tr>
<tr>
<td>Directory</td>
<td>Financial Aid</td>
<td>Official</td>
</tr>
<tr>
<td>Property</td>
<td>Sponsored Research</td>
<td>User Data</td>
</tr>
<tr>
<td>Department Data</td>
<td>External Data</td>
<td>Dictionary Metadata</td>
</tr>
</tbody>
</table>

#2 - Reporting Environment  
AKA  
“MyReports”
We Have Rocket Scientists at ASU

Dr. Phil Christensen - ASU

...And Student Rocket Scientists
MyReports – Tool for Rocket Scientists

Oracle/Hyperion Interactive Reporting (formerly Brio)

Ad Hoc Reporting Capability
Sample Report

Report of Retention Information

Not Everyone is a Rocket Scientist!

*Apologies to Gary Larson*
#3 - Dashboards

Advin: Learn all you can about Dashboards and then see me.

cc: JS  MMC

5/30/06
Who is MMC?

Dr. Michael Crow, President of ASU
Non-Rocket Scientist Query Tool

http://dashboard.asu.edu

http://analytics.asu.edu
Where Students Are Coming From

Dashboard Examples
### Where Students Are Coming From

#### Top 10 States

<table>
<thead>
<tr>
<th>State</th>
<th>Fall 13</th>
<th>Fall 14</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ</td>
<td>20,684</td>
<td>22,130</td>
<td>1,446</td>
</tr>
<tr>
<td>CA</td>
<td>8,447</td>
<td>11,052</td>
<td>2,605</td>
</tr>
<tr>
<td>IL</td>
<td>1,351</td>
<td>1,805</td>
<td>454</td>
</tr>
<tr>
<td>TX</td>
<td>1,095</td>
<td>1,616</td>
<td>521</td>
</tr>
<tr>
<td>WA</td>
<td>1,022</td>
<td>1,438</td>
<td>416</td>
</tr>
<tr>
<td>CO</td>
<td>988</td>
<td>1,257</td>
<td>269</td>
</tr>
<tr>
<td>NY</td>
<td>775</td>
<td>1,144</td>
<td>369</td>
</tr>
<tr>
<td>PA</td>
<td>578</td>
<td>825</td>
<td>247</td>
</tr>
<tr>
<td>NJ</td>
<td>605</td>
<td>825</td>
<td>220</td>
</tr>
<tr>
<td>NIN</td>
<td>397</td>
<td>658</td>
<td>262</td>
</tr>
</tbody>
</table>

#### Note:
- All Fall 13 data is calculated as of 02/24/2013. This date is based on today's date minus the difference in term begin dates for Fall 13 and Fall 14.
- Geographic Distribution data is updated as of 02/22/2014 06:22 AM.

From ASU's Admissions Dashboard

### Arizona Community Colleges Info

#### Undergraduate - TRS by State and Institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Applied</th>
<th>Applied Completed</th>
<th>Admitted</th>
<th>Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>College 1</td>
<td>Fall 13</td>
<td>Fall 14</td>
<td>Fall 13</td>
<td>Fall 14</td>
</tr>
<tr>
<td>College 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Note:
- Fall 13 Enrollment YTD data is updated as of 02/24/2013.
- This data is based on today's date minus the differences in term begin dates for Fall 13 and Fall 14.
- UG TRS by State & Institution data is updated as of 02/22/2014 06:22 AM.
Monitoring Class Enrollment

From ASU’s Course Enrollment Management Dashboard

What is the Balance of My Accounts?

From ASU’s Financial/SuperReport Dashboard
### Research Administration

**From ASU's Research Dashboard**

<table>
<thead>
<tr>
<th>Month</th>
<th>Research Administration</th>
<th>My Info</th>
<th>My Profile</th>
<th>My Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Proposals**

<table>
<thead>
<tr>
<th>Value</th>
<th>May 2014</th>
<th>12 Month Total</th>
<th>FYTD Change</th>
<th>FYTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,954,794</td>
<td>1,870,741,912</td>
<td>2,405,928</td>
<td>5%</td>
<td>51,877,595</td>
</tr>
<tr>
<td>241</td>
<td>2,010</td>
<td>26% 5% 5%</td>
<td>2%</td>
<td>2,162</td>
</tr>
</tbody>
</table>

**Awards**

<table>
<thead>
<tr>
<th>Value</th>
<th>May 2014</th>
<th>12 Month Total</th>
<th>FYTD Change</th>
<th>FYTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,624,683</td>
<td>246,872,293</td>
<td>1,746,302</td>
<td>5%</td>
<td>3,185,295</td>
</tr>
<tr>
<td>323</td>
<td>2,866</td>
<td>57% 5% 5%</td>
<td>2%</td>
<td>2,866</td>
</tr>
</tbody>
</table>

**Expenditures**

<table>
<thead>
<tr>
<th>Value</th>
<th>May 2014</th>
<th>12 Month Total</th>
<th>FYTD Change</th>
<th>FYTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>79,492,596</td>
<td>246,872,293</td>
<td>35,283,524</td>
<td>5%</td>
<td>9,295,863</td>
</tr>
<tr>
<td>323</td>
<td>1,087</td>
<td>57% 5% 5%</td>
<td>2%</td>
<td>1,087</td>
</tr>
</tbody>
</table>

**Research Administration (More)**

**From ASU's Research Dashboard**
Faculty Profile

From ASU’s Faculty Dashboard

Faculty Instruction/Research

From ASU’s Faculty Dashboard
“Learning” Analytics

From ASU’s Blackboard Dashboard

Review - ASU’s BI/Analytic Products

• Enterprise Data Warehouse
• Reporting Environment
• Dashboards
Big Data
1943

Records Department of FBI
ASU Use Cases For Big Data

• Aggregating **Blackboard** Activity/LMS Data
  – Up to 2 Million Rows of Data a Day

• Crunching Apache **Web Logs** of Student Portal
  – Usage, Devices, Browsing Behavior, etc.
  – Being Replaced by Google Analytics/Splunk

• **Chat** Analysis
  – Negative/Positive Sentiment, “Chats Gone Bad”

• **Survey** Analysis
  – NGrams, Negative/Positive Words

---

Adding “Big Data” to Architecture

(Simplified)

(Simplified and Adding Big Data)
Typical Higher Ed Subject Areas

- Students
- Alumni
- Directory
- Property
- Department Data
- Financial
- Facility
- Financial Aid
- Sponsored Research
- External Data
- Human Resources
- Course
- Official
- User Data
- Dictionary Metadata

“Big Data” Extends Data Capability

- Students
- Alumni
- Directory
- Property
- Department Data
- Financial
- Facility
- Financial Aid
- Sponsored Research
- External Data
- Human Resources
- Course
- Official
- User Data
- Dictionary Metadata
- Unstructured/Web
- Swipe/Sensor Data
- Social Media
Improving Student Success with Analytics
One Stop Shopping Student Portal

Google Analytics on These Pages
Improve Student Experience with Data

Heat Maps
Heat Maps

![Image of Heat Maps]

Student Portal Service Page

![Image of Student Portal]

Built in Salesforce
Analytics from Salesforce

---

Welcome to eAdvisor, the personalized student support tool at Arizona State University. eAdvisor helps you monitor your academic progress, access personalized resources, and track your progress towards graduation.

What is eAdvisor?
We are committed to ensuring your success at ASU. eAdvisor provides personalized support to help you achieve your academic goals.

eAdvisor: Improving Retention
ASU's focus on improving individual student success is reflected in the tools and resources provided by eAdvisor.

Visit eadvisor.asu.edu for more information.
Students Know How They Stand

Order and Track Classes for Success

**Term 1** 0 - 16 Credit Hours  Critical courses signified by ❁

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 114: General Chemistry for Engineers (5Q) OR CHM 116: General Chemistry I (3Q)</td>
<td>4</td>
<td>❁</td>
<td>As SAT, ACT, or TOEFL score determines placement into first-year composition courses. ASU Math Placement Exam score determines placement in Mathematics course. ASU 101 is a College specific academic Freshman Seminar required of all freshman Laurentians and should be completed in the Fall semester. If English 105 is taken, a 3 in applicable elective must also be taken prior to graduation. See Advisor.</td>
</tr>
<tr>
<td>FSE 101: Introduction to Engineering</td>
<td>2</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>MAT 225: Calculus for Engineers I (5H)</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: English for Foreign Students</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>Humanities, Fine Arts, and Design (M) OR Social and Behavioral Sciences (S)</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>Minimum 2.0 GPA ASU Cumulative.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 16

**Term 2** 17 - 31 Credit Hours  Critical courses signified by ❁

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 242: Elementary Linear Algebra</td>
<td>2</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>MAT 265: Calculus for Engineers II (5H)</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>PHY 121: University Physics I (Math)</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>PHY 122: University Physics I (Lab)</td>
<td>1</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>CEE 101: Introduction to Sustainable Engineering: Technological, Social, and Sustainable Systems (PA)</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: English for Foreign Students</td>
<td>3</td>
<td>❁</td>
<td></td>
</tr>
<tr>
<td>Complete ENG 104 OR ENG 105 OR (ENG 107 course(s).)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum 2.0 GPA ASU Cumulative.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 15
Degree Search Tool

Integrated Class Search
Tracking Student Progress

From ASU’s eAdvisor Dashboard

Finding Student Not Registered
Early Warning/Retention Tool

From ASU’s Retention Dashboard

Retention Dashboard – Student Detail
Retention Dashboard (cont.)

From ASU’s Retention Dashboard

Clean Integration to Multiple Systems

Dashboard Links Directly to ERP, Eventually to Salesforce
Gains in Freshman Retention Rates

First-Time Full-Time Freshman

2002: 76.7
2003: 76.8
2004: 79
2005: 78.5
2006: 77.2
2007: 79.5
2008: 81.2
2009: 84
2010: 83.5
2011: 80
2012: 83.8

Demonstration
Best Practices/Smart Strategies

Get Leadership Support

Dr. Elizabeth Phillips
Former Provost of ASU
Creator of eAdvisor

Dr. Michael Crow
President of ASU
One of “America’s Top 25 Thinkers”

Dr. Morgan Olsen
CFO of ASU
Data Driven
Build Dedicated BI/Analytics Team

BI Staff

14

Data Warehouse Team (7)

• Oracle 11G RAC Hosted
• Both Buy (EPM) and Build
• 400 GB
• ETL – Ascential/DataStage
• Hosted

Director (1) and Student Workers (4)

Dashboard/Reporting Team (6)

Data Warehouse

BI Tools

• Hosted at ASU

Use Students

Student Developers in the “Cave”
Build “Data Driven” Culture

Policies/Appropriate Security In Place

Data Policies Circa 1992
Dashboards Make Consumption Easy

Focus on Data/Information Delivery, Not Beautifully Built Data Warehouse

Dashboard Can Help with Transparency

http://syshealth.asu.edu
Make Data/Information Actionable

Use Scorecards to Measure

http://www.azregents.edu
Create Analytic Mission Statement

“We are Enterprise Information & Analytics.

“We construct and reconcile integrated information in order to provide open access to trusted data for campus consumption. We advocate the use of business intelligence in operational reporting and strategic decision support. We measure our success by our customers' successful use of and continued interest in our product.”

(http://www.eia.arizona.edu/)

Put Analytics on Top of Your Analytics

ASU's Dashboard are Featured in Chapter of Wayne Eckerson's Book

From ASU’s Dashboard Information Dashboard
Put Analytics on Top (cont.)

Consider Predictive Analytics
“It is a wonderful thing to be part of a place that is becoming, rather than a place that has been.”

—Rip Hodgins, founding director, ASU School of Earth and Space Exploration and foundation professor of geological sciences

Questions?
Thank You.

John Rome  
Arizona State University  
John.Rome@asu.edu