Data Visualization and Data Integrity: Meaningful Implication for Institutional Researchers

Sunny Moon
Afshin Karimi
Alexis Furuichi
Rohit Murarka

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Data Visualization

- Process of displaying abstract data in meaningful graphics, and it is a powerful method of communicating quantitative data or information via human visual perception
- Modern form equivalent of visual communication
- One of the steps in analyzing data & presenting it to users
- Effective Data Visualization: Provide clear message using visualization techniques and gain viewer’s attention
What is Dashboard?

- A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance (Stephen Few, 2006)
5 Best Practices for Creating Effective Dashboards

- Choose metrics based on why they matter
- Keep it visual
- Make it interactive
- Keep it current or don’t bother
- Make it simple to access and use
Improve Student Success thru Actionable Data?

Institutional Culture Change thru Data-Driven Conversation

Mobilize Campus Communities thru Strategic Use of Actionable Data
The Approach

Identify Campus Needs, Key Stakeholder’s interests
- Univ. Strategic Planning
- Graduation Initiative

Develop Dashboard
Process Data; Data Integrity / Validation

Launching Dashboard & Cost-Effectiveness

Utilization of Visualized Dashboard
Student Success Dashboard
- Based on Enrolled / Graduated / Drop-Out

Course Bottleneck Dashboard
- Based on Low Success and High Demand Courses

Curriculum Interdependency Dashboard
- Based on Course-Based FTES across Colleges

Enrollment Management Dashboard
- Based on Applicants’ County of Origin

Department Snapshot Dashboard / PPR Dashboard
- Based on Student Major, Ethnicity, Status

FTES Dashboard
- Course-Based vs. Student-Based

Faculty Data Dashboard
- Based on Ethnicity, FTEF
Dashboard Example (Student Success Dashboard)

### Cohort Comparison Summary

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Enrollment Type Description</th>
<th>Initial Cohort Size</th>
<th>Graduated Count</th>
<th>% Graduated</th>
<th>Enrolled Count</th>
<th>% Enrolled &amp; Not Graduated</th>
<th>Not Graduated &amp; Not Enrolled Count</th>
<th>% Not Graduated &amp; Not Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>fa04</td>
<td>First-time Full-Time Freshman</td>
<td>3,542</td>
<td>2,180</td>
<td>61.5%</td>
<td>23</td>
<td>0.6%</td>
<td>1,339</td>
<td>37.8%</td>
</tr>
<tr>
<td>fa05</td>
<td>First-time Full-Time Freshman</td>
<td>3,820</td>
<td>2,252</td>
<td>59.0%</td>
<td>27</td>
<td>0.7%</td>
<td>1,541</td>
<td>40.3%</td>
</tr>
<tr>
<td>fa06</td>
<td>First-time Full-Time Freshman</td>
<td>3,737</td>
<td>2,245</td>
<td>60.1%</td>
<td>41</td>
<td>1.1%</td>
<td>1,451</td>
<td>38.8%</td>
</tr>
<tr>
<td>fa07</td>
<td>First-time Full-Time Freshman</td>
<td>4,042</td>
<td>2,449</td>
<td>60.6%</td>
<td>94</td>
<td>2.3%</td>
<td>1,499</td>
<td>37.1%</td>
</tr>
<tr>
<td>fa08</td>
<td>First-time Full-Time Freshman</td>
<td>4,519</td>
<td>2,750</td>
<td>60.9%</td>
<td>165</td>
<td>3.7%</td>
<td>1,604</td>
<td>35.5%</td>
</tr>
<tr>
<td>fa09</td>
<td>First-time Full-Time Freshman</td>
<td>3,845</td>
<td>2,395</td>
<td>62.3%</td>
<td>318</td>
<td>8.3%</td>
<td>1,132</td>
<td>29.4%</td>
</tr>
<tr>
<td>fa10</td>
<td>First-time Full-Time Freshman</td>
<td>3,749</td>
<td>1,842</td>
<td>49.1%</td>
<td>813</td>
<td>21.7%</td>
<td>1,094</td>
<td>29.2%</td>
</tr>
<tr>
<td>fa11</td>
<td>First-time Full-Time Freshman</td>
<td>4,091</td>
<td>899</td>
<td>22.0%</td>
<td>2,193</td>
<td>53.6%</td>
<td>999</td>
<td>24.4%</td>
</tr>
<tr>
<td>fa12</td>
<td>First-time Full-Time Freshman</td>
<td>4,419</td>
<td>24</td>
<td>0.5%</td>
<td>3,484</td>
<td>78.8%</td>
<td>911</td>
<td>20.6%</td>
</tr>
<tr>
<td>fa13</td>
<td>First-time Full-Time Freshman</td>
<td>4,512</td>
<td>1</td>
<td>0.0%</td>
<td>3,713</td>
<td>82.3%</td>
<td>798</td>
<td>17.7%</td>
</tr>
<tr>
<td>fa14</td>
<td>First-time Full-Time Freshman</td>
<td>4,243</td>
<td>0</td>
<td>0.0%</td>
<td>3,742</td>
<td>88.2%</td>
<td>501</td>
<td>11.8%</td>
</tr>
</tbody>
</table>
Dashboard Example (Course Bottleneck Dashboard)

Course Enrollments and Repeatable Grades (C- thru F, including WU and NC)

Hover mouse over circles to see course information.
Repeatable Grades include C- through F, including WU and NC.
Size of the circles corresponds to number of students with repeatable grades.

<table>
<thead>
<tr>
<th>College</th>
<th>Dept</th>
<th>Course</th>
<th>Course Title</th>
<th>Course Type</th>
<th>Course Enrollment</th>
<th># Repeatable Grades</th>
<th>% Repeat. Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and</td>
<td>ACCT</td>
<td>ACCT201A</td>
<td>Financial Accounting</td>
<td>Lower Division</td>
<td>619</td>
<td>147</td>
<td>24%</td>
</tr>
<tr>
<td>Economics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Curriculum Interdependency Matrix: Which Students Do Our Colleges Teach?

**FTES**

<table>
<thead>
<tr>
<th>Student College of Major</th>
<th>ARTS</th>
<th>Business &amp; Economics</th>
<th>Communications</th>
<th>Education</th>
<th>Engineering &amp; Computer Science</th>
<th>Health &amp; Human Development</th>
<th>Humanities &amp; Social Sciences</th>
<th>Natural Sciences &amp; Mathematics</th>
<th>OTHER</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTS</td>
<td>1,410</td>
<td>14</td>
<td>59</td>
<td>24</td>
<td>6</td>
<td>27</td>
<td>336</td>
<td>120</td>
<td>16</td>
<td>2,011</td>
</tr>
<tr>
<td>Business &amp; Economics</td>
<td>236</td>
<td>5,140</td>
<td>140</td>
<td>35</td>
<td>11</td>
<td>113</td>
<td>1,116</td>
<td>538</td>
<td>46</td>
<td>7,374</td>
</tr>
<tr>
<td>Communications</td>
<td>112</td>
<td>55</td>
<td>1,738</td>
<td>39</td>
<td>27</td>
<td>108</td>
<td>755</td>
<td>153</td>
<td>20</td>
<td>3,007</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>671</td>
</tr>
<tr>
<td>Engineering &amp; Computer Science</td>
<td>129</td>
<td>17</td>
<td>78</td>
<td>9</td>
<td>2,082</td>
<td>33</td>
<td>521</td>
<td>1,025</td>
<td>10</td>
<td>3,905</td>
</tr>
<tr>
<td>Health &amp; Human Development</td>
<td>172</td>
<td>23</td>
<td>94</td>
<td>169</td>
<td>9</td>
<td>3,558</td>
<td>940</td>
<td>465</td>
<td>39</td>
<td>5,469</td>
</tr>
<tr>
<td>Humanities &amp; Social Science</td>
<td>203</td>
<td>62</td>
<td>156</td>
<td>114</td>
<td>11</td>
<td>330</td>
<td>4,577</td>
<td>416</td>
<td>38</td>
<td>5,907</td>
</tr>
<tr>
<td>Natural Science &amp; Mathematics</td>
<td>77</td>
<td>38</td>
<td>65</td>
<td>41</td>
<td>15</td>
<td>80</td>
<td>476</td>
<td>1,547</td>
<td>27</td>
<td>2,367</td>
</tr>
<tr>
<td>OTHER</td>
<td>107</td>
<td>27</td>
<td>95</td>
<td>520</td>
<td>4</td>
<td>81</td>
<td>503</td>
<td>239</td>
<td>21</td>
<td>1,596</td>
</tr>
<tr>
<td>Grand Total</td>
<td>2,445</td>
<td>5,377</td>
<td>2,425</td>
<td>1,622</td>
<td>2,164</td>
<td>4,331</td>
<td>9,223</td>
<td>4,501</td>
<td>217</td>
<td>32,306</td>
</tr>
</tbody>
</table>
Dashboard Example (Enrollment Management Dashboard)

Where Do Our (U.S.) Applicants Come From?

Semester
fall 2015

Applicant Type
- First Time Freshman
- New Undergraduate Transfer

Ethnicity
- (All)
- Asian/Pacific Islander
- Black
- Hispanic
- Int'l
- Multi
- Unknown
- White

Minimum Number of Applicants (by zip code)
13 unknown
421
### Dashboard Example (Dept Profile Dashboard)

**Student Major/Dept. (5 Year) Profiles**

#### # of New and Continuing/Returning Students

<table>
<thead>
<tr>
<th>Type</th>
<th>fall 2012</th>
<th>fall 2013</th>
<th>fall 2014</th>
<th>fall 2015</th>
<th>fall 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuing/Returning</td>
<td>23,358</td>
<td>23,514</td>
<td>24,203</td>
<td>24,515</td>
<td>25,753</td>
</tr>
<tr>
<td>New</td>
<td>8,869</td>
<td>9,419</td>
<td>8,330</td>
<td>8,392</td>
<td>8,549</td>
</tr>
</tbody>
</table>

**NOTE:** Number of enrolled students less than 10 show as * in the table above.

#### Students Gender

![Gender Distribution Charts]

#### First Generation Students Working Towards Degrees

![First Generation Students Chart]

#### Students Ethnicity

![Ethnicity Distribution Chart]

#### Pell Grant Recipients (low income)

![Pell Grant Recipients Chart]

#### Underrepresented Status

![Underrepresented Status Chart]
### Dashboard Example (Student-Based FTES Dashboard)

#### HeadCount, Rebenched FTES and Unit Load by College and Student Level

<table>
<thead>
<tr>
<th>College Year</th>
<th>Summer</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Headcount</td>
<td>rb-FTES</td>
<td>Unit Load</td>
</tr>
<tr>
<td>2015-2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Art (BA/MA)</td>
<td>842</td>
<td>683.8</td>
<td>12.2</td>
</tr>
<tr>
<td>Art History</td>
<td>40</td>
<td>30.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Dance</td>
<td>74</td>
<td>71.6</td>
<td>14.5</td>
</tr>
<tr>
<td>Fine Art (BFA/MFA)</td>
<td>508</td>
<td>381.6</td>
<td>11.1</td>
</tr>
<tr>
<td>Music (BA/MA)</td>
<td>120</td>
<td>111.3</td>
<td>13.8</td>
</tr>
</tbody>
</table>

#### College Year

<table>
<thead>
<tr>
<th></th>
<th>HeadCount</th>
<th>rb-FTES</th>
<th>Unit Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art (BA/MA)</td>
<td>820</td>
<td>659.0</td>
<td>10.2</td>
</tr>
<tr>
<td>Art History</td>
<td>43</td>
<td>31.5</td>
<td>9.4</td>
</tr>
<tr>
<td>Dance</td>
<td>74</td>
<td>70.0</td>
<td>13.5</td>
</tr>
<tr>
<td>Fine Art (BFA/MFA)</td>
<td>537</td>
<td>400.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Music (BA/MA)</td>
<td>119</td>
<td>105.6</td>
<td>11.9</td>
</tr>
<tr>
<td>Music (BM/MM)</td>
<td>120</td>
<td>120.0</td>
<td>11.9</td>
</tr>
</tbody>
</table>

*Rebenched FTES (rb-FTES) are at the student-level and reflect rb-FTES for students in each major/college regardless of which department the course enrollments are in.*

College Year rb-FTES, unit load and headcount calculated (summer+fall+spring)/2.

Before 2006-2007, rb-FTES are all student credit units being taken divided by 15. For 2006-2007 and subsequent years, rb-FTES are the total student credit units being taken by non-graduate students divided by 15, plus the total student credit units being taken by master's and doctoral students divided by 12.
### Dashboard Example (Course-Based FTES Dashboard)

#### Course Level Rebenched FTES by College Year

FTES based on course enrollments

<table>
<thead>
<tr>
<th>College Year</th>
<th>Lower Division Rebenched FTES</th>
<th>Upper Division Rebenched FTES</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Art</td>
<td>0.00</td>
<td>0.00</td>
<td>5.25</td>
</tr>
<tr>
<td>Music</td>
<td>0.00</td>
<td>0.00</td>
<td>16.43</td>
</tr>
<tr>
<td>Theatre and Dance</td>
<td>0.00</td>
<td>0.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
<td>11.50</td>
</tr>
<tr>
<td>Fall 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>0.00</td>
<td>0.00</td>
<td>5.25</td>
</tr>
<tr>
<td>Business Administration</td>
<td>0.00</td>
<td>0.00</td>
<td>16.43</td>
</tr>
<tr>
<td>Economics</td>
<td>0.00</td>
<td>0.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Finance</td>
<td>0.00</td>
<td>0.00</td>
<td>11.50</td>
</tr>
<tr>
<td>Information &amp; Decision Sci</td>
<td>0.00</td>
<td>0.00</td>
<td>85.95</td>
</tr>
<tr>
<td>Management</td>
<td>0.00</td>
<td>0.00</td>
<td>11.50</td>
</tr>
<tr>
<td>Marketing</td>
<td>0.00</td>
<td>0.00</td>
<td>10.50</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
<td>61.50</td>
</tr>
<tr>
<td>Spring 2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>0.00</td>
<td>0.00</td>
<td>5.25</td>
</tr>
<tr>
<td>Business Administration</td>
<td>0.00</td>
<td>0.00</td>
<td>16.43</td>
</tr>
<tr>
<td>Economics</td>
<td>0.00</td>
<td>0.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Finance</td>
<td>0.00</td>
<td>0.00</td>
<td>11.50</td>
</tr>
<tr>
<td>Information &amp; Decision Sci</td>
<td>0.00</td>
<td>0.00</td>
<td>85.95</td>
</tr>
<tr>
<td>Management</td>
<td>0.00</td>
<td>0.00</td>
<td>11.50</td>
</tr>
<tr>
<td>Marketing</td>
<td>0.00</td>
<td>0.00</td>
<td>10.50</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
<td>61.50</td>
</tr>
</tbody>
</table>

**FTES based on course enrollments**
Data Integrity:

• Conventional FTES vs. Rebenched FTES

• There was system change in Fall 2008 and we shifted from SIS plus to CMS/PeopleSoft. So there were changes in variable names and we had to make sure the variables were mapped to the correct fields.

• Change in Ethnicity Definitions (Multi-Race) – Before / After 2009

• Common Misinterpretation
  a. Course-Based vs. Student-Based FTES.
  b. Ethnicity for International Students
  d. First generation student
Data Preparation: (Faculty Data Dashboard)

- Define Faculty
  - Tenured Professor
  - Tenure Track Professor
  - Lecturer
  - Student Instructor
  - Volunteer Instructor
  - Taught or did not teach
  - Only if taught

- Find Faculty
  - Course list: pull out Instructor IDs
  - Peoplesoft: obtain ranks, departments, & demographics
Data Cleanup (Faculty Data Dashboard)

- Multi job codes within a department: common for lecturers & student instructors
  - Combine FTE

- Multi departments: common for lecturers
  - Assign primary department

- Non academic departments: common for MPP
  - Correct department & college using APDB
  - Correct FTE by using APDB IFF

- Department name changes across time
Dashboard Example (Faculty Data Dashboard)

http://www.fullerton.edu/analyticalstudies/faculty/

Head Count VS. FTEF
Promoting

Data Utilization & Culture of Evidence

Dashboard Developed/Launched

Now What?

With Who?

How?
Promoting Data Utilization & Culture of Evidence

Current

Student Success Dashboard
- Training with Faculty at FDC, Advisors in Student Affairs, Student Success Team

Course Bottleneck Dashboard
- COD (Council of Deans), individual meeting with deans
- COC (Council of Chairs) visiting each college
- HR Professional Development Series

IRAS Dashboards @ website
- HR Professional Development Series

Campus Data and Statistics
- Graduation Initiative 2025
- New planning goals
Promoting Data Utilization & Culture of Evidence

**Future**

- Student Success Dashboard
  - On-going Training with Student Success Team (Advisors in Academic & Student Affairs)
  - Individual Visit to the college or division

- IRAS Dashboards @website, & other Dashboards
  - HR Professional Development Series
  - FDC

- Campus Data and Statistics
  - HR Professional Development Series
6-year Graduation Rates of First-Time Freshmen

Graduation Rates
First-Time Freshmen

4-Year Graduation Rates of Transfers

Graduation Rates
Transfers
Gap in 6-Year Grad Rates for First-Time Freshmen

- Fall 2006: 11.5%
- Fall 2007: 7.2%
- Fall 2008: 12.4%
- Fall 2009: 8.7%
- Fall 2010: 6.6%

First-Time Freshmen

Gap Closing!

Gap in 4-Year Grad Rates for Transfers

- Fall 2008: 5.7%
- Fall 2009: 5.7%
- Fall 2010: 2.8%
- Fall 2011: 0.6%
- Fall 2012: -0.3%

Transfers
Q & A

http://www.fullerton.edu/analyticalstudies/