MIND THE GAP
Getting Actionable Data on Teaching Activities and Costs

“Exploring New Opportunities; Addressing Common Challenges”
2014 California Public Higher Education Collaborative Business and Administrative Services Conference

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August 21, 2014
MIND THE GAP

NOTE THAT THE LEVEL OF GAP

Please mind the gap
There are some really big gaps in how colleges and universities look at teaching.

Clay Christensen, writer on economic disruption, says “Higher education is on the edge of the crevasse.” He argues convincingly that universities must find innovative and less costly ways of teaching.

To do so without undermining our essential values, we must learn to understand the big gaps and devise strategies for “minding” them.

There are three kinds of gaps.
1. Holes

in what we know about Teaching Activities and their Costs

- No systemic data on teaching activity profiles, how they differ across departments, schools, and campuses, or how they vary over time

- No systemic data on the full, direct, or incremental cost of teaching for courses, departments and degree programs

These shortfalls greatly inhibit the development of academic strategies, plans, and budgets. They also make it very difficult to comply with external reporting requirements.
2. **Walls**  
between the Academic and Financial People that block better understanding of teaching

- Higher education is the only “industry” I know where most of the people responsible for designing and delivering its most important output don’t consider cost to be a central element of what they do.

- There is a deep cultural divide between the academic and financial sides of the institution.

Despite goodwill on both sides, this divide has seriously inhibited progress for many decades.
3. Spaces
between potential Partners for Benchmarking
and the sharing of Best Practice

- Organizational distance and inadequate data structures have prevented schools, campuses, and systems from sharing the information needed to contain cost without undermining academic values.

- The lack of robust criterion-referenced measures of educational quality exacerbates the problem.

California higher education institutions are in a good position to pioneer solutions to these problems.
It’s time to fill in these holes, tear down these walls, and traverse these spaces.

- I’ll describe a Teaching Activity and Cost Model that can help do these things.
  - “Big enough data” and the power of IT
  - A “structural” approach to analysis and reporting
  - “Value for everyone”: strategy development, resource allocation, reporting, and departmental planning

- The model has evolved through a combination of foundation-funded research and commercial R&D on activity-based costing in higher education.
The Teaching Activity and Cost Model:

- Connects demand drivers (e.g. enrollments) to resource requirements (e.g. faculty FTEs).
- Is evidence-based and data-driven.
  - Populated by the campus’s transactions systems
- Is “structural” (depicts causal relations among understandable and relevant variables), not a “black box.”
  - Structural models permit inferences about “latent variables” like the delivered quality of education.
- Includes performance-related metrics, in addition to costs, wherever possible.
Why a Non-Structural Model Falls Short

- **Example: Single-factor productivity ratios**
  - *Cost per Student Credit Hour (Cost/SCH); Student Credit Hours per Faculty FTE (SCH/FFTE)*
  - They can be helpful as rough indicators but are very dangerous if used uncritically.

  What does it mean for such a ratio to be above or below its benchmark?

  - Low productivity?
  - High quality?
  - Strong research?
  - Free riding?
  - High productivity?
  - Low-quality?
  - Weak research?
  - Unsustainable workload?

- Structural models are designed from the ground up to avoid such ambiguities.
The “English Story”

- **The Circumstances**
  - The English Department at a public flagship university
  - Heavy emphasis on “productivity” due to state appropriations cuts
  - The Department looked very good on Cost per Credit Hour

- **What I Found**
  - Larger class sizes
  - More use of adjuncts
  - Less assigned writing
  - Multiple choice exams

- The Department had repeatedly sought more funds but, when these were denied, it hunkered down and made do with what it had.
Building the Teaching Activity and Cost Model

- Use timetabling, student registration, HR, facilities, and general ledger data to determine:
  - enrollments; section counts; contact hours; teacher profiles; cost drivers; room capacities; personnel costs

- Summarize departmental results in terms of:
  - course level: e.g. lower division, upper division, graduate
  - course category: e.g. “primary” and “secondary” discussions, lectures, labs, seminars—all grouped by average class size

- For each course level and category:
  - calculate the demand for and the supply of sections
  - set supply equal to demand
  - apply appropriate “business rules” to fill any gaps in the data.
The Basic Model

- Demand for class sections in a course
  \[ nCS = \frac{ENR}{ACS} \]

- Supply of class sections in a course
  \[ nCS = FAC_{FTE} \times ATL + OT_n \]

- Supply equals demand. Then, for all courses:
  \[ SFR = \frac{ACS}{(ATL (1 - frOT))}, \text{ where } frOT = \frac{OT_n}{nCS} \]
  - Can calculate tradeoffs among policy variables: \( SFR, ACS, ATL, frOT \)

- Sources of insight about educational quality
  - The policy variables; also student attrition during the semester

- Implications for faculty research
  - Augmenting \( ATL \) with time for advising and mentoring students gives total time devoted to teaching. More teaching time means less research time.
Adding Money to the Model

- Estimate “direct teacher cost” for course levels and categories (and individual courses if desired).  
  - Apply personnel costs by teacher type (e.g. per $FAC_{FTE}$, $OT_n$, $TA_n$) to get total cost, and average cost per section & $ENR$.

- Allocate “non-teacher direct cost” (e.g. $TA_a$, supplies).  
  - Based on contact hours, $ENR$

- Allocate indirect expense.  
  - Facilities: based on contact hours  
  - Other overhead: based on $ENR$, contact hours, $nCS$

- Get tuition revenue from the enrollment data. Then calculate burdened and unburdened margin.
Other Available Metrics

- **Incremental cost per enrollment**
  - Depends on the change in ENR.
  - Assume a probability distribution.
  - Calculate the expected value.

- **Capacity utilization** (percent of available seats)

- **Student attrition** (from beginning to end of semester)

- **Exception reporting** (e.g., on a dashboard)

- **Plus anything else obtainable at the level of individual courses** (e.g., fail rates, faculty-developed learning metrics)
Results of a Pilot Test…

- In three volunteer departments at a large research-intensive public flagship university (data for one science department here)
- Funded by the Lumina Foundation in 2012
- Assistance by the National Center For Higher Education Management Systems (NCHEMS)
- Independent evaluation conducted by the nonprofit Public Agenda organization
## Course and Primary Section Attributes

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<tr>
<th>Instruction Mode</th>
<th>Class Size</th>
<th>Number of Courses</th>
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<th>Number of Sections</th>
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Class Size v. Attrition for Undergraduate Lecture Courses

![Graph showing the relationship between class size and attrition rate. The x-axis represents class size, ranging from 0 to 500, and the y-axis represents attrition rate, ranging from 0% to 9%. The data points indicate a positive correlation between class size and attrition rate.](image-url)
Distribution of Academic Year Teaching

Number of Primary Sections Taught for (clockwise from upper left): Full Professors, Associate Professors, Assistant Professors, and Other Teaching Staff
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<tr>
<th>Instruction Mode</th>
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Evaluation by the Public Agenda Organization

- The department chairs were skeptical at the beginning of the project, but “Within a few minutes of demonstrating the prototype, they were asking questions and finding information that was surprisingly interesting to them.”
  - The model “provides answers to questions that are extremely important and yet are very difficult to answer in practical terms.”

- “Many of the most important decisions that impact productivity and the student experience involve assigning courses of different sizes with different types of instructors for different categories of students.”
  - Although all the data “needed for these decisions exist in various university systems, there is no easy way to... access the information or for deans or other administrators to analyze and compare how departments are deploying their resources to meet the needs of students.”
As Bill Gates put it in his recent NACUBO keynote on the role of business officers in initiating change:

“Technology is taking things that used to be separate and bringing them together.”

Bill Gates NACUBO Annual Meeting 2014
Where the Model Stands Now

- The two R&D streams have converged to produce a practical “build once-use repeatedly” Teaching Activity and Cost Model that is available for immediate implementation.
  - My research, funded by the Lumina Foundation
  - Work by the Pilbara Group on campus-wide applications of activity-based costing (beginning at the course level)

- Both streams used the same basic ideas and data structures, so it was not difficult to combine them – a task that now has been accomplished.

- This is not pie in the sky: the basic model has been running in Australia for some years now.
  - Model building takes only about 2 to 4 months depending on campus size and complexity.

- Alternatively, it’s possible for a campus or system to build its own model with or without outside help.
Benefits of Activity and Cost Modeling*

- **Reporting and Operational Reform**
  - Operational transparency for school and department heads
  - Bridge-building between financial and academic people
  - Benchmarking, and analysis of time trends
  - Improved resource utilization efficiency—including facilities

- **Planning and Predictive Analysis**
  - A framework for long-range thinking and strategic planning
  - A tool for departmental and school-level tactical planning
  - Ability to link teaching activities to campus budget models
  - Ability to do “what-if” analysis on teaching-related issues

Approach to Implementation

- Because the model uses data already present in most campus transaction systems, the decision to build it can be made by the central administration.
  - Interested faculty members should be consulted throughout the process, but no primary data inputs from faculty are required.
- Sharing preliminary results with departments, as in the pilot test, will promote buy-in and help identify problems.
- Establishing a mechanism for sharing results with potential partners will be essential for benchmarking.
  - Common data definitions and business rules are crucial.
  - Robust coordination should be established at the outset.
The Way Forward

1. Disseminate information about teaching activity and cost models:
   • To financial and, importantly, academic officers
   • Through written materials and presentations.

2. Campuses decide whether they are interested in pursuing such modeling initiatives.
   • This is not “all or nothing”: campuses can opt in at any time.

3. Empower an inter-campus task force to work on common approaches and definitions.
   • Establish common definitions for course categories, teacher types, and key business rules. However, the model itself can be customized to meet the needs of individual campuses

4. Create one or more permanent committees to oversee the model’s development and implementation.
End

Contact wfmassy@gmail.com for further information.
## Glossary of Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tbody>
<tr>
<td>$nCS$</td>
<td>Class sections: annual number of instances of offered courses</td>
</tr>
<tr>
<td>$ENR$</td>
<td>Enrollment: number of students taking courses. May be differentiated by student level (UG, GR) or degree program</td>
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<tr>
<td>$ACS$</td>
<td>Average class size</td>
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<td>$FAC_{FTE}$</td>
<td>Tenure-line faculty FTEs</td>
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<tr>
<td>$ATL$</td>
<td>Average teaching load (sections per year) for tenure-line faculty</td>
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<tr>
<td>$OT_n$</td>
<td>Sections taught by Other Teaching Staff (%$OT_M$ is the percentage of modules by Other Teaching Staff: an important teaching metric)</td>
</tr>
<tr>
<td>$TA_n$</td>
<td>Teaching assistants in charge of class sections (e.g., breakouts, labs)</td>
</tr>
<tr>
<td>$TA_a$</td>
<td>Teaching assistants who assist with grading, demonstrations, etc.</td>
</tr>
<tr>
<td><strong>Sect Type</strong></td>
<td>Primary (plenary) section or Secondary (breakout) section. The variables apply separately to Primary and Secondary sections. Sum of Primary ENR = Sum of Secondary ENR.</td>
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<tr>
<td>$SFR$</td>
<td>Student faculty ratio based on overall course enrollment</td>
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