

# Peer Selection

Methodology and Models

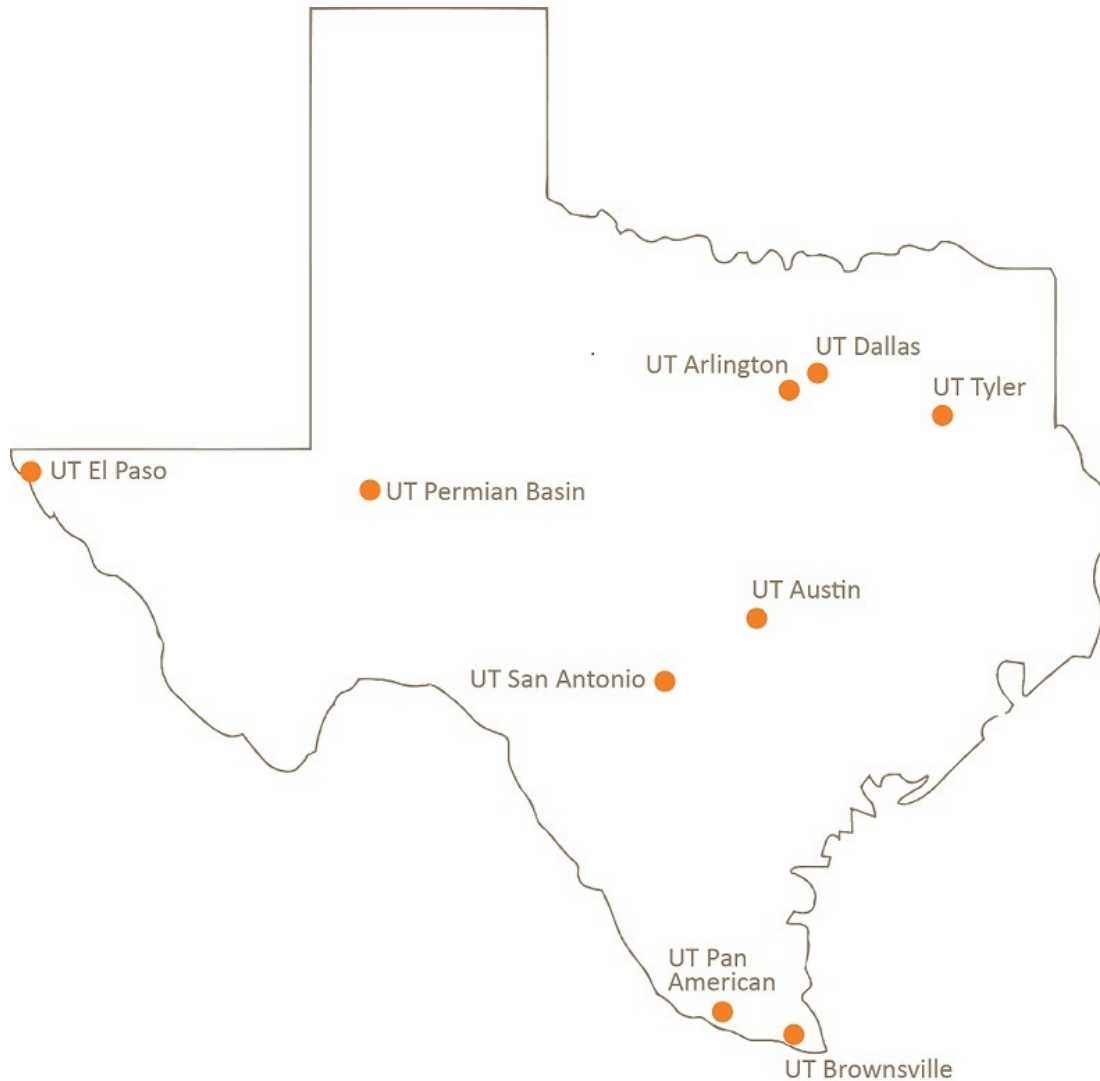
Drs. Alicia Betsinger, Roy Mathew, and Lawrence Redlinger

SAIR

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- **15 institutions**
  - 9 academic institutions
  - 6 health institutions
- **214,861 students (Fall 2011)**
  - 74% undergraduate
  - 40% Hispanic
- **46,094 degrees/certificates awarded (AY 2011)**
  - 66% undergraduate
  - ~35% of degrees awarded by public universities in Texas
  - ~63% of degrees awarded by public health-related institutions in Texas
- **19,099 faculty, including 7,621 T/TT faculty**
- **\$2.54 billion in research expenditures (FY 2011)**
  - 54% federally funded
  - 65% by the health-related institutions
- **\$13.1 billion in budgeted expenses (FY 2012)**
- **\$17.6 billion in endowments (FY 2011)**

# University of Texas System



# Academic Institutions

- **What is Benchmarking?**

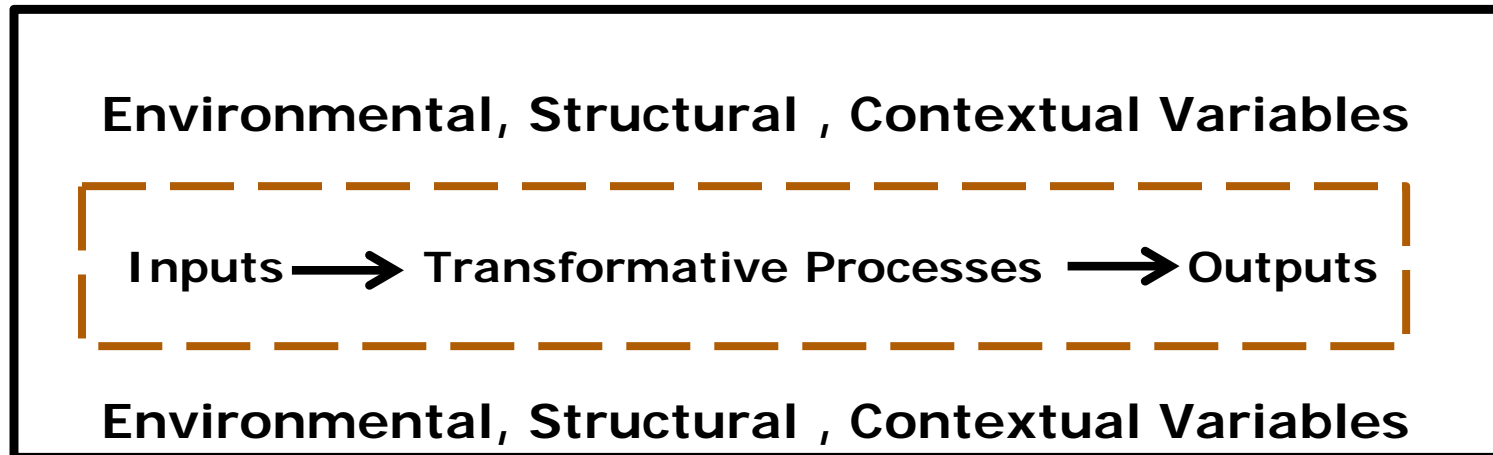
Benchmarking is the process where policymakers compare the performance, practices, and policies of institutions or groups of institutions to gain insight.

- **Why is Benchmarking Important?**

So that policymakers can more accurately answer questions such as, "What are the characteristics that allow for superior institutional performance?" "How can we improve institutional performance?" "All else being equal – why do some institutions outperform others?"

**The "What" and "Why"**

# The Benchmarking Model



From: Redlinger, Lawrence J., J. Wiorowski and A. Moses, (2013 - Forthcoming).

"Taming Multivariate Data: Conceptual and Methodological Issues" in G. Levy and N. Valcik (Ed.) *Benchmarking in Institutional Research*. New Directions for Institutional Research, Hoboken, NJ, John Wiley and Sons, Inc.

- Transitioned from nine separate approaches to peer/benchmarking analysis to single method that was empirically-based
- Previously, benchmarking carried less policy, and by implication fiscal weight, but began to shift in 2010 and continued to evolve through this most current iteration

**Peer Selection: System & Institution**

- **Institutional Size**
- **Student Population**
- **Research Focus**
- **Program Mix**

**UT System Benchmarking: 2010**

## Graduation Rates

4-year

6-year

## Research Expenditures

Total

Federal

## Degrees:

Degree Production Ratio:  
Baccalaureate

Degree Production Gap:  
Baccalaureate

## Other:

Endowment

Operational Revenue per FTE

# Performance Metrics



- Included nearly 40 variables, many of which were highly related
  - Strong relationships between variables may lead one to conclude that the relationship – similarity in this case – is stronger than it actually is
- Certain critical variables were missing:
  - Percent Hispanic
  - Percent Minority
  - Percent Part-time

## Challenges to 2010 Model

- First, Factor analysis was used to reduce the number of variables
- Second, created a composite variable of various outcome measures:
  - Graduation rates: 4-year and 6-year
  - Research Expenditures: Total and Federal
  - Degree Production Ratio
  - Endowments
  - Doctoral Degrees awarded (UT Austin and Emerging Research Universities only)

## **Approach #1: Multiple Regression**

- Finally, used reduced set of variables to understand where the institution stood on composite outcome:
  1. Operational revenue per FTE (proxy for program mix)
  2. Total UG enrollment
  3. SAT 75th percentile
  4. Undergraduate Enrollment as % of Total Enrollment
  5. Full-Time Enrollment as % of Total Enrollment
  6. Undergraduate percent minority

**Approach #1: Multiple Regression (cont.)**

- Decided to return to Factor Analysis model using distance scores on factors
- Pulled in “cost” variables:
  - High cost fields
  - Average faculty salaries

## **Approach #2: Principal Components Analysis (PCA)**

- New variables added:
  - Average professor salary (3-year avg)
    - Virtually no difference when used Associate or Assistant – if Professors were paid well, so were the other ranks
  - Percent of high cost programs (3-year avg)
    - Computer & Information Sciences (CIP 11)
    - Engineering (CIP 14)
    - Engineering Technologies and Engineering-related Fields (CIP 15)
    - Biological and Biomedical Sciences (CIP 26)
    - Physical Sciences (CIP 40)
    - Health Professions and Related Programs (CIP 51)
    - Business, Management, Marketing, and Related Support Services (CIP 52)

## Approach #2: PCA (cont.)

- First, reduced the number of variables
  - Created correlation matrix of data set
  - Selected subset of inputs correlated with outputs of interest
  - Removed input variables that were strongly correlated with other input variables
- Second, normalized data to z-scores so the unit of measure doesn't influence the results
- Next, calculated the distance between all institutions to create proximity score matrix
- Finally, based on other analysis, chose 10 institutions from among nearest 25 institutions

## Approach #3: Z-scores

- UTD Historical Approach to Benchmarking
  - Applied Contextual Filters (e.g., no-medical school) first
  - Created groups of “peers” based on a small set of variables measuring specific objectives.
  - Methods used were based on benchmarking a single institution (UTD) against others with reference to a specific set of variables (e.g., funding per student outcome; student characteristics)
- The new process was to create a single model for nine diverse campuses using a set of weights. The received model was based on work done in Arizona.
  - Worked with the Provost’s Office on reframing benchmarking processes. The first questions focused what the variables measured, how interrelated were they and which had the most impact?
  - We decided to use PCA; to reduce the variable pool; to remove up front filters and weighting.
  - Initial modeling results for UTD were checked against additional data; as were results for selected other campuses.
  - The variables that might be best for UTD might not be best for the other components or for the UT System benchmarking process.

## UTD Process on campus

## Peer data is used to assess progress, target setting, and strategy development

- We use peer groups with similar input characteristics to assess progress and for target setting
  - The challenge is in finding peer institutions whose missions match UTEP, emphasizing both access and excellence
  - Another challenge is finding institutions with similar characteristics: location, size, student demographics
- We use peer group data to identify effective strategy
  - Need large number of peers in broad categories (e.g., public baccalaureate awarding institutions, research institutions)
  - Focus on institutions with significant change in outcomes
  - Difficulty is in identifying factors that explain change – change in input, environmental factors, or innovation

**UTEP Process on campus**



Primary concern – **Can we develop an reasonable “statistical” approach to identify peers** for all academic institutions in the UT System, which has a mix of research, emerging research, and doctoral institutions?

- Discussed possible approaches with campus administrators
- Conducted extensive literature search
- Consulted with other IR colleagues, including Larry and Alicia
- Consensus was that we should only include input variables and use hybrid peer selection approach; the distinction between input peers and output peers also became apparent

**Explored several different approaches** using different combinations of “input” elements – 42 unique models

- General conclusion that that most models produced a core of institutions that could be acceptable peers

**Assessed 10 to 20 potential peers carefully**

- Are they similar enough to be considered peers?
- Are they stable – have the input variables changed dramatically over last five years?
- Shared analysis and recommended 10 institutions to senior administrators

**UTEP Process on campus (cont.)**

## Institutional Size

Total Enrollment  
Number of Full-time Instructional Faculty

## Cost

Average Professor Salary  
Percent High Cost Degrees  
Operational Revenue per FTE

## Student Population:

75<sup>th</sup> Percentile SAT  
Percent Pell eligible  
Undergraduate Enrollment as % of Total Enrollment  
Full-Time Enrollment as % of Total Enrollment  
Undergraduate Percent Minority

## Degrees:

Bachelor's Degrees Awarded as % of Total Degrees  
Graduate Degrees Awarded as % of Total Degrees

**Final Set of Variables**

- The peers list changes whenever new variables are added or removed
  - Filter before-or-after the fact changes it as well
- It is worth looking at different approaches – exercise identified institutions that we wouldn't have considered
- Need to minimize the reputational impact of selecting peers
- Don't fall into trap of the fallacy of exactness – are differences in outcome based on inputs, environmental changes, productivity, or strategy?

## Final Thoughts

- Alicia Betsinger, PhD  
Assistant Director, Office of Strategic Initiatives  
[abetsinger@utsystem.edu](mailto:abetsinger@utsystem.edu)
- Roy Mathew, PhD  
Associate VP, Center for Institutional Evaluation  
Research and Planning  
[rmathew@utep.edu](mailto:rmathew@utep.edu)
- Lawrence Redlinger, PhD  
Professor & Executive Director, Strategic Planning and  
Analysis  
[redling@utdallas.edu](mailto:redling@utdallas.edu)

**Questions**

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