Peer Selection

Methodology and Models

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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
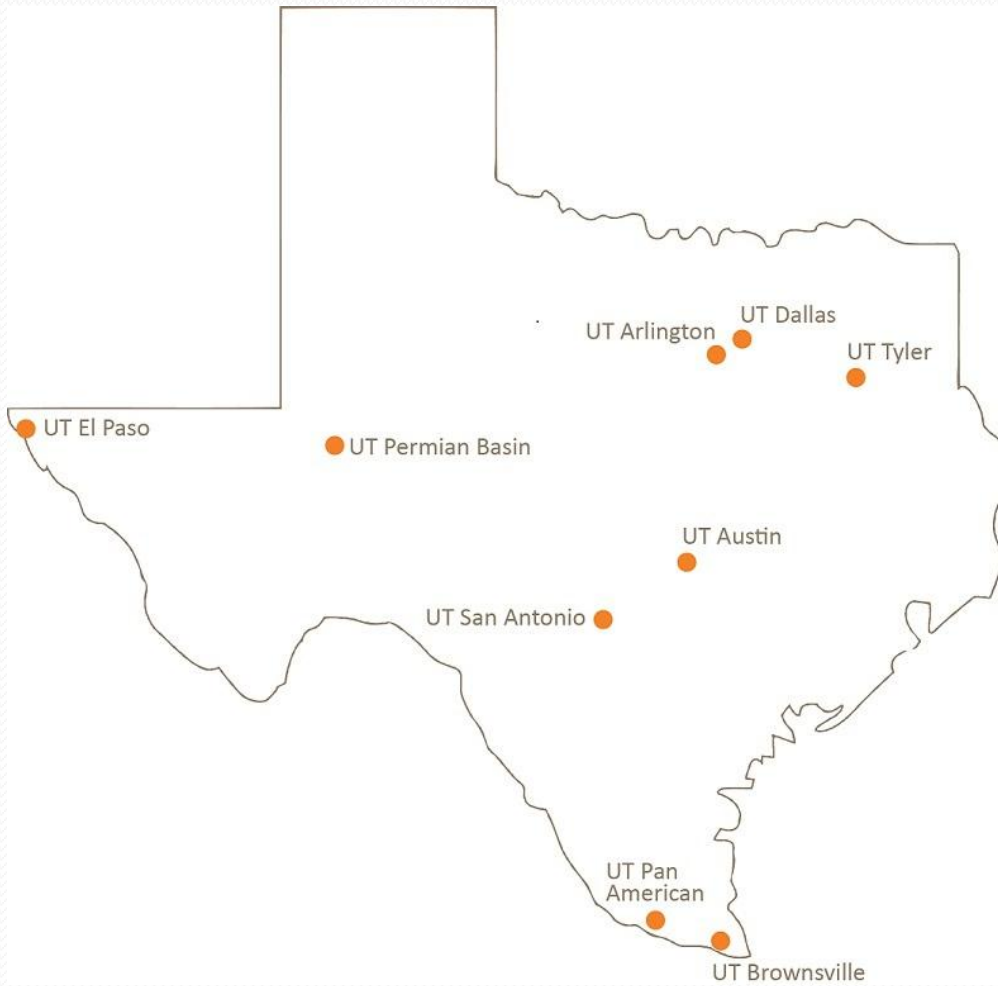
Academic Institutions

- **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"
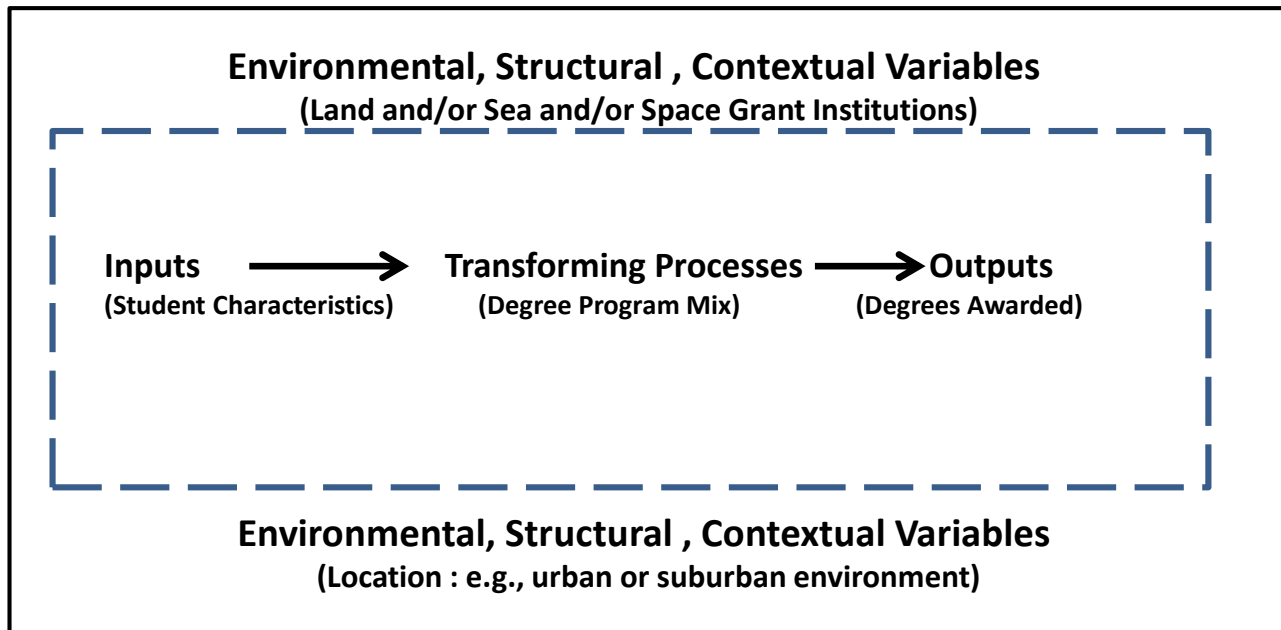
The Benchmarking Model

Environmental, Structural , Contextual Variables
(Land and/or Sea and/or Space Grant Institutions)

Inps
(Student Characteristics) → **Transforming Processes**
(Degree Program Mix) → **Outputs**
(Degrees Awarded)

Environmental, Structural , Contextual Variables
(Location : e.g., urban or suburban environment)

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Figure 8.1
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- 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	Research Expenditures
4-year	Total
6-year	Federal

Degrees:	Other:
Degree Production Ratio: Baccalaureate	Endowment
Degree Production Gap: Baccalaureate	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 <u>assess progress and for target setting</u>

- 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 <u>identify</u> effective <u>strategy</u>
  - Need large number of peers in broad categories (e.g., public baccalaureate awarding institutions, research institutions)
  - Focus on institutions with significant change in outcomes
  - Difficultly 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	Cost
Total Enrollment	Average Professor Salary
Number of Full-time Instructional Faculty	Percent High Cost Degrees
	Operational Revenue per FTE

Student Population:	Degrees:
75th Percentile SAT	Bachelor's Degrees Awarded as % of Total Degrees
Percent Pell eligible	Graduate Degrees Awarded as % of Total Degrees
Undergraduate Enrollment as % of Total Enrollment	
Full-Time Enrollment as % of Total Enrollment	
Undergraduate Percent Minority	

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

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Questions

- Borden V. M. H. (2005) "Identifying and Analyzing Group Differences." In M. A. Coughlin (ed.) Applications of Intermediate/Advanced Statistics in Institutional Research Tallahassee, Fl. Association for Institutional Research. 132-168.

- Merrill T and Stanley, J. (2010) "An Evidence-Based Strategy for Selecting Peer Institutions," presentation at the PacAIR Annual Meeting November 19, 2010.

- Teeter, D. J., and Brinkman, P. T. (1987)"Peer Institutional Studies/Institutional Comparisons." In J.A. Muffo and G. W. McLaughlin (eds.) A Primer on Institutional Research. Tallahassee, Fl. Association for Institutional Research. 89-100.

- Teeter, D. J., and Brinkman, P. T. (1992)"Peer Institutions." In M. A. Whiteley, J. D. Porter and R. H. Fenske (eds.) The Primer on Institutional Research. Tallahassee, Fl. Association for Institutional Research. Resources for Institutional Research no. 7 63-72.

- Teeter, D.J. & Christal, M.E.(1984). A Comparison of Procedures for Establishing Peer Groups. Paper presented at the Annual Meeting of the Southern Association for Institutional Research.

- Terenzini, P.T., Hartmark, L., Lorang, W.G. & Shirley, R.C. (1980). A conceptual and methodological approach to the identification of peer institutions. Research in Higher Education, 12, 4, 347-364.

- Trainer, J. (2008). The role of institutional research in conducting comparative analysis of peers. New Directions for Higher Education, 141, 21-30.

- Weeks, S. F., Puckett, D., & Daron, R. (2000). Developing peer groups for the Oregon University System: From politics to analysis (and back). Research in Higher Education, 41, 1, 1-20.

Selected References