UNLV

University of Nevada, Las Vegas

# A Knowledge-Based Selection Methodology of Peer Institutions

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AIR Annual Forum

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UNLV

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# Peerless

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# Peer Play


CAN YOU APPROVE THE NEW PEERS?
I'LL HAVE TO RUN IT BY THE PRESIDENT'S CABINET.
AND WE'RE IN JOINT PROGRAM EVALUATION TEAM (JET) TALKS, SO THEY'LL NEED TO CLEAR IT WITH THE DEANS.
NO ONE WILL KNOW WHO SHOULD MAKE THE DECISION OR WHAT THE RIGHT DECISION IS.
WHEN DO YOU THINK YOU'LL HAVE AN ANSWER?
SOMETIME BETWEEN NEXT WEEK AND WHENEVER THE EARTH IS DEVOURED BY A GRAVITATIONAL SINGULARITY.
MEANWHILE I WILL ASK YOU FOR YEARLY UPDATES OF THE 300 VARIABLES.
YOU FORGOT THE PEER CLUSTER ANALYSES.
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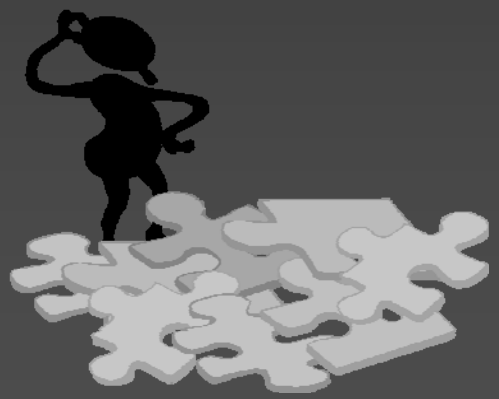
# A Peer for Every Season and Every Reason

- UNLV Comparison Institutions:
  - The Early Years (1980-2000)
  - WICHE Universities
  - Legislative Peers – AB203
  - USN&WR 3rd and 4th tiers
  - Planning

# The Question

What are the 15 (or n) most similar institutions to UNLV?



# Choosing a Methodology

- Criteria:
  - Tied to strategic planning priorities
  - Methodologically legitimate
  - Easy to replicate and update
  - Provides opportunity for campus input

# Quantitative Methodology

**statistical clustering** is the most commonly used methodology

***Curry (1972) out of NCHEMS, Terenzini et al. (1980, 1983), Teeter (1984), Christal (1987) and Brinkman (1987)***

# Methodology: Clustering

- The results of a statistical clustering approach to select peers depend on:
  - Variables chosen
  - Quality of the variables chosen
  - Clustering algorithm and options
- How do you choose the variables and an algorithm?

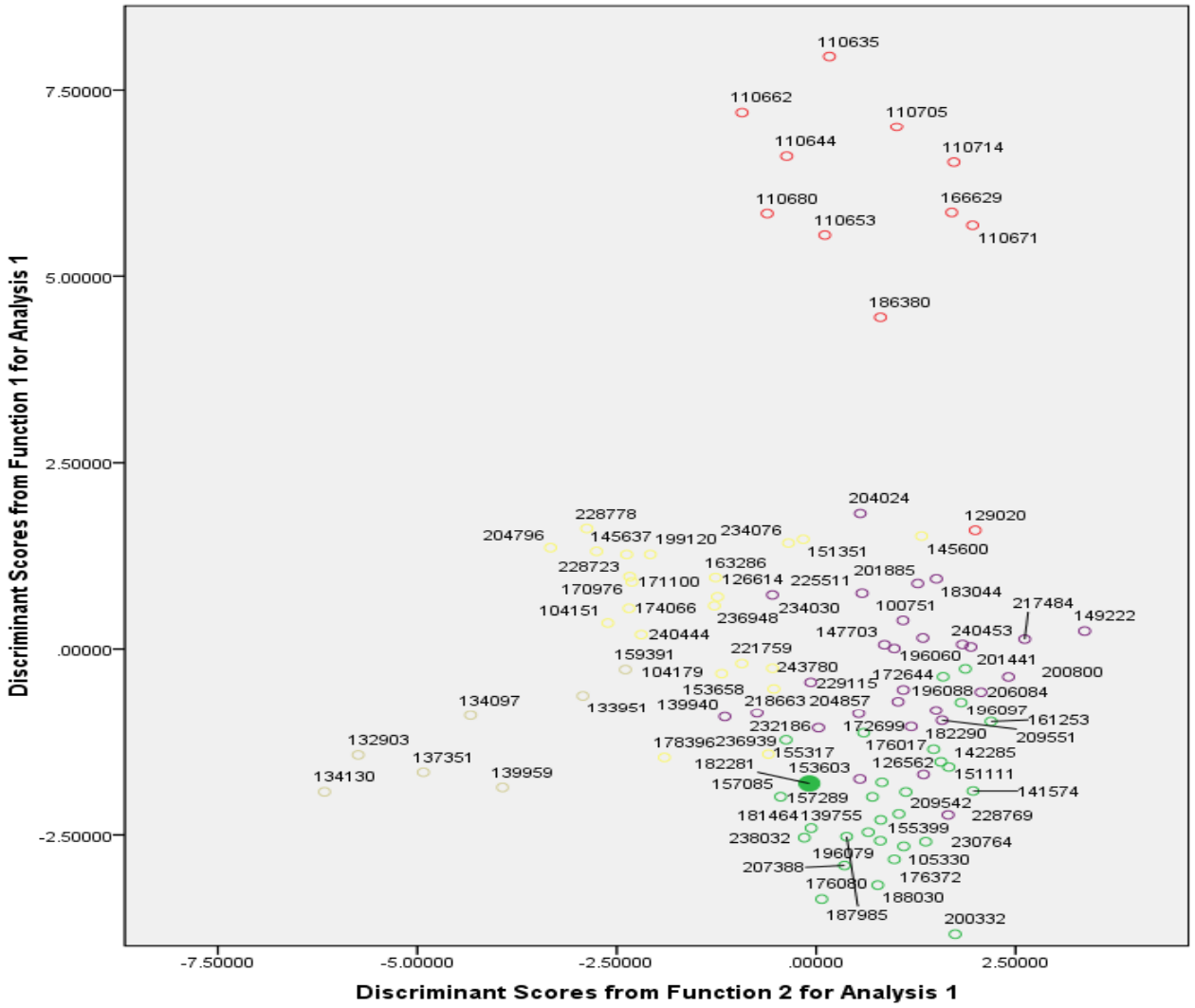
# Methodology: Cluster Algorithms

- Based on distance or similarity of measures between any two institutions
- Distance/similarity is measured using institutional characteristics (Variables)
- Minimize distance between institutions within clusters and maximize distance between clusters

# Methodology: Cluster Limitations

- The number of clusters is unknown
- The number of institutions in the selected cluster may be too large or too small
- Final peer set is a byproduct of clustering and not the focus

# Methodology: Cluster Limitations



# Methodology: Reference Institutions

- Total of over 2,800 accredited, public and private postsecondary institutions in U.S.
- Only 102 Public, Comprehensive Doctoral Institutions including UNLV with high/very high research activity (Carnegie Classification of Institutions, 2005)

# Methodology: Variable Selection

- 54 variables grouped into 7 dimensions related to planning priorities

- 7 dimensions are of interest to UNLV:
  - 1-Enrollment
  - 2-Student Performance
  - 3-Research
  - 4-Personnel
  - 5-Finance
  - 6-Financial Aid
  - 7-Urbanization

# Methodology: Variable Selection

- The most informative variables in each dimension are transformed into smaller number of principal components
- Source :  National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), 2006-07

# Limitations

- Limitations on national data elements collected
  - Reliability: variations in way national definitions are interpreted by institutions
  - Validity: how well they measure the concept
  - Missing values

# Variables:
# Enrollment Dimension

- % total enrollment for each race/ethnicity
- % total enrollment for each gender
- Full-time undergraduate enrollment
- Part-time undergraduate enrollment
- Full-time graduate enrollment
- Part-time graduate enrollment

# Variables:
# Student Performance Dimension

- Full-time retention, part-time retention
- Master's degrees awarded
- Bachelor's degrees awarded
- 4, 5, and 6-year graduate rates
- 6-year graduation rate by gender

# Variables:
# Financial Aid Dimension

- % receiving federal grant aid
- Average amount of federal grant aid
- % receiving state/local & institutional grant aid
- Average amount state/local & institutional grant aid
- % receiving student loan aid received
- Average amount of student loan aid

# Variables: Personnel Dimension

- Total FTE staff
- FTE in instruction/research and public service
- FTE in executive/administrative and managerial
- FTE other employees (excluding medical schools)

# Variables: Research Dimension

- Total number of ranked programs
- # Programs Ranked in Top 20
- # Programs Ranked in Top 10
- Doctoral degrees per tenured/tenure track faculty
- Research expenditures as percent of total
- Research expenditures per tenured/tenure-track faculty

# Variables:
# Finance Dimension

- Instruction as percent of total expenses
- Public service as percent of total expenses
- Academic support as percent of total expenses
- Student service as percent of total expenses
- Institutional support as percent of total expenses
- Tuition and fees as a percent of total revenues
- In-State Tuition and Fees
- Out-of-State Tuition and Fees

# Variables: Finance Dimension

- Instruction expenses per FTE
- Public service expenses per FTE
- Academic support expenses per FTE
- Student service expenses per FTE
- Institutional support expenses per FTE
- Average salary of full-time professors
- Average salary of associate professors
- Average salary of assistant professors

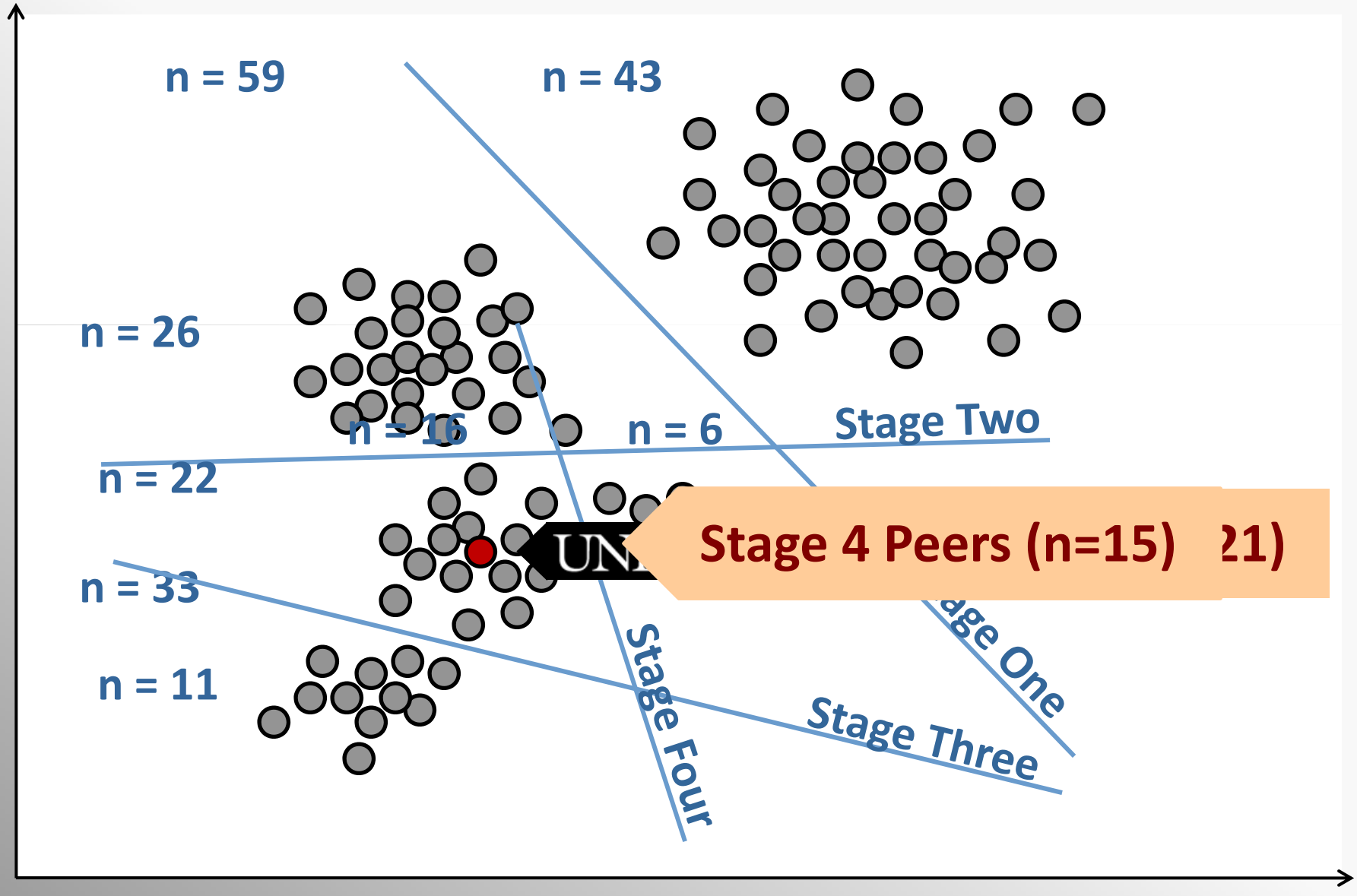
# Variables: Urbanization Dimension

- Degree of Urbanization
- Land Grant Status

# Methodology: Sequential Clustering Elimination

- Two-step with sequential elimination
  - First step separates 102 comprehensive doctoral institutions into two sets:  UNLV set and other institutions;
  - Eliminates institutions not in UNLV set over additional sequential stages

# Stage [illegible] including UNLV)…



# Methodology: Indexing

- 1st stage delivers two clusters—one contains UNLV, the other drops out
- 2nd, 3rd, and 4th stages—at each successive stage cluster containing UNLV is split, with non-UNLV cluster dropping out
- Each institution carries an index of 0-4, representing the number of times it clustered with UNLV, that can be used to estimate its similarity to UNLV

# Methodology: Advantages

- Allows for categorical variables (urban, rural, land grant, etc.)
- Breaks large, complex problem into manageable steps
- Not required to establish an ideal # of clusters
- Identifying similar institutions becomes easier at each stage
- Information is retained for each successive cluster using stage index
- Stage indices provide information for external input or judgments

# Methodology: Disadvantages

- Institutions that are not selected in early stages will no longer appear in subsequent stages
- Analysis is designed to produce peers; does not retain nearby clusters for other comparisons (e.g. aspirants)

# Results: Original Dimensions

- Institutions determined using 6 dimensions
- Urbanization & land grant dimension considered separately later
- The 10 institutions obtained form a set of “core institutions”

# Results:
# Stage 4 Original Dimensions

| UNLV Stage 4 Peers | Stage |
|---|---|
| Florida International University | 4 |
| George Mason University | 4 |
| Georgia State University | 4 |
| The University of Texas at Arlington | 4 |
| University of Houston | 4 |
| University of North Texas | 4 |
| Virginia Commonwealth University | 4 |

# Results:
# Stage 3 Original Dimensions

| UNLV Stage 3 Peers | Stage |
|---|---|
| Florida State University | 3 |
| University of Central Florida | 3 |
| University of South Florida | 3 |

# Results:
## Basic Dimensions Non-Peer Examples

| | |
|---|---|
| University of Arizona | 0 |
| University of California-Berkeley | 0 |
| University of California-Los Angeles | 0 |
| University of Colorado at Boulder | 0 |
| University of Florida | 0 |
| University of Illinois at Urbana-Champaign | 0 |
| University of Michigan-Ann Arbor | 0 |
| University of North Carolina at Chapel Hill | 0 |
| University of Washington-Seattle Campus | 0 |

# Dimension Effect Testing

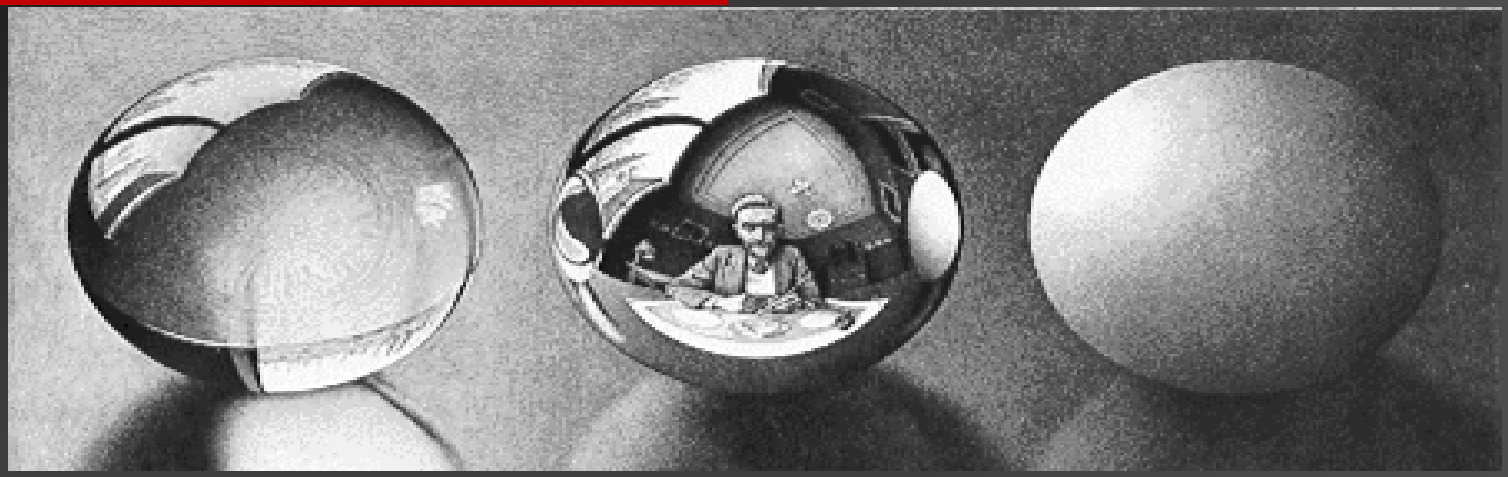
# Dimension Effect Testing

- The sequential clustering algorithm applied to all dimensions is the control group
- A treatment is obtained by applying the sequential clustering algorithm to all but one dimension

# Dimension Effect Summary

- The stage index measures the institution's proximity to UNLV associated with the presence/absence of  dimension
- The stage index computed for each set of dimensions is aggregated to measure closeness to UNLV in different dimensions

# Results: Dimension Effects



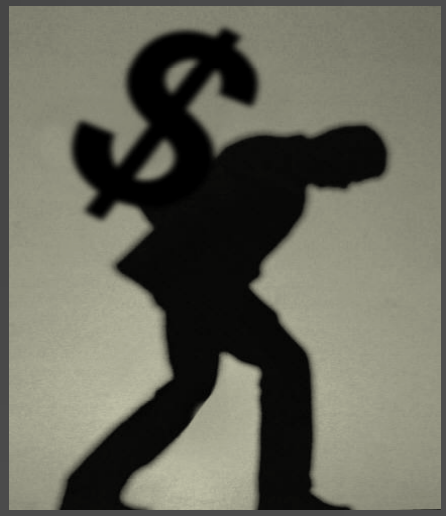
- Removing Finance
- Removing Research
- Adding Urbanization & Land-Grant

# Finance—Why test?

- To determine to what extent it constrains the composition of our peer group
- Does it limit our peers to less well-funded institutions to the detriment of other characteristics?

# Impact of Removing Finance

- When the finance dimension is removed from the algorithm, UNLV clusters with institutions that are better funded



# Research—Why test?

- Importance of research as a strategic priority… issues similar to what we have said about finance.

# Results of Removing Research

- When the research dimension is removed from the algorithm, there is no change in the composition of the stage 4 and 3 clusters
- It appears that the dimension is not bringing in additional information

# Results Refined: Urbanization & Land Grant

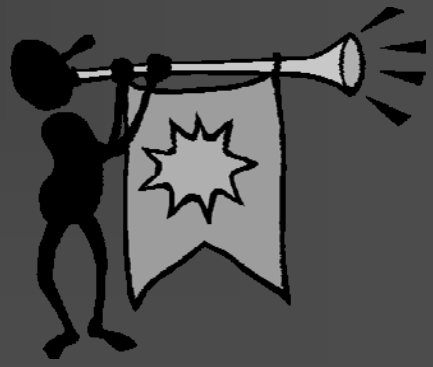
- Added two categorical variables to form the 7th dimension
- Both factors help discriminate campus environment, location (urban, rural), and conditions in which it operates.

# Urbanization and Land Grant Effects

- Institutions that cluster more often with UNLV when Urbanization and Land Grant status are accounted for:
  - Have higher total research expenditures
  - Produce fewer doctoral degrees
  - Spend significantly more on students

# Final Results: Combining Peer Sets

- Combined peer sets to provide a more comprehensive view of candidate institutions
- Summed the stage measure for each institution to determine proximity to UNLV
- 5 new peers added to the 6 dimension results—these are highlighted in green.



# 15 Proposed Candidate Institutions

| | All Dimension Stage | Finance Excluded Stage | Urbanization & Land Grant Stage | Total |
|---|---|---|---|---|
| UNLV | 4 | 4 | 4 | 12 |
| Florida International | 4 | 4 | 4 | 12 |
| Georgia State University | 4 | 4 | 4 | 12 |
| George Mason University | 4 | 3 | 4 | 11 |
| University of Houston | 4 | 3 | 4 | 11 |
| University of Louisville | 2 | 4 | 4 | 10 |
| University of New Mexico | 2 | 4 | 4 | 10 |
| Virginia Commonwealth | 4 | 3 | 3 | 10 |

# 15 Proposed Candidate Institutions

| | All Dimensions Stage | Finance Excluded Stage | Urbanization & Land Grant Stage | Total |
|---|---|---|---|---|
| The U. of Texas at Arlington | 4 | 4 | 2 | 10 |
| University of Central Florida | 3 | 2 | 4 | 9 |
| University of South Florida | 3 | 2 | 4 | 9 |
| Indiana U.-Purdue U.-Indianapolis | 2 | 3 | 4 | 9 |
| Temple University | 2 | 3 | 4 | 9 |
| University of Oklahoma-Norman | 2 | 3 | 4 | 9 |
| Wayne State University | 2 | 3 | 4 | 9 |
| University of North Texas | 4 | 3 | 2 | 9 |

# Notes on Methodology

- Use normalized data to eliminate variable size effects (ranks, ratios)
- By extracting only significant principal component factors:
  - Number of variables is reduced to a small set of factors
  - Number of variables in each dimension does not impact results; they are reduced to factors which contribute statistically independent information
  - Potential correlation among variables is eliminated

# Choosing a Methodology:
# Did We Satisfy all the Criteria?

- Tied to strategic planning priorities --------**YES**
- Methodologically legitimate----------**YES**
- Easy to replicate and update ----------**YES**
- Provides opportunity for campus input ----**NO/YES**

# Peer Into The Future

- Performance Comparisons
- Establishing Benchmarks
- Program Evaluation
- Aspirant Institutions
- Strategic Planning

# Questions?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