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ABSTRACT

Measures of institutional quality for 98 research universities were measured by the technique of spatial configuration to determine similarities and differences among the institutions. The use of research measures that directly address the concept of institutional quality or prestige was also examined (composite institutional scores derived from Cartter (1966) and Roose and Andersen (1970) studies). A secondary study objective was to examine the relationship between these two measures of institutional quality and variables commonly used in previous research on similarities/differences among schools. Institutional profiles among Research Universities I and II (Carnegie Commission, 1976) were found to be markedly different when the following six measures of institutional quality were analyzed by the spatial configuration technique: number of doctoral programs, total number of doctorates, student/faculty ratio, total research expenditures per faculty member, verbal and math scores of the Scholastic Aptitude Test, and the composite university Roose and Andersen score. It is concluded that once the structural quality of comparative data is assured, the spatial configuration technique offers a convenient methodology for data analysis. (SW)

QUALITATIVE AND CONVENTIONAL INDICES OF BENCHMARK INSTITUTIONS

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Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

QUALITATIVE AND CONVENTIONAL INDICES OF BENCHMARK INSTITUTIONS

Higher education scholars and practitioners are expressing a growing interest in the measurement of similarities and differences among institutions of higher learning. Scholarly interests have been heightened by the emergence of the contingency theory of organizations which focuses on understanding the factors by which some organizations are more successful than others and recognizes that there is no one best way to organize and manage for effective performance (Lawrence and Lorsch, 1967; Lorsch and Morse, 1976; Woodward, 1976). Scholarly research interests in the topic have been manifested in the development of typologies of colleges and universities to systematically examine differential patterns of campus organization, governance, administration, and performance effectiveness (Baldridge, Curtis, Ecker, and Riley, 1978; Cameron, 1978). Practical interest in the topic has been heightened by the press of a deteriorating economic situation and a concomitant emphasis on improved planning and performance evaluation processes to guide the more intelligent use of increasingly scarce resources. Practical interests have been manifested in the growing use of peer or benchmark institutions by campus and state officials in their efforts to judge the adequacy of resource allocations, expenditure patterns, and institutional performance levels.

Any typology or list of benchmark institutions is to a considerable degree a function of the methodology and variables used in its development. A review of the current research literature reveals a broad diversity in both the methodologies employed and variables included in previous efforts. For example, the Carnegie Commission (1976) and Stanford Project on Academic Governance (Baldridge et al., 1978) used unspecified threshold levels (i.e., cut-off points), Smart (1978) used discriminant analysis procedures, and Terenzini, Hartmark, Lorang, and Shirley (in press) used cluster analysis procedures to develop

their respective typological frameworks. Similarly, wide variation is also found in the variables used in these analyses (e.g., enrollment size and distribution patterns, faculty salary averages and rank distributions, degree offerings, and research and development expenditures). The substantive nature of the previous research has distinctive qualities and limitations. First, the methodologies employed have resulted in the classification of colleges and universities into mutually exclusive institutional categories and have not permitted examination of the relative similarity of different pairs of institutions. Second, the majority of variables used in studies to date have been principally measures of institutional size (e.g., enrollment levels, research budgets) and have neglected direct consideration of the concept of institutional quality.

The present study seeks to avoid these two limitations through the use of (1) a methodological procedure (i.e., spatial configuration) which reveals the relative similarity of all possible pairs of institutions in the sample and (2) research measures which directly address the concept of institutional quality or prestige (i.e., composite institutional scores derived from the Cartter (1966) and Roose and Andersen (1970) studies sponsored by the American Council on Education). As a secondary purpose, this study will examine the relationship between these two measures of institutional quality and variables commonly used in previous research on the similarities and differences among institutions of higher learning.

Research Procedures

Sample

The sample selected for this study consisted of all 98 universities included in the Research Universities I and II categories of the Carnegie Commission (1976) typology. The definitions for these two institutional

categories are:

RESEARCH UNIVERSITIES I. The 50 leading universities in terms of federal financial support of academic science in at least two of the three academic year years, 1972-73, 1973-74, and 1974-75, provided they awarded at least 50 Ph.D's (plus M.D.'s if a medical school was on the same campus) in 1973-74. Rockefeller University was included because of the high quality of its research and doctoral training, even though it did not meet these criteria.

RESEARCH UNIVERSITIES II. These universities were on the list of the 100 leading institutions in terms of federal financial support in at lease two out of the above three years and awarded at least 50 Ph.D.'s (plus M.D.'s if a medical school was on the same campus) in 1973-74. At least 25 of these degrees must have been Ph.D.'s. Alternatively, the institution was among the leading 60 institutions in terms of the total number of Ph.D.'s awarded during the years from 1965-66 to 1974-75. In addition, a few institutions that did not quite meet these criteria, but that have graduate programs of high quality and with impressive promise for future development, have been included.

Variables

The principl criteria which guided the selection of variables for this study were that the measures must be either direct or indirect reflections of quality or prestige within the academic community or measures commonly used in the research literature to examine the relative similarity and differences among universities. Based on these criteria, the following variables were selected: library resources (Morgan, Kearney, and Regens, 1976); median faculty salary (Cartter, 1966); total research expenditures (Lodahl and Gordon, 1973); federal research expenditures (Lodahl and Gordon, 1973); total number of doctorates awarded (Beyer and Snipper, 1974); number of doctoral fields (Elton and Rodgers, 1971); Astin's selectivity level (Astin, 1965); composite SAT V + M (Astin, 1971); Krislov's salary dispersion measures (Adams and Krislov, 1978); composite university Cartter score (Abbott, 1972); composite university Roose and Andersen score (Abbott, 1972); Gourman index

score (Gourman, 1977); total number of faculty (Beyer and Snipper, 1974); student-faculty ratio (Janes, 1969); total research expenditures per faculty member (Lodahl and Gordon, 1973); federal research expenditures per faculty member (Lodahl and Gordon, 1973); and total number of doctorates awarded per doctoral program (Elton and Rose, 1972).

Results

Table 1 shows the mean and standard deviation values for the 17 measures. These data, it should be noted, are based on a variable number of institutions because some measures were not available for all institutions.

Insert Table 1 here

The intercorrelations among these measures are given in Table 2. These correlations also are based on a variable number of institutions. That is, Gourman scores were available only for 46 institutions; correlations between the other measures and Gourman scores are based on the same set of 46 institutions.

Insert Table 2 here

The correlations in Table 2 ranged from a low of -.36 to a high of .96 with a median value of .38. We decided to see if a smaller list of variables could be found that would differentiate institutions. Number of doctoral programs (F) and total number of doctorates awarded per doctoral program (Q) were selected because these two variables appear to be related to institutional size. Beyer and Snipper (1974), Hagstrom (1971), and Elton and Rodgers (1971) reported significant relationships between departmental size and Cartter ratings. SAT V + M was chosen as a proxy measure for institutional quality since Astin (1971) has used SAT scores as a measure of institutional selectivity or quality. Roose-Andersen (K) ratings were based on original Roose-Andersen data and were developed by adding the individua departmental ratings for each

institution and multiplying by the number of departments to provide an institutional score (Abbott, 1972). They were employed as a measure of institutional quality because of the high correlation (.96) with the Cartter ratings. It seemed reasonable to assume they are measuring the same phenomenon and aggregating the data to the institutional level ought to reduce the error variance associated with individual units of analysis. Several investigators have reported a relationship between Cartter ratings and various measures of departmental quality (Knudsen and Vaughan, 1969; Hagstrom, 1971; Elton and Rose, 1972; Glenn and Villemez, 1970). Student-faculty ratio (N) was selected because of the finding reported by Janes (1969) that there was a positive relationship between Cartter rankings and the student-faculty ratio in departments of sociology. Total research expenditures per faculty member (O) was included as a variable because Lodahl and Gordon (1973) found that the average research funding of faculty is an important predictor of quality for physical science departments but less important in the social science departments.

Table 3 presents the means and standard deviations for the six measures of institutional quality that were selected for additional analysis. These data are based on 63 institutions.

Insert Table 3 here

The intercorrelations among these six measures are given in Table 4. Only minor variations appear when the correlations among these measures are compared to those presented in Table 2. Subsequently, these six variables were used in a spatial configuration analysis (Cole and Cole, 1970) to examine the relative similarity of all possible pairs of universities for which complete data were available (N = 63).

Insert Table 4 here

Figure 1 shows the relationship among the six measures of institutional quality plotted on a plane. The location of each measure is indicated by the labels F through Q. The location of each measure is a projection of the deviation (from the mean) of the measure of unit length (in six-dimensional space) onto the two-dimensional plane. This plane minimizes the variation among the six measures (Cole and Cole, 1970). In this case, 80.76 percent of the variance accounted for in six dimensions is retained in two dimensions.

Insert Figure 1 here

It is clear from the location of measures H (SAT V + M), K (Roose-Andersen), and Q (total number of doctorates awarded per doctoral program) that they are highly intercorrelated. These relationships are also shown in Table 4. This is not surprising since one of the strengths of spatial configuration is its ability to provide an understanding of relationships among measures. The spatial configuration analysis allows us to visualize these relationships more easily than is generally possible from attempting to make a simutaneous interpretation of a table of intercorrelations. The relationships among any set of measures should approximate the intercorrelations between these measures since the vectors representing the locations of the measures are of unit length (although reduced to a plane). Thus, since measure F (number of doctoral programs) is most distant from measure O (total research expenditures per faculty member), the correlation between these two measures should be the lowest. An inspection of Table 4 confirms this relationship.

It is possible to use the data given in Figure 1 to make interpretations of three different kinds. First, the profile of each institution, consisting of six scores or measures, can be summarized as a single point that is based on the resolution of those six scores. For example, the location of Duke (12) suggests that it is pulled upward by its relatively high score on SAT V + M (H); its very low score on number of doctoral programs (F); its below average

score on student-faculty ratio (N); and its above average socre on total number of doctorates awarded per doctoral program (Q). (Refer to institutional scores in Table 5).

Second, a comparison may be made of the profile of any institution with the profile of institutions in general by noting how close they are on the plane. For example, Michigan State University (28) deviates from the mean of all institutions (indicated by the square in Figure 1) by its dominance on measure F (number of doctoral programs), whereas the University of Virginia (53) lies nearest to the mean for all institutions and demonstrates a more balanced profile of scores.

Third, the profile of scores of a specific institution may be compared with the profile of any other institution. For example, Harvard's (16) profile of scores is most similar to that of Yale (59), even though Yale has a much smaller student-faculty ratio (N). The fact that Harvard and Yale are plotted on the same point in Figure 1 is due to rounding. (Refer to Table 6 for values used in plotting institutions). The University of Michigan (27) is most similar to the University of Illinois (17) and next most similar to the University of California at Berkeley (3).

Table 5 provides the standardized scores on each of the six measures of institutional quality for each institution. Table 6 gives the reference points for locating each one of the 63 institutions on the plane shown in Figure 1. It should be noted that not all institutions are plotted in Figure 1.

Insert Tables 5 and 6 here

Discussion

Institutional profiles among Research Universities I and II (Carnegie Commission, 1976) are markedly different when six measures of institutional quality are analyzed by the technique of spatial configuration. Although some differentiation might be expected among the 100 leading universities in the Carnegie classification scheme, it is apparent that wide variation exists in the profiles of the 50 leading universities (Research Universities I). For examples, Berkeley (3) and Stanford (46) are located in different quadrants and the University of Chicago (6) is not located in a quadrant shared by either Berkeley or Stanford. One apparent finding is that although institutions may be grouped or classified on the basis of one or two variables, such as those employed by the Carnegie Commission, the classification scheme may not be appropriate when it is desired to compare institutions on multiple measures of quality.

A frequent institutional practice is to select peer or benchmark institutions on the basis of geography. That is, in some cases, institutions located within the same state compare themselves with each other on the basis of some arbitrarily selected measures, usually faculty salary and enrollment are two such measures. This practice is becoming more popular with the advent of state coordinating boards. In other cases, the major state university in a state compares itself, not to other institutions within the state, but to comparable institutions in adjoining states. How valid is this practice?

Suppose we compare two institutions located in the same state. The University of Michigan (27) profile is more similar to that of the University of North Carolina (33) than it is to Michigan State University (28). Florida State's (15) profile is more like Maryland (26) than it is like the University of Florida (14). The University of Pennsylvania's (39) profile is more similar to that of Berkeley (3) than it is to Penn State (40). Purdue (42) and

Colorado (8) have more similar profiles than do Purdue (42) and Indiana (18). Iowa (19) is closer to the profile of Virginia (53) than it is to Iowa State (20).

But neither should one succumb to the assumption that land-grant institutions are naturally different from their sister rivals in each state, for the great similarity of Oklahoma (36) and Oklahoma State (37) argues that this is not always the case. Or if it is assumed that land-grant institutions in adjacent states are more similar than different, it is difficult to find examples to support that assumption. Furthermore, it is worth noting the close similarities between the profiles of Oregon State (62) and Florida State (15). Certainly geographical proximity is not a likely explanation for this phenomenon.

Another specific example will illustrate this point. The benchmark institutions for the University of Kentucky are: Ohio State (35), Missouri (30), Illinois (17), Purdue (42), Indiana (18), West Virginia (not in sample), Virginia (53), VPI (not in sample), Tennessee (50), North Carolina (33), and North Carolina State at Raleigh (not in sample). Although five of these eleven institutions are located in the same quadrant as Kentucky (24), two institutions, Illinois (17) and North Carolina (33) are located in a different quadrant. Furthermore, one might wonder why Rutgers (44) and Oregon (38) are not included as benchmark institutions since their profiles are more similar to that of Kentucky (24) than Indiana (18), Ohio State (35), Illinois (17), Missouri (30), North Carolina (33), and Tennessee (50).

Peer and benchmark institutions are often chosen on the basis of geography. This widely employed method of assembling a peer group of institutions may owe as much to the lack of other appropriate models to guide choice as it does to the desire of an administration to impress legislators and news-

paper readers. Nonetheless, the six measures of institutional quality analyzed in this study do not offer much support for the rationale of geography in selecting peer institutions.

In summary, it should be emphasized that any typology of institutions, benchmark, peer or other, ultimately rests on the structural quality of the data that are being used for comparison purposes. Once that quality is assured, the spatial configuration offers a convenient methodology for the analysis of the data. The outstanding feature of the spatial configuration is that it can handle multidimensional data and display that data as a single point in a plane. Furthermore, the point location of an institution on the plane preserves the important features of that institutional profile. This feature then allows the investigator to compare the profile of a single institution either with the mean profile of all institutions or with the profile produced by any single institution.

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Table 1

Means and Standard Deviations for
17 Measures of Institutional Quality

Variable	N	Mean	Standard Deviation
A. Library Resources	98	.00	1.00
B. Faculty Salary	98	19451.02	2027.76
C. Total Research Dollars	98	29720129.80	21914502.51
D. Federal Research Dollars	98	19948008.65	16877740.70
E. Total Doctorates	98	244.91	159.62
F. Number of Doctoral Programs	98	47.87	24.12
G. Astin's Selectivity Index	93	5.03	1.43
H. SAT V+M	97	1111.63	161.96
I. Krislov's Index	97	4270.62	1214.53
J. Cartter	69	2.56	.68
K. Roose-Andersen	64	42.08	28.88
L. Gourman	46	4.54	.30
M. Total Number of Faculty	98	881.28	441.07
N. Student-Faculty Ratio	98	18.67	9.22
O. Total Research Expenditures Per Faculty Member	98	41328.60	42768.50
P. Federal Research Expenditures Per Faculty Member	98	28237.08	31598.86
Q. Total Number of Doctorates Awarded Per Doctoral Program	98	5.27	2.88

Table 2.

Intercorrelations Among 17 Measures of Institutional Quality

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
A																		Library
S	-07																	Faculty Salary
C	.08	42																Total Research $
D	.05	51	94															Federal Research $
E	-12	30	65	56														Total Doctorates
F	-17	13	42	30	71													Number of Doctor. Prog.
G	42	56	39	50	16	-01												Astin's Selectivity Level
H	41	41	46	56	21	04	96											SAT V+M
I	23	70	44	56	23	05	62	57										Krislov
J	58	67	79	83	60	32	56	56	70									Cartter
K	50	64	84	87	70	42	59	58	63	96								Roose-Andersen
L	46	48	54	58	33	11	37	52	56	85	78							Gourman
M	-17	02	38	24	66	62	-26	-24	-10	20	30	01						Total Number of Faculty
N	-25	-03	-12	-13	08	01	-15	-05	-23	-12	-09	-25	-07					Student/ Faculty Ratio
O	23	22	71	54	05	-04	36	42	45	40	35	39	-36	-11				Total Res./ Faculty
P	17	35	54	66	06	-07	51	54	57	50	47	39	-36	-12	91			Federal Res./ Faculty
Q	-11	28	33	36	49	-10	27	30	18	24	26	03	15	25	06	13		Total Doctor./ Doctor. Prog.

Table 3

Means and Standard Deviations for
Six Measures of Institutional Quality

Variable	N	Mean	Standard Deviation
F. Number of Doctoral Programs	63	55.86	24.34
H. SAT V+M	63	1117.26	146.92
K. Roose-Andersen	63	42.08	28.88
N. Student-Faculty Ratio	63	19.14	5.43
O. Total Research Expenditures Per Faculty Member	63	5.57	2.74
Q. Total Number of Doctorates	63	187.64	83.42*

*Original data were subjected to square root transformation.

Table 4

Intercorrelations Among Six Variables

		F	H	K	N	O	Q
F.	Number Doctoral Programs						
H.	SAT V + M	07					
K.	Roose-Andersen	42	58				
N.	Student-Faculty Ratio	08	-05	-09			
O.	Total Research Expenditures Per Faculty Member	-22	30	25	27		
Q.	Total Number of Doctorates	-02	51	46	-06	11	

Table 5.

Standardized Institutional Scores
for Six Qualitative Variables

Spatial New ID	Name of Institution	Variable F	Variable H	Variable K	Variable N	Variable O	Variable Q
1	Arizona	.09	-.87	-.76	-.23	-.68	-.24
2	Boston	-1.80	.56	-1.18	3.05	5.45	.05
3	Berkeley (U.C.)	1.44	.63	2.32	.31	.85	4.93
4	U.C.L.A.	.05	.21	1.31	-.10	.78	.10
5	Case Western	-1.06	.70	-.07	-1.19	.14	.25
6	Chicago	-.04	1.38	1.38	2.07	.48	3.37
7	Cincinnati	-.77	-.59	-.94	.67	-.94	-.56
8	Colorado	-.53	-.19	-.11	.29	.41	.11
9	Columbia	-.16	1.19	1.42	-.98	.97	1.23
10	Connecticut	1.07	-.12	-.94	-.60	-1.14	-.41
11	Cornell	.62	1.31	1.17	.43	.13	1.29
12	Duke	-1.02	.97	.21	-.63	.15	.50
13	Emory	-1.47	.77	-.90	-.12	-.65	.00
14	Florida	-1.06	-.46	-.42	-1.28	1.53	-.58
15	Florida State	.09	-.12	-.87	.05	.06	-.65
16	Harvard	-.98	1.86	1.97	-.14	-.49	1.15
17	Illinois	1.20	.21	1.62	-.60	.83	-.30
18	Indiana	1.57	-.73	.72	3.45	-.11	-1.18
19	Iowa	-.45	-.12	.13	-.26	.19	-.49
20	Iowa State	1.20	.21	-.35	-.50	-1.08	-.33
21	Johns Hopkins	-.90	1.18	.76	-.54	-.09	3.13
22	Vanderbilt	-1.27	.90	-.38	-.28	1.21	.13
23	Kansas	-.03	-.26	-.11	-.32	-.52	-.68
24	Kentucky	-1.18	-.72	-1.21	.32	-.06	-.74

Table 5. (Continued)

Spatial New ID	Name of Institution	Variable F	Variable H	Variable K	Variable N	Variable O	Variable Q
25	Louisiana State	-.28	-1.27	-.90	-.36	-.91	3.64
26	Maryland	-.20	-.72	-.56	.36	.61	-.66
27	Michigan	1.40	.56	1.76	-.06	.82	.37
28	Michigan State	2.84	-.78	.52	.05	-.57	-.46
29	Minnesota	1.03	-.12	1.31	-.04	.28	.04
30	Missouri	.05	-.60	-.83	.64	-.76	-.19
31	Nebraska	-.57	-.60	-1.25	-.54	-.20	-.58
32	New York	1.44	.43	.24	-1.02	-.33	.16
33	North Carolina	-.24	.22	.31	-.60	.19	-.25
34	Northwestern	-.08	.63	.93	-1.13	.10	-.30
35	Ohio State	1.03	-.97	.34	1.02	.66	-.47
36	Oklahoma	-.45	-.97	-1.04	.55	-.65	-1.12
37	Oklahoma State	-.86	-1.27	-1.11	.99	-.86	-.51
38	Oregon	-.94	-.59	-.07	.23	.25	-.80
39	Pennsylvania	1.77	1.31	1.00	-.76	-.85	.83
40	Penn State	1.40	.15	.10	2.53	-.73	-.24
41	Pittsburgh	.29	.02	-.28	-.87	.08	-.70
42	Purdue	-.16	-.25	.14	.16	.61	-.15
43	Rochester	-.49	1.18	.21	-1.46	-.46	1.21
44	Rutgers	-.28	.02	-.45	.49	1.06	-.55
45	Southern California	-.20	-.19	-.28	-.43	1.41	-.02
46	Stanford	.05	2.05	1.56	-.93	.85	1.36
47	Buffalo, SUNY	-.12	.50	-.25	.18	.03	-.76
48	Syracuse	1.48	.29	-.31	-.48	-1.11	-1.21
49	Temple	1.07	-.91	-1.39	-.95	-1.11	-.93
50	Tennessee	.17	-.97	-1.08	-.36	-.96	-1.49

Table 5. (Continued)

Spatial New ID	Name of Institution	Variable F	Variable H	Variable K	Variable N	Variable O	Variable Q
51	Texas	-.24	-.12	1.04	.53	1.28	-.24
52	Utah	.13	-.72	-.76	.23	-.70	-.11
53	Virginia	-.57	-.12	-.49	-.12	-.62	-.52
54	Washington	.17	.84	1.07	-.30	-.03	.25
55	Washington State	-.81	-.19	-1.04	.27	-.70	-.40
56	Washington U. (St. Louis)	-.73	.70	.34	-.95	-.42	.83
57	Wayne State	-.49	-.66	-1.15	.08	-.29	-1.12
58	Wisconsin	2.84	.22	1.62	.67	-.06	.94
59	Yale	-.49	1.79	1.45	-1.26	.36	.62
60	Arkansas	-1.10	-.80	-1.35	1.41	-.60	-.53
61	New Mexico	-1.02	-.97	-1.07	.84	.09	-.78
62	Oregon State	-.36	-.80	-.80	.53	-.67	.10
63	George Washington	.05	.43	-1.42	.32	-1.09	.11

Table 6
Reference Points to Locate All Institutions on the Plane in Figure 1.

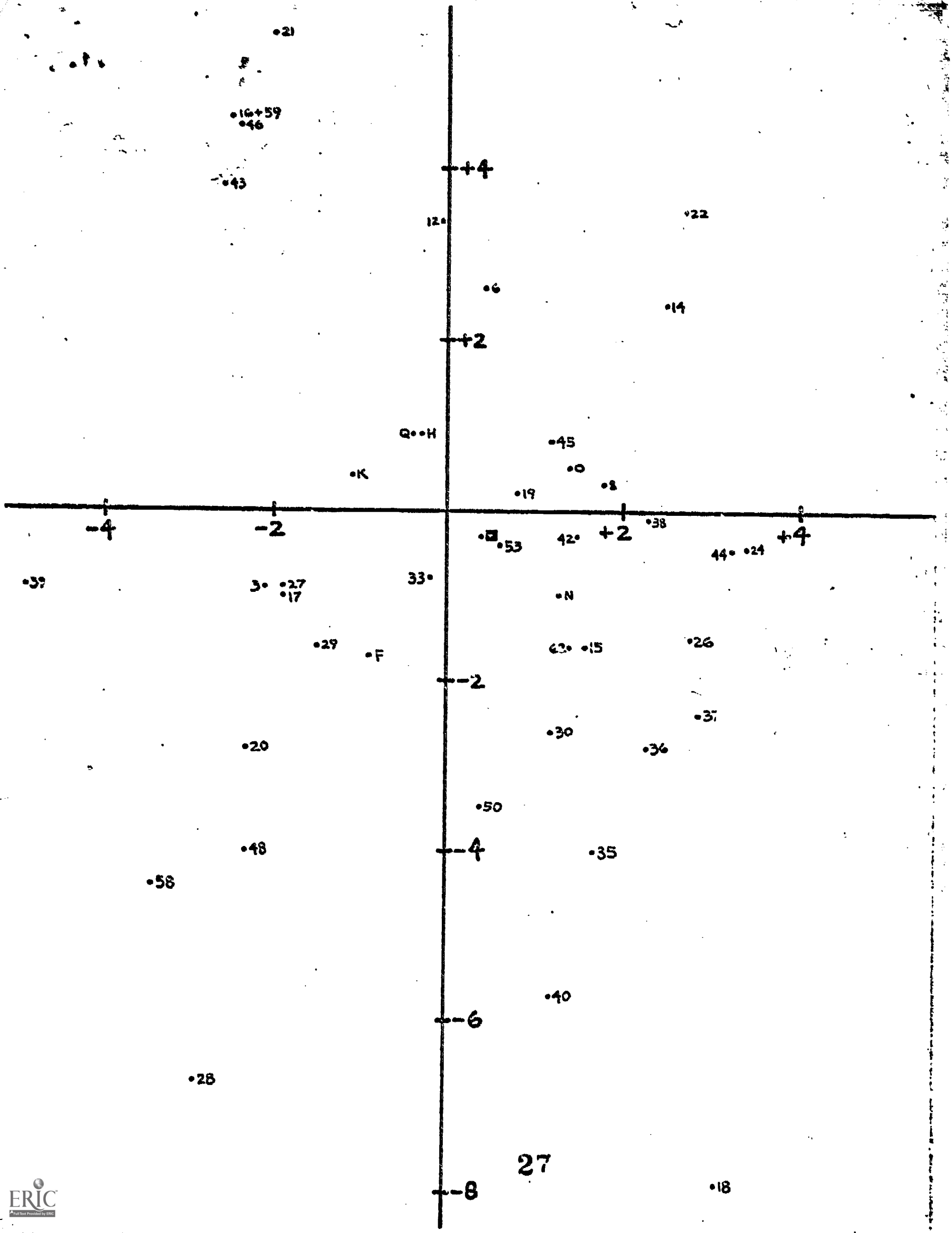
Spatial New ID	Name of Institution	X	Y
1	Arizona	.22	-2.03
2	Boston	13.65	2.84
3	Berkeley (U.C.)	-2.07	-0.93
4	U.C.L.A.	-0.17	0.76
5	Case Western	-0.23	3.48
6	Chicago	0.46	2.59
7	Cincinnati	1.95	-1.60
8	Colorado	1.82	0.31
9	Columbia	-1.68	3.99
10	Connecticut	-1.68	-3.15
11	Cornell	-1.53	0.90
12	Duke	-0.02	3.46
13	Emory	1.30	2.30
14	Florida	2.47	2.37
15	Florida State	1.55	-1.59
16	Harvard	-2.53	4.60
17	Illinois	-1.87	-0.98
18	Indiana	3.06	-7.95
19	Iowa	0.76	0.22
20	Iowa State	-2.29	-2.83
21	Johns Hopkins	-1.97	5.66
22	Vanderbilt	2.72	3.52
23	Kansas	-0.23	-1.20
24	Kentucky	3.39	-0.45
25	Louisiana State	-1.18	1.50
26	Maryland	2.78	-1.55
27	Michigan	-1.90	-0.89
28	Michigan State	-2.87	-6.69
29	Minnesota	-1.49	-1.65
30	Missouri	1.78	-2.55
31	Nebraska	1.55	-0.54
32	New York	-3.00	-1.54
33	North Carolina	-0.19	0 77

Table 6 (Continued)

Spatial New ID	Name of Institution	X	Y
34	Northwestern	-1.81	1.52
35	Ohio State	1.71	-4.04
36	Oklahoma	2.31	-2.77
37	Oklahoma State	2.87	-2.37
38	Oregon	2.34	-0.14
39	Pennsylvania	-4.90	-0.94
40	Penn State	1.25	-5.71
41	Pittsburgh	-0.32	-0.76
42	Purdue	1.48	-0.30
43	Rochester	-2.63	3.78
44	Rutgers	3.22	-0.46
45	Southern California	2.16	0.78
46	Stanford	-2.39	4.47
47	Buffalo, SUNY	1.10	-0.65
48	Syracuse	-2.26	-4.02
49	Temple	-1.17	-4.15
50	Tennessee	0.44	-3.47
51	Texas	1.98	0.23
52	Utah	0.63	-2.30
53	Virginia	0.61	-0.40
54	Washington	-1.59	0.95
55	Washington State	1.72	-0.53
56	Washington U. (St. Louis)	-1.58	3.02
57	Wayne State	2.26	-1.82
58	Wisconsin	2.26	-1.82
59	Yale	-2.49	4.56
60	Arkansas	4.03	-1.86
61	New Mexico	4.03	-1.38
62	Oregon State	1.43	-1.61
63	George Washington	0.52	-1.43
64	Means	0.36	-0.43

Figure 1

The Location of Selected Universities on a Plane


21
1
16+59
46
43
+4
12
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6
14
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H
45
K
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8
19
-4
-2
+2
+4
38
53
42
44
24
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3
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29
F
63
15
26
-2
37
30
20
36
50
48
-4
35
58
40
-6
28
27
-8
18