A New Paradigm for C-School Ranking

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This work proposes a new paradigm for a ranking system for four year C-Schools. Over the past few years various authors have suggested a need for ranking C-Schools. Ostensibly rankings are to be used to "create" competition. The need to rate or match-up is often driven by the nature of western competitive culture and by university politics at the highest levels. Rankings are also driven by the "ranking" business as profit center, in national publications such as U.S. News and World Report and The Washington Monthly among others. The author recommends ranking of ASC programs grouped by Carnegie Foundation classifications using current (recent) metrics established by ASC faculty members of the suggested peer groups

Keywords: C-Schools, Rankings, Washington Monthly, Carnegie Foundation

Introduction

"The public construction (C-Schools) ranking game can trace its meager beginnings to Engineering News Record ENR and a select group of peer-construction programs leader's efforts beginning in 2000" (Williamson & Burt, 2006). In their 2005 paper, presented at the Annual Conference of Associated Schools of Construction, Badger and Smith assert that professional organizations such as ACCE, AGC, NAHB, and ENR are interested in ranking construction programs. They also suggested a straw man ranking system (Badger & Smith, 2005). Williamson and Burt (2006) stated that the Badger and Smith suggestion had "overtones of competition by selected program size".

Universities and colleges in the United States have an established ranking system.

Unfortunately, the highly influential U.S. News & World Report annual guide to "America's Best Colleges" pays scant attention to measures of learning or good educational practices, even as it neatly ranks colleges in long lists of the sort that Americans love. It could be a major part of the solution; instead, it's a problem. U.S. News' rankings primarily register a school's wealth, reputation, and the achievement of the high-school students it admits. At one time, most academics believed in one simple equation: Good students plus good faculty equals good school. (Graham & Thompson, 2001)

The US News and World Report rankings are based on inputs rather than outputs. The U.S. News' ranking system relies heavily on the wealth of the institution and student selectivity to provide some measure of excellence. As an alternative, in 2005, the Editors' of Washington Monthly began publishing rankings based on selected output metrics.

The first question we asked was, what does America need from its universities? From this starting point, we came up with three central criteria: Universities should be engines of social

mobility, they should produce the academic minds and scientific research that advance knowledge and drive economic growth, and they should inculcate and encourage an ethic of service. We designed our evaluation system accordingly. (Washington Monthly Editors, 2005)

The idea of rankings and evaluations based on outputs is a recent development for universities and colleges. What does this new paradigm shift mean for C-Schools? If we accept a system of rankings based on outputs, our focus will shift to improving our output metrics, rather than putting effort into acquiring inputs for their own sake. For some schools it might mean improving students scores on the American Institute of Constructors examination, for other schools it might mean increasing the number of theoretical research papers by faculty and students or increasing the number of completed Ph.D.'s. (Not simply supervising a graduate student, which is an input.)

Under the US News and World Report system, to improve your ranking you add more inputs, under the Washington Monthly system, to improve your ranking you create more outputs. Williamson and Burt (2006) seem to support rankings based on outputs by suggesting a fully verifiable, straight-forward measure of faculty output in a research environment. Not every C-School will need, or want to, use this proposed output metric, leading to the question of, how do we select the metrics?

The fundamental output metric questions should be:

- What does the U.S. construction industry want from universities and colleges?
- How can we measure our effectiveness and efficiency in meeting the construction industry's desires?

Based on the wide diversity of C-Schools, and the vertical and geographic stratification of the construction industry, the answer to the question of construction industry's desires might be surprisingly broad and narrow at the same time.

Gaining consensus of C-School leaders and faculty on any ranking system is only part of the problem. Some form of grouping or classification is clearly necessary. It would be counter productive to rank a new start-up program at a regional masters' level college against a well established program with graduate programs and research capabilities. The goals and mission of individual university and of every construction program vary widely.

Classification is a ubiquitous human activity, an essential part of how we perceive and make sense of the world. It helps us collect, organize, store, and retrieve complex information. For instance, when asked to describe someone, we may say he (not she) is of medium height, in his mid-30s, with brown eyes, short curly hair, and a slender build. This short description is full of classification choices, but other contexts might call for entirely different choices. In an emergency room, for instance, many of these features might be ignored in favor of other characteristics that would lead to a diagnostic classification: consciousness, pupil dilation, shallowness of breath, and coherence of speech, to name a few.

In this sense, classification is a way of seeing, a social practice that directs attention toward selected characteristics and away from others. Classifications based on different criteria represent different perspectives on or approaches to understanding a phenomenon. No absolute standard or the "best" solution exists; rather, the value of a classification is closely linked to its intended use. Thus in a library, classification according to subject matter is far more useful than other possible approaches, such as grouping books by paper type, typeface, number of pages, or jacket design (some of which might be entirely appropriate in a different context, such as a museum collection. (McCormick and Zhao, 2005)

How can any classification or grouping system work? and what metrics should be used for the groupings of institutions? During 2005, the Carnegie Foundation for the Advancement of Higher Education finalized the new system of college classifications first proposed in 2001 (Carnegie Classifications, 2006).

The Carnegie Classification System

In 2000, the Carnegie Foundation dropped the Research 1 and Research 2 designations for the more generic designations "doctoral-extensive" and "doctoral-intensive". The Carnegie Foundation reclassified again in 2005 to remove the resultant confusion in those classifications (Carnegie, 2006).

Under the Carnegie Foundation classification system, peer groupings of schools based on commonalities begin to emerge. The Carnegie classification system has shortcomings, but the groupings are not established randomly. Carnegie Foundation classifications are well known and understandable to the administrations and to boards of trustees and regents of colleges and universities.

The new Carnegie Foundation classifications system includes thirty-four separate designated classifications. Eliminating the associate degree college classifications reduces the number further to twenty. Eliminating medical and health schools, law schools, reduces the number of potential classifications applicable to Associated Schools of Construction (ASC) member schools could fall under to thirteen possible groupings, eleven groupings if you discount the 2 in 4 year programs.

As illustrated in Table 1. thirteen Carnegie Foundation classifications apply to Associated Schools of Construction four year programs. At this time only ten classifications are actually filled by ASC four year member schools. Basic Code classifications 11 and 12 are filled by two year degree programs, and there are no Basic Code 22 institutions with ASC programs.

Table 1. Carnegie Classification Institutions and ASC Schools

Basic Code	Description	Number of Institutions	Average Enrollment	Number of ASC Schools
11	**Assoc/Pub2in4:** Associate's--Public 2-year colleges under 4-year universities	55	2,440	2
12	**Asoc/Pub4**: Associate's--Public 4-year Primarily Associate's	18	8,245	1
15	**RU/VH:** Research Universities (very high research activity)	96	24,638	22
16	**RU/H**: Research Universities (high research activity)	103	16,444	26
17	**DRU**: Doctoral/Research Universities	84	10,159	9
18	**Master's L**: Master's Colleges and Universities (larger programs)	350	8,063	34
19	**Master's M**: Master's Colleges and Universities (medium programs)	198	3,827	7
20	**Master's S**: Master's Colleges and Universities (smaller programs)	141	2,713	4
21	**Bac/A&S**: Baccalaureate Colleges--Arts & Sciences	274	1,802	0
22	**Bac/Diverse:** Baccalaureate Colleges--Diverse Fields	345	1,637	3
23	**Bac/Assoc**: Baccalaureate/Associate's Colleges	120	2,232	4
28	**Spec/Tech:** Special Focus Institutions--Other technology-related schools	56	710	1
30	**Spec/Arts**: Special Focus Institutions--Schools of art, music, and design	105	1205	1
	Totals	1872		114

The Carnegie Foundation uses single year reporting to make its classifications. At the margins, using a single year reporting system, university and college classifications could change from year to year.

Single-year data. Previous editions of the Carnegie Classification used a combination of single-year data and multiple-year averages. While using data from several years can smooth out year-to-year fluctuations, it can also diminish the classification's sensitivity to changes. Because the classifications are inherently retrospective, time-specific snapshots, accuracy and timeliness are enhanced by using the most current data available. (Carnegie Basic, 2006)

Metrics

Under the new paradigm, rankings will be based on output metrics. As demonstrated by Williamson and Burt, (2006) methods exist to report verifiable metrics for at least one area of construction higher education. The Williamson and Burt model suggested ranking faculty output by counting and sometimes normalizing publications in the ASC Journal. Williamson and Burt did not suggest application of a quality modifier to their metric. In the proposed model reporting and ranking will be based on outputs, with metrics selected by C-School leaders and faculty in

the peer groups established by the Carnegie classification system. Quality modifiers will be discussed, selected, and applied as part of the output metric selection process. At present the only well known quality measurement for ASC member programs is accreditation by ACCE, ABET, NAIT, or through peer led program reviews.

Effectiveness is defined as doing the right things; efficiency is defined as doing the right things well. Input metrics rarely have a direct relation to the quality of the outputs. A ranking system based on inputs without relation to the effectiveness or efficiency of a program is out of step with current thinking. Reporting the number of undergraduate or graduate students, their SAT scores, the number of research dollars received, the number and total of alumni gifts, endowment amounts, etc., while measurable, and verifiable, are all types of inputs metrics. While it is somewhat easy to measure output quality, in a university setting it is difficult, at best, to directly connect input to the quality of output. However, no construction organization would expect to measure profits without some measure of both the quantity and quality of and outputs against the use of inputs.

Table 2. summarizes the input versus output categories of the Badger and Smith ranking model. A review of the proposed metrics by Badger and Smith reveals forty proposed metrics, eleven of which can be classified as outputs. The remaining twenty-nine metrics can be classified as inputs. The Badger and Smith model uses a weighted (unbalanced) numerical score for the individual category metrics. Although the total rank scoring numbers do not tote properly in the Badger and Smith paper; of the 1100 possible points, a maximum of 235 are available for the output ranking categories. Clearly, the Badger and Smith model favors the input ranking system of U.S. News and World Report.

Table 2. A comparison of input and output metrics in the Badger and Smith ranking model.

Category	**Number of Metrics**	**Inputs**	**Input Maximum Weighted Score**	**Outputs**	**Output Maximum Weighted Score**
Peer Ranking	1	1	250	0	0
Faculty	7	5	140	2	60
Students	10	7	170	3	30
Funding	4	4	100	0	0
Industry	3	1	50	2	50
Programs	4	2	30	2	70
Facilities	4	4	50	0	0
Globalism	4	3	30	1	20
Alumni	3	2	40	1	10
Total	40	29	860	11	240

The author proposes that the selection of output metrics will be made by peer group faculty and leadership. The Badger and Smith model proposed a strawman (sic) set of metrics. Table 3. displays a list of some suggested metrics. The author acknowledges those metrics are in-part

fueled by his biases. The author further proposes that no subjective weighting be used, and that any metric, other than pure reports like the number of students in a program, would be normalized to eliminate program size bias.

Table 3. Suggested ranking metrics.

Description	**Output**
American Institute of Constructor AC or FE/FS examination results	Yes
Percentage passing grade	Yes
Average score	Yes
Number of alumni (normalized) achieving CPC/PE/LS	Yes
Number of graduating students (normalized) seeking public service such as military or peace corps	Yes
Number of graduates (normalized) per full time faculty	Yes
Number of degrees awarded	Yes
Number of journal articles (normalized) per full time faculty	Yes
Patents awarded to faculty and students	Yes
Faculty publications (normalized)	Yes
ASC contest results (normalized by student headcount)	Yes
Service learning volunteer hours	Yes
Percentage of students going on to graduate studies	Yes
Percentage of student hires before graduation (less those going to graduate school)	Yes
Number of educational outreach programs, classes, seminars	Yes

Conclusions

The author agrees with Badger, Smith, Williamson and Burt, that the academic debate regarding C-school ranking is a good thing. However, the author does not believe that it is a good idea for the construction industry, potential student recruits, or for construction higher education to embrace a ranking system that mirrors the US News and World Report. It is quite possible to be the "best undergraduate" construction professional program without being housed at a RU/VH university. Conversely, a mature program, at a great urban institution, in a growth area, does not necessarily provide the most effective and efficient learning and scholarly activity center for every student-recruit for the construction industry.

C-School grouping or classification of programs should be based on a well known and accepted classification system. Any classification system unfamiliar to university administrators should be avoided. Badger and Smith (2005) proposed using a grouping method that made Group 1 superior and put Group 4 programs in the dubious position of permanent inferior status. The Badger and Smith grouping factors were based on their admittedly small group discussions, not on broad-based ASC member discussions.

It is not the intent of the author to ignore output quality issues. The author believes that peer review in the form of accreditation or otherwise is an effective way to assure program output quality. However, the author suggests that peer group members hold the responsibility to assign some aspect of quality to the metrics. Deming defined quality as meeting the customer's needs, and that the quality characteristics of the output of a process are what is important to the

customer. In our work we have many customers, so defining quality will be as important, and as difficult, as agreeing to any classification system and the related metrics.

The author agrees with the Editors of Washington Monthly that a ranking system for higher education should be based on what you do for your constituency, not who or what you are, or what you look like.

Imagine, then, what would happen if thousands of schools were suddenly motivated to try to boost their scores on *The Washington Monthly College Rankings*. They'd start enrolling greater numbers of low-income students and putting great effort into ensuring that these students graduate. They'd encourage more of their students to join the Peace Corps or the military. They'd intensify their focus on producing more Ph.D. graduates in science and engineering. And as a result, we all would benefit from a wealthier, freer, more vibrant, and democratic country. (Washington Monthly Editors, 2005)

If we pick the right classification system and the right metrics for construction education fair competition will force us to enroll more students and more diverse students and have more graduates entering the construction industry. We will create more knowledge and contribute more scholarly work to the betterment of the construction industry. We will encourage our students to become life-long learners and committed citizen-employees.

As an editorial aside, it is possible to be both rich and good. Table 4. Shows the top six rankings by Washington Monthly vs. their individual U.S. News and World Report rankings.

Table 4. Washington Monthly rankings vs. U.S. News

WM Ranking	Institution	US News Ranking
1	Massachusetts Institute of Technology	7
2	University of California Berkeley	20
3	Pennsylvania State University (university Park	48
4	University of California Los Angeles	25
5	Texas A&M University	60
6	University of California San Diego	32

Texas A&M University made the largest leap among the top ten rankings by Washington Monthly. Texas A&M was ranked number sixty by US News and World Reports and number five by Washington Monthly for national universities (Washington Monthly College Rankings, 2006). Eleven ASC parent institutions went from unranked by U.S News and World Report to top 100 ranking by Washington Monthly.

Recommendations

The author recommends that the grouping as proposed in Badger and Smith's model be abandoned and that the groupings in accordance with classification of the parent institution under The Carnegie Foundation for the Advancement of Higher Education be adopted. (For a list of the ASC member schools sorted by Carnegie Foundation Rankings see Appendix A.) The Carnegie

Foundation classification system provides a known framework that allows for the flexibility of organizational change based on university changes. For those few ASC programs who object to this classification, they would be free to change classifications with the consent of their university administration.

The author, while offering some output metrics, humbly suggests that those details be left to members of the individual peer groups. When the Master's L group decides that the number of masters degrees awarded is a good metric, or a certain score on the AIC exam is a good metric, that will be the metric the group will aspire to.

The author recommends that any ranking system should be administered by an outside "agency". As famously put by a great individual "….trust but verify" (Regan, 1989). The issue of quality is best left to those closest to the customers, therefore those selecting the metrics should address the quality of output issue. Perhaps RU/H peer groups would administer the rankings of the RU/VH group.

When the group members establish metrics for outputs, it is plausible, that every ASC C-School program could aspire to be "best in class" in some or all metrics. Achieving "best in class" and bragging about it will help construction higher education grow in acceptance and stature. As implied by Badger and Smith. "Construction programs will not achieve world class status without university (institutional) investment and support" (Badger and Smith, 2005).

The author recommends, that any ranking system be based on recent activities and measurements and suggest that recent is defined as no more than three years past. This suggestion is an effort to keep the game current, not based on activities that have happened before the most recent students have entered the program. Underlying this argument is the fact that undergraduate students are taught and graduate students are mentored by the existing faculty not the faculty emeriti.

The author recommends that an outside board of review be established to validate the self reporting of any information used for ranking. Any ranking system should be based on verifiable facts, not uneducated opinion, not inference, weighted averages, or self serving bias. This position conflicts with Badger and Smith that "the ranking system must be complicated enough to seem scientific and the results must match, more or less, people's nonscientific prejudices" (Badger & Smith, 2005).

The author further suggests that a regional ranking system would be a better way to present data to the construction industry and student groups.

The author recommends that this discussion continue among faculty of ASC schools of construction leading to a consensus document, allowing us to control our collective destiny rather than have a ranking system imposed on us by individual colleagues or outside entities.

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Appendix A

Carnegie Classifications of ASC 4 year school members (Source ASC Website & Carnegie Foundation website)

RU/VH Research Universities (Very high research activity) Basic Code 15	**22 ASC Institutions**	
Arizona State University	Oregon State University	University of Nebraska - Lincoln
Colorado State University	Purdue University - BCM/CEM	University of New Mexico
Georgia Institute of Technology	Stanford University	University of Southern Califomia
Iowa State University	Texas A&M University	University of Washington
Kansas State University	The University of Kansas	Virginia Polytechnic Institute and State University
Louisiana State University	University of California Berkeley	Washington State University
Michigan State University	University of Cincinnati	
Montana State University	University of Florida	
RU/H Research Universities (High research activity) Basic Code 16	**26 ASC Institutions**	
Auburn University	North Dakota State University	Texas Tech University
Bowling Green State University	Northern Arizona University	University of Alaska Fairbanks
Brigham Young University	Oklahoma State University	University of Denver
Clarkson University	Old Dominion University	University of Houston
Clemson University	Polytechnic University	University of Maine
Drexel University	San Diego State University	University of Nevada - Las Vegas
Florida International University	South Dakota State	University of Oklahoma
Indiana University - Purdue University Indianapolis	State University of New York/ESF	University of Southern Mississippi
Michigan Technological University	Temple University	
DRU Doctoral/Research Universities Basic Code 17	**9 ASC Institutions**	
Ball State University	Illinois State University	Texas A&M University - Commerce
East Carolina University	Indiana State University	University of Arkansas - Little Rock
Georgia Southern University	Louisiana Tech	University of North Carolina at Charlotte
Master L (Larger Programs) Basic Code 18	**34 ASC Institutions**	
Boise State University	Eastern Michigan	University of Alaska Anchorage
Bradley University	Middle Tennessee State University	University of Central Missouri
California Polytechnic State University - San Luis Obispo	Minnesota State University, Mankato	University of Louisiana at Monroe
California State Polytechnic University - Pomona	Missouri State University	University of Nebraska - Lincoln (Omaha)
California State University - Chico	Northern Kentucky University	University of North Florida
California State University - Fresno	Northern Michigan University	University of Northern Iowa
California State University - Sacramento	Pennsylvania State - Harrisburg	University of Wisconsin - Stout
California State University, Dominguez Hills	Pittsburg State University	Western Carolina University
California State University, Long Beach	Rochester Institute of Technology	Western Illinois University
Central Connecticut State University	Southeast Missouri State University	Western Kentucky University
Central Washington University	Southern Illinois University Edwardsville	
Eastern Kentucky University	Texas State University	

Masters M (Medium Programs) Basic Code 19	**7 ASC Institutions**	
Alfred State College	Southern Polytechnic State University	Weber State University
Ferris State University	University of Nebraska - Kearney	University of Wisconsin - Platteville
Humboldt State University		
Master S (Smaller Programs) Basic Code 20	**4 ASC Institutions**	
John Brown University	Roger Williams University	University of Maryland Eastern Shore
Minnesota State University Moorhead		
Bac/Diverse Basic Code 22	**3 ASC Institutions**	
Milwaukee School of Engineering	Tuskegee University	U.S. Air Force Academy
Bac/Assoc Basic Code 23	**4 ASC Institutions**	
Brigham Young University-Idaho	State University of New York - Farmingdale	
Pennsylvania College of Technology	Utah Valley State College	
Special/Tech Basic Code 28	**1 Institution**	
Wentworth Institute of Technology		
Special/Arts: Basic Code 30	**1 Institution**	
Pratt Institute		