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An analysis of mobility in global rankings: making institutional strategic plans and positioning for building world-class universities

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Since the start of the twenty-first century, university rankings have become internationalized. Global rankings have a variety of uses, levels of popularity and rationales and they are here to stay. An examination of the results of the current global ranking reveals that well-reputed world-class universities are amongst the top ranked ones. A major concern for university administrators in many parts of the world is how to use the global rankings wisely in their mid-term and long-term strategic planning for building their institutions into world-class universities. Four major global rankings have been developed: the Academic Ranking of World Universities, the World University Rankings, the Webometrics Ranking of World Universities and the Performance Ranking of Scientific Papers for World Universities. The main purpose of this paper is to explore the most influential indicators in these global university rankings that will affect the rank mobility of an institution. Based on an analysis of correlation coefficients and K-means clustering, a model of strategic institutional planning for building a world-class university is proposed.

Keywords: global ranking; higher education policy; university reputation; world-class university

Introduction

Over the past decade, the use of the term ‘world-class’ to describe how a university develops its capacity to compete in the global higher education marketplace has been used widely. In 2005, the first research centre designed to study world-class universities, called ‘The Center for World-Class Universities’, was founded by Shanghai Jiao Tong University, after the inception of its global ranking in 2003. Gradually, ‘a growing acceptance from inside and outside academia that cutting-edge technologies and innovations originate from, and require, exceptional centres of research and learning has precipitated the worldwide phenomenon known as the “world-class university”’ (WUC-3 official website, 2009, n.p.). World-class universities are top universities striving for ‘excellence’. In other words, this means that their ‘quality must surpass the expectation of their various stakeholders’ (De Maret, 2007, p. 33). Feng (2007) stated that there were two generic features for a world-class university: presidential leadership and producing graduates with global citizenship. Altbach (2007) described ‘world-class universities’ in a more specific way, indicating that the key elements of

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a world-class university are excellence in research, top professors, academic freedom, governance, adequate facilities, funding and so on. In order to make its features more explicit, the Tertiary Education Coordinator at the World Bank, Jamil Salmi (2009) defined a world-class university as having three major indispensable elements, which are summarized below:

(1) a high concentration of talents with excellent faculty and extremely able students
(2) abundant resources to offer a rich learning environment and to conduct advanced research
(3) favourable governance features that encourage strategic vision, innovation and flexibility and enable institutions to make decisions and manage resources without being encumbered by bureaucracy.

Examining current global ranking outcomes, it can be found that universities that figure in the top ranks have many of these attributes. Many nations tend to use rankings as a basis for building world-class universities despite their well-documented methodological flaws, particularly 'reductionism', where the nature of higher education quality is reduced to one or two simple, or fundamental, measurements. Indeed, many universities initially strongly criticized and resisted these rankings. At the same time, many top university administrators are learning to use global rankings wisely in order to achieve their institution's mid-term and long-term strategic objectives as well as to build their institutions as world-class universities in the future. Some recent examples are: the University of Minnesota's initiative to become one of the top three research institutions in the world (Institute for Higher Education Policy, 2007), the National Taiwan University's announcement of its intention of 'Moving into the top 100' at its 80th anniversary (National Taiwan University, 2008) and Griffith University setting its ambition to reach, by 2012, a place in the top 500 Academic Ranking of World Universities and the Performance Ranking of Scientific Papers for World Universities, known as the Higher Education Evaluation & Accreditation Council of Taiwan (Griffith University, 2010).

Implementing educational and research policy changes that result in a rise in the rankings may not always be easy and successful, yet, if rankings can be used in an appropriate way by college administrators based on social science analysis, then academic users, institutions and students will be the beneficiaries. The main purpose of this paper is to explore the leading indicators in four major global rankings that will most affect the rank mobility of an institution in terms of correlation coefficients and K-means clustering analysis. Based on this analysis, a strategic institutional framework for becoming a world-class university is proposed at the end of the paper.

Characteristics of four major global rankings and their methodological limitations

Since early in the twenty-first century, the development of college rankings has become internationalized. At the present time, four major global rankings have been developed and are recognized worldwide. Shanghai Jiao Tong University published the first global ranking of universities in 2003, the 'Academic Ranking of World Universities', also known as ARWU. The ARWU ranking uses internationally recognized academic performance and achievements as the major indicators in rating 1000 universities

worldwide. Shortly after ARWU'S release, in 2004, Britain's *Times Higher Education Supplement* came out with its own 'World University Rankings', now called QS ranking (Quacquarelli Symonds Limited), covering 200 universities. Another world ranking system entitled 'Webometrics Ranking of World Universities' was published by Cybermetrics Lab, *Consejo Superior de Investigaciones Científicas* in Spain in the same year. A fourth global ranking, 'Performance Ranking of Scientific Papers for World Universities' from the Higher Education Evaluation & Accreditation Council of Taiwan (HEEACT), is calculated on the basis of the quantity and quality of papers on the Science Citation Index (SCI) and Social Science Citation Index (SSCI) journals and has been published annually since 2007 (Hou & Morse, 2009).

These four rankings have common elements. They have been published constantly for more than three years and the total number of indicators used does not exceed 10. Except for the '*Academic peer review*' criterion used by QS, the other categories of indicators are generally objective, using internationally comparable data and mainly focusing on research outputs, particularly in ARWU and HEEACT. They tend to judge research quality objectively because they rely on independent third parties to collect comparable data, such as the ISI database, Scopus and Nobel prize websites. They all rank the top universities in descending order based on a unified score. With regards to the ranking outcomes, the top institutions are usually in the US and UK, despite the different weighing and aggregation schemes (see Table 1).

Each ranking has its own features and characteristics due to its different objectives and organizational nature. Extensive differences exist amongst these four ranking systems in terms of what they measure, how they measure it and how they implicitly define 'quality'. The ARWU ranking, using quantitative indicators such as numbers of Nobel Prize winners and highly cited researchers, tends to favour universities with exceptional research output and award-winning faculty. Similarly, the HEEACT ranking employs objective bibliometric indicators that evaluate both the quantity and quality of a university's scientific papers and incorporates the assessment of long-term and short-term achievements in composite measures. It focuses exclusively on the research outputs of an institution compared with other rankings. The QS ranking evaluates an institution mainly on academic peer review measures. By contrast, the Webometrics ranking relies entirely on academic presence and impact of an institution on the Internet and its international visibility on the worldwide web.

It is evident that these ranking systems have common methodological limitations. Global rankings are fundamentally of a simplistic nature and have increased the unbalanced campus culture of emphasizing research over teaching. They are only measuring a reduced part of universities' multiple functions because of the emphasis on publication indexes and the use of reputational surveys. No list of the strongest universities can capture all the intangible, life-changing and paradigm-shifting work that universities undertake. For example, no ranking can even fully capture some of the basics of university activity – learning and teaching quality. Besides, 'using citation counts as a way of measuring excellence also presents serious problems' because these data 'emphasize material in English and journals that are readily available in the larger academic systems' such as in the US and the UK (Altbach, 2006, p. 3). Many studies also show that those with medical schools and departments in the hard sciences generally have a significant advantage because these fields generate more external funding and their researchers publish more articles (Altbach, 2006). Moreover, rankings marginalize institutions in non-English speaking, developing countries, ensuring that they remain on the knowledge periphery (Portnoi, Bagley, & Rust, 2010). All in all, ranking may be misleading the public

Table 1. Comparison of four major global ranking systems.

	ARWU	QS (THE)*	Webometrics	HEEACT
Year established	2003	2004	2004	2007
Institution type	Academic institution	Mass media/Private education consulting firm	Governmental research unit	QA agency
Goal	Academic competition	Profit making	Academic sharing	Benchmarking
Number of indicators	6	6	4	8
Indicator category	Research output/ Learning input	Research output/ Reputation/ Learning input	Web size/ Research output/ Reputation	Research output
Data sources	Database	Survey/Database/ Institution	Database	Database
Presentation	Only top 100 of 500 institutions are shown in numerical order	Top 400 are shown in numerical order	Top 1000 in numerical order	Top 500 in numerical order

Note: *As of October 2009, Times Higher Education (THE) was no longer involved with QS in producing the World University Rankings (http://www.che.de/downloads/Berlin_Principles_IREG_534.pdf).

into believing that the limited number of indicators represents the overall quality of an institution, resulting in what is called 'reductionism' (Neubauer, 2010).

Impact of global rankings on institutional behaviours

Despite several methodological flaws, many reports illustrate that institutions use rankings to know where they stand and with whom they can partner. More and more institutions have started to include in their mission statements both the achievement of 'world-class status' and the development of the long-term strategic goal of becoming a world-class university as measured by the global rankings. Ten years ago, a survey of US college presidents indicated that over 50% of institutions thought rankings were very important for them and had used rankings as an internal benchmark (Levin, 2002). Recently, two other influential studies also demonstrated how the institutions use rankings for policy making. According to the OECD-supported survey of higher education leaders and senior managers by Ellen Hazelkorn (2007), over 50% of respondents regarded rankings as having a positive impact on the institution's reputation and on helping its development in the areas of student recruitment, academic partnerships and collaborations and staff morale. The majority of institutions surveyed were found to incorporate the outcomes of rankings into their strategic planning processes at all levels of the organization and to take policy actions based on them. In addition, 70% wanted to be in the top 25 internationally (Hazelkorn, 2007; King, 2009). The other survey, an on-line UK study, focused on English universities' attitudes toward rankings, also showed that rankings often reflect the views of what properties a good university should develop. There was also a high level of agreement that the reputation of an institution might be affected by rankings (Lock, Verbik, Richardson, & King, 2008). Because of the high correlation between rankings and reputation, institutions are looking increasingly strategically on how to improve their rankings, although many institutions further down in the rankings do not appear to care too much about their position (Altbach, 2006; King, 2009; Lock et al., 2008).

However, owing to the different goals and methodological approaches in the rankings, it could be dangerous if institutions do not understand the key methodological features of the world rankings when they are identifying one or more of the ranking systems to be included as part of their strategic planning. Therefore, if some evidence of the adequate use of global rankings could be provided for the policy makers before setting a specific 'global numerical rank' as a benchmark of success, the goal may become more easily achievable (Sadlak, 2010).

Research methods and design

Given that different ranking schemes provide consistent results for some institutions and inconsistent ones for others, there are probably one or two key indicators that mainly affect the top institutions' overall rank: typology (input, output or outcomes indicators) and quality (data resources from survey, institutions or third parties) (Usher & Savino, 2007). None of the same one or two key indicators appear in all four ranking systems.

Hence, in order to study this, the paper first adopted correlation coefficients by measuring linear association between two indicators within each ranking, to identify the leading factors that will affect the rank stability of an institution as a top university. Institutions ranked from 90 to 110 were particularly chosen to understand which critical factors had the most impact in enabling an institution to move into the top 100.

Secondly, those who were not among the top 100 institutions in 2008, but moved up into the top 100 in 2009, were selected as research targets in order to analyse which indicator drives them to change the most. All institutions were clustered into three subgroups according to K-means clustering analysis. K-means clustering is a data mining technique used to cluster observations into groups of related concepts without any prior knowledge of those relationships. So, based on the number of rank movements from 2008 to 2009, the level of stability of the four ranking systems and the probability for an institution to move up as well as down in a certain period of time can be understood.

Major findings

Statistical analysis of the major indicators in four global rankings, by correlation coefficients

Table 2 shows that the indicator of '*Score on papers published in Nature and Science*' in the ARWU ranking has the highest correlation coefficients in the top ranked institutions, particularly in the cluster ranked from 1st to 100th institutions, with a highest score of 0.93. However, the correlation coefficients for '*Score on staff of an institution winning Nobel prizes and Fields medals*' and '*Score on alumni of an institution winning Nobel prizes and Fields medals*' increase when moving from the lower to the higher ranked cluster, which results in the institutions with Nobel prize faculty having a better chance of moving into the top 30. If an institution wishes to move into the top 100, '*Score on Nature and Science*' and '*Papers in SCI & SSCI*' are the key indicators that need to be improved first. As soon as it moves into the top 100, however, the influence of '*Papers in SCI & SSCI*' will then not be as strong. Additionally, those who are not strong in science fields will be unfairly underrepresented in the ARWU ranking.

As for the QS Ranking, Table 3 shows that the highest correlation coefficients of the top 100 institutions is the indicator '*Academic peer review*' regarded as 'the centrepiece' of the QS Ranking. Universities with a rank ranging between 71 and 100 have the lowest positive relationship on '*Academic peer review*' and even a negative relation on '*Employer review*', '*Citations per faculty*' and '*Faculty student ratio*'. An ironic finding is that the indicator '*International faculty*' has no significant impact on all three clusters when many institutions are investing substantially to

Table 2. Correlation coefficients among indicators, by cluster, in ARWU ranking.

Rank range	Score on Alumni	Score on Awards	Score on HiCi	Score on N&S	Score on PUB	Score on PCP
1–30	0.812**	0.875**	0.860**	0.900**	0.319	0.728**
31–70	−0.151	0.250	0.440**	0.741**	0.129	0.010
71–100	0.171	0.064	0.061	0.100	0.426*	0.235
90–110	−0.075	0.170	0.041	0.184	0.110	−0.090
1–100	0.761**	0.838**	0.871**	0.930**	0.636**	0.783**

Note: *p value < 0.05 means level of significance is obviously correlated; **p value < 0.01 means level of significance is obviously correlated; Alumni = alumni of an institution winning Nobel Prizes and Fields Medals; Awards = staff of an institution winning Nobel Prizes and Fields Medals; HiCi = highly cited researchers in 21 broad subject categories; N&S = papers published in Nature and Science; PUB = papers indexed in Science Citation Index-expanded and Social Science Citation Index; PCP = per capita academic performance of an institution.

Table 3. Correlation coefficients among indicators, by cluster, in QS ranking.

Rank range	Academic peer review	Employer review	Faculty/ student ratio	Citations per faculty	International faculty	International students
1–30	0.452*	0.201	0.629**	0.627**	0.059	0.278
31–70	0.318*	0.486**	0.224	0.135	−0.006	0.210
71–100	0.214	−0.047	−0.158	0.221	0.051	0.031
90–110	−0.123	0.281	0.206	−0.024	−0.002	0.144
1–100	0.700**	0.523**	0.565**	0.363**	0.140	0.341**

Note: *p value $<$ 0. 05 means level of significance is obviously correlated; **p value $<$ 0. 01 means level of significance is obviously correlated.

attract more foreign scholars. The major cause of this finding could be the relatively low (5%) weighting of the indicator compared with 50% in '*Academic peer review*'.

Table 4 on the HEEACT ranking shows that the correlation coefficients in the top 100 ranked institutions cluster are all quite high, more than 0.80, except for '*Citations in the last 11 years*'. The three clusters in the HEEACT ranking all have a highest point on '*Citations in the last two years*'. In the top ranked 1–30 cluster, '*Articles in high-impact journals in the current year*' and '*Citations in the last 11 years and highly cited papers*' are more important than the others. Surprisingly, 'H-index', which is an indicator measuring the productivity and impact of the published work of a scientist (based on the set of the scientist's most cited papers and the number of citations that they have received in other people's publications) is not as important as expected in the two clusters ranked 31–70 and 71–100.

With regards to the Webometrics ranking, all three clusters, ranked 1–30, 31–70 and 71–100, have their highest point value on '*Visibility*'. '*Size*', which represented the number of files, documents and publications an institution contributed to academic communities, has a greater influence on all three clusters, particularly in the first cluster, ranked 1–30 (see Table 5).

Table 4. Correlation coefficients among indicators, by cluster, in HEEACT ranking.

Rank range	Articles in the last 11 years (n)	Articles in the current years (n)	Citations in the last 11 years (n)	Citations in the last 2 years (n)	Average number of citations in the last 11 years	H-index of the last 2 years	Highly cited papers (n)	Articles in high-impact journals in the current year (n)
1–30	0.825**	0.881**	0.987**	0.991**	0.482**	0.903**	0.974**	0.989**
31–70	0.414**	0.422**	0.679**	0.694**	0.031	0.525**	0.662**	0.495**
71–100	−0.017	0.091	0.349	0.577**	0.238	0.405*	0.177	0.312
90–110	0.231	0.041	0.363	0.286	0.141	0.022	0.338	0.108
1–100	0.854**	0.834**	0.984**	0.988**	0.439**	0.920**	0.971**	0.977**

Note: *p value $<$ 0. 05 means level of significance is obviously correlated; **p value $<$ 0. 01 means level of significance is obviously correlated.

Table 5. Correlation coefficients among indicators, by cluster, in Webometrics ranking.

Rank range	Size (number of web pages)	Visibility (number of unique external links)	Rich (volume of the different academic files)†	Scholar (number of papers and citations from the Scholar database)
1–30	0.807**	0.946**	0.606**	0.756**
31–70	0.449**	0.797**	0.595**	0.531**
71–100	0.473*	0.331	0.170	0.361
90–110	−0.330	0.578**	−0.285	−0.004
1–100	0.845**	0.949**	0.835**	0.822**

Note: *p value $<$ 0. 05 means level of significance is obviously correlated; **p value $<$ 0. 01 means level of significance is obviously correlated; †including Adobe® Acrobat® (.pdf), Adobe PostScript® (.ps), Microsoft® Word (.doc) and Microsoft Powerpoint® (.ppt).

Rank differences and position movement in the four global ranking systems

As mentioned earlier, different clusters for each ranking have critical indicators that may safeguard their place in the very top rank, such as '*Score on Nature and Science*' in ARWU, '*Academic peer review*' in QS ranking and '*Number of citations in the last 2 years*' in HEEACT ranking. In order to realize how many places an institution can move up in the four rankings, the top 500 institutions whose ranks improved in 2009 are selected to demonstrate how fast they achieved the goal.

In the ARWU ranking, all top 500 institutions are categorized into three subgroups: Cluster One (1–17), Cluster Two (18–50) and Cluster Three (over 50). Table 6 shows that there are a total of 218 institutions moving up the rankings, with 71% located in Cluster One, 25.2% in Cluster Two and only 3.2 % moving up over 50 rank positions. Mean ranks improved are 6 in Cluster One, 29 in Cluster Two and 74 in Cluster Three. The highest rank position increase is 94 places. On average, the number of ranks most institutions would probably move up within one year is about six, which explains the stability of ARWU ranking.

On the other hand, Table 7 shows that those institutions whose ranks are on the rise between 1 and 50 places improve considerably on the indicators of '*Papers published in Nature and Science*' and '*Per capita academic performance of an institution*' and

Table 6. ARWU: number of institutions whose ranks moved up, by cluster.

Clusters	Number of rank positions improved	Institutions (n)	%	Average ranks improved (mean)	SD (n)
Cluster One	1–17	156	71.6	6.51	4.65
Cluster Two	18–50	55	25.2	29.33	10.88
Cluster Three	Over 50	7	3.2	74.71	15.76
Total number of institutions whose rank position moved up		218	100.0		
Highest rank position improvement	94 places				

Table 7. ARWU: number of institutions whose ranks moved up, by indicator.

Rank position improvement	Score on Alumni	Score on Awards	Score on HiCi	Score on N&S	Score on PUB	Score on PCP
1–50 ranks up	0	1	72	138	137	149
51–100 ranks up	4	0	3	21	2	10
101 –150 ranks up	0	0	0	3	0	8
151–200 ranks up	1	0	1	0	0	9
over 300 ranks up	0	0	0	0	0	7
No change	13	43	18	4	11	11
Total number of institutions whose rank positions moved up	5	1	76	162	139	183
Institutions whose rank positions moved up (%)	2.3	0.5	34.9	74.3	63.8	83.9

Note: Alumni = alumni of an institution winning Nobel Prizes and Fields Medals; Awards = staff of an institution winning Nobel Prizes and Fields Medals; HiCi = highly cited researchers in 21 broad subject categories; N&S = papers published in Nature and Science; PUB = papers indexed in Science Citation Index-expanded and Social Science Citation Index; PCP = per capita academic performance of an institution.

'*Papers in SCI and SSCI*'. However, none of them improved the scores on awards, or only moved up a little on the scores of alumni.

In the QS ranking, as Table 8 shows, 170 institutions whose ranking position moved up are categorized into two subgroups: the mean ranks improved are 13 in Cluster One, and 62 in Cluster Two. The highest rank position improvement is 125 places. Hence, the number of ranks that most institutions would probably move up is about 13.

In addition, Table 9 shows that those moving up rank positions improved considerably on the indicators of '*Academic peer reviews*' and '*Citations*'. It was found that '*Number of international faculty*' is the least influential indicator for maintaining a place in the top 100, and 105 institutions dropped due to this indicator. However, three institutions moved up dramatically.

The Webometrics ranking is published twice a year. The research subjects are selected from the versions of 2009 July and January 2010. In the Webometrics ranking, 242 institutions who improved their ranking position are categorized into

Table 8. QS: number of institutions whose ranks moved up, by cluster.

Clusters	Rank positions improved (*n*)	Institutions (*n*)	%	Average ranks improved (mean)	SD (*n*)
Cluster One	1–30	144	84.7	13.15	10.11
Cluster Two	Over 30	26	15.3	62.84	19.69
Total number of institutions whose rank positions moved up		170	100.0		
Highest rank position improvement	125 places				

Table 9. QS: number of institutions whose ranks moved up, by indicator.

Rank position increase/ decrease	Academic peer review	Employer review	Faculty/ student ratio	Citations per faculty	International faculty	International students
1–50 ranks up	113	58	71	87	38	59
51–100 ranks up	11	12	17	10	7	7
101–150 ranks up	1	8	2	1	6	1
151–200 ranks up	0	2	4	1	1	2
Over 300 ranks up	0	0	1	0	3	0
Moved down	39	87	67	65	105	94
No change	6	3	7	6	9	6
Total number of institutions whose rank positions moved up	125	80	95	99	55	69
Institutions whose ranks moved up (%)	73.5	47.1	56.2	58.2	32.5	40.8

three subgroups: Cluster One (1–39), with 64.7%, Cluster Two (40–99), with 31.4% and Cluster Three (over 100), with 4.1%. Table 10 shows that the mean rank improvement is 16 in Cluster One, higher than the previous ARWU and QS rankings, 61 in Cluster Two and 137 in Cluster Three. The highest number of increased rank positions is 212. On average, the number of ranks most institutions would probably move up is 16 ranks within a half-year.

Table 11, for Webometrics, shows those institutions who increased their ranking position 1–50 places improved more on the indicators of '*Rich*' (number of files) and '*Scholars*'. On the other hand, there are 76.9% of institutions moving up rank positions on '*Visibility*', which is consistent with its being the leading indicator for the top 100 institutions, as described in the previous section.

In the HEEACT ranking system, as Table 12 shows, 231 institutions that improved their ranking position are categorized into Cluster One (1–19), with 66.2%, Cluster Two (20–45), with 26.4% and Cluster Three (over 46), with 7.4%. The mean rank

Table 10. Webometrics: number of institutions whose ranks moved up, by cluster)

Clusters	Rank positions improved (*n*)	Institutions (*n*)	%	Average rank positions improved (mean)	SD (*n*)
Cluster One	1–39	156	64.5	16.21	10.90
Cluster Two	40–99	76	31.4	61.45	16.49
Cluster Three	Over 100	10	4.1	137.40	34.03
Total number of institutions whose rank positions moved up		242	100.0		
Highest rank position improvement	212 places				

Table 11. Webometrics: number of institutions whose ranks moved up, by indicator.

Number of rank positions increase/decrease	Size	Visibility	Rich	Scholar
1–50 ranks up	44	85	95	91
51–100 ranks up	36	45	29	45
101–150 ranks up	24	27	5	14
151–200 ranks up	11	17	1	6
Over 200 up	46	12	5	10
Moved down	80	50	103	74
No change	1	6	4	2
Total number of institutions whose rank positions moved up	161	186	135	166
Institutions whose rank position moved up (%)	66.5	76.9	55.8	68.6

improvement is 8 places in Cluster One, which is lower than in Cluster Two and Cluster Three. The highest number of ranks increased is 82.

Table 13 also shows that those whose ranking position moved up improve more on the performance of the '*Number of citations in the last two years*' indicator, which is consistent with the leading factor of being in the top 100. But the H-index seems to play a more significant role here, compared with those for the top 100 ranked institutions, as described in the previous section.

To sum up, the analysis results may be useful to some universities making strategic plans to improve their global rankings within a certain period of time. However, as the results show, how many ranks and how fast an institution could move up is correlated, to a large extent, with the indicators and weightings that each ranking system adopts. Some leading indicators, in fact, have a higher weighting than others. This finding will be discussed in detail in the next section.

Discussion and proposed model

As analyzed above, some useful information is provided for those institutions using global rankings to develop their strategic goals. First, the total number of rank positions

Table 12. HEEACT: number of institutions whose ranks moved up, by cluster.

Clusters	Rank positions improved (*n*)	Institutions (*n*)	%	Average ranks increased (mean)	SD (*n*)
Cluster One	1–19	153	66.2	8.24	5.34
Cluster Two	20–45	61	26.4	30.23	7.11
Cluster Three	Over 46	17	7.4	60.18	10.49
Total number of institutions whose rank positions moved up		231	100.0		
Highest rank position improvement	82 places				

Table 13. HEEACT: number of institutions whose ranks moved up, by indicators.

Number of rank positions increase/ decrease	Articles in the last 11 years (*n*)	Articles in the current year (*n*)	Citations in the last 11 years (*n*)	Citations in the last 2 years (*n*)	Average citations in the last 11 years (*n*)	H-index of the last 2 years	Highly cited papers (*n*)	Articles in high-impact journals in the current year (*n*)
1–50 up	94	121	125	162	105	142	101	128
51–100 up	8	4	6	11	3	39	8	9
101–150 up	0	3	0	5	4	13	2	3
151–200 up	4	1	0	0	1	3	4	0
Over 200 up	0	2	0	0	1	0	2	1
Moved down	114	93	92	49	113	34	96	81
No change	11	7	8	4	4	0	18	9
Institutions whose rank positions moved up (*n*)	106	131	131	178	114	197	117	141
Institutions whose rank positions moved up (%)	45.9	56.7	56.7	77.1	49.4	85.3	50.6	61.0

that institutions in Cluster One might typically expect to move up in the ARWU ranking is, with an average of 6.5 rank positions, less than in the QS, Webometrics and HEEACT ranking systems. Nagoya University and Emory University are the only two institutions that moved up into the top 100 in 2009 in the ARWU ranking. Comparing them with the top 101–150, as Table 7 shows, the two reasons for their better performance were their scores on '*Number of highly cited researchers*', '*Papers in Nature and Science*' and '*Per capita academic performance of an institution*', not for their scores on '*Awards*' or '*Alumni winning Nobel Prizes and Fields Medals*'. However, if institutions would like to move into the top 30 or maintain their rank at the very top, '*Awards*' (0.875) would become the leading indicator instead. Generally speaking, moving up in the ARWU ranking is much more difficult than in the other rankings systems.

Secondly, the results show that the total of number of institutions who improved in the Webometrics ranking is 242, compared with 231 in HEEACT, 218 in ARWU and 170 in QS. The Catholic University of Leuven is the top improver with a total number of 212 rank positions increasing within a half year. It made substantial progress on the indicator of '*Size*', moving up from the 705th rank into the 136th rank, followed by 394 positions in '*Scholar*', 330 in '*Rich*' but only 31 in '*Visibility*'. As mentioned earlier, '*Visibility*' is the most influential indicator for moving up ranks but, on the other hand, it is the most difficult to improve. So it is suggested that institutions can improve '*Size*' first. Given the fact that the range of movement up and down ranks within a half year is extremely large in the Webometrics ranking, institutions are likely to move into the top 100 within one year if they continue to increase publication rates and to share academic knowledge and research output through the Internet.

Thirdly, there were nine institutions moving into the top 100 of the QS in 2009, including the University of North Carolina, Chapel Hill, the University of Adelaide, University College Dublin, Nagoya University, the University of Zurich, Freie Universität Berlin, the National Taiwan University, Tohoku University and the University of Leeds. '*Academic peer review*' and '*Employer review*' are the two leading factors for their moving up even though they are regarded as subjective indicators. Generally speaking, if institutions wish to move up in the rankings, building up their overall international outlook and visibility via an enhanced reputation is a priority.

Finally, the HEEACT ranking system separated medical schools and branch campuses from the main institutions in 2009, which made some institutions' rank positions drop rapidly, such as Pennsylvania State University (University Park) and University of Connecticut (Health Centre/Storrs). There are also five institutions that moved into the top 100 in 2009, including the University of Paris XI Sud, the University of Bristol, Purdue University-West Lafayette, the University of Geneva and the University of Queensland. Compared with their performance in 2008, they improved considerably within one year because of the indicators '*Citations in the last two years*', '*Articles in the current years*' and '*H-index*'.

Though the highest rank position improvement in HEEACT is the lowest of the four systems (82), its total number of institutions moving up ranks (231) is the second highest, next to 242 in the Webometrics ranking. Generally speaking, it is not easy for institutions to move up very far within a year in the HEEACT system, and keen competition remains among them because many have a significant increase in quality and quantity of scientific papers in a short time (see Table 14).

Table 14. Comparison among the four global rankings, by rank position increase.

	ARWU	QS	Webometrics	HEEACT
Cluster One	1–17	1–30	1–39	1–19
Cluster Two	20–45	Over 30	40–99	20–45
Cluster Three	Over 46	*	Over 100	Over 46
Number of institutions moving up (total number of ranked institutions)	218 (500)	170 (400)	242 (500)	231 (500)
Highest rank position improvement	94	125	212	82

Note: *no Cluster 3 in QS ranking.

Building a model of strategic institutional planning and positioning

Based on the above statistical analysis, it can be concluded that the key indicators fall within the following three categories:

(1) Staying in the top 30. The most influential indicators to be in the top 30 ranks are '*Awards*' *and 'Nobel Prize Alumni*' in ARWU, '*Citation per faculty*' and '*Faculty student ratio*' in the QS, '*Internet visibility*' in Webometrics and '*Citations in the last two years*' in the HEEACT ranking system.
(2) Moving into the top 100: if an institution is heading towards the top 100, '*Papers in Nature and Science*' and '*Per capita academic performance of an institution*' are the most influential indicators in ARWU, '*Academic peer review*' in the QS, '*Visibility*' in Webometrics and '*Citations in the last two years*' in the HEEACT ranking.
(3) Moving up rank positions: '*Papers in Nature and Science*' and '*Per capita academic performance of an institution*' are the key indicators in ARWU, '*Academic peer review*' in the QS, '*Visibility*' in Webometrics and '*H-index*' in the HEEACT ranking.

Frequently, when a university president announces that they wish to 'move the institution into the top 100 universities' globally, it confuses faculty members, students or even the public because many things are not explained clearly, such as what 'moving up to the top 100 universities' means, how to achieve it and which world ranking the president is referencing as the goal. According to the results above, and using a more pragmatic approach based on the nature of different rankings, institutions can develop their strategic plans on a long- and short-term basis in order to achieve their intended goals. Institutions should first clearly identify which categories they fall into at present and thereby establish a clear starting point to move up the global rankings. Hence, the model illustrated in Figure 1 is suggested as a blueprint for institutional policy making. In the 3–5-year, short-term strategic plan, Webometrics ranking can help universities to enhance their web presence, technology and E- learning in order to be more internationally exposed. The QS ranking could be used to examine the international reputational dimension and a university's image can be made more visible, possibly within 5–15 years. The most challenging ranking system would be ARWU because of its 'Nobel Prize laureates' indicator and it would, therefore, take more time to

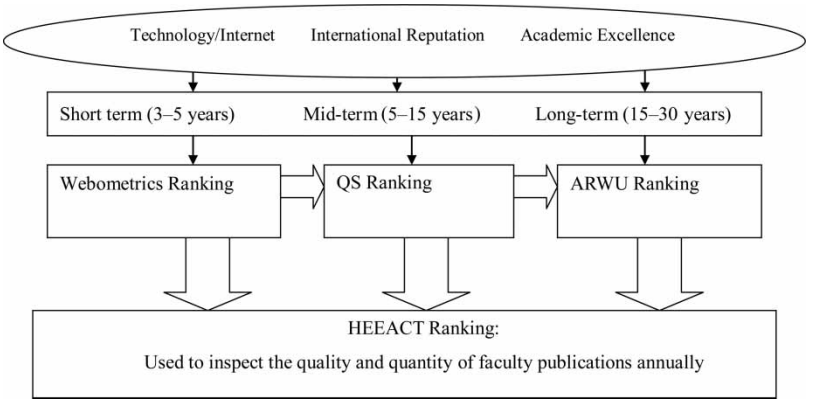

Figure 1. Flow chart of implications of the four global rankings on making institutional strategic plans.

become a top world-class university in the ARWU ranking. However, the HEEACT ranking, in other ways, can be adopted as a basis of regular examination of research output.

To sum up, the proposed strategic planning model is based on the four global ranking systems, so the leading indicators in the three categories of 'Staying in the top 30', 'Moving into the top 100' and 'Moving up rank position' are definitely relevant to the research outputs of an institution. Some of these indicators will take a longer time to improve, such as Nobel Prize Laureates and a change in a university's global academic reputation. On the other hand, if all institutions follow the model, it is highly likely that not all of them will actually move into the ranking they expect to be in. Therefore, it is necessary to note that these are only guidelines and not meant to be used as rigid cause-and-effect models. The other key point here is to inform academics about the rankings, so that they do not rely on only a single model to implement policies for improving the institution's standing.

Conclusion

To achieve a good global ranking is becoming more and more important because the areas of general reputation of the institution, student recruitment, networks, alliance building and even the recruitment of academics and attracting financial resources, are inevitably affected. Therefore, understanding more about the features of global rankings is the first step to improving performance and making informed decisions. If institutions are going to set goals about rising to a certain level in a given world ranking system, administrators must understand what actions need to be taken to reach that goal and what limitations could be encountered. Such knowledge will enable top decision-makers on campus to set realistic goals that have a chance of being attained.

On the one hand, the proposed model demonstrates that while the Webometrics' indicators are more appropriate for short-term planning, the QS rankings are for mid-term planning and the ARWU rankings are for long-term planning. The HEEACT ranking can be used as a tool for the annual check on the quantity and quality of research output of an institution but it can only provide very rough guidance and clues to institutions on which road to take to achieve academic excellence.

Institutions still have to be very careful in making educational policy choices that could potentially result in the university moving up in the ranking based on the above analysis.

On the other hand, it should be noted that a clear vision, institutional features, favourable governance and sufficient resources, which were not taken into consideration in the above model (or in the four global rankings themselves), are all crucial if a university is to rise and stay at the top in the rankings. When an institution focuses largely on improving these indicators, which are not part of the rankings, it could have the longer-term beneficial effect desired. Therefore, it should be understood that 'parachuting' Nobel Prize winners into the institution is not going to make it world-class overnight. In addition to rankings, there are various perspectives on what comprises a world-class university, such as internationalization, diversity, talented people, quality of teaching, IT use, university links with the community and so on (Levin, Jeong, & Ou, 2006). As Salmi (2010) stated, 'there is no single road to excellence' (p. 14). Only with effective leadership and vision will institutions have the potential to become 'world-class' universities.

References

Altbach, P.G. (2007). The costs and benefits of world-class universities. In J. Sadlak & N.C. Liu (Eds.), *The world-class university and ranking: Aiming beyond status* (pp. 363–370). Bucharest: UNESCO-CEPES.

Altbach, P.G. (2006). The dilemmas of ranking. *International Higher Education*, *42*, 2–3. Retrieved February 22, 2011, from https://htmldbprod.bc.edu/pls/htmldb/f?p=2290:4:0::NO:RP,4:P0_CONTENT_ID:100222

De Maret, P. (2007). Universities in the world: What for? In J. Sadlak & N.C. Liu (Eds.), *The world-class university and ranking: Aiming beyond status* (pp. 31–38). Bucharest: UNESCO-CEPES.

Feng, V.D.H. (2007). World universities rankings: Generic and intangible features of world-class universities. In J. Sadlak & N.C. Liu (Eds.), *The world-class university and ranking: Aiming beyond status* (pp. 55–60). Bucharest: UNESCO-CEPES.

Griffith University (2010). Global benchmarking of Griffith University's research performance and strategy, Unpublished manuscript.

Hazelkorn, E. (2007). The impact of league tables and ranking systems on higher education decision making. *Higher Education Management and Policy*, *19,* 81–105.

Hou, Y.C., & Morse, R. (2009). Quality assurance and excellence in Taiwan higher education: An analysis of three major Taiwan college rankings. *Evaluation in Higher Education*, *3*(2), 45–72.

Institute for Higher Education Policy. (2007). *College and university ranking system*. Washington, DC: Author.

King, R. (2009). *Governing universities globally: Organization, regulation and rankings*. Cheltenham, UK: Edward Elgar.

Levin, D.J. (2002). *The uses and abuses of the US News rankings.* Association of Governing Boards Priorities, Autumn.

Levin, H.M., Jeong, D.W., & Ou, D. (2006, March). What is a world-class university? Paper presented at the Conference of the Comparative & International Education Society, Honolulu, Hawaii. Retrieved February 20, 2010, from http://www.tc.columbia.edu/centers/coce/pdf_files/c12.pdf

Lock, W., Verbik, L., Richardson, J., & King, R. (2008). *Counting what is measured or measuring what counts? League Tables and their impact on higher education institutions in England*. Bristol, UK: Higher Education Funding Council for England.

National Taiwan University (2008). *National Taiwan University's 'Aim for the Top University Project'.* Retrieved February 20, 2010, from http://top100.ntu.edu.tw/en/proposal.pdf

Neubauer, D. (2010). Ten globalization challenges to higher education quality and quality assurance. *Evaluation in Higher Education*, *4*(1), 13–38.

Portnoi, L.M., Bagley, S.S., & Rust, V.D. (2010). Mapping the terrain: The global competition phenomenon in higher education. In L.M. Portnoi, V.D. Rust, & S.S. Bagley (Eds.), *Higher education policy, and the global competition phenomenon* (pp. 1–14). New York: Palgrave Macmillan.

Sadlak, J. (2010). Quality challenges in a changing landscape of higher education: Place and impact of academic rankings. *Evaluation in Higher Education*, *4*(1), 1–12.

Salmi, J. (2009). *The challenges for establishing world-class universities*. Washington, DC: World Bank.

Salmi, J. (2010). The road to academic excellence: Lessons of experience, Unpublished manuscript.

Usher, A., & Savino, M. (2007). A global survey of university ranking and league tables. *Higher Education in Europe*, *32*(1), 5–16.

WUC-3 official website (2009). *3rd International Conference on World-Class Universities*. Retrieved June 30, 2010, from http://gse.sjtu.edu.cn/WCU/wcu-3.htm