one parent with a four-year college degree, suggesting the need to rethink the assumption that "low-income" students are also "first-generation college-going" (and vice versa).

At the same time, Pell Grant recipients at UC have only slightly lower GPAs than their wealthy counterparts; this is true in math, science, and engineering and in humanities and social science fields. Poor students at UC generally have the same levels of satisfaction with various aspects of their undergraduate experience (e.g., overall satisfaction and quality of advising received) and in their sense of belonging within a campus community as rich students.

We also found some small but intriguing differences across UC campuses with poor students less satisfied relative to their affluent peers at those campuses with smaller proportions of lower-income students. Having a "critical mass" of low-income students may be extremely important in retaining and boosting their academic performance, and therefore we might see different results among, for example, the Ivy League campuses.

Without an equivalent data source to the survey Student Experience in the Research University Project and Consortium at other US universities currently, we sense that the increased presence of immigrant groups and their relatively high academic performance will grow as a phenomenon across the nation, as well as in Europe and other relatively open societies that depend economically on in-migration.

We also think it relatively safe to say that, in the case of the United States, public institutions will remain the primary entry point for middle- and lower-income students. Indeed, there may be a further market shift in which demand increases significantly for public institutions in light of significant shifts in the economic status of families during the current economic crisis—that is, if public universities gain the funding to take on growing enrollment demand. ■

Regional Citation Indexes: A Global Research Priority

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In 1955, Eugene Garfield, the founder of the Institute for Scientific Information (ISI, now part of Thomson Reuters), introduced his ideas to create "citation indexes for science." Garfield addressed the use of cited references in a scholarly paper as descriptors of the "molecular unit of thought" of the author. The basic challenges of traditional subject-based indexes were, as he pointed out, that human indexers cannot anticipate the infinite number of possible scientific approaches each scientist may take and that those indexers were required to be familiar with the subject matter. Compared to human indexing, the recording of all cited references in a given paper is a mindless task. Therefore, it can overcome those challenges while maintaining the interlinking relationship of literature by making proper references from one to another. The citation index was proposed as an information retrieval tool to trace the development of a particular topic over time, through cited references.

Today, the Web of Science® database indexes more than 10,000 journals of natural and social sciences and the arts and humanities.

The first edition of the Science Citation Index was published in 1963 in five volumes with 102,000 source articles from 613 journals, and the cited references yielded 1.4 million items. As technology advanced, the citation index evolved from print format to microfiche, to compact disc, and to the Web database. Today, the Web of Science® database indexes more than 10,000 journals of natural and social sciences and the arts and humanities. Its depth of coverage has been expanded to cover the period from 1900 to the present. In 2008 alone it indexed more than 1.6 million records with 41 million cited references. Over 20 million users in 90 countries use Web of Science.

Citation Indexes for Quantitative Analysis

While the original motivation in creating citation indexes was to enhance the retrieval of scientific information, the inventor and his supporters foresaw more purposes—as monitoring the growth and structure of scientific activities or measuring the significance of someone's research indicated by citation impact. The ever-growing scale of scientific research, as well as its interdisciplinary nature, sometimes hampered objective and fair research assessment, even when done by a field expert.

Moreover, what was once considered as a time-consuming exercise—to capture a sizable body of scholarly literature and index all the cited references—turned out to be a cost-effective enterprise accelerated by the advancement of information technology and computing. The bibliometric study, where publication and citation counts are the basic units, became widely adopted to complement human judgment in assessing scientific research outcomes of countries, institutions, and researchers.

Regional Citation Indexes and the Global View

It was only in recent years since the 1990s that citation indexes and bibliometric research drew the attention of Asian countries. By that time, bibliometric applications had been widely exercised in Western countries for the purpose of measuring scientific output and research performance. The need for citation indexes to cover non-English literature was a natural response from Asian research communities, as the ISI citation indexes focused on internationally recognized "high-quality" journals, the majority of which were written in English. The lack of complete coverage of scientific literature was not necessarily an argument against the original citation index Garfield had envisioned. Rather, it was created as a "starting point" for virtually all researchers working on any given topic in any field.

When adopted for research evaluation purposes, however, the pressing need became obvious to adequately supplement what was already provided by ISI with locally collected materials. Especially in the regions where scholars publish not only in English but also in their local language, there has been a growing demand of indexing local journals to form their own citation indexes.

These regional citation indexes are available in China, Japan, Korea, and Taiwan. Recently, in those countries where English is more commonly used, such as India, there is discussion of the benefit of creating their own versions of citation indexes.

> *The bibliometric study, where publication and citation counts are the basic units, became widely adopted to complement human judgment in assessing scientific research outcomes of countries, institutions, and researchers.*

Globalization of Scholarly Research

In 2005, ISI (then Thomson Scientific) reported the United States' declining share of the world's science output. This trend had been observed since the early 1990s and the US share has since been surpassed by the European Union countries' output share. The output share from the Asia Pacific region has shown a steady rise since the early 1990s, and it has been predicted that, at that prevailing rate, the Asia Pacific region would likely outstrip the share of the United States by 2011. In fact, by 2007 Asia Pacific accounted for 28.62 percent of the total number of papers published in the world, while the US share came down to 30.95 percent from what was once 39.14 percent in 1981.

The overall number of papers published in most countries has been increasing, even as the percentage share from each may have fluctuated. These fluctuations can be caused by many factors, each of which may have influenced another. One obvious pattern is an increasing frequency of research involving international collaboration, resulting in many authors contributing to a paper from diverse locations around the globe.

Conclusion

While having been motivated primarily to satisfy the research assessment needs of the local scientific community, regional citation indexes have now inspired a global audience to seek scientific collaboration with them. Garfield's citation index has stimulated many groups to create additional options to expand what was originally envisioned as the Web of Science.

Beyond the transformative role of citation indexes in information retrieval, the citation counts have ushered in a new era in research performance assessment. One that demonstrates quality, as implied by citation impact, is more important than mere quantity of output. The regional citation indexes will reveal which institutions, people, and papers have had an influential place in moving science forward at the local level. ■

Wolves in Chancellors' Clothing

George D. Gollin

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Software engineers realize that their new operating systems will be deployed into a perilous networked environment. Aerospace engineers build their jets with an eye toward unexpected thunderstorms and engine failures. These professionals understand that scrupulous attention to system integrity in hostile environments is part of the design process for any complex system.

The higher education community, however, has not yet evolved a similar professional culture: our organizational structures can be naïve, unintentionally opening new channels for substandard degree providers to misrepresent their legitimacy. We would do well to learn from our engineering colleagues who build systems that are expected to come under attack.

Pay-to-play and the US Medical Licensing Exam

The Foundation for Advancement of International Medical Education and Research maintains the barrier between the United States Medical Licensing Exam and students from non-US medical schools. Only graduates from schools in the foundation's International Medical Education Directory can take