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Organizational Cultures in U.S. Research-Oriented Universities

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Introduction

The governance of any type of organization, including research-oriented universities, is constrained by pre-existing organizational cultures. An organizational culture consists of attitudes, experiences, beliefs, and values shared by members of an organization that are reinforced over time through a variety of practices. Organizational cultures are maintained or altered consciously by leaders, but many are also transmitted from generation to generation without the direct intervention of management.[1]

Two such cultures that strongly affect the governance of universities in the United States are those created by federal funding for research, which I will refer to below as the Vannevar Bush approach (VB for short), and the liberal arts tradition.

The Vannevar Bush Approach and Federal Funding

Vannevar Bush was a prominent intellectual and policy maker during World War II and the early years of the Cold War. He designed and became the first head of the National Defense Research Committee (NDRC) in 1940. The NDRC was absorbed into the Office of Scientific Research and Development (OSRD) in 1941, which Bush also headed. One of the responsibilities of the OSRD was to oversee the Manhattan Project. The OSRD shrank in size and importance after the end of World War II. Bush moved on to become head of the Carnegie Institution of Washington. In 1947, President Truman vetoed a bill, supported by Bush, proposing the conversion of the OSRD into a National Science Foundation (NSF), because he thought the proposed NSF was not sufficiently accountable to the executive branch. Nevertheless, he appointed Bush to lead the newly created Research and Development Board which took over the duties of the OSRD. Finally, in 1950, President Truman signed the National Science Foundation Act, which was organized along the lines proposed by Bush is his 1945 report, *Science – The Endless Frontier*.[2]

Bush's idea for the NSF was that there needed to be more generous and long-term federal funding of science in colleges, universities, and research centers. He proposed five fundamental principles for the agency:

– there must be stability of funds over a period of years so that long-range programs may be undertaken.
– The agency to administer such funds should be composed of citizens selected only on the basis of their interest in and capacity to promote the work of the agency. They should be persons of broad interest in and understanding of the peculiarities of scientific research and education.
– The agency should promote research through contracts or grants to organizations outside the Federal Government. It should not operate any laboratories of its own.
– Support of basic research in the public and private colleges, universities, and research institutes must leave the internal control of policy, personnel, and the method and scope of the research to the institutions themselves.
– While assuring complete independence and freedom for the nature, scope, and methodology of research carried on in the institutions receiving public funds, and while retaining discretion in the allocation of funds among such institutions, the Foundation proposed herein must be responsible to the President and the Congress.[3]

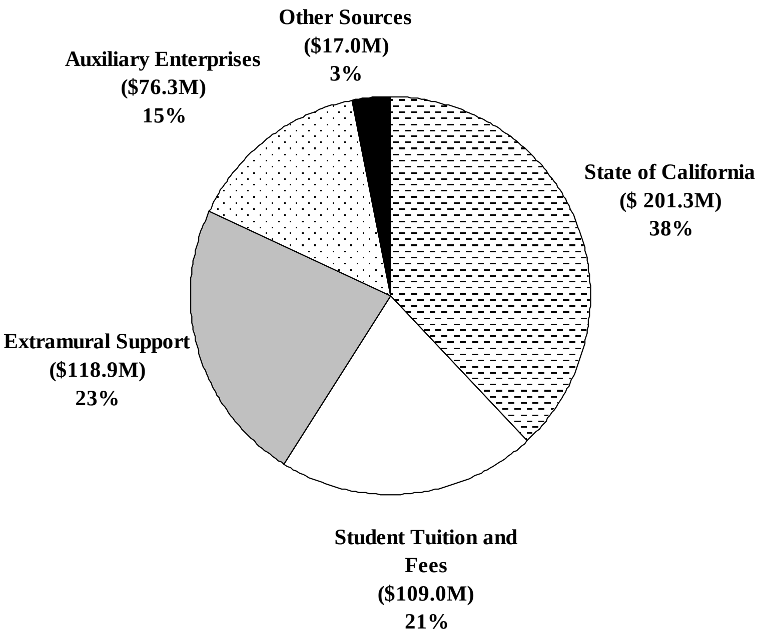
Bush's intent was clearly to keep civilian research separate from military research (he is quite explicit about this throughout the report). He wanted all NSF employees and contractors to be civilians with scientific backgrounds and did not want the NSF to operate its own laboratories. He wanted to assure that government funding to colleges and universities did not come with any undue governmental influence. The fifth fundamental principle addressed President Truman's concern about accountability.

Although not specified in Bush's proposals, NSF grant proposals were sent out for "peer review" by program officers.[4] The initial low funding levels and the inevitable concentration of grants in elite colleges and universities made the NSF vulnerable to attacks of elitism by members of Congress. A division of labor between the National Institutes of Health and the NSF resulted in the former handling the majority of grants for the health sciences and medicine, and the later dealing only with basic biological research along with research in the other natural sciences. Support for the social sciences was initially low and controversial, but rose gradually.[5]

The significance of this tradition lies in the overwhelming importance of public funding of university research in the United States by the NSF and the NIH primarily. Universities ask for and receive "indirect costs"[6] for each grant awarded to affiliated "principal investigators." An indirect cost is cost that cannot be specifically attributed to an individual project, but which is incurred as a result of the need to provide facilities or administration associated with the grant. An award for biological research, for example, will pay direct costs such as the salaries of researchers and equipment needed to conduct the research, but also indirect costs to the university that supplies the physical and administrative infrastructure for the research.

Many universities depend heavily on indirect costs from "sponsored research." A recent example can be found in the budget for the University of California at Santa Cruz for the 2007-2008 fiscal years.[7]

Figure 1: Where the Funds Come From…



Extramural support includes federal grants made to UCSC researchers, which in this case constituted over 20 % of annual revenues. This was not atypical for research-oriented universities in the United States. My own university, Indiana University, depended about equally on state subsidies and tuition for about half of its revenues. Some states were more generous than others. Some universities, like Johns Hopkins University in Baltimore, were more dependent than UCSC or Indiana on sponsored research. In fiscal year 2006, Johns Hopkins received $1.3 billion in research funding from the NSF, the NIH, the National Aeronautics and Space Agency (NASA), and the Department of Defense (among others), giving it the distinction of being first in the nation in federal funding for the 28th consecutive year.[8]

The National Science Foundation publishes annual rankings of universities in terms of total federally funded research.[9] The University of Washington at Seattle is a far second to Johns Hopkins, followed the University of Michigan, and Stanford University.

Table 1:

Federally financed R&D expenditures at universities and colleges, ranked by FY 2006 expenditures: FY 1999-2006 (Dollars in thousands)

Rank	Institution	1999	2000	2001	2002	2003	2004	2005	2006
	All institutions	16,103,436	17,538,286	19,233,421	21,863,925	24,758,853	27,630,624	29,191,369	30,033,156
1	Johns Hopkins U, The	770,580	793,266	879,741	1,022,510	1,106,971	1,229,426	1,277,292	1,307,453
2	U. WA	368,112	389,622	435,103	487,059	565,602	625,218	606,317	650,394
3	U. MI all campuses	334,226	364,033	396,117	444,255	516,818	521,339	554,516	565,739
4	Stanford U.	353,947	367,083	384,468	426,620	483,540	541,667	574,675	540,069
5	U. WI Madison	249,212	278,629	304,009	345,003	396,231	434,423	477,582	491,810
6	U. CA, Los Angeles	251,999	274,162	312,858	366,762	421,174	461,145	469,889	483,873
7	U. PA	279,013	312,434	351,996	397,587	415,631	435,343	465,284	478,773
8	MA Institute of Technology	308,921	306,668	304,319	330,409	356,206	427,552	457,235	476,362
9	U. CA, San Francisco	233,181	248,878	277,489	327,393	371,697	418,944	438,988	464,660
10	U. CA, San Diego	292,007	326,037	343,276	359,383	400,100	465,629	463,946	463,807

Federally financed R&D expenditures at universities and colleges, ranked by FY 2006 expenditures: FY 1999-2006 (Dollars in thousands)

The desire to emulate the success of these universities is a strong motivator for university administrators. Anything that results in increases in federal funding of research is highly valued not just for purposes of prestige but also because of the impact on university revenues. As a result, many universities provide incentives and rewards for faculty that apply successfully for federal grants. This includes giving credit for grant seeking activity in tenure and promotion decisions.

Because success in obtaining grants depends at least partly on scholarly productivity, universities also reward productivity. They might do so in any case, but the need to compete with other universities for federal funding makes it even more desirable. Scholarly productivity is measured, albeit imperfectly in terms of quantity of publications and quality of outlets. Because some book publishers and journals are more prestigious than others, publications of books by prestige presses and journals count more than other publications for tenure and promotion.

Another consequence of the Vannevar Bush approach to federal funding is the stress on basic as opposed to applied research, especially in the sciences. While Bush spoke about the practical implications of research for commerce and the need for universities to maintain control over the intellectual property (patents and copyrights) that resulted from university research, Bush and subsequent policy makers stressed the importance of supporting basic research because they assumed that private firms and laboratories would not be as willing to engage in basic research because it made more sense for private firms to do applied rather than basic research. Applied research was more likely than basic research to result in new products and processes that could affect the corporate bottom line. University researchers would be at a disadvantage because they were too far from the market to understand its imperatives.

Scholars like Edwin Mansfield argued that basic research in universities eventually resulted in new products/processes in any case, so the key to a positive economic impact of university research on the economy was to make sure that there was an efficient way of transferring scientific results and technologies from the university to private sector.[10] This and the desire to control intellectual property made possible by university research led universities to establish bureaus of technology transfer. At Indiana University, the success of Crest fluoride toothpaste became a model for how to manage technology transfer, much to the chagrin of scientists in recent decades.

The Liberal Arts Tradition

Alongside the Vannevar Bush approach to the administration of university research efforts, a much older tradition, that of the liberal arts, remained influential not just for the arts and humanities but also for other disciplines. Many of the university's researchers completed their undergraduate studies at liberal arts colleges where the stress was on a balanced education in a wide variety of disciplines to produce graduates who could transcend disciplinary boundaries and draw upon the best ideas not just to inform their research but to enable them to provide an education to their students that was not overly specialized, and that improved the quality of their lives.

The liberal arts tradition has its routes in Greek and Roman ideas of education.

After Greek philosophy had reached full flower in the fourth century B.C., scholars and teachers sought to establish a curriculum to prepare students for the higher and more difficult studies. Out of these efforts came what was called the *enkuklios paideia*, the learning circle, from which we get our word encyclopedia.

A first century B.C. scholar and statesman named Marcus Terentius Varro codified this slowly developing curriculum into nine disciplines and introduced it to Rome. His work provided a model for Latin scholars ("encyclopedists") of the later Roman period; such famous names as St. Augustine, Boethius, and Cassiodorus refined and developed the tradition; and by the fifth to sixth century A.D. a canon of seven liberal arts (dropping Varro's architecture and medicine) had been established and incorporated into Christian education.

These seven arts were divided into the two familiar categories: the trivium, consisting of the verbal arts of logic, grammar, and rhetoric; and the quadrivium, consisting of the numerical arts of mathematics, geometry, music, and astronomy. These disciplines came to constitute the liberal arts, which "provided the basic content and form of intellectual life [in Europe] for several centuries." The liberal arts were, in effect, regarded as "the seven pillars of wisdom."[11]

The basic idea behind the liberal tradition, therefore, is that all learning must be built on a foundation that requires students and scholars to understand how to use language, logic, mathematics, and other types of puzzle-posing and puzzle-solving tools to advance the state of knowledge. As a result, liberal arts colleges and universities establish distribution requirements for all students who attend so that they will be exposed at least to all these approaches. Regardless of where in the universe of disciplines a given individual decides to invest their time and energy, there is a strong benefit, according to defenders of the liberal arts tradition, for everyone to have this common foundation of learning.

In some respects, the liberal arts tradition is antithetical to the Vannevar Bush approach. Those concerned with maximizing federal grants, for example, to the natural sciences, may find the demands imposed on university resources by advocates of the liberal arts tradition to be inefficient and wasteful. Since many of the disciplines that are supposed to be part of the liberal arts curriculum do not receive any form of federal funding, they may be seen as a drag on the rest of the university's ability to achieve its most important goals (i.e. more government-funded research).

Advocates of the Vannevar Bush approach and the liberal arts tradition share certain values, including, among others, the pursuit of high-quality scholarship as evidenced in publications in visible outlets, the need for students to be educated broadly so that they will be aware of developments in fields or disciplines that are not their main focus but that are still potentially important. For example, no physicist would be unhappy about requiring students to study mathematics or statistics and they might even by willing to encourage them to study philosophy or the history of religion to the extent that great physicists in history have been influenced by these disciplines. Similarly, scholars of comparative literature might want their students to have an exposure to the sciences in order to understand allusions to scientific ideas and discoveries in literature.

Interestingly, the two traditions tend to share a lack of interest in applied scientific and technological research because this area of inquiry is seen as not contributing to the prestige of the university and may drag the university into relationships with governments or private business enterprises that compromise the intellectual independence of universities. Classicists and biologists sometimes agree, therefore, that universities should resist pressures to contribute to economic development through cooperative scientific and technological endeavors with businesses and/or governments.

Transcending the Two Traditions?

Major research universities like Johns Hopkins, Stanford, MIT, and the University of California system have engaged extensively in activities that cross the line that some advocates of the two traditions would like to impose on applied research. A wide variety of institutional innovations have arisen to deal with the concerns of humanists and scientists about the potential loss of intellectual autonomy that might result from these endeavors. These include the creation of special laboratories with contractual relationships with public or private donors, business incubators to allow academics to make the transition from teaching and research to participating in entrepreneurial startups, and special mechanisms to allow some intellectual property rights resulting from government-funded university research to be transferred to startup firms.

It is common for administrations of top research universities to organize "dog and pony shows" to brief government officials and potential investors on university research that might have commercial implications. These special events become a form of university-business-government networking that, in principle, can shorten the time between the creation of new knowledge in the academy and the commercialization of products and services based on that new knowledge. In the so-called "competition state" that has succeeded the "welfare state" in an increasingly globalized world economy, there has been a marked rise in the perceived value of these sorts of university activities. To the extent that this is seen as undermining the purity of both the Vannevar Bush approach and the liberal arts tradition, university faculty invested in those two traditions will continue to resist it.

Endnotes

[1] Joanne Martin, *Organizational Culture: Mapping the Terrain* (Thousand Oaks, Calif.: Sage, 2001); Edgar Schein, “Organizational Culture and Leadership,” in Jay Chafitz and J. Steven Ott, eds., Classics *of Organization Theory* (Fort Worth: Harcourt, 2001); Edgar Schein, *Organizational Culture and Leadership*, 3rd Edition (San Francisco: Jossey-Bass, 2004).

[2] G. Pascall Zachary, *Endless Frontier: Vannevar Bush, Engineer of the American Century* (Cambridge, Mass.: MIT Press, 1999).

[3] Vannevar Bush, *Science – The Endless Frontier*, <http://www.nsf.gov/about/history/vbush1945.htm#ch6.3>.

[4] Peer review is an institution considerably older than the National Science Foundation and dates back to the 18th century according to Dale J. Benos et al.: “The Ups and Downs of Peer Review”, *Advances in Physiology Education*, Vol. 31 (2007), pp. 145–152. For an argument that peer review had much earlier origins see Ray Spier, “The history of the peer-review process”, *Trends in Biotechnology*,. Vol.20 (2002), p. 357-358.

[5] NSF 88-16, *A Brief History* (Washington, D.C.: NSF, July 15, 1994), <http://www.nsf.gov/pubs/stis1994/nsf8816/nsf8816.txt>.

[6] The current formal name is Facilities and Administrative (F&A) costs.

[7] <http://planning.ucsc.edu/budget/reports/profile2007.pdf>.

[8] “Johns Hopkins First in R&D Expenditures for 28th Year,” Headlines@Hopklins news release, December 3, 2007, <http://www.jhu.edu/~news_info/news/univ07/dec07/r&d.html>.

[9] <http://www.nsf.gov/statistics/nsf08300/pdf/tab28.pdf>.

[10] See, for example, Edwin Mansfield, “Contribution of R&D to Economic Growth in the United States,” *Science*, Vol. 175, No. 4021 (February 4, 1972), 477-486.

[11] Christopher Flannery, “Liberal Arts and Liberal Education,” *On Principle*, Vol. 6, No. 3, (June 1998), <http://www.ashbrook.org/publicat/onprin/v6n3/flannery.html>; quotations from David L. Wagner, ed., *The Seven Liberal Arts in the Middle Ages* (Bloomington, Indiana University Press, 1983).