



Building an Entrepreneurial University

by Michael M. Crow
President, Arizona State University

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“**E**nterprise” is a concept sometimes wholly lacking in discussions about higher education and the American research university. “Academic enterprise” and the entrepreneurial academic culture that such an orientation instills encourage creativity and innovation with intellectual capital—the primary asset of every college and university.

Generally associated with the private sector, the spirit of enterprise is nonetheless highly relevant to the advancement of all of our nation's colleges and universities, but especially our research universities—institutions dedicated to both teaching and discovery. There are approximately 5,000 institutions of higher education in the United States and, of these, roughly 150, both public and private, are classified as “research extensive” in the classification established by the Carnegie Foundation for Higher Education. These are the institutions that increasingly fuel the national economy by producing leaders in all sectors of academia, business, industry, and government, and through perpetual innovation in products and processes.

a view from the united states

Since becoming the president of Arizona State University in July 2002, I have been leading an effort to reconceptualize a large public university as an academic enterprise—agile, competitive, adaptable, and responsive to the changing needs both of our constituencies and global society alike. The speed with which we now make and implement decisions and establish collaborative relationships with other academic institutions, and with business and industry, is characteristic of private enterprise. As an enterprise, we acknowledge and embrace the fact that we operate in a competitive arena. We are competing not only for research dollars and private investment, but also for the very best students, faculty, and administrators, and above all, for the very best ideas.

Instilling the spirit of enterprise into the institutional culture of a public university is only one of my objectives as the president of an emerging research institution. The larger task we have taken on is to redefine public higher education through the creation of a prototype solution-focused institution that combines the highest level of academic excellence, maximum societal impact, and inclusiveness to as broad a demographic as possible. Predicated thus on excellence, access, and impact, the paradigm is conceptually framed as the “New American University.”

The spirit of enterprise I endorse therefore must be integrated into a larger context. Academic enterprise is only one of eight “design aspirations” for the New American University. There are many ways to parse the concept of the New American University, but, in brief, its objectives are inherent in the following guidelines that, reduced to their essential terms, enjoin the academic community to (1) embrace the cultural, socioeconomic, and physical setting of the institution; (2) become a force for societal transformation; (3) pursue a culture of academic enterprise and knowledge entrepreneurship; (4) conduct use-inspired research; (5) focus on the individual in a milieu of intellectual and cultural diversity; (6) transcend disciplinary limitations in pursuit of intellectual fusion; (7) socially embed the university, thereby advancing social enterprise development through direct engagement; and (8) advance global engagement. Taken together, these comprise a paradigm for academic institutions, both public and private, that I advocate without reservation. All of the design aspirations are interrelated, but in the following I will focus primarily on academic enterprise. Before we consider our efforts to rethink the contemporary

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American research university, the following brief historical overview of the institutional form will set the context for a discussion of its present design flaws and the imperative for its reconceptualization.

The Evolutionary Trajectory of the American Research University

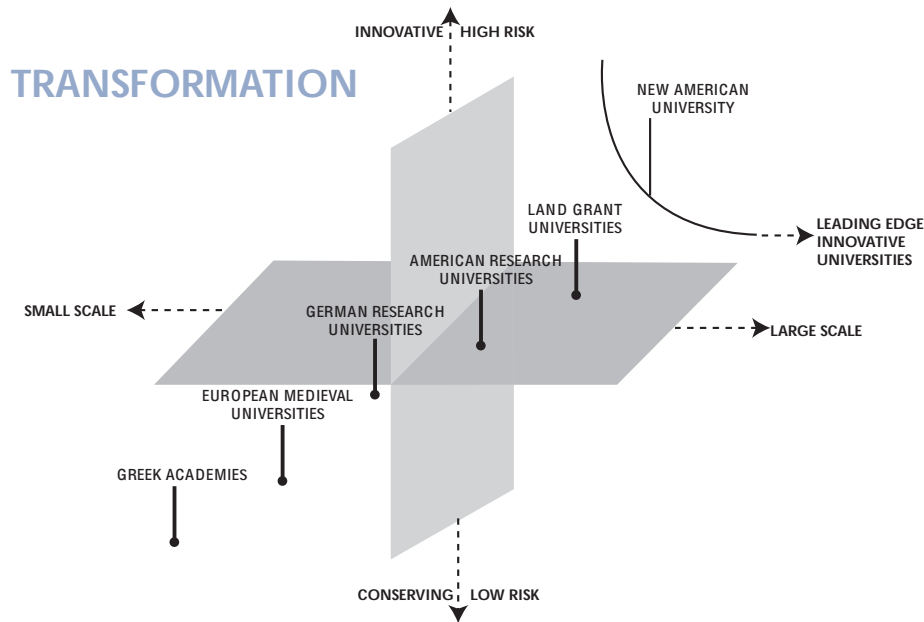
With a global population of 6.5 billion projected to increase to 8.5 billion by mid-century, we face challenges of unimaginable complexity, both as a species and, more narrowly, in terms of our standard of living and quality of life as a nation. But we strive to deny complexity in our national policymaking and planning, and, rather than learning to understand and manage complexity in the academy, we restrict our focus with ever-greater specialization and the narrowing of disciplines. Our universities remain highly static, resistant to change, unwilling to evolve in pace with real time, and focused primarily on their advancement of abstract knowledge. The organizational frameworks we call universities—this thousand-year-old institutional form—have not been designed to accommodate change on the scale we are witnessing or the attendant increases in complexity. Moreover, organizational constraints derived from the flawed institutional design of our colleges and universities prevent them from realizing their entrepreneurial potential. In order for our universities to overcome their ossification, academic enterprise must become a new organizing principle, both organizationally and conceptually. American research universities need not remain static, monolithic behemoths, unwilling or unable to advance their own institutional evolution or to catalyze positive societal transformation.

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The evolutionary trajectory of universities in the Western world can be modeled as a process visualized along two axes. The x-axis represents the scale of the institution, with scale meaning more than just size. Scale in this usage refers to the *breadth of functionality*, which measures more than just the number of disciplines studied. If the institution is a comprehensive knowledge enterprise such as the New American University, it will be committed to the traditional missions of teaching, research, and public service, but, in addition, will advance innovation and entrepreneurship. Scale thus refers to both the intellectual, or pedagogical, and

a view from the united states

functional breadth. The y-axis, meanwhile, reflects the institution's *conception of itself* as an evolving, entrepreneurial entity. At the low end of the y-axis, we have what organizational theorists call conserving institutions, those that are inwardly focused, risk-averse, and concerned primarily with self-preservation. At the upper end are entrepreneurial institutions, those willing to adapt, innovate, and take risks in rethinking their identities and roles. In the following chart, the New American University appears in the curve in the upper-right quadrant reserved for leading-edge institutions designed to accommodate innovation, rapid decision-making, and entrepreneurial behavior.



A brief historical overview of the lineage of our universities—in a sense, our institutional genetic code—demonstrates the dynamics between scale and innovation. On the hills around Athens in Greece, academies formed more than 2,400 years ago when individuals of astonishing intellect like Socrates and Plato and Aristotle assembled and began to conceptualize and advance the core pedagogical methodology that we still use to the present day. The ancient Greek academies developed the capacity to understand nature and society in complex terms, but they were tiny in scale and exclusively “conservative,” in the sense of entrusting themselves to conserve

a view from the united states

knowledge. The ancient academies had little impetus to disseminate knowledge beyond their small circles and no conception of the notion of risk and reward.

Fast-forward 1,500 years: The first universities begin to emerge. Bologna, probably the oldest university in the Western world, was established in the eleventh century, followed by the University of Paris and, soon thereafter, Oxford and Cambridge; institutions like Uppsala University, in Sweden, and Jagiellonian University, in Krakow, become great centers of learning. Within this ethos, universities emerged as organizations focused on discovery. Our very understanding of who we are as a species and our place in the universe is the product of scholars and scientists working in these great institutions. In the office of the rector of Jagiellonian University, an institution established in 1364, one can find the instruments that Copernicus used to determine that the Earth was not the center of the universe. The medieval European universities were slightly larger in scale and only slightly more focused on disseminating knowledge. These institutions had only the most limited concept of risk and reward.

Fast-forward again to the late eighteenth century: Industrialization in Europe begins to transform the socioeconomic and cultural landscape, spreading from Great Britain throughout Western Europe, and especially into central and northern Germany. Driven largely by industrial competition and the emergence of the notion of efficient technology-driven competitiveness, the German universities that arose in the eighteenth century focused on specialized scientific research and were thus the predecessors of American research universities, but, with few exceptions, entrepreneurship was still little in evidence.

The prototype for the American research university was established in 1876 by Johns Hopkins University, which combined the traditional American undergraduate liberal arts college with the German model of the elite scientific research institute offering specialized graduate training. The American research university thus came into being in the decades between 1876 and 1915. During this formative period, existing mature universities redefined themselves as research-grade institutions and new institutions were established on the Hopkins prototype. The roster includes institutions that set the standard for the American research university, including Harvard, Columbia, Michigan, Illinois, California, Stanford, Chicago, MIT, and others. Some of these were land-grant universities established under the Morrill Act. With their connection to large-scale agricultural research, these were among the first universities to explicitly take on a broader functional mission, that of advancing the “agricultural and mechanical arts” for the growth of the country. Rather than focus on teaching the classics to the privileged,

a view from the united states

the land-grant institutions became involved in production agriculture and thus further advanced the model of the entrepreneurial university. The land-grant schools had the capacity to create products and processes and other forms of capital that could be sold and used by consumers outside the university system, and entrepreneurship came to the forefront. Following the example of these pioneering institutions, universities like Stanford and MIT committed themselves to entrepreneurial risk-taking and prospered.

The establishment of the prototype of the American research university was a critical evolutionary step in the growth and development of universities, setting the pattern for intense and focused discovery across all disciplines, the emergence of American-style graduate study leading to advanced degrees, including the PhD, and the emergence of the professoriate as both teachers and practitioners. The important point in this sketchy historical overview is that institutions of higher learning, like all organizations, are evolving entities. To the extent that they can adapt to a changing environment or, better yet, lead the change, they survive and flourish. Like other organizations, they also must be wary of institutional inertia, the resistance to change that almost certainly would bring about their demise.

Institutional inertia is nowhere more evident than in the academic valorization of increasingly specialized knowledge. In our effort to produce abstract knowledge without regard for its impact, many universities have lost sight of the fact that they are also institutions with the capacity to create products and processes and ideas with entrepreneurial potential. Prestige always will attach to the pursuit of the unknown, but I would argue that we must reprioritize our practices and rethink our assumptions if we are not to minimize the potential contributions of academic enterprise. Through some

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strange elitist logic, the concept of entrepreneurship has been eradicated from institutions of higher education in this nation. I would argue that we have been excessively attached to our lineage from the academies of ancient Greece and the medieval European universities. We must instead design some of our institutions to allow us to be competitive and address the challenges that will confront global society in the decades ahead. Our universities must

recover an entrepreneurial edge if they are to be relevant and useful on a global scale. Yet, however significant the potential of their contributions to societal advancement, entrepreneurial universities must first expand access to a broader demographic if their impact is not to be diminished.

Dilemma: Excellence or Access?

Research universities both in the United States and around the world are the primary sources of the knowledge and innovation that have driven the global economy and provided those of us in advanced nations with the standard of living that we have come to take for granted. But in America and elsewhere, leading institutions tend to be *exclusive*—that is to say, they define their excellence based on exclusion. It generally is taken for granted that there are two types of universities: those that focus on academic excellence and discovery, and those that focus on access—providing a base level of higher education. Institutions that focus on academic excellence generally admit only the finest students, most of whom come from privileged socioeconomic backgrounds and have enjoyed undeniable advantages. All others are expected to attend less competitive schools. In terms of societal outcomes, this implicit calculation not only is shortsighted, but also may, in the long run, be a fatal error. There is growing social and economic stratification between those with access to a quality higher education and those without. More and more students who would most benefit from access to this most obvious avenue of upward mobility—those whom we might categorize as “disadvantaged” or “underrepresented”—are denied access for lack of means or choose not to pursue for lack of understanding of a high-quality university education.

Higher education is the means by which a skilled workforce is produced and the source of new knowledge capital and, thus, economic growth and advances in society, for the benefit of both the individual and the collective. The global economy requires skilled workers, and the wage gap between those with education and skills and those without continues to widen. More and more knowledge inputs are increasingly required to perform almost any job in the new global knowledge economy. The economic success of individuals contributes to the success of a society—in fact, it is the main driver.

If we continue to exclude a high proportion of the population from reaching their prosperity potential by excessive and sometimes arbitrary “culling,” we deprive countless individuals of opportunities to attain prosperity. We need to make more of an effort to understand how to educate greater numbers of individuals successfully, but we also must educate people to be successful. This economic dimension is intrinsic to the societal mission of colleges and universities. Individuals deprived of higher education through lack of funds represent not only personal opportunity lost, but also the loss of societal economic prosperity. Individuals deprived of college educations likely will earn lower wages and generate fewer jobs than they would have as graduates. A lack of

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higher education is not only a personal loss; it is a loss for all of society and the global economy.

We reject the conventional wisdom that excellence and access cannot be achieved in a single institution and have committed ourselves to building a university that combines the highest levels of academic excellence with access to a broad demographic, and to accomplish this at scale. Such an institution seeks to provide the best possible education to the broadest possible spectrum of society, embracing the educational needs of the entire population—not only a select group, and not only the verbally or mathematically gifted. Its success will be measured not by whom the university *excludes*, but rather by whom the university *includes*, and from this inclusion will come the diversity necessary for the advancement of society.

Our mission, as we have conceived it, is to build a comprehensive metropolitan research university that is an unparalleled combination of academic excellence and commitment to its social, economic, cultural, and environmental setting. Excellence, access, and impact are thus integral to our mission and integrated in a single institution. Of the 150 major research institutions in our nation, both public and private, ASU alone has sought to redefine the notion of egalitarian admissions standards. Our approach has been to expand the capacity of the institution to meet burgeoning enrollment demand, and provide expanded educational opportunities to the many gifted and creative students who do not conform to a standard academic profile, as well as offering access to students who demonstrate every potential to succeed but lack the financial means to pursue a quality four-year undergraduate education. Our admissions standards are determined by our assessment of a potential student's ability to do university-level work, not by test scores or some other arbitrary indicator.

In the rapidly changing and highly competitive global knowledge economy, the value of a university education has never been greater. Higher education is the means by which a skilled workforce is produced, and is the source of economic growth and advances in our society, for the benefit of both the individual and the collective. Our colleges and universities play a key role in ensuring that, as a nation, we will continue to lead the world in innovation, maintain our competitive advantage, and weave the fabric of our economic prosperity. Without an increasingly highly educated citizenry, we as a nation may face a reduction in our quality of life in the next generation, something unheard of in the past. In order for America to remain competitive, it is imperative that our universities prepare our students to learn rapidly, and make them capable of integrating a broad range of disciplines in a rapidly changing world. But the institutional

design of our universities may itself represent an inherent obstacle. Our reconceptualization of ASU has been undertaken to correct a number of inherent design flaws in American research universities.

Demographic Challenges to Excellence, Access, and Impact

Arizona State University is at once the youngest and largest and fastest growing of all major American research institutions, enrolling more than 64,000 undergraduate, graduate, and professional students in twenty-one colleges of equally high aspiration configured across metropolitan Phoenix. ASU is the only comprehensive university in a metropolitan region with a population that already exceeds four million and is projected to merge into a megapolitan corridor with a population that could approach ten million in the coming few decades. As one of the fastest-growing states in the nation, Arizona will continue to experience large increases in its college-age population but lacks a sufficient four-year college infrastructure to accommodate that growth. Arizona's economy is insufficiently diverse to accommodate its population expansion, and the state has major challenges associated with its environment, health care, social services, immigration, and the performance of P-12 education. As is the case in California, where minorities already constitute a majority, within the near term, no single demographic category will comprise a majority of the population in Arizona. The rapid population growth is accompanied by rapid cultural diversification, and the unprecedented transformation of the regional demographic profile requires ASU to offer access, promote diversity, and meet the special needs of underserved populations.

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At the same time that the greater Phoenix metropolitan region matures and becomes the heart of a vast megapolitan region, ASU has set a course to evolve from a regional university to a national research institution of top rank. In response to demographic pressures, and because we believe that the university can best accommodate the needs of the region by facilitating the broadest possible distribution of its teaching, research, and community service, we plan to increase enrollment from the current level of 64,000 students to approximately 100,000 by 2020, thus providing expanded educational opportunities—both on-campus and online—to qualified students. To accommodate enrollment increases from 35,000 students in 1975 to 100,000 in 2020 is no small feat. In terms of resources and infrastructure, during the past five years we have added nearly seven million square feet of new academic space,

a view from the united states

including more than one million square feet of new research space. The infrastructure required to accommodate such growth requires billions of dollars in capital investment and, in the past five years, we have invested \$ 1.5 billion in new facilities. There remain \$ 3.5 billion of additional facilities yet to come, and the government will finance less than one-third of those. Investment has come from private sector partners, donors, and multiple municipal governments. A master plan is redefining the relationships between the four ASU campuses, the clusters of colleges and schools that comprise each campus, the university community and its academic programs, and the university and surrounding metropolitan region. The intent of the master plan is to create campuses whose buildings and grounds reflect the scope and stature of a world-class institution and provide for our students a vibrant living and learning environment. Among the most important planning principles we observe is the integration of the campus into the community, which is consistent with our design aspiration of “social embeddedness.”

Consistent with our design aspirations to focus on the individual and transform society, ASU proudly champions diversity, and the enrollment of students of color since 1996 has increased by 81 percent. And, while the freshman class has increased in size by 36 percent during the past five years, enrollment of students of color has increased by 40 percent, with students from Hispanic backgrounds now comprising more than 14 percent of undergraduate enrollment. And, in addition to our Latino students, ASU enrolls roughly 1,500 students from Native American backgrounds, one of the largest such enrollments in the nation. In Arizona, our twenty-two Native American tribes speak different dialects that often are correlated with one another, but have no correlation with either English or Spanish.

Demographic diversification among ASU students is accompanied by differentiation in wealth. The average family income of the upper quintile of our students exceeds \$ 200,000 per year. The bottom quintile has a tenfold lower level of income, less than \$ 20,000 per year. Our institution thus enrolls students from families that are wealthy, even by American standards, and others from families that have virtually no income. The current level of investment in undergraduates through scholarship and gift support is approaching \$ 100 million annually and, for graduate students, exceeds \$ 50 million. We have greatly expanded both our investments in general financial aid, and in specific programs designed to help low-income Arizona students attend and graduate. The number of students enrolled from families below the poverty line has risen by roughly 500 percent, a number we expect will continue to grow, and we have increased the number of Pell Grant recipients by one-third, from

a view from the united states

9,200 to 12,300 recipients. A program called ASU Advantage provides tuition, fees, room, board, and books (via merit- and need-based grants and scholarships, and work-study) for students who meet all normal admissions standards and whose family incomes do not exceed \$25,000. And all other students at all income levels pay only about 2 percent of the cost of tuition after merit-based scholarships and need-based grants. Although we expend university resources for programs like ASU Advantage and receive no support from the state, we are overcoming financial barriers to access.

As a public metropolitan research university, the profile of the student body, the character of the research enterprise, and the scope of community engagement differ from that of other institutions. ASU is a public asset that belongs to all the citizens of Arizona, and is an active partner with the private sector in initiatives to enhance the social well-being, economic competitiveness, cultural depth, and quality of life of metropolitan Phoenix and statewide. Consistent with our design aspirations associated with community engagement and societal transformation, ASU offers more than 1,000 outreach opportunities in partnership with more than 500 community organizations across Arizona. ASU is investing in the future of the many diverse communities beyond our campuses.

Institutional Redesign to Facilitate Access to Excellence and Academic Enterprise

Arizona State University is mid-point in a decade of unprecedented change and decisive maturation, positioning itself to emerge as a prominent global university and comprehensive knowledge enterprise committed to teaching, discovery, creativity, and innovation. To promote access to excellence despite the challenges of burgeoning enrollment, we have adopted a distributed model, operating from four differentiated campuses of equally high aspiration, with each campus representing a planned clustering of related but academically distinct colleges and schools. We term this empowerment of colleges and schools “school-centrism.” The school-centric model produces a *federation* of unique colleges, schools, academic departments, and interdisciplinary institutes and centers (“schools”), and a deliberate and planned clustering of programs on each campus around a related theme and mission. Predicated on devolving intellectual and entrepreneurial responsibility to the level of the college or school, the model calls for each school to compete for status, not with other schools within the university, but with peer schools around the country and around the world. Consistent with the design aspiration of academic enterprise, schools are encouraged to grow and prosper to the extent of their individual intellectual and market limits.

a view from the united states

The reconceptualized school-centric organization has produced a federation of twenty-one unique interdisciplinary colleges and schools that, together with departments and research institutes and centers, comprise close-knit but diverse academic communities that are international in scope. Consistent with this school-centric model, we have conceptualized and launched sixteen new interdisciplinary schools, including the School of Global Studies, the School of Human Evolution and Social Change, the School of Materials, and the School of Earth and Space Exploration. Although we are first and foremost committed to educating the students of Arizona, we are equally a cutting-edge discovery organization, focused on contributing to regional economic development through enhanced research and academic programs, including major interdisciplinary research initiatives such as the Biodesign Institute, focused on innovation in health care, energy and the environment, and national security; the Global Institute of Sustainability (GIOS), incorporating the world's first School of Sustainability; and the Center for the Study of Religion and Conflict.

Consistent with our objective of creating differentiated learning environments that address the needs of individual students, we have designated one of our campuses, for example, to emerge as one of the nation's leading polytechnics, with programs that provide both a theoretical and practical learning experience, preparing graduates for direct entry into the workforce. We are advancing two differentiated schools of engineering, one focused on research and the theoretical aspects of technology, and the other on practical application. Similarly, we have established three schools of education and three schools of management or business, each of which is built on a different learning platform. Some are focused on research, some on cultivating leadership skills, and some on practical application through learning-by-doing. We are overlapping and merging these programs to achieve maximum leverage.

At our four campuses, we have instituted a model with no campus-level governance—neither chancellors nor provosts, but only deans heading colleges and schools. Deans are responsible for the emergence of individualized learning environments. We also have made efforts to eliminate the hierarchization or “tiering” of campuses. We do not observe a distinction between a “good” campus, a “not-so-good” campus, and a “still-lesser” campus. Although not always explicit, that tiering process is very common in American universities, and perhaps in some European institutions, and it is a pernicious structural obstacle to student success. The historic Tempe campus used to be known as the “Main Campus,” but now we simply refer to it as Arizona State University at the Tempe campus.

a view from the united states

To fill out the picture of our organizational reconceptualization to maximize academic enterprise, I would like to consider some more complex and even radical modes of innovation. The first is an example of what we call “system innovation.” The goal is to have impact on a major social system through innovation in multiple yet interrelated ways, and the system we are targeting is the P-20 education system. This is a term used in the United States to refer to the whole spectrum of formal education, with the “P” standing for pre-kindergarten and the “20” standing for the last year of formal instruction in graduate school. However, I will summarize what we are doing as an institution to transform education through the twelfth grade.

First, we are building up our institutional capacity to deal with education. For instance, we now have not one but three schools of education, each with a different learning platform for the teachers and prospective teachers who enroll. One school has a focus on preparing leaders in education, another has a focus on technology and innovation, and the third is our more traditional school, the highly ranked Fulton College of Education. At the same time, we are building new collaborative partnerships with entities outside the university. These range from independent, nonprofit groups concerned with education to public school districts in Arizona. We also are becoming more active in education policy, working with public policy makers in our state government and with national organizations.

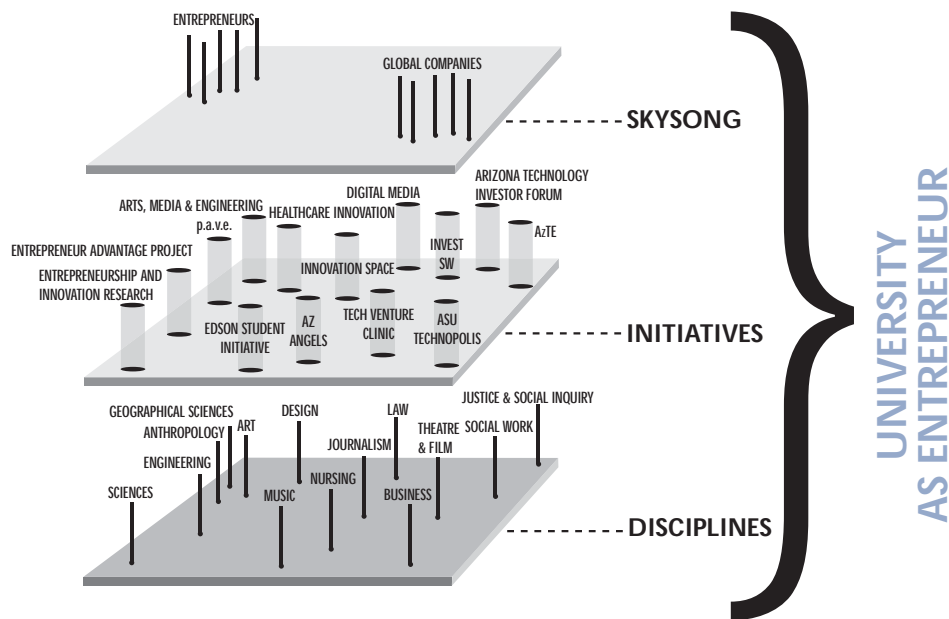
Finally, we are launching a number of strategic initiatives. One is a nonprofit enterprise called University Public Schools, Inc., through which we will operate our own schools to implement new ideas in education. Our first prototype, an elementary school, opened in August 2008. Our schools will not be elite schools for the children of professors, by the way. They will be for students from all backgrounds, including low-income families and immigrant households where the primary language is not English. We want to demonstrate how education can work for every student. We believe that, when education falls short, the main obstacle is not resource constraint, but, rather, idea constraint. So we are working across multiple dimensions—from redesigning the structure of our own university to starting actual new schools in the field—in order to create an entire system of innovation for transforming this social system.

Fostering an Entrepreneurial University: Toward an Ecology of Innovation

To foster the entrepreneurial potential of our institution, ASU also is trying to innovate more effectively by improving core processes that lead to innovative output. The obvious example here is technology transfer or intellectual property

a view from the united states

commercialization. A good bit of what we are doing in this area draws on the work of the Ewing Marion Kauffman Foundation, which has studied the issues extensively. At ASU, we are experimenting with several new approaches at once. To simplify the licensing process, for example, we have introduced the use of licensing templates and master sponsored research agreements, which can reduce the need to negotiate over terms and conditions. In terms of strategic objectives, we are managing our IP for deal flow density rather than for revenue—in other words, to maximize the number of inventions and discoveries actually moved into use, instead of trying to maximize near-term income from fewer and bigger deals. We also are experimenting with faculty entrepreneurship incentives, allocating the income so as to give faculty inventors a greater incentive for starting companies.



A systems innovation approach is reflected in our institution-wide campaign, called “University as Entrepreneur.” The overarching objective of this initiative is perpetual institutional innovation. Toward this end, we seek to inspire and enable both students and faculty members to innovate. In practice, we actually generate new enterprises—whether for-profit startup companies or new ventures in research or education, or useful new projects of any kind. As you can see from the chart, creating

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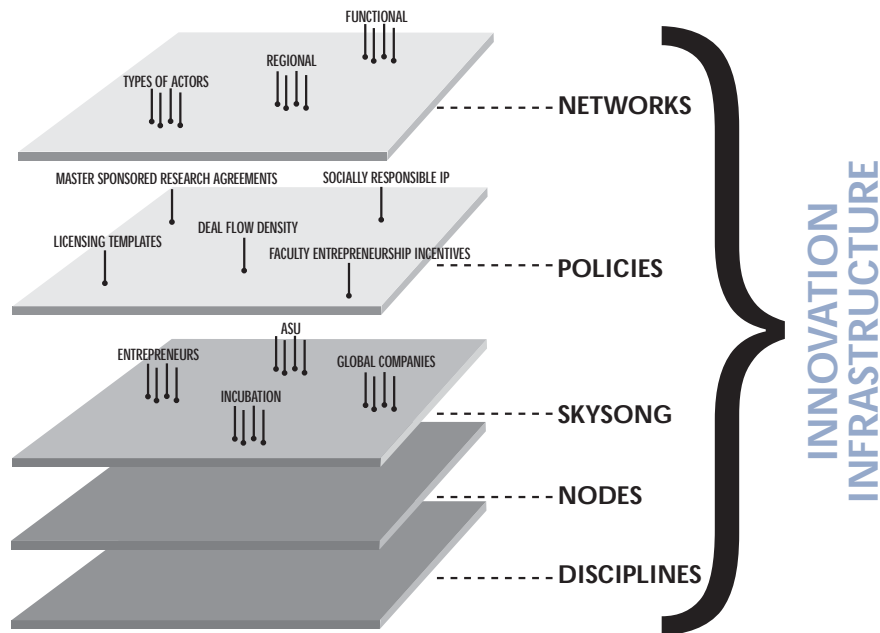
an entrepreneurial university is a multi-level task. We start at the foundation with our academic disciplines. We want to engage all of them, from the arts and humanities and social sciences, to the natural sciences and engineering and the professional schools. Instead of just teaching courses in entrepreneurship that would reach all of the disciplines, we have decided to embed entrepreneurial opportunities and learning environments within each of them. So our nursing college now has an innovation and entrepreneurship center. Our journalism school has a major industry-funded center for innovation in the news media. In every school and discipline, there is now a set of dynamic mechanisms for making innovation something that lives habitually within the context of the discipline.

At the next level up, we launch and facilitate a series of initiatives geared to assisting entrepreneurial ventures that come out of work in the disciplines. We believe there is value in fostering large numbers of initiatives because, inevitably, some will fail. In this manner, we allow natural selection to demonstrate which have merit. One that has shown particular merit is the Edson Student Initiative. Here we have raised an endowed fund to finance companies started by students. The students own the companies and the university expects no return other than seeing the companies take off. This is an idea we picked up from Tec de Monterrey in Mexico, and it is working well in metropolitan Phoenix: We are incubating about eighty student-led companies right now. Another initiative that has worked well is ASU Technopolis, which brings together entrepreneurs, venture capitalists, and creative thinkers in the Phoenix region. ASU Technopolis encourages innovation and economic development by providing fledgling technology and life sciences entrepreneurs with skills and strategies necessary to convert ideas into commercially viable businesses. Guidance is available for product development, business infrastructure development, proof-of-concept capital formation, revenue development, and access to funding. Technopolis stimulates economic development by offering a series of rigorous programs that educate, coach, and network local entrepreneurs. Through this program, approximately 500 early-stage companies have received coaching and mentoring, and they have raised about \$75 million in private investment capital.

The top level in the chart is labeled “SkySong,” which requires some clarification. It is not uncommon for universities to establish research parks, which begin as entrepreneurial ventures but often turn out to be more about real estate. We decided to make our enterprise more than the typical real estate project by expanding the vision. To position metropolitan Phoenix and the state of Arizona as competitive in

a view from the united states

the global knowledge economy, ASU conceptualized and designed a hub for knowledge-driven industries, technology innovation, and commercial activity. In collaboration with the City of Scottsdale and the ASU Foundation, ASU established SkySong, named for an iconic shade structure that is the signature architectural element of the complex. We enlisted a public-sector partner and a private-sector partner and, instead of just providing space for locally grown companies, decided also to recruit large global and foreign-based companies that could engage in beneficial exchange with the university and its startups. SkySong is a \$500 million world-class assembly point for knowledge and technology research and commerce. With 1.5 million square feet of densely packed and creative educational, research, cultural, retail, and residential space, SkySong will be the nucleus for an entire open-ended community of entrepreneurs dedicated to innovation and learning.



We have instituted a number of institutional policies that promote entrepreneurship and make it easy to move ideas into action, consistent with the policies mentioned earlier relating to intellectual property commercialization. Conversely, policies that discourage entrepreneurial behavior should be minimized. Unfortunately, many

universities have a wide range of such constraints—the kinds of policies that can inhibit decision-making, deaden creative thinking, and turn deans into paper-pushers. Changing the policy structure of the institution is an ongoing project that goes hand in hand with changing institutional culture. There have certainly been individuals who have disagreed with the objective of fostering an entrepreneurial university, or who did not see the value in it, and we have resolved the issue in a number of ways. We have conducted meetings and discussions to resolve concerns, and, as we advance, we attract new faculty and staff who are aligned with the vision and want to be part of it. In my six years as president, we have been able to move forward significantly.

Finally—and this is very important—an entrepreneurial university is highly *networked*. It has contacts and working alliances with entrepreneurs and industries, and with all sorts of individuals and groups concerned with innovation and growth. Along with cutting-edge research, universities that aspire to have broad impact are marked by a very high degree of connectivity, both internal and external. Such an ecosystem of networked connectivity creates many pathways for people to move ideas from conception to reality. When all of the elements are working together, one perceives a well-rounded *innovation infrastructure*, and the university becomes part of a larger *ecology of innovation*.

An Investment Model for Academic Enterprises

Along with organizational redesign comes the need for reconceptualization of the institutional mindset. Like other public institutions, ASU derives the majority of its operating budget from the State of Arizona, which has led it in the past to conceive of itself as an agency of the state government. But as universities reinvent themselves as academic enterprises navigating in the competitive academic marketplace, it is imperative that they assume responsibility for their advancement consistent with the paradigm of an investment model. With the investment model at ASU, we make the case that if either the private sector or the public is willing to lend us financial or political support, we promise to work to deliver a specified return on investment. The simple argument for investment of taxpayer dollars in a public university proceeds according to the following logic: If the appropriations committee of the state legislature invests specified resources, the university promises to work to deliver an agreed-upon return. Without such an investment, there can be no return on investment. Here is the negative impact from not making that investment. Here is the impact of that non-return on the overall enterprise—the state—that is in your charge. The same argument can be made for investment from the federal government, business and industry, and foundations and individuals.

a view from the united states

When we have made requests for tuition adjustments, we present it as an argument for investment. This past year, we published a sixty-page white paper on the return on investment to a family making investments in tuition for their children, or students making investment in themselves, and we calculated the annual rate of return to the individual over his or her lifetime at 12 percent. A college education is the most significant investment that anyone can make over that time frame. When we requested \$233 million from the City of Phoenix to establish an ASU campus downtown, we made it on an investment basis. We went to the city with our vision of what we want the university to become, and said, “If you make this investment in us, we will be able to start a campus on twenty-two acres of land in downtown Phoenix. Here is what we will commit and what our schools will be able to achieve with these new facilities.” It is difficult to refute such sound logic.

When one considers the effort required to build this new kind of university, one perfectly reasonable question that may arise is: How do you pay for it? The answer to that question has several parts. We have had to rethink and make adjustments to our overall financial structure, as one would with any major program of reconceptualization. In some cases, new initiatives have been launched on an entrepreneurial basis—that is to say, they receive initial seed funding, but beyond that they must raise or generate their own funds. But here is the best part: We have found that this model of the entrepreneurial university *attracts investment* from others. It is a model that invites wide-ranging participation and promises and delivers wide-ranging benefits. If an institution can put forth an entrepreneurial model of this type, individuals and corporations and foundations and governments will validate it by investing in the vision.

To summarize a few major investments: The Kauffman Foundation has given us a \$5 million grant for our effort, which we leveraged to attract another \$25 million in matching funds. Entities of regional government, with whom we had no financial relationship in the past, have put in significant funding: the \$233 million grant from the City of Phoenix and a \$100 million grant from the city of Scottsdale. Private individuals have invested hundreds of millions of dollars to create endowments for venture funds, for other initiatives, or for particular schools and colleges at the university. Altogether, in advancing this model, we have been able to generate about \$1.2 billion per year of new resources for the institution in the last six years.

This model puts us in a much better position to compete for major research funding because, in addition to basic research capability, we can demonstrate the *entrepreneurial* capability to move the research forward and develop it for application.

This is valuable to sponsors who want to see not only the discovery of new knowledge but also real-world results. Recently, for example, we have attracted significant investment for new approaches to attacking cancer. The government of the Duchy of Luxembourg is partnering with us on a \$200 million effort targeted to lung cancer, and we were one of three institutions to win highly competitive grants for new cancer research authorized by the U.S. Congress. Also, the U.S. Army has funded a \$110 million project to develop a thin-film flexible display that would be wearable on the body or disposable like paper. Again, they chose ASU because they believe that our faculty—working with the thirteen companies that we have brought into our facility with us—will be able not only to determine the scientific pathway to this technology but also be able to actually develop it.

Toward Entrepreneurial Universities Capable of Perpetual Innovation

The very identity of the university is at stake today and each institution must focus on establishing its own unique and differentiated identity. The question, “What is a university?” is one that every speaker at this conference is in some respect addressing. What are these institutions called universities, and how are they different from other institutions and organizations in our society? And, more to the point, why do universities need to assert their difference from other institutions and insist on their status as enterprises? The greatest universities that exist on the planet have emerged in America during the past several hundred years, and especially during the past century. All of these institutions share a set of characteristics that are consistent with the great universities that have emerged in the past. A principal characteristic of great universities is that not one of these institutions conceives of itself as either a corporation or an agency, by which I mean a standardized unit of government. All of them have emerged as enterprises. Some are public and owned by collectives such as the State of California or the State of Michigan. And some are private and self-perpetuated by groups of committed stewards who, over the course of centuries, have guided their institutions to greatness.

A number of environmental forces are, or should be, influencing how each of us redesigns our universities going forward. Different institutions may succeed by responding differently, but there are some strategies that are almost sure to fail. One is to rely on existing approaches, trying to advance the university as it has been advanced in the past. Another is the insular approach, simply perpetuating the university as if it is a remote monastery immune to outside forces. The temptation is great for universities to isolate themselves in abstractions, perpetuating their institutional cultures with their own sociologies and vocabularies, focused primarily on their own dynamics and their own

a view from the united states

constraints. It is incumbent on universities as never before to help solve the pressing global issues of our time: population growth, climate change, national and international security. The scale of knowledge transfer must increase as the demand for new knowledge increases. It is essential to realize that continued economic growth depends upon innovation and that the global economy operates according to the forces of “creative destruction,” described by the economist Joseph Schumpeter nearly a century ago. The only way to move forward is to replace what you have with something better—to innovate and to create new technologies and products and processes that replace those that already exist. We must accelerate the pace of our academic culture to move in sync with the needs of the world. And the ultimate driver is competition. The globalization of American universities is accelerating because of the rise of global competition. Globalization is the outcome of hundreds of years of connectivity through trade and the transfer of knowledge between cultures, and, as the nations of the world become more deeply entrenched in the process of globalization, universities have no alternative but to embrace it.

The industrialized nations peaked some time ago in their capacity to continue to enhance capital creation, both in terms of raw numbers and access to that capital creation process by all segments of our society. Several decades ago, the United States was the world’s dominant economic force. But now we face a challenge to our identity because we must look toward the future as only one of a number of major economic powers, each interrelated and cooperating with others, but, at the same time, competing in completely new ways. Continued economic growth must remain an overarching objective, because if we stop growing economically the social outcomes will be dire. If we do not embrace perpetual innovation—and by this I mean innovation in university design itself—not just the products of the university but also our collective standard of living will decline, our way of life will be threatened, and opportunities for the success of future generations will be diminished. The scale and speed of knowledge transfer is unprecedented, but we must ask ourselves where the new entrepreneurial institutions are that will teach our students how to thrive in this new environment. Where is the next great entrepreneurial university that will prepare the next generation for perpetual innovation?