Wave 5 of American Higher Education Evolution: The "National" Universities

21st Century Technology Enhanced Teaching and Learning Enterprises

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The 18th Century Ideal

"Wisdom and knowledge, as well as virtue, diffused generally among the body of the people, being necessary for the preservation of their rights and liberties; and as these depend on spreading the opportunities and advantages of education In the various parts of the country, and among the different orders of the people, it shall be the duty of legislatures and magistrates, in all future periods of this commonwealth, to cherish the interests of literature and the sciences, and all seminaries of them... especially the university at Cambridge."

John Adams

Chapter 5, Section 2, Constitution of the Commonwealth of Massachusetts ratified in June 1780



America's Greek Academies

Harvard Yale Pennsylvania Princeton Columbia Bowdoin

The National University

We knew the "Greek Academy" was limited

"Nor am I less persuaded that you will agree with me in the opinion that there is nothing which can better deserve your patronage than the promotion of science and literature. Knowledge is in every country the surest basis of public happiness. Whether this desirable object will be best promoted by affording aids to seminaries of learning already established, by the institution of a national university, or by any other expedients, will be well worthy of a place in the deliberations of the legislature."

George Washington

First annual message to Congress January 1790



America's Areligious Greek Academies

University of Georgia1785University of North Carolina1789University of South Carolina1801University of Michigan1817University of Virginia1825

James Smithson (1765-1829)

- British scientist who left his estate to the U.S. to create "an establishment for the increase and diffusion of knowledge."
- Years of debate resulted in the rejection of a university in favor of the Smithsonian Institution.



Wave 3

New 19th Century Ideal – Egalitarian Access and Practical Science

University of Wisconsin	1848
University of Minnesota	1851
Pennsylvania State University	1855
Iowa State University	1858
MIT	1860
Cornell University	1865
University of Illinois	1867
University of California	1868

Justin Smith Morrill (1810-1898)

The Morrill Act of 1862

- Established at least one college in every state
- "<u>accessible to all, but</u> <u>especially to the</u> <u>sons of toil</u>…" (serving the children of farmers and laborers)





New Emerging 20th Century Hybrid – British and German Models Combined

Points of Emergence

Johns Hopkins University1876Stanford University1885University of Chicago1890



New Emerging 20th Century Hybrid – British and German Models Combined

From Wave 1:Harvard University
Columbia University
University of Pennsylvania
Princeton University

From Wave 2: University of Michigan

From Wave 3:

University of California, Berkeley Cornell University University of Illinois



New Emerging 21st Century Integrated (socio/technical) Scalable Complex Adaptive University (*Mega*)

Point of Emergence

Arizona State University 2015-2020



New Emerging 21st Century Integrated (socio/technical) Scalable Complex Adaptive University (*Mega*)

From Wave 1	None
From Wave 2	TBD
From Wave 3	TBD
From Wave 4	TBD

Public Value vs. Market



Teleonomic Failure of the Scalable Market Driven "Universities"

Teleonomy, n.

Biol. The property, common to all living systems, of being organized towards the attainment of ends. Purpose and goal-directedness of structures and functions of organisms.

Higher Education Evolution



Design and Adaptation

Wave 1

Americanized British Colleges

- small, elite, classical
- separate
- not scalable

Wave 2

American Public Colleges

- 19th century elites
- 19th century teachers colleges and non-elites
- 20th century non-elites
- specialized public and a few privates
- community colleges

Design and Adaptation

Wave 3 Americanized Democratic University

- de Tocqueville (practical)
- Local, regional focus
- Focus on the working class/ masses
 - Focus on science practice

Wave 4 Research Institutions

- Transformative American innovation
- Inherent tension between missions
- Large scale, but limited

The American Challenge

Size

Diversity

Speed of Change

Economics of the Model

Class Inequities

Required Improvements



Rate

Massive Change Drivers



Progress at Scale



ASU Charter

ASU is a comprehensive public research university, measured not by whom it excludes, but by whom it includes and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural, and overall health of the communities it serves.

Design Aspirations

Leverage Our Place

ASU embraces its cultural, socioeconomic and physical setting.

Transform Society

ASU catalyzes social change by being connected to social needs.

Value Entrepreneurship

ASU uses its knowledge and encourages innovation.

Conduct Use-Inspired Research

ASU research has purpose and impact.

Enable Student Success

ASU is committed to the success of each unique student.

Fuse Intellectual Disciplines

ASU creates knowledge by transcending academic disciplines.

Be Socially Embedded

ASU connects with communities through mutually beneficial partnerships.

Engage Globally

ASU engages with people and issues locally, nationally and internationally.

Design (n).

Purpose, planning or intention that exists or is thought to exist behind an action, thought or material object.

Design (v).

Do or plan (something) with a specific **purpose** in mind.

Oxford English Dictionary

The ASU Pathway





Share of Total Enrollment

Share of Total Degrees



Share of High Demand Degrees



Share of Research Expenditures





ASU Freshman Enrollment by Annual Family Income



ASU is achieving its targets for degree production

Undergraduate and Graduate Degrees Awarded

Actual and Projected





Research expenditures have almost tripled in ten years and are tracking with the metric target





ASU faculty perform at a very high level of productivity 10-20% growth is required to achieve all of the metric goals

FTE Faculty Employees Per 100 FTE Students (Excludes Medical School Employees)

	FY10	FY11	FY12	FY13	FY14	10
University of Maryland-College Park	9.77	9.99	10.3	10.31	10.36	
University of Minnesota-Twin Cities	8.16	8.08	8.08	8.82	9.13	9
University of Washington-Seattle Campus	5.19	5.73	5.6	8.31	8.67	8
Rutgers University-New Brunswick	8.03	7.58	7.81	8.27	8.28	7
Pennsylvania State University-Main Campus	7.58	7.63	7.56	8.05	8.14	
University of Wisconsin-Madison	5.87	5.8	5.71	9.14	7.63	
Michigan State University	5.73	5.56	5.52	5.27	7.22	5
University of Connecticut	5.24	5.25	5.37	6.45	6.62	4
University of California-Los Angeles	6.03	6.07	6.97	6.51	6.38	2
Indiana University-Bloomington	6.38	6.45	6.42	6.57	6.35	3
University of Illinois at Urbana-Champaign	6.34	6.06	5.86	5.98	6.07	2
University of Iowa	5.62	5.66	5.82	5.77	5.79	1
The University of Texas at Austin	5.68	5.48	5.42	5.43	5.76	0
University of Arizona	5.46	5.66	5.71	5.41	5.66	EY10 EY11 EY12 EY13 EY14
Florida State University	5.04	4.81	4.74	4.93	4.96	
Ohio State University-Main Campus	4.92	4.84	4.70	4.85	4.86	Peer Median
Arizona State University	4.42	4.26	4.06	4.09	4.15	Arizona State University
Peer Median	5.87	5.80	5.82	6.51	6.62	

Full time equivalent postsecondary teachers whose principal activities are for instruction, research, and/or public service. They may hold academic rank titles of professor, associate professor, assistant professor, instructor, lecturer or equivalent of any of those academic ranks.



ARIZONA STATE UNIVERSITY

SCHOOL OF ARTS, MEDIA AND ENGINEERING

in association with Herberger Institute for Design and the Arts

SCHOOL OF EARTH AND SPACE EXPLORATION

in association with the College of Liberal Arts and Sciences

SCHOOL OF SUSTAINABILITY

TRANSDISCIPLINARY PARTNERS

THE BIODESIGN INSTITUTE

GLOBAL INSTITUTE OF SUSTAINABILITY

SECURITY AND DEFENSE SYSTEMS INITIATIVE

transcending the traditional

school of biological and health systems engineering

1.066 students

881 undergraduate

185 graduate

biomedical

engineering

biological design

school of computing, informatics, and decision systems engineering

4,151 students 2,904 undergraduate 1,247 graduate

computer engineering computer science computer systems engineering engineering management industrial engineering informatics software engineering 2,490 students 1,382 undergraduate 1,108 graduate

school of

electrical,

computer

and energy

engineering

electrical engineering computer engineering and energy 3.520 students

school for

of matter.

transport

engineering

2,778 undergraduate 742 graduate

aerospace engineering chemical engineering materials science and engineering mechanical engineering solar energy engineering and commercialization

1,414 students 1,068 undergraduate 346 graduate

school of

sustainable

engineering

and the built

environment

civil, environmental and sustainable engineering construction engineering construction management 3,277 students 3,030 undergraduate 247 graduate

polytechnic

school

aviation human systems engineering engineering (integrated concentrations) manufacturing engineering environmental and resource management graphic information technology information technology technological entrepreneurship and management

Current academic programs and schools structure (6 schools, 2 campuses, 20+ degree programs)

Exemplar University Partnerships

- US Army Flexible Electronics and Display Center (10 years/\$94M and 40+ industry partners)
- NSF/DOE QESST Photovoltaic Engineering Research Center (ASU lead + MIT, Cal Tech, GA Tech, UH, UNM, UA and 30+ industry partners)
- NSF FREEDM Engineering Research Center (NC State lead + ASU, MUST, FSU and 30+ industry partners)
- NSF Engineering Research Center Center for Bio-mediated and Bio-inspired Geotechnics (ASU lead + GA Tech, NMS, UC-Davis and 12+ industrial partners)
- **5 NSF Industry-University Collaborative Research Centers** (IUCRC's, 4 with ASU leads, more than GA Tech, Michigan, UC Berkeley, and 50+ industrial partners))
- Higher Engineering Education Alliance Program (HEEAP + USAID, Intel, Siemens, National Instruments and other industry partners)

ASU Teaching and Learning Realms for Wave 5





The university faculty is at the core of all models.



Adaptive knowledge creation is at the core of the university and is essential.

Advancing Learning and Knowledge

Core Enterprise Structure



Full Immersion / On-campus / Technology Enhanced

- Broad admission standards
- Fluid interface with community colleges
- Socioeconomic status predicts nothing
- All students are science and technology literate
- 2-3 majors are common
- costs are lowered for all
- scalable to 3x the historic norm

Digital Immersion / On-line / Technology Enhanced

- College completion for the majority
- Lifelong personalized learning
- Lifelong network learning

Digital Immersion / Massive Scale / Technology Enhanced

- Enhance social scale learning
- Enhance learning activation
- Enhance college pipeline
- Move at social speed

Education through ETX / Technology Enhanced

- Global scale engagement
- Totally personalized learning

Five Forces Are Reshaping Higher Education

- 1. Economic and social disruption is continuing to accelerate, which is placing many institutions at risk.
- 2. The globalization of education is accelerating.
- 3. New business and delivery models are gaining traction.
- 4. Greater transparency about student outcomes is becoming the norm.
- 5. Student and family demands are rising for a greater return on investment in higher education.

The Wave 5 Emergent North Star Trajectory

Phase 3

 Phase 1 Current Projects (e.g. University Innovation Alliance)
Phase 2 Refinement of an Executable (and Repeatable) Strategy

> Execution (including financing, technology platforms, staffing, organizational framework, and outcome measurement

