

A Tale of Two Futures



The Future of the University
in an Age of Knowledge

A Quote ...



It was the best of times, it was the worst of times,
It was the age of wisdom, it was the age of foolishness,
It was the epoch of belief, it was the epoch of incredulity,
It was the season of Light, it was the season of Darkness,
It was the spring of hope, it was the winter of despair,
...

Charles Dickens

A Tale of Two Cities

Two quotes...

“Thirty years from now the big university campuses will be relics. Universities won’t survive. It is as large a change as when we first got the printed book.”

Peter Drucker

“If you believe that an institution that has survived for a millennium cannot disappear in just a few decades, just ask yourself what has happened to the family farm.”

William Wulf

Two contrasting futures

Scenario 1: A **dark, market-driven future** in which strong market forces drive a major restructuring of the higher education enterprise, driving the system toward the mediocrity that has characterized other mass media markets such as television and journalism.

Scenario 2: A **society of learning**, in which all our citizens are provided with the education and training they need, throughout their lives, whenever, wherever, and however they desire it, at high quality and at an affordable cost.

The Forces of Change



- Financial imperatives
- Changing societal needs
- Technology
- Market forces

Financial Imperatives

- Increasing societal demand for university services (education, research, service)
- Increasing costs of educational activities
- Declining public support
- Public resistance to increasing prices
- Inability to re-engineering cost structure

Concern: The current paradigms for conducting, distributing, and financing higher education may not be able to adapt to the demands and realities of our times

Changing Societal Needs



- 30% increase in traditional students
- Education needs of high-performance workplace
- The “plug and play” generation
- “Just-in-case” to “just-in-time” to “just-for-you” learning
- Student to learner to consumer

Another issue ...

Over half the world's population is under 20, including two billion teenagers!!! Yet higher education in most of the world is mired in a crisis of access, cost, and flexibility. The United States may have the world's strongest university system, but our high-cost, campus-based paradigms and our belief that quality in education is linked to exclusivity of access and extravagance of resources is irrelevant to the rest of the world.

Concern: There are many signs that the current paradigms are no longer adequate for meeting growing and changing societal needs.

Technology

Since universities are knowledge-driven organizations, it is logical that they would be greatly affected by the rapid advances in knowledge media (computers, networks, etc.)

We have already seen this in administration and research.

But the most profound impact could be on education, as technology removes the constraints of space, time, reality (and perhaps monopoly ...)

Concern: The current paradigm of the university may not be capable of responding to the opportunities or the challenges of the digital age.

A Detour: The Evolution of Computers

Mainframes (Big Iron)
...IBM, CDC, Amdahl
...Proprietary software
...FORTRAN, COBOL
...Batch, time-sharing

Minicomputers
...DEC, Data Gen, HP
...PDP, Vax
...C, Unix

Microcomputers
...Hand calculators
...TRS, Apple, IBM
...Hobby kits -> PCs

Supercomputers
...Vector processors
...Cray, IBM, Fujitsu
...Parallel processors
...Massively parallel

Networking
...LANs, Ethernet
...Client-server systems
...Arpanet, NSFnet, Internet

Batch → *Time-sharing* → *Personal* → *Collaborative*

Some Theorems of the Digital Age

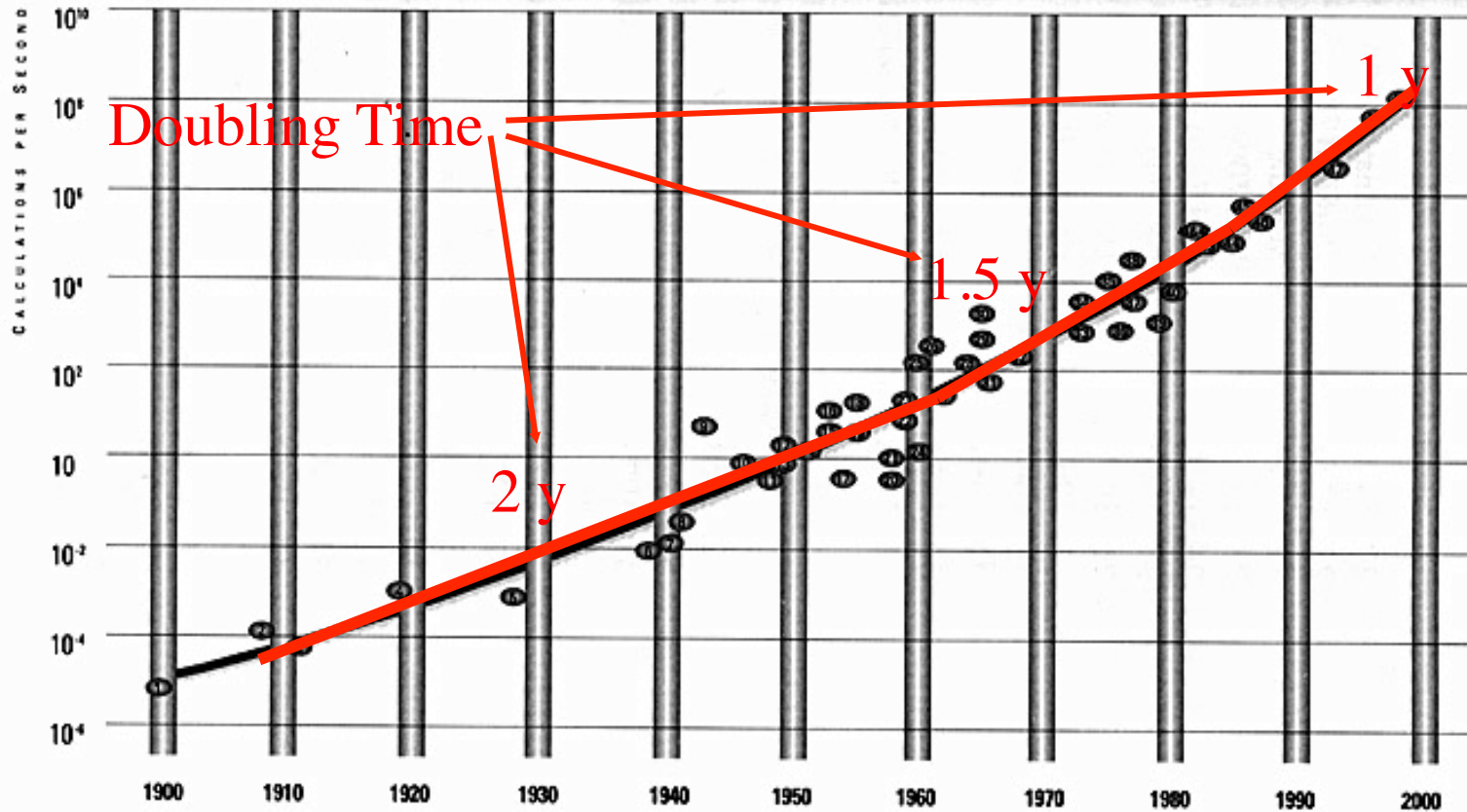
Moore's Law: The power of computing for a given price doubles every 18 months. In ten years, the power of the technology increases by a factor of 100.

Metcalf's Law: The usefulness of a network increases as the square of the number of users.

Moore's Second Law: The cost of the manufacturing facility for chip production also doubles every 18 months.

The Evolution of Computing

\$1,000 OF COMPUTING BUYS



Some Examples

- Speed
 - MHz to GHz (Merced) to THz to Peta Hz
- Memory
 - MB (RAM) to GB (CD,DVD) to TB (holographic)
- Bandwidth
 - Kb/s (modem) to Mb/s (Ethernet) to Gb/s
 - Internet (Project Abilene): 10 Gb/s
- Networks
 - Copper to fiber to cellular to Iridium to Teledysec

Computer-Mediated Human Interaction



- 1-D
 - Text, e-mail, chatrooms, telephony
- 2-D
 - Graphics, video, WWW, multimedia
- 3-D
 - Virtual reality, distributed virtual environments
 - MUDs and MOOs, avatars, telepresence
 - Virtual communities and organizations

Another Way to Look at It ...



A “communications” technology that is increasing in power by a factor of 1,000 every decade will soon allow any degree of fidelity that one wishes. All of the senses will be capable of being reproduced at a distance ... sight, sound, touch, taste, smell ... through intelligence interfaces.

At some point, we will see a merging of

...natural and artificial intelligence

...reality and virtual reality

...carbon and silicon ...

Evolution of the Net



- Already beyond human comprehension
- Incorporates ideas and mediates interactions among millions of people
- 100 million today; more than 1 billion in 2001
- Internet II, Project Abilene

A Case Study: the University

Missions: teaching, research, service?

Alternative: **Creating, preserving, integrating, transferring, and applying knowledge.**

The University: A **“knowledge server”**, providing knowledge services in whatever form is needed by society.

Note: The fundamental knowledge roles of the university have not changed over time, but their realizations certainly have.

Research



- **Simulating reality**
- **Collaboratories: the virtual laboratory**
- **Changing nature of research**
 - Disciplinary to interdisciplinary
 - Individual to team
 - “Small think” to “big think”
- **Analysis to creativity**
 - Tools: materials, lifeforms, intelligences
 - Law, business, medicine to art, architecture, engineering

Teaching to learning



- Student to learner
 - Classroom to environment for interactive, collaborative learning
 - Faculty to designer, coach, Mr. Chips
- Classroom
 - Handicraft to commodity
 - Learning communities
 - Virtual, distributed environments
- Open learning
 - Teacher-centered to learner-centered
 - Student to learner to consumer
 - (Unleashing the power of the marketplace!)



Scenario 1

A massive restructuring of the higher
education industry

or

Swept away by the tsunami of market forces

The current monopoly



Universities operate with a monopoly sustained by geography and credentialing authority.

But this is being challenged by

- demand that cannot be met by status quo
- antiquated cost structures
- information technology
- open learning environments

Restructuring



Hypothesis: Higher education today is about where the health care industry was a decade ago, in the early stages of a major restructuring.

However, unlike other industries such as energy, telecommunications, and health care that were restructured by market forces after deregulation, the global knowledge and learning industry is being restructured by emerging information technology, that releases education from the constraints of space, time, and credentialing.

A quote from a venture capital prospectus

“As a result, we believe education represents the most fertile new market for investors in many years. It has a combination of large size (approximately the same size as health care), disgruntled users, lower utilization of technology, and the highest strategic importance of any activity in which this country engages Finally, existing managements are sleepy after years of monopoly.”

A possible future

- \$300 billion (\$3 trillion globally)
- 30 million students
- 200,000 faculty “facilitators”
- 50,000 faculty “content providers”
- 1,000 faculty “celebrity stars”

(compared to 800,000 current faculty serving a \$180 billion enterprise with 15 million students ...)

Some implications



- Unbundling
- A commodity marketplace
- Mergers, acquisitions, hostile takeovers
- New learning lifeforms
- An intellectual wasteland???



Scenario 2

A Society of Learning

or

Renewing the Social Contract

A Culture of Learning



Since knowledge has become not only the wealth of nations but the key to one's personal prosperity and quality of life, it has become the responsibility of democratic societies to provide their citizens with the education and training they need, throughout their lives, whenever, wherever, and however they desire it, at high quality and at an affordable cost.

Key Characteristics



- Learner-centered
- Affordable
- Lifelong learning
- A seamless web
- Interactive and collaborative
- Asynchronous and ubiquitous
- Diverse
- Intelligent and adaptive

Evolution or Revolution?

Many within the academy believe that “this too shall pass”.

Others acknowledge that change will occur, but within the current paradigm, i.e., evolutionary.

Some believe that both the dramatic nature and compressed time scales characterizing the changes of our times will drive not evolution but revolution.

Some even suggest that long before reform of the education system comes to any conclusion, the system itself will have collapsed.

The Key Policy Question

How do we balance the roles of market forces and public purpose in determining the future of higher education in America. Can we control market forces through public policy and public investment so that the most valuable traditions and values of the university are preserved? Or will the competitive and commercial pressures of the marketplace sweep over our institutions, leaving behind a higher education enterprise characterized by mediocrity?

Which of the two scenarios will be our future?

Some “Systemic Issues”



AAU Res U

Res U I, II

Doc U I, II

Comp U I, II

Lib Arts Colleges

Comm Colleges

K-12

Some “Systemic Issues”



For profit U

AAU Res U

Virtual U

Res U I, II

Doc U I, II

Open U

Comp U I, II

Lib Arts Colleges

Niche U

Comm Colleges

Corp U

K-12

New learning lifeforms

Knowledge Infrastructure

(production, distribution, marketing, testing, credentialing)

Economic Development



The keys to technology-driven economic development:

1. Technological innovation
2. Human and financial capital
3. Entrepreneurs

The source:

World-class research universities!

Some Caveats

- The need for a diverse higher ed ecosystem
- Government vs. market-drive accountability
- Regional vs. national vs. global competition
- Technology-driven economic development
- The importance of excellence

The Competition



Wisconsin

UW-Madison

Illinois

IU

Northwestern

Chicago

Michigan

UM

MSU

New York

Cornell

Columbia

NYU

Minnesota

UM-MSP

Indiana

IU

Purdue

Ohio

OSU

CWRU

Pennsylvania

Penn

Penn State

An Action Agenda

- Determine those key roles and values that must be protected and preserved during this period of transformation
 - Roles: education of the young, preservation of culture, research, critic of society, etc.
 - Values: academic freedom, a rational spirit of inquiry, excellence, etc.
- Listen carefully to society to learn and understand its changing needs, expectations, and perceptions of higher education.

An Action Agenda (continued)

- Prepare the academy for change, by removing unnecessary constraints, linking accountability with privilege, redefining tenure, and restructuring graduate education.
- Restructure university governance, particularly lay boards and shared governance models, to allow strong, visionary leadership.
- Development a new paradigm for financing higher education, balancing public and private support, implementing new cost structures, and enhancing productivity.

An Action Agenda (continued)

- Encourage experimentation with new paradigms of learning, research, and service by harvesting the best ideas from the academy (or elsewhere), implementing them on a sufficient scale to assess their impact, and disseminating the results.
- Place a far greater emphasis on building alliances among institutions that will allow individual institutions to focus on core competencies while relying on alliances to address the broader and diverse needs of society. Differentiation among institutions should be encouraged, while relying upon market forces rather than regulations to discourage duplication.

Concluding Remarks



We have entered a period of significant change, driven by a limited resource base, changing societal needs, new technologies, and new competitors.

The most critical challenge before us is to develop the capacity for change.

Only a concerted effort to understand the important traditions of the past, the challenges of the present, and the possibilities for the future can enable institutions to thrive during a time of such rapid and radical change.

A Renaissance?



Certainly the need for higher education will be of increasing importance in our knowledge-driven future. Certainly, too, it has become increasingly clear that our current paradigms for the university, its teaching and research, its service to society, its financing all must change rapidly and perhaps radically.

Hence the real question is now whether higher education will be transformed, but rather **how** and **by whom**.

If the university is capable of transforming itself to respond to the needs of a culture of learning, then what is currently perceived as the challenge of change may become the opportunity for a **renaissance** in higher education in the years ahead.