

# Emerging Technology Trends and What They May Mean for Design, Education, and Society

A talk in three parts:

PART ONE

**Key Technology Trends**

PART TWO

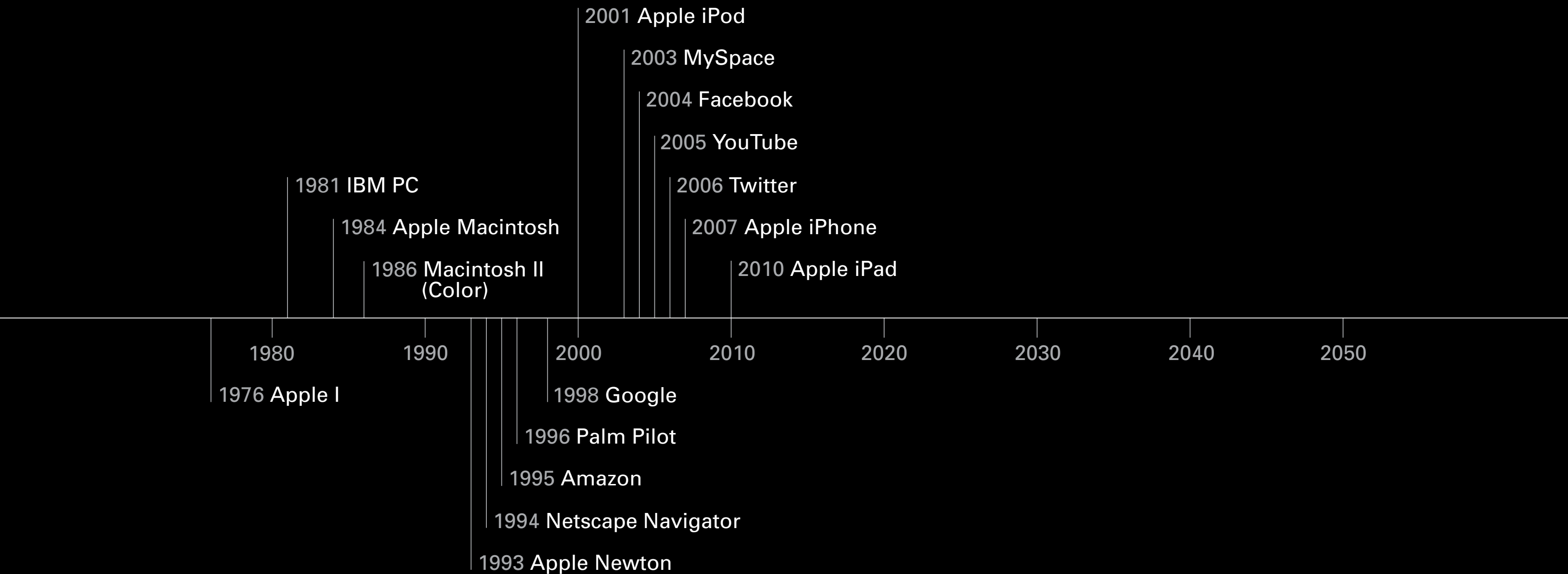
**Some Implications for Design Practice**

PART THREE

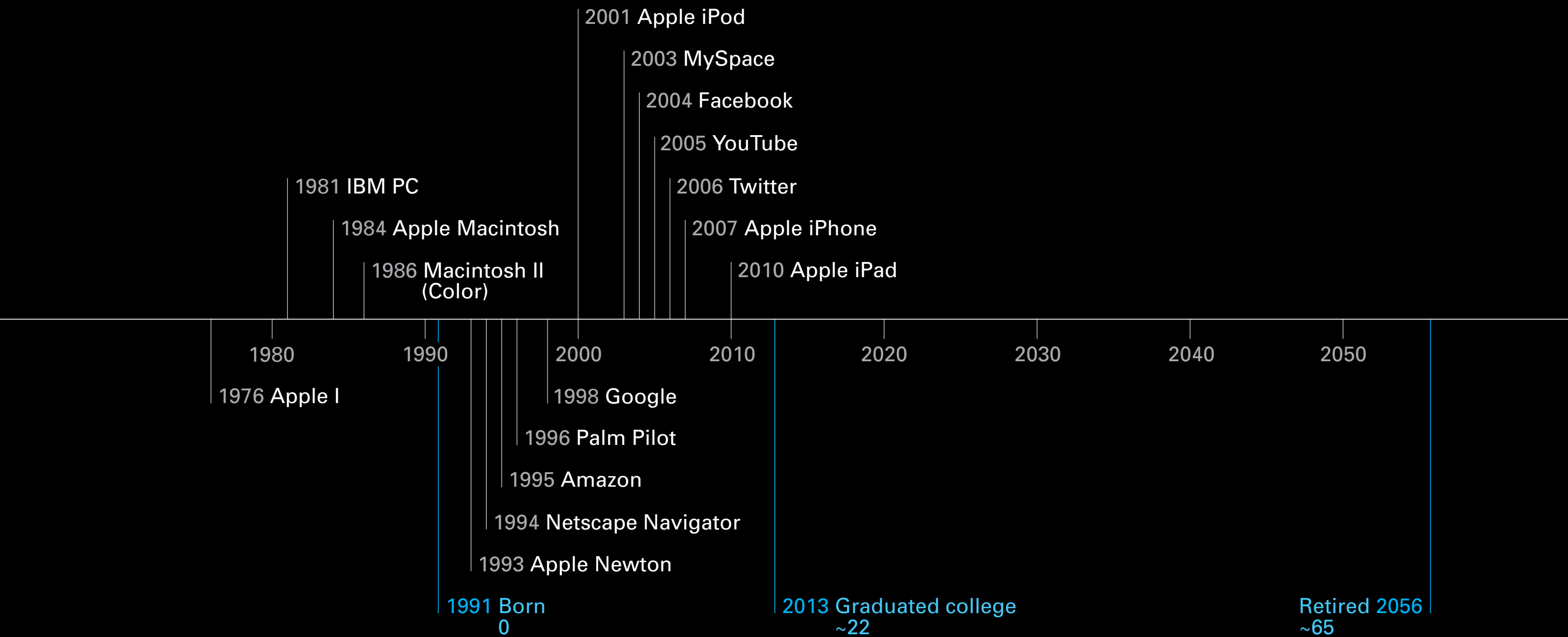
**Some Implications for Education**

# Key Technology Trends

# Technology change in the last 30 years has been staggering.



# Students graduating from college this year grew up with computers and the Internet.



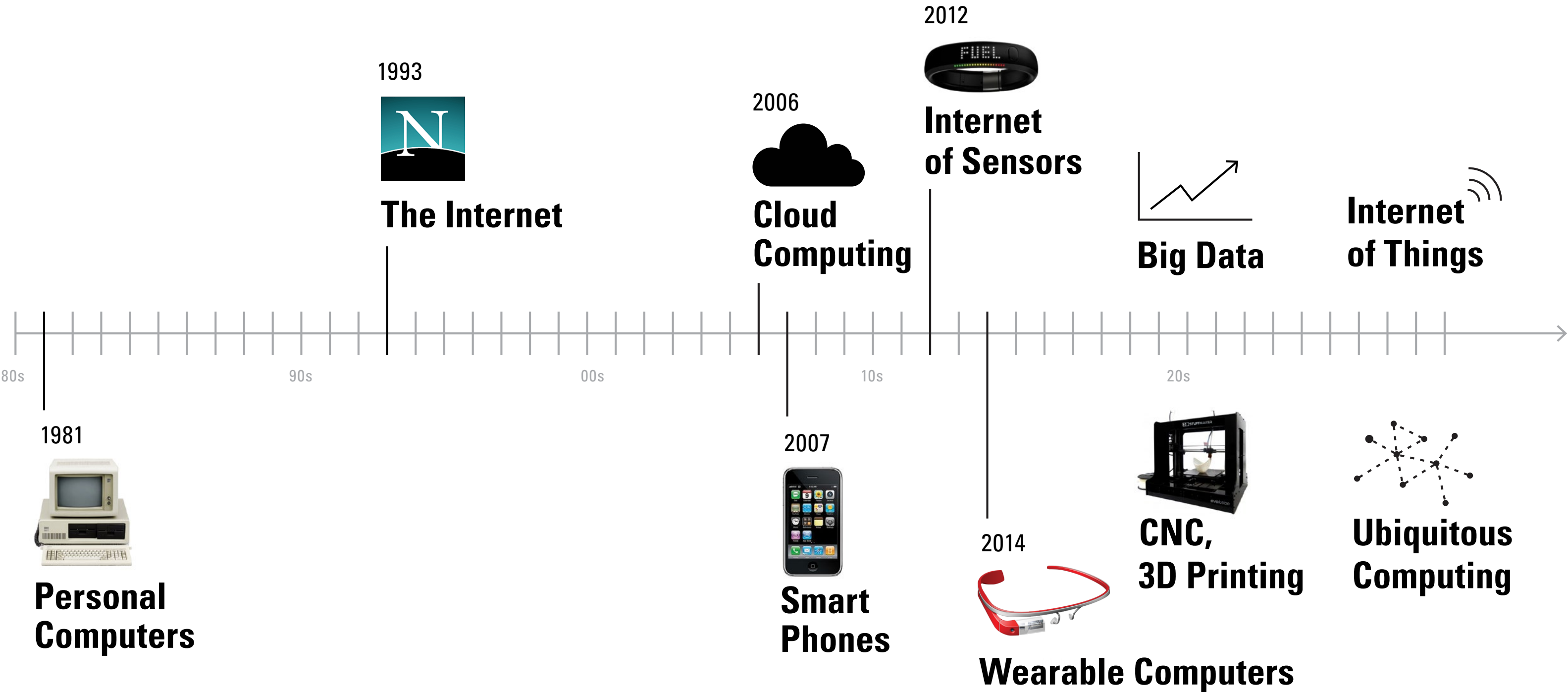
**Imagine the change to come  
over the rest of their lives.**

*“The rate of change is such  
that the amount of change  
since the 1700s to now,  
will be like the amount of change  
in the next 15 years or so.”*

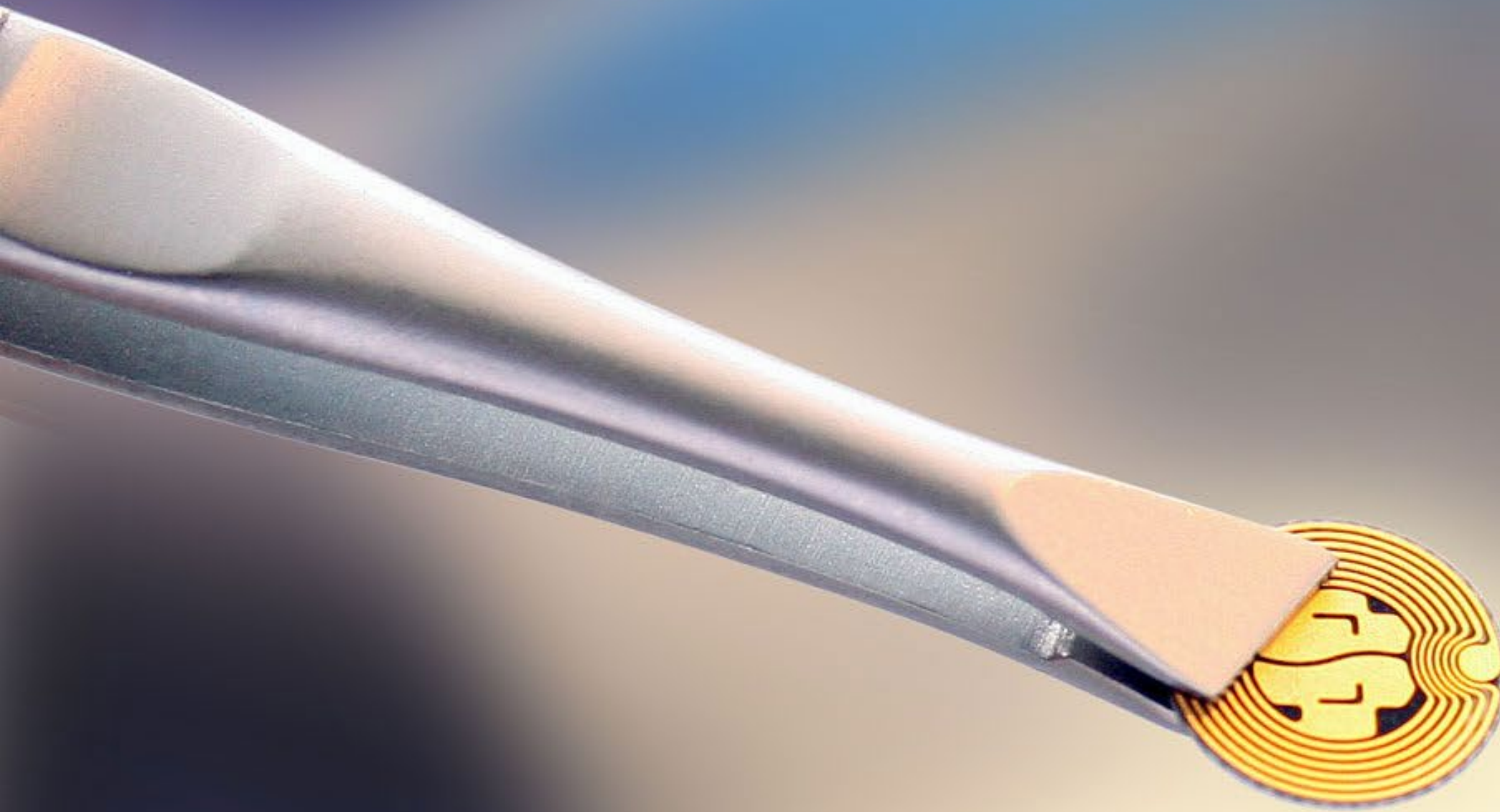
— Thomas Seder, Lab Group Manager, GM Research & Planning



# Several “revolutions” are interacting, fostering “combinatorial innovation.”



**Sensors are being printed—like micro-processor chips;  
quantities are increasing; prices are dropping.**



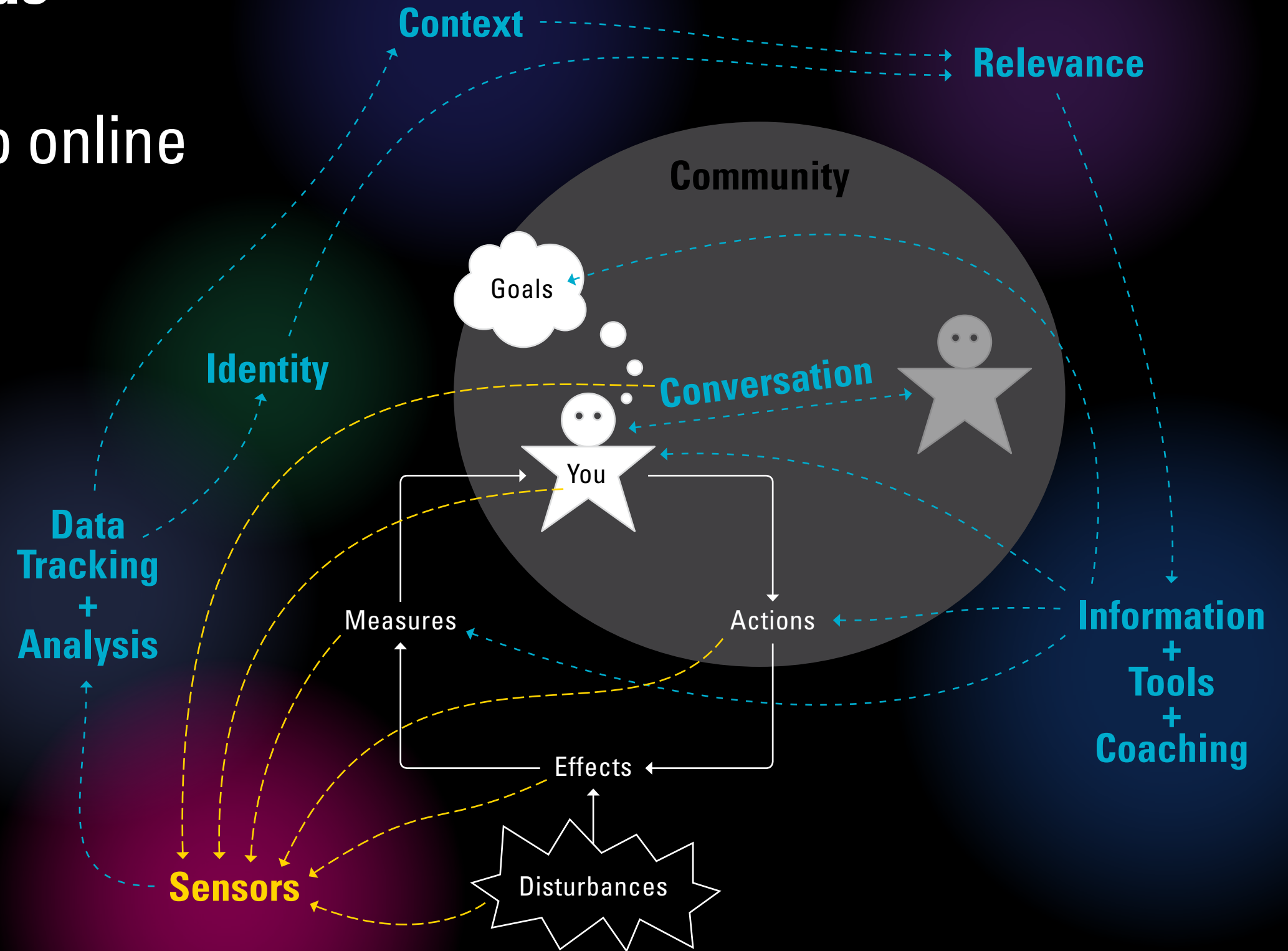


Wal-Mart has mandated that **every package** in its stores **include an RFID chip**.



# Sensors will be ubiquitous

- at checkpoints
- logging everything you do online
- all around you
- on you
- in you



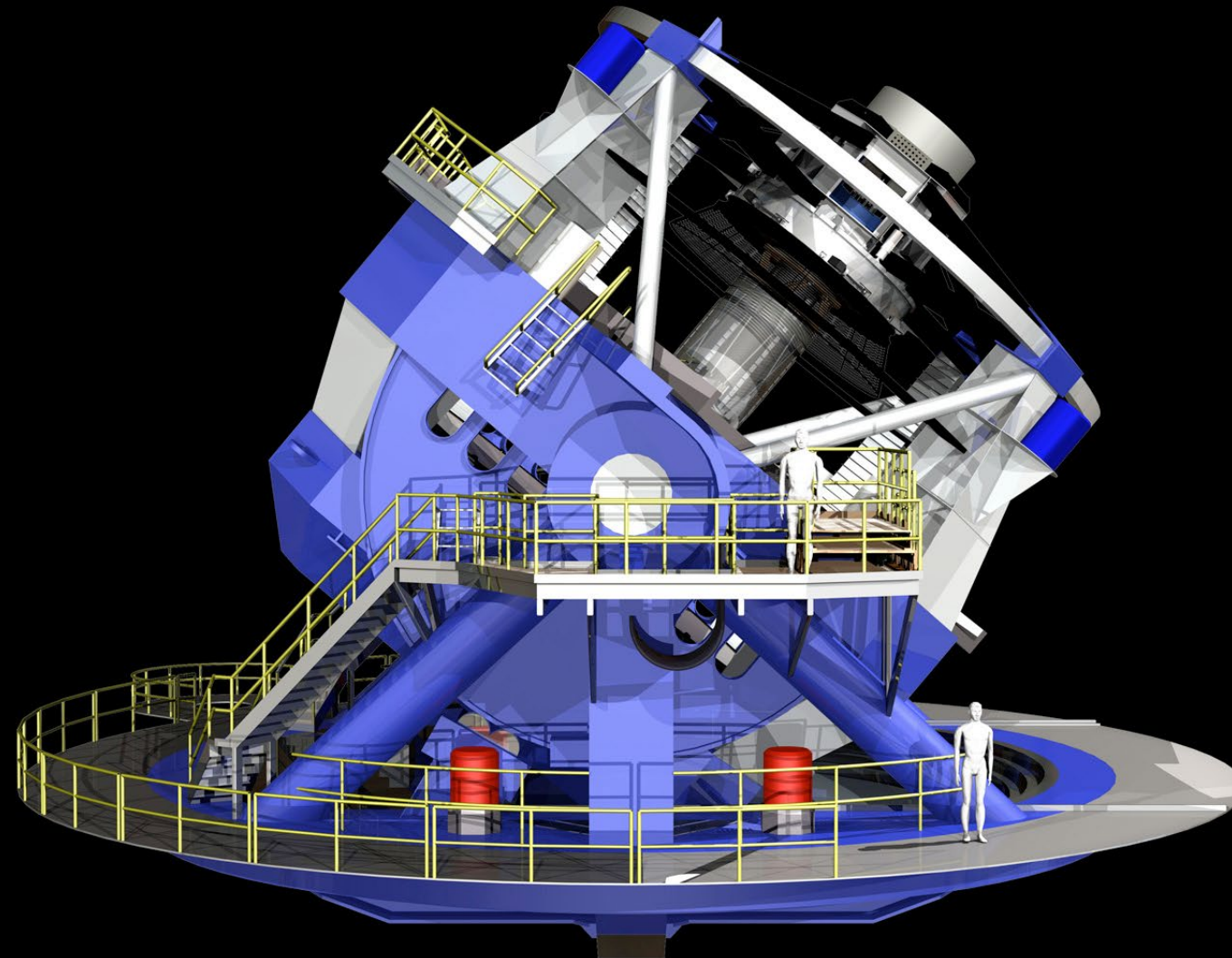


**Sensors are connecting—forming mesh networks.**  
Each vine has a sensor; each sensor talks to the next;  
hubs connect to the internet, providing a heat and humidity map.





**Sensors will produce unprecedented amounts of data.**  
**The new Large Synoptic Survey Telescope (LSST)**  
**will produce 30 terabytes of data EACH night.**  
**The current largest public database of such images is about 80 terabytes.**





Expanding **networks** deliver rapidly growing **data streams** for processing by massive **cloud-based computer systems** which deliver the results almost anywhere.



Sensors



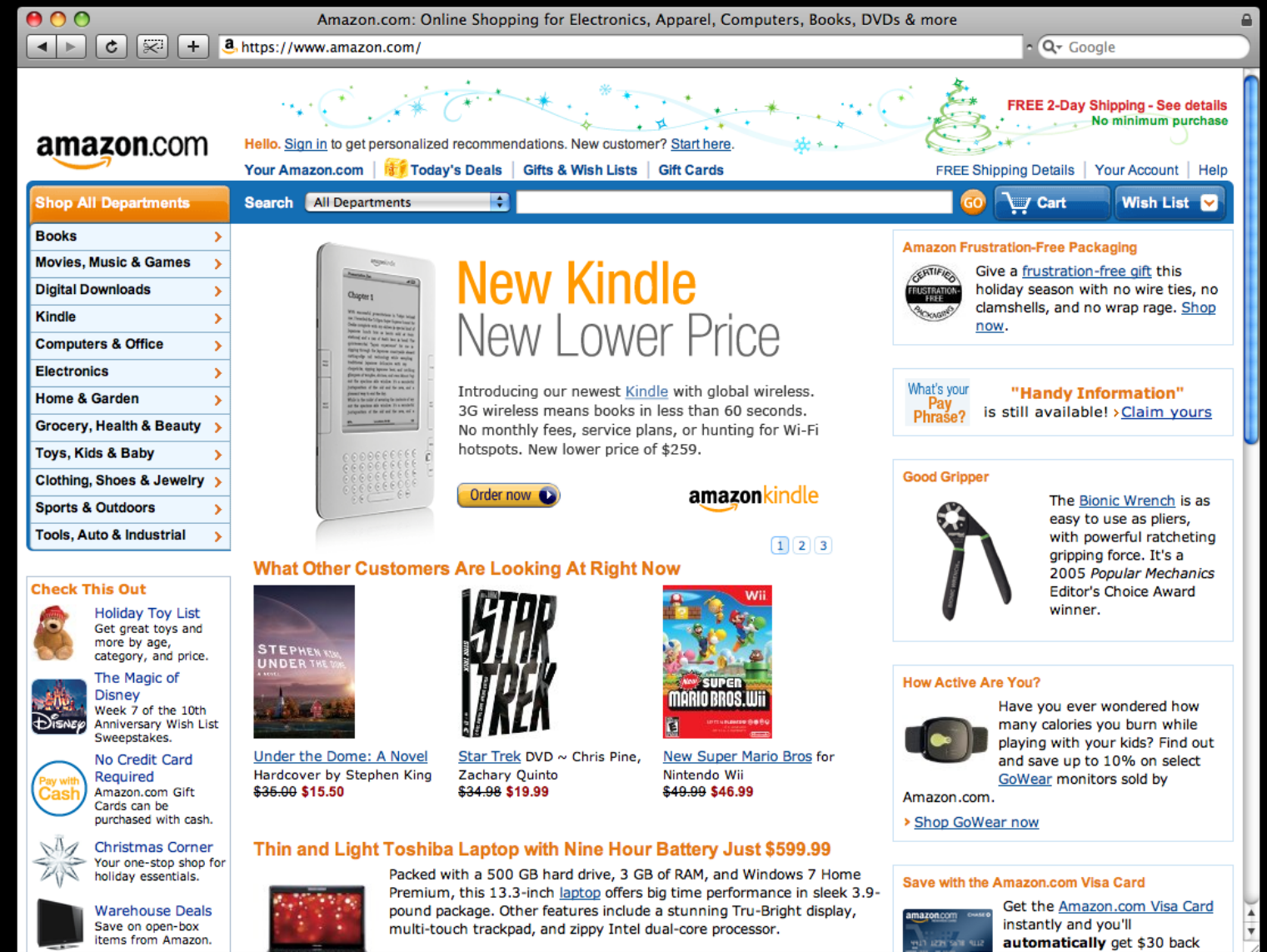
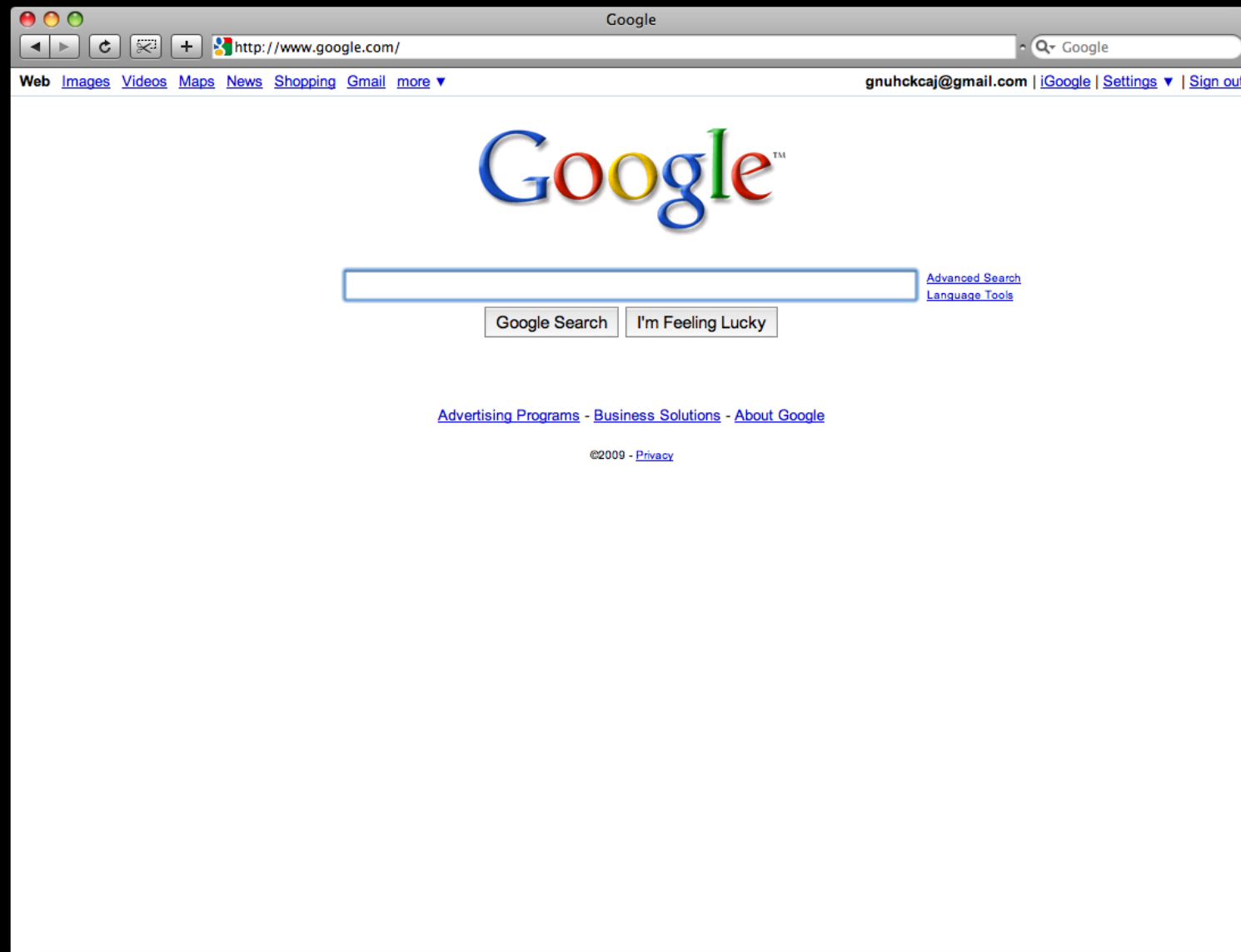
Cloud-based Computing



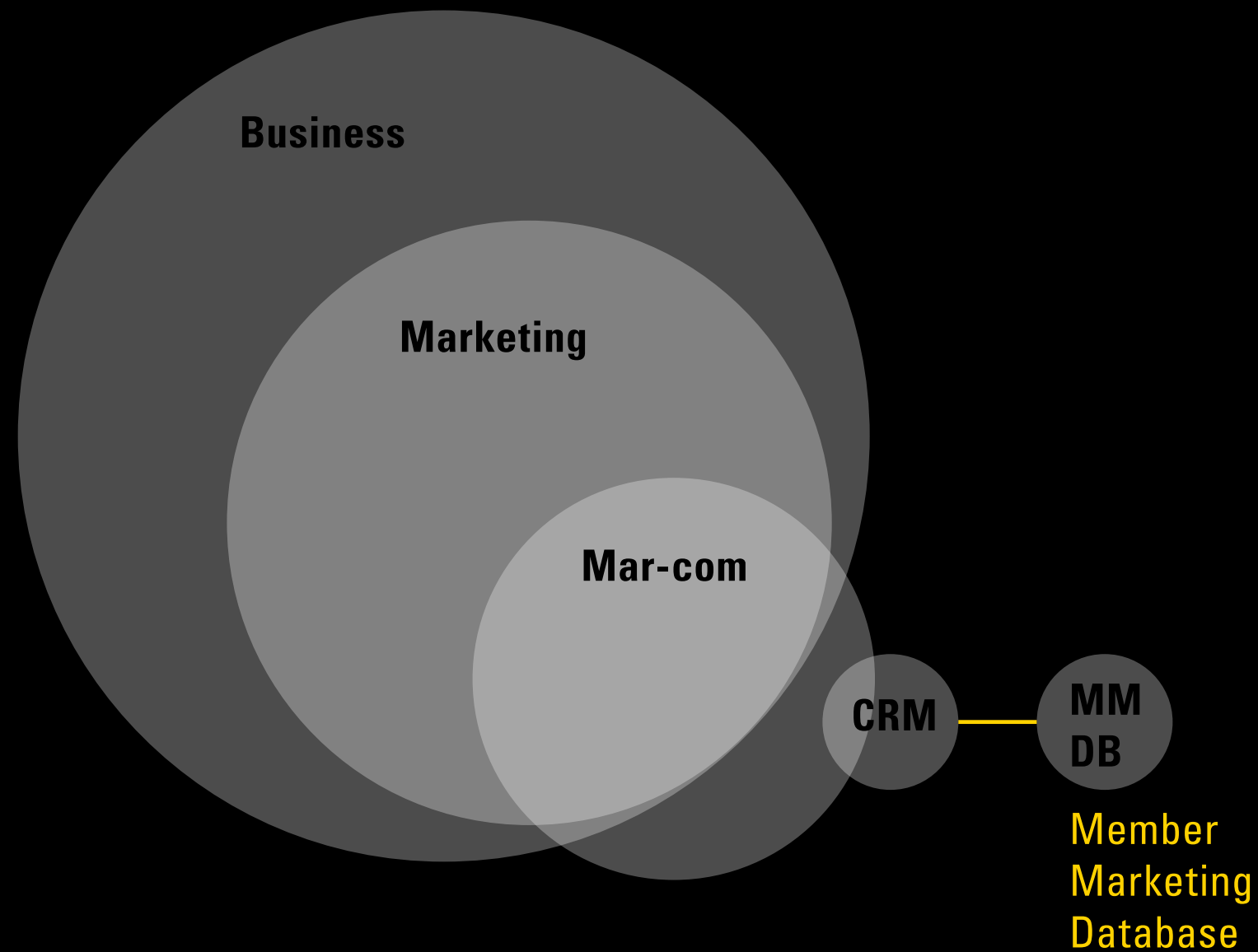
Mobile Devices



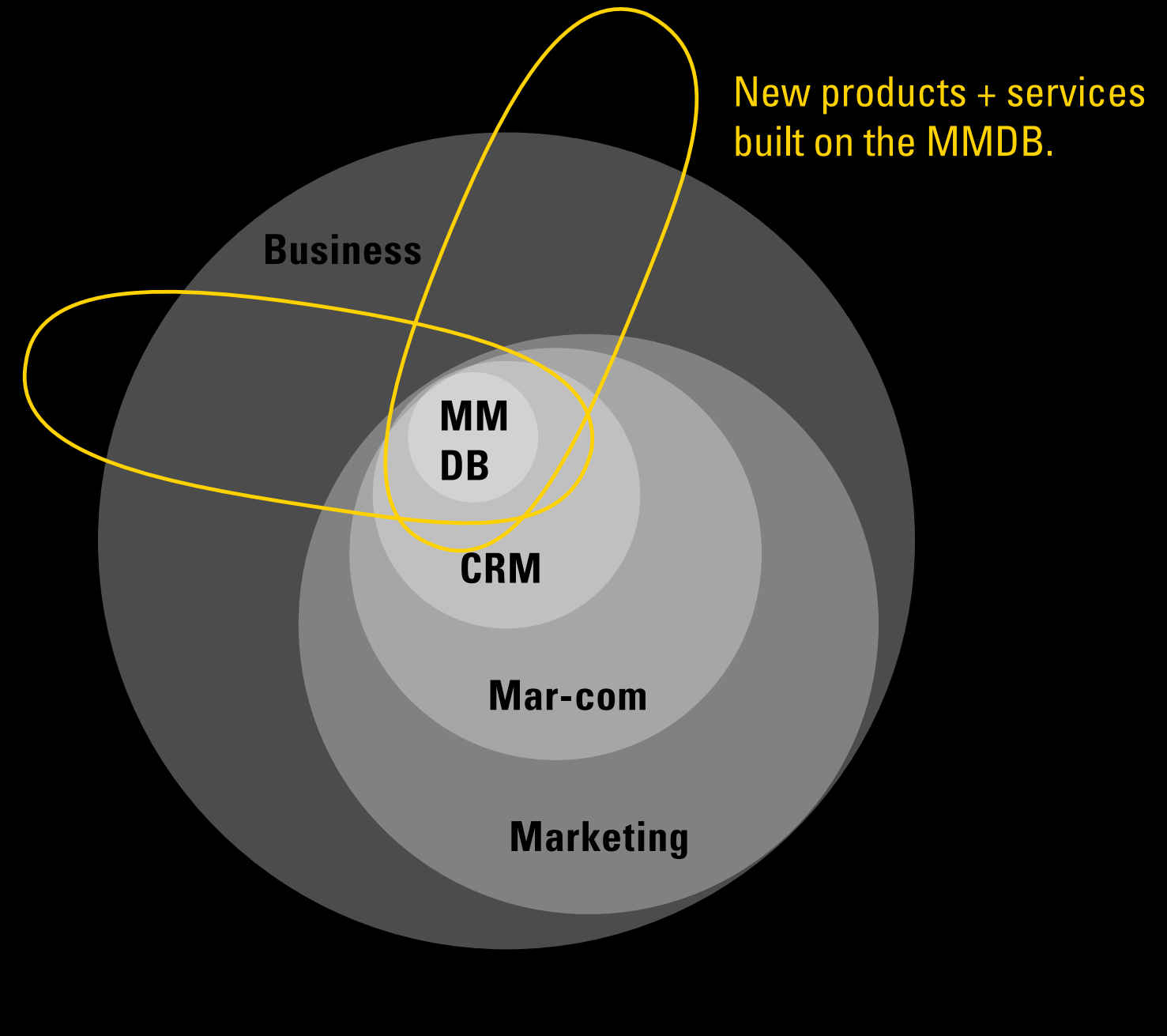
# Google + Amazon have built big businesses collecting huge amounts of data. They are not anomalies, they are signals of the future.



**Collecting data about customers has become central to all businesses.**  
You have to know your customers.



Existing model of CRM



Emerging model of CRM

**Augmented reality**—a virtual overlay on the physical world—is poised to move from experiment to commercial application.





# Imagine the possibilities for games.



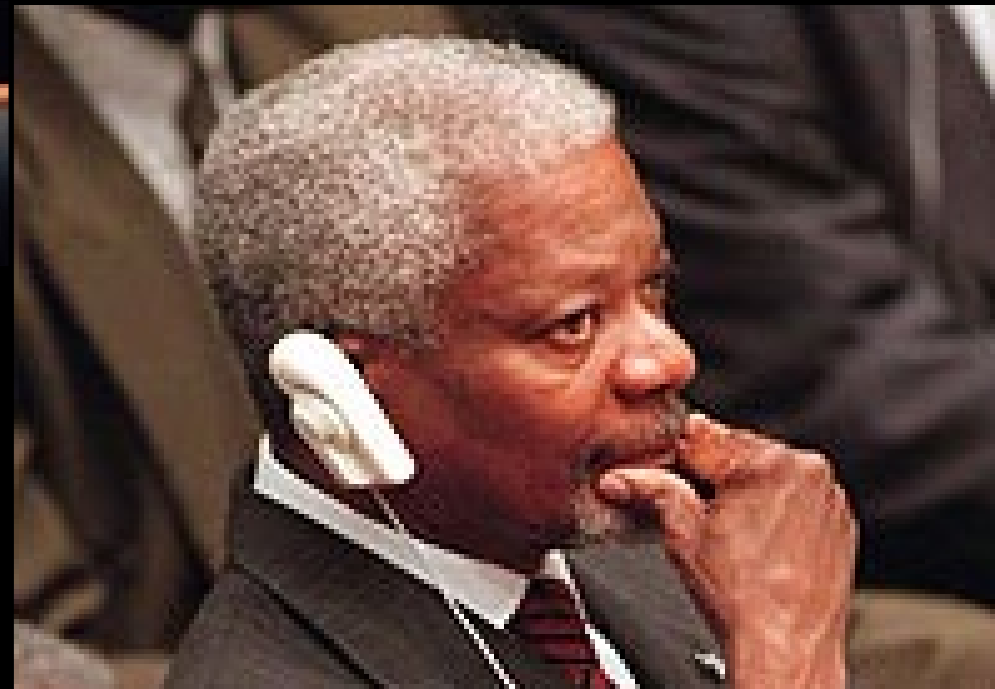
# Imagine the possibilities for games.



# Imagine the possibilities for games.

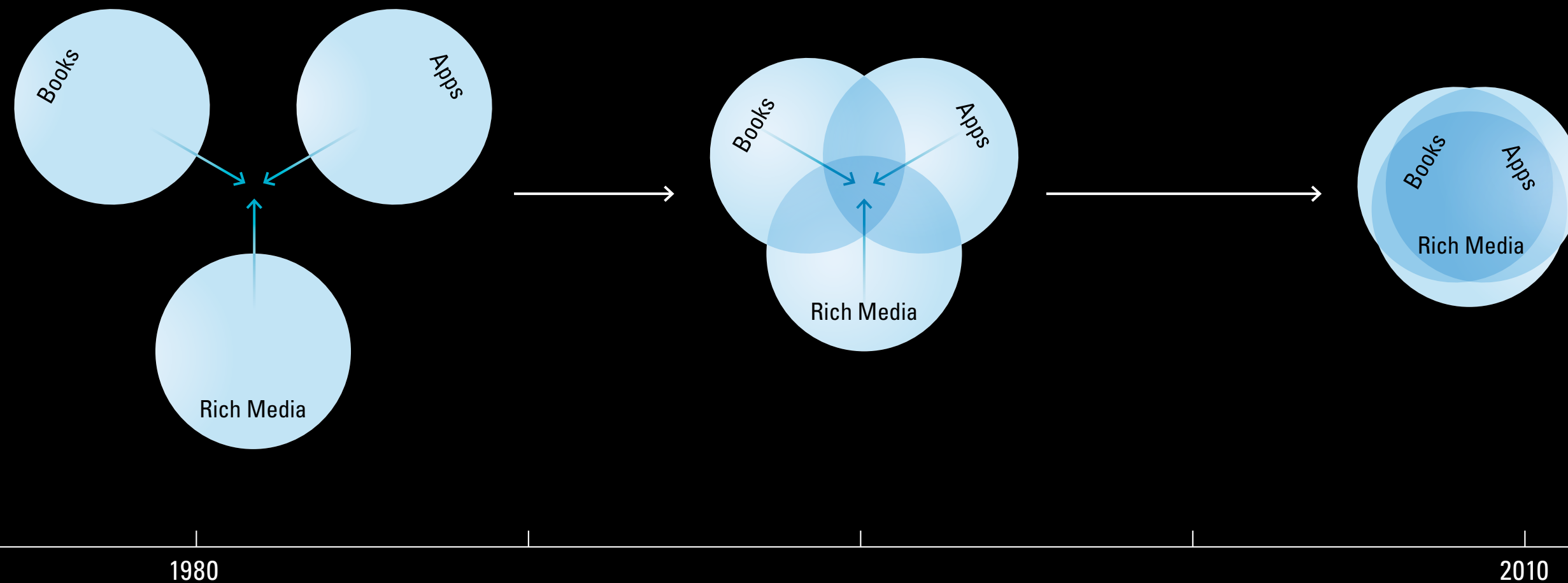


Imagine **continuous connection** and multiple parallel input streams—  
whispering **relevant information** into your ear.

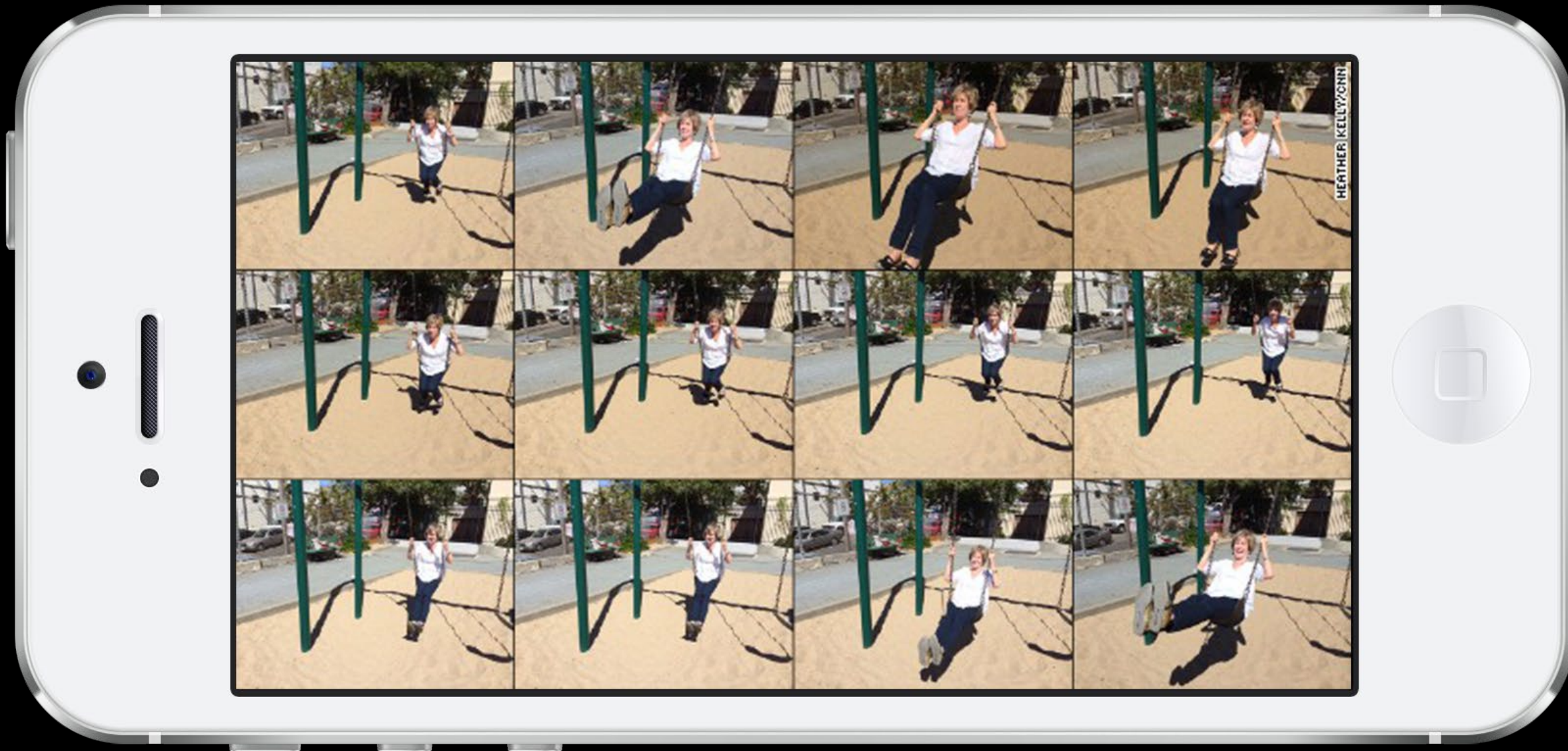




In 1980, Nicholas Negroponte described the coming **convergence of publishing, broadcasting, and computing.**  
30 years later, it's here.

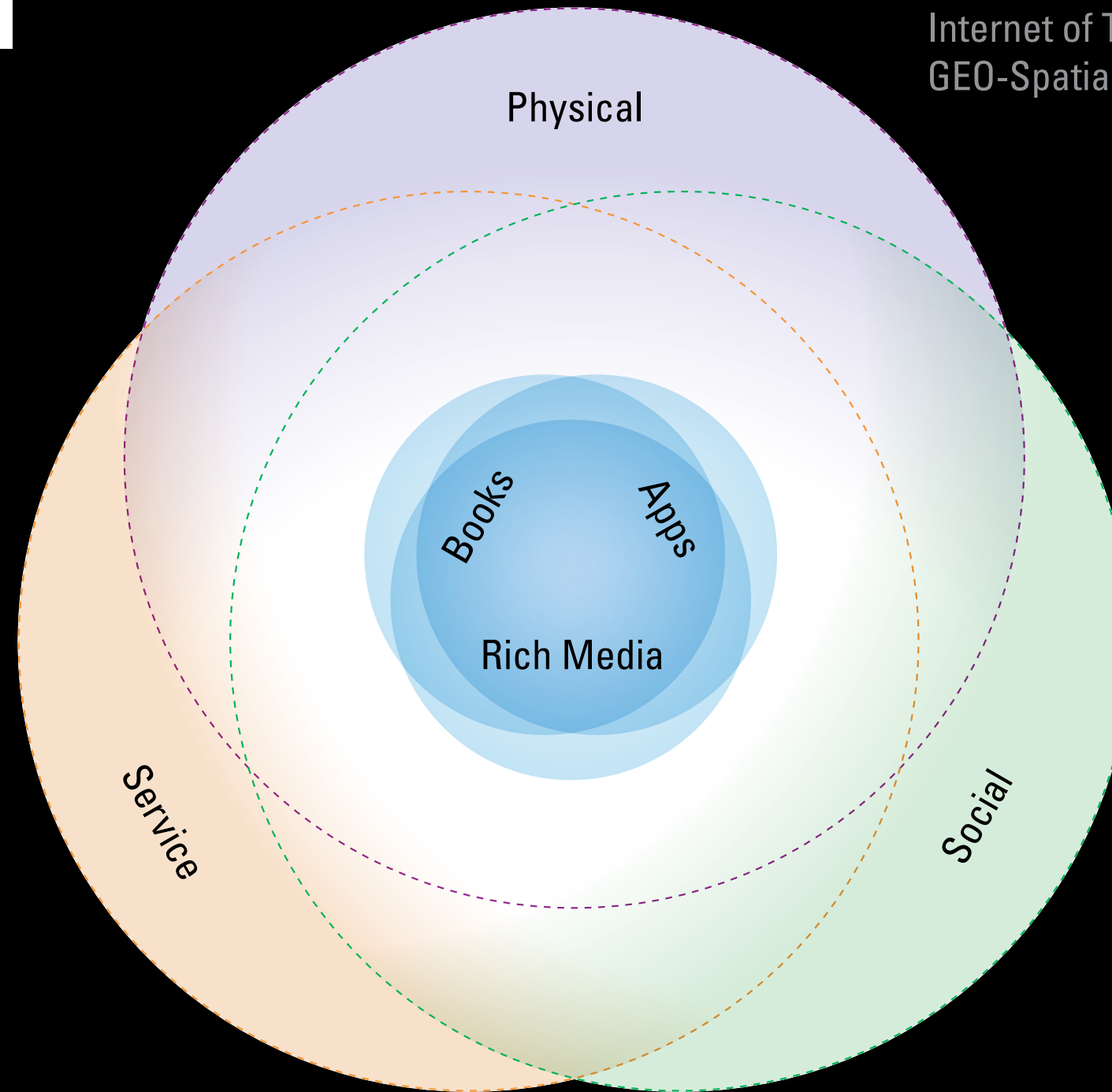


# Video has become as ubiquitous as smart phones.



# Convergence 2.0 = **Service + Social + Physical**

Routing + DNS  
Communications  
Computation + Storage  
Search  
Maps  
Media Access  
Payment + Advertising  
Speech + Image Recognition  
Automated Translation



Locations (GPS)  
Sensors  
Internet of Things  
GEO-Spatial Web

ID + Automation  
Contacts  
Social Graph  
Conversations  
Calendar + Time  
UGC + Crowd-sourcing  
Activity Streams  
Government Data

## Five key trends:

- 1 **Sensors** are proliferating.
- 2 **Networks** are connecting everything.
- 3 **Big data** is being collected on everything that happens.
- 4 Virtual overlays **augment** the physical world with **relevant** information.
- 5 **Video** is becoming the new lingua franca.



# Some Implications for Design Practice

We are in the midst of  
**a fundamental shift**  
in how we view the world.

from

# Industrial age

to

# Information age

# Product Eras

Subsistence	Craft	Manufacturing	Information
Made at home as needed	Made one at a time by specialists	Made in large editions by teams	Made on demand by anyone
Used at home	Used by others, often known by the maker	Used by others, almost always unknown to the makers	Tailored to each user, by definition known to the system
Sourced by user	Sourced locally	Distributed globally	Available anywhere, anytime
Hunting + gathering	Agriculture	Power sources	Computers
Family groups	Cities	Shipping networks	Data networks

The shift in world view  
is changing  
**the nature of products.**



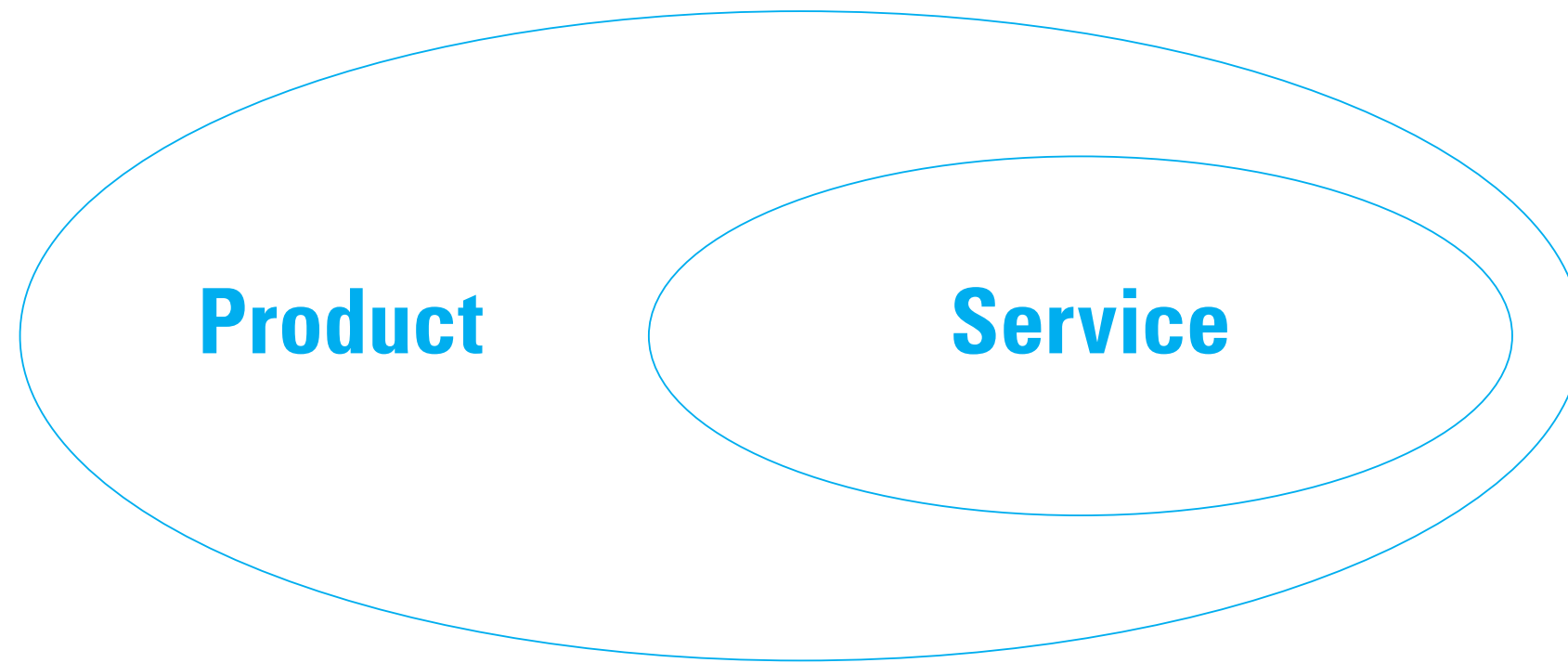
from  
**Objects**



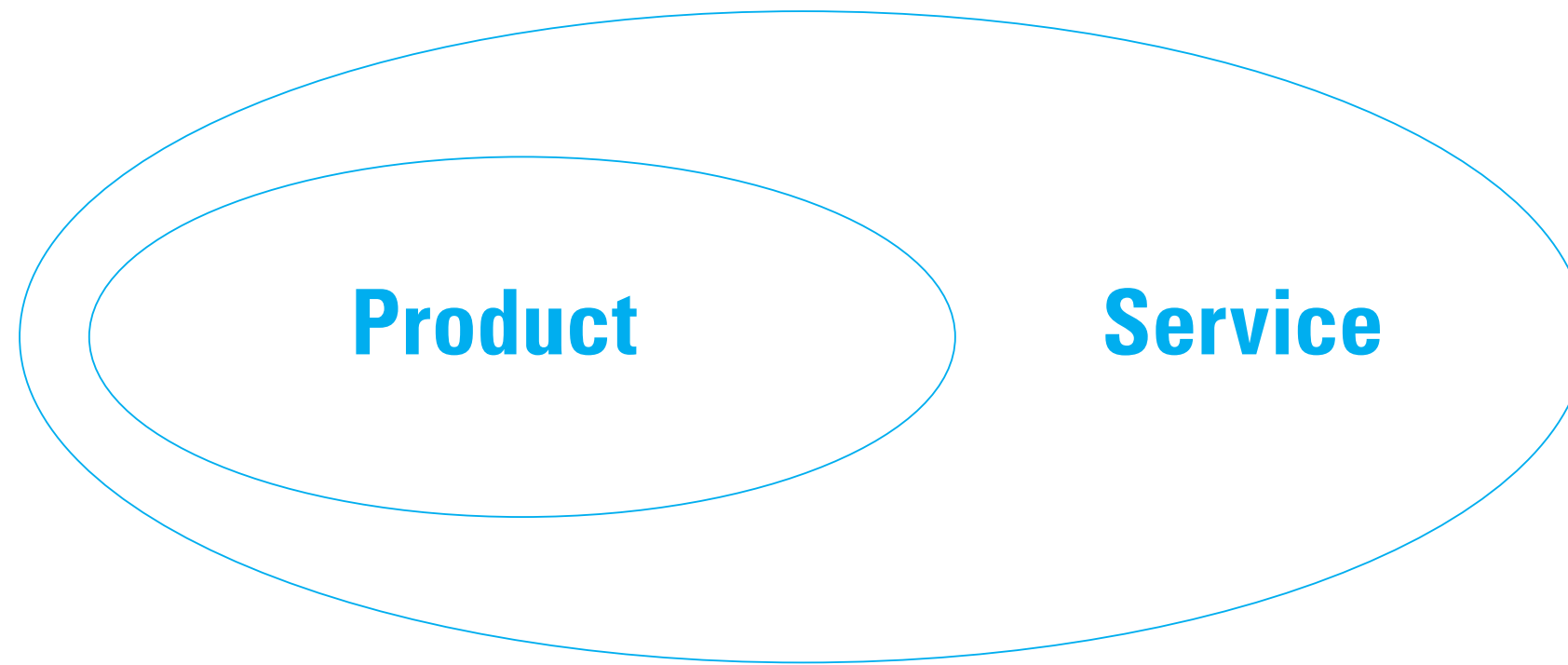
to  
**Experiences**



Traditionally, “**products**” has meant  
not just hard goods  
but also information and **services**.



In the last 20–30 years,  
“**services**” have become a way  
to deliver “**products**.”





*“... commercial products are best treated  
as though they were services.*

*It's not what you sell a customer,  
it's what you do for them.*

*It's not what something is,  
it's what it's connected to, what it does.*

*Flow becomes more important than resources,  
Behavior counts.”*

— Kevin Kelly, Wired



In this view, products are delivered *as* services;  
e.g., GE builds engines *and* sells aircraft up-time.



Formerly “shrink-wrapped” **software**  
is now being “**rented.**”



Adobe Creative Cloud

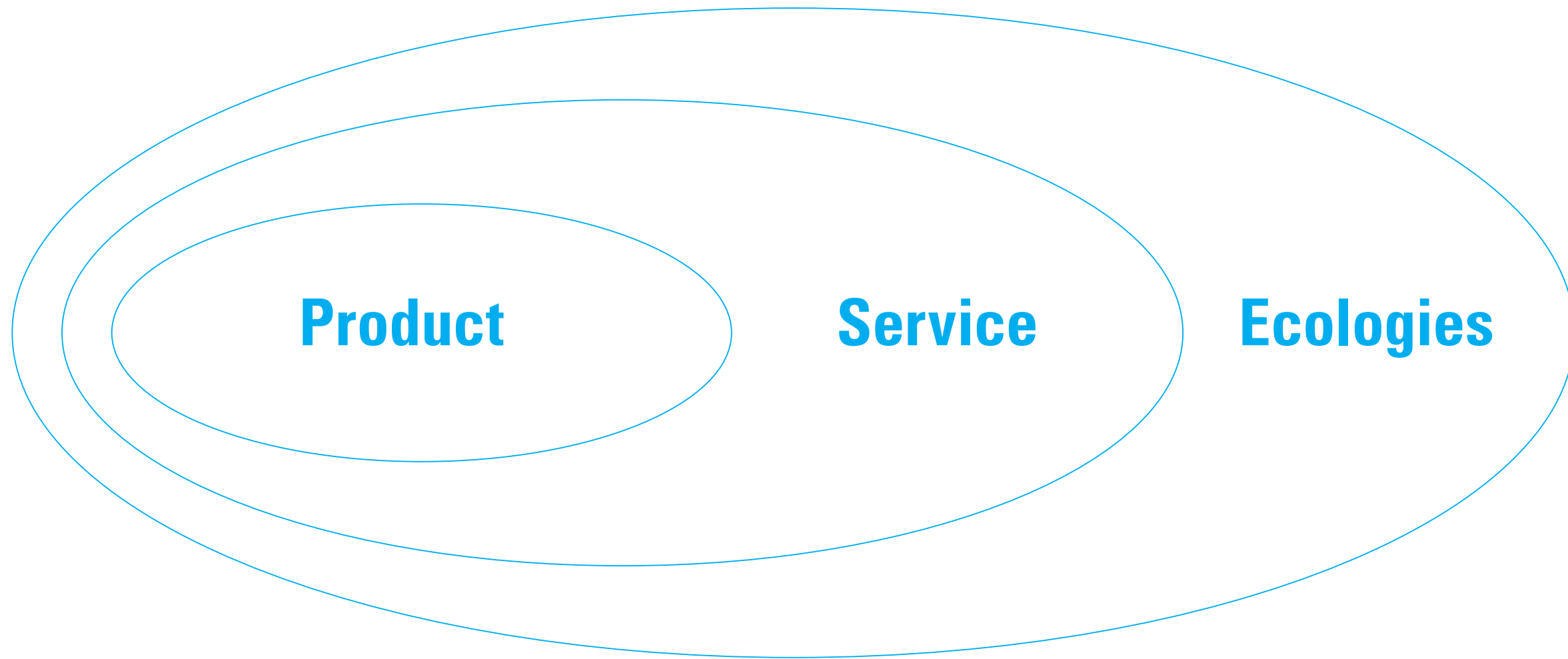


Autodesk 360



Microsoft Office 365

More recently,  
**services** are connecting to **integrated systems**,  
forming **product service ecologies**.



*“... networks of products,  
services, technology, people,  
and collective and collaborative interaction  
are generating value  
for the populations they serve.”*

— Jodi Forlizzi, CMU



# The “Space” of Products

	Product ("stuff")	Service (delivering products)	Ecology (connecting services, etc)
Primary level	Materials + Labor (sell)	Processes + Interaction (coordinate)	Networks + Cooperation (co-create + co-evolve)
Meta level	Tools (make more stuff)	Platforms (make new types of products + services)	Language (build knowledge)



# Stages of Experience

—Pine & Gilmore

## Commodity



**1¢–2¢** Per Cup

Beans

## Goods



**5¢–25¢** Per Cup

Roasted and ground

## Service



**75¢–\$1.50** Per Cup

Brewed and served

## Experience

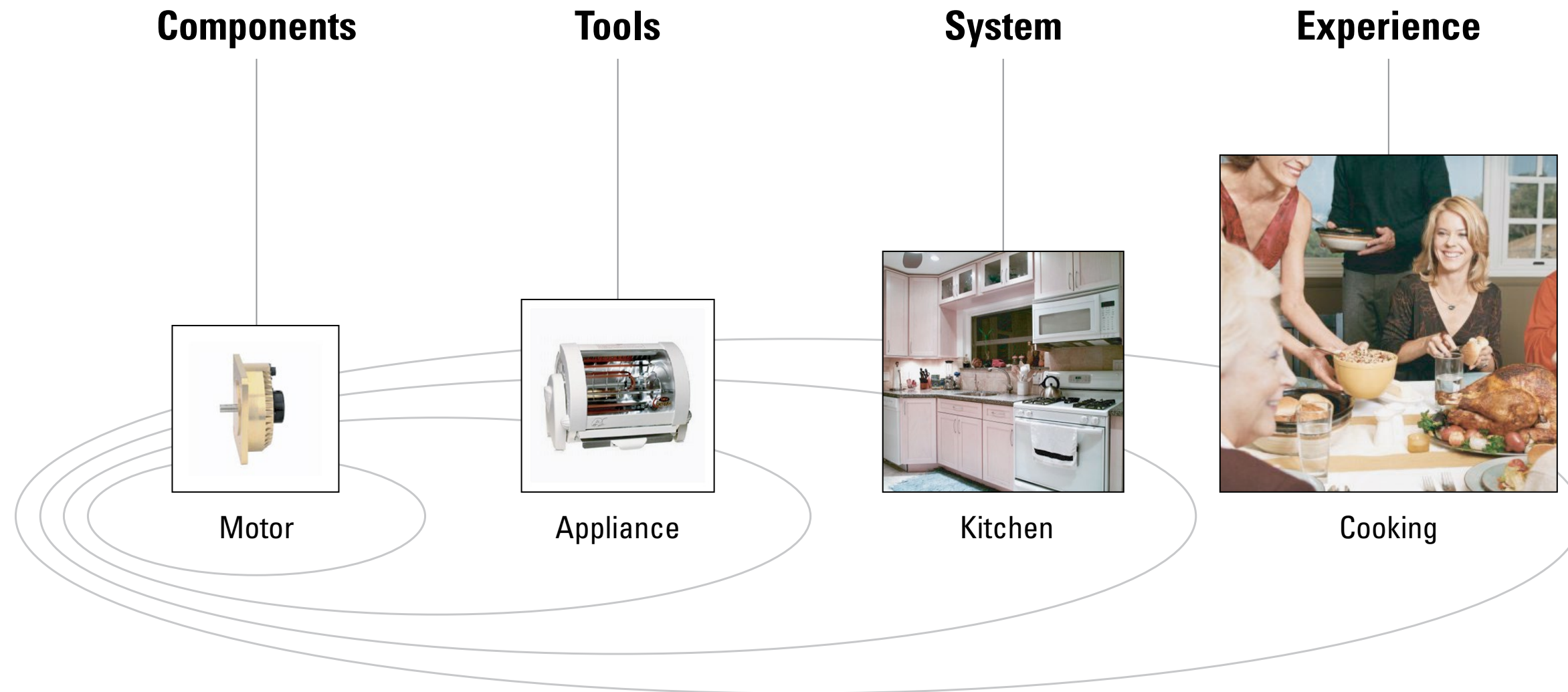


**\$2–\$5.00** Per Cup

Treating yourself  
to something special

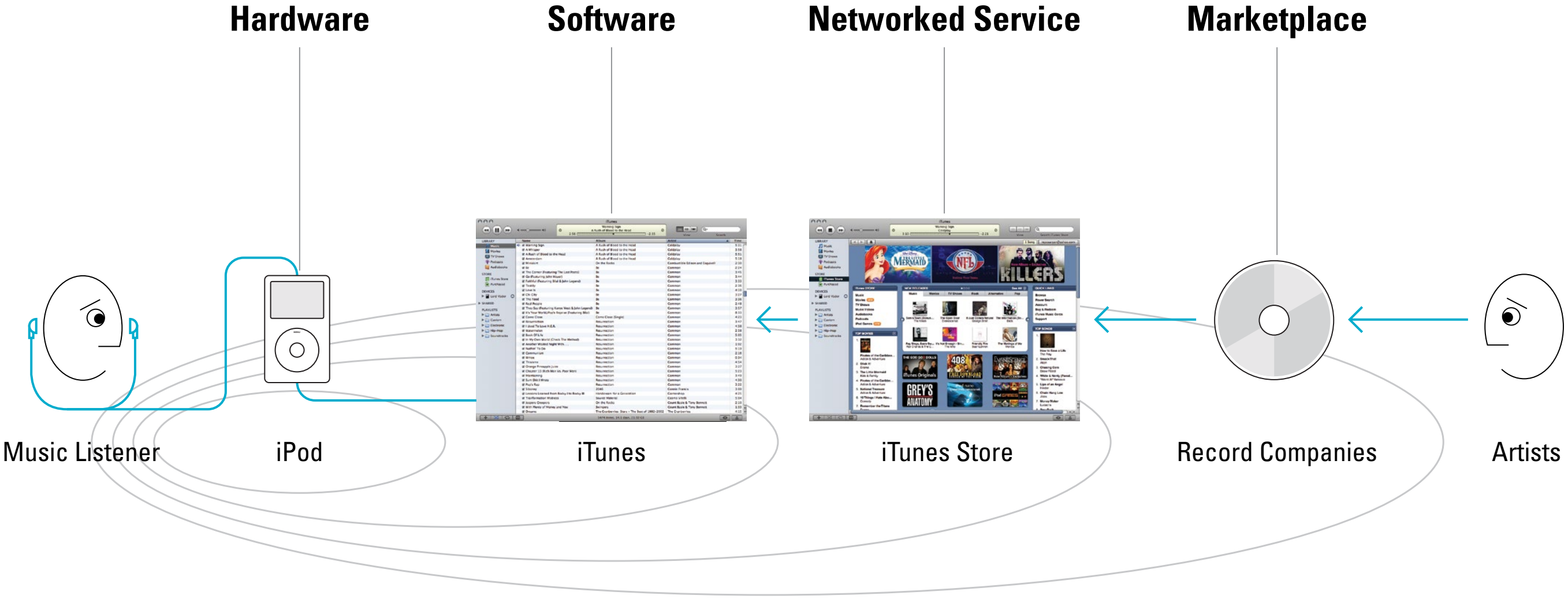
# Market-space

—Rheinfrank & Murrell





# iPod is not a stand-alone product; it's an integrated system— a **product-service ecology**.



# Apple has cautiously opened its ecology to others— teaming up with Nike to extend the iPod system.

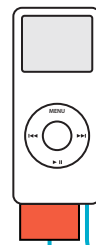
**Pressure  
Sensor**



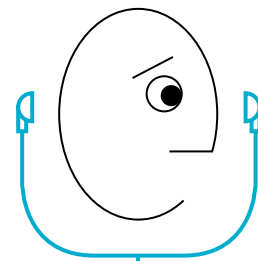
**Shoe**



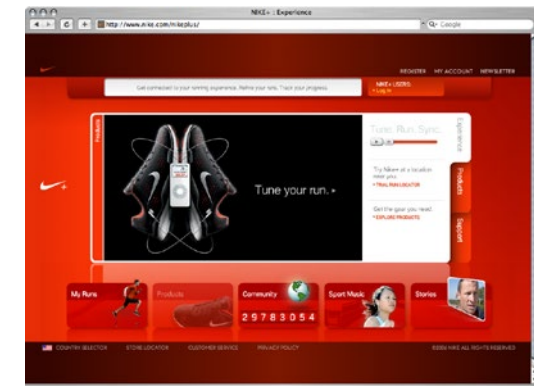
**iPod Nano  
(with Receiver)**



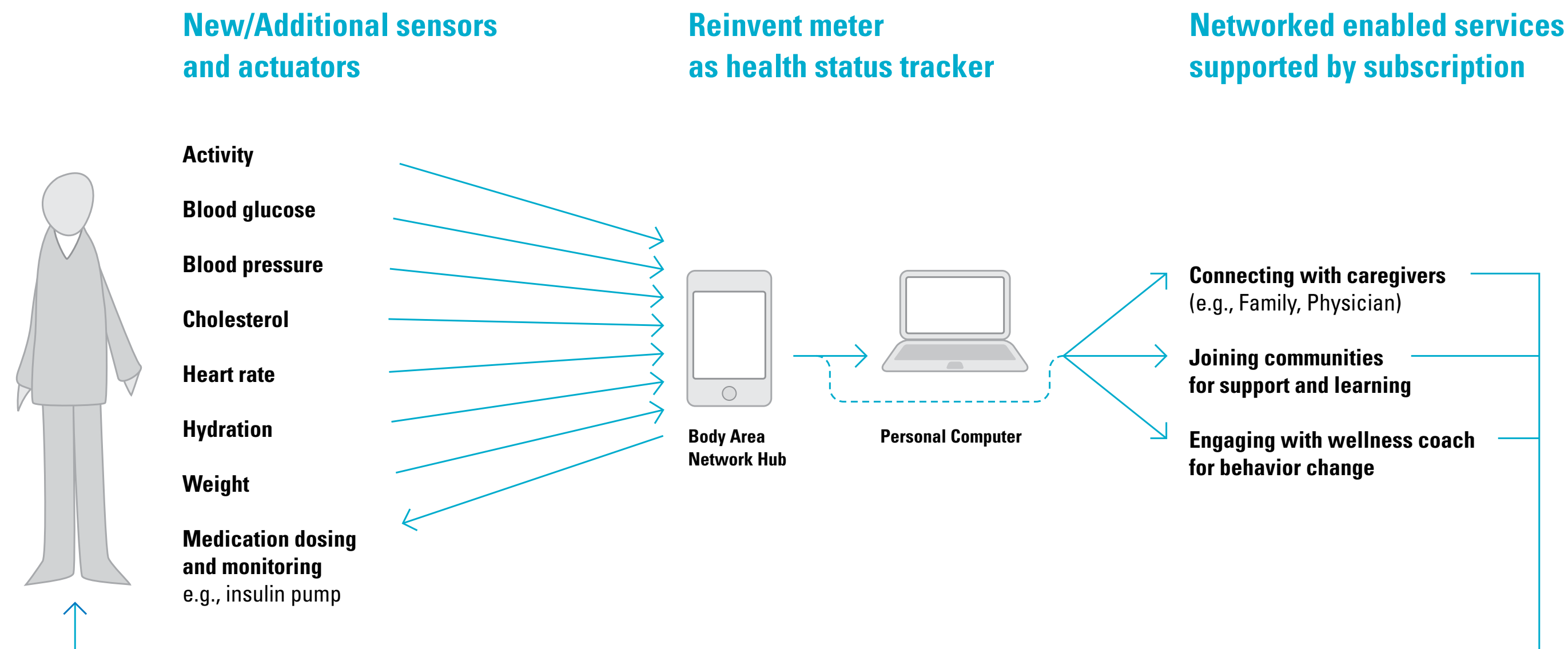
**User**



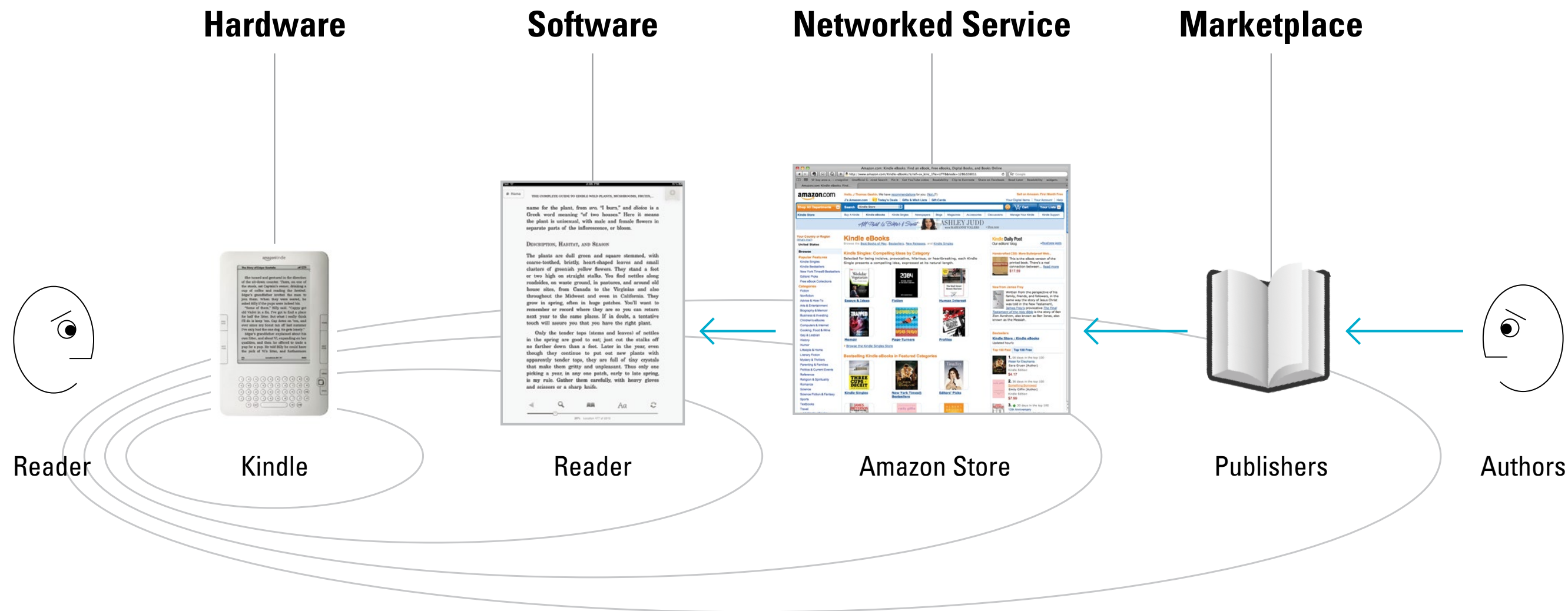
**Nikeplus.com**



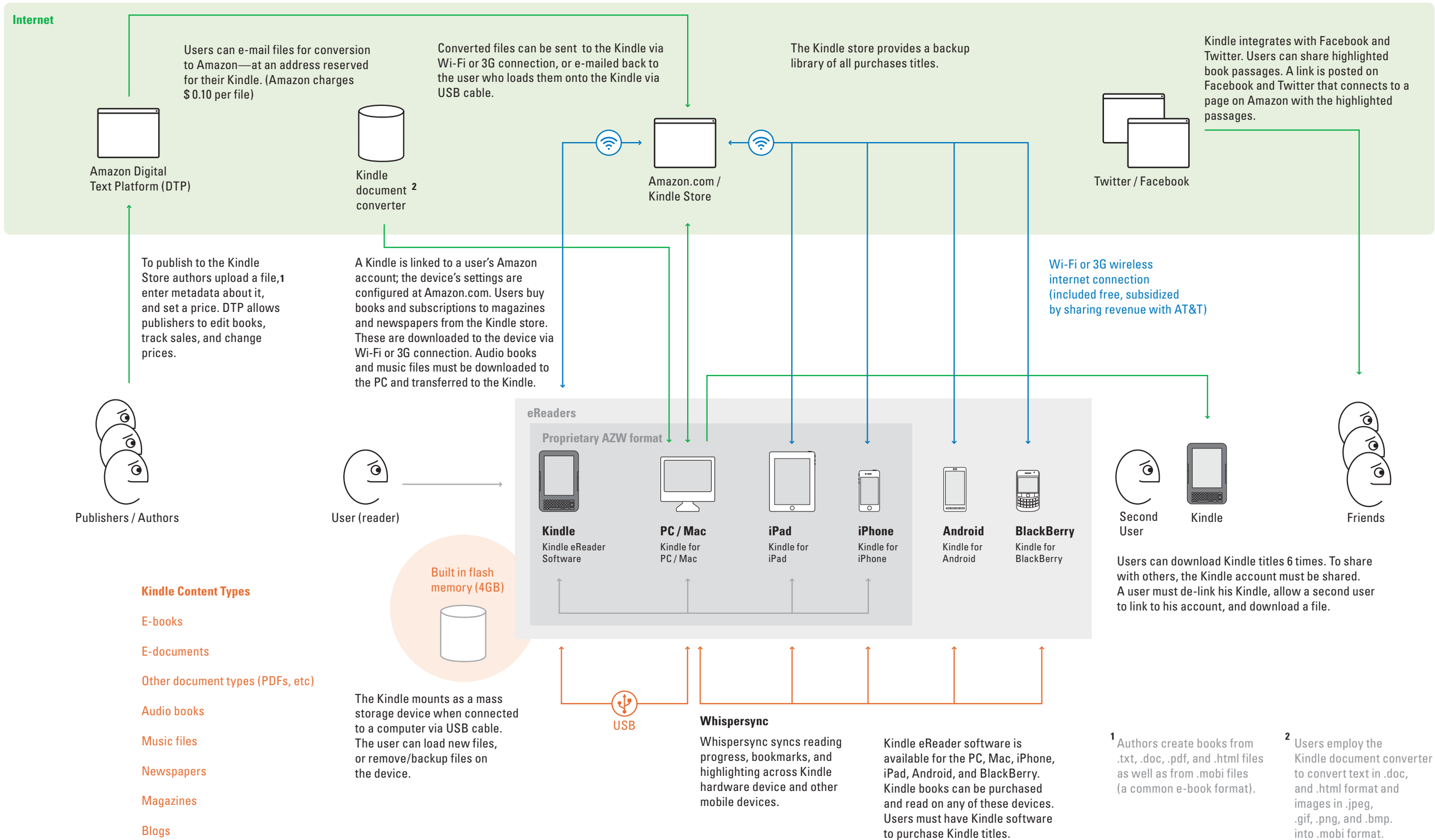
# In just a few years, iPhone and other smartphones will become hubs of **body-area networks**.



# Amazon's Kindle-Reader-Wispernet-Store system is another product-services ecology.



# In fact, the Kindle ecology is even more complex.



*“I think of [the Kindle] as a service.  
Part of [it] is of course the hardware,  
but really, it’s the software, the content,  
it’s the seamless integration of those things.”*



— Jeff Bezos, founder of Amazon

# Some Implications for Education



# Basic implications for design curricula:

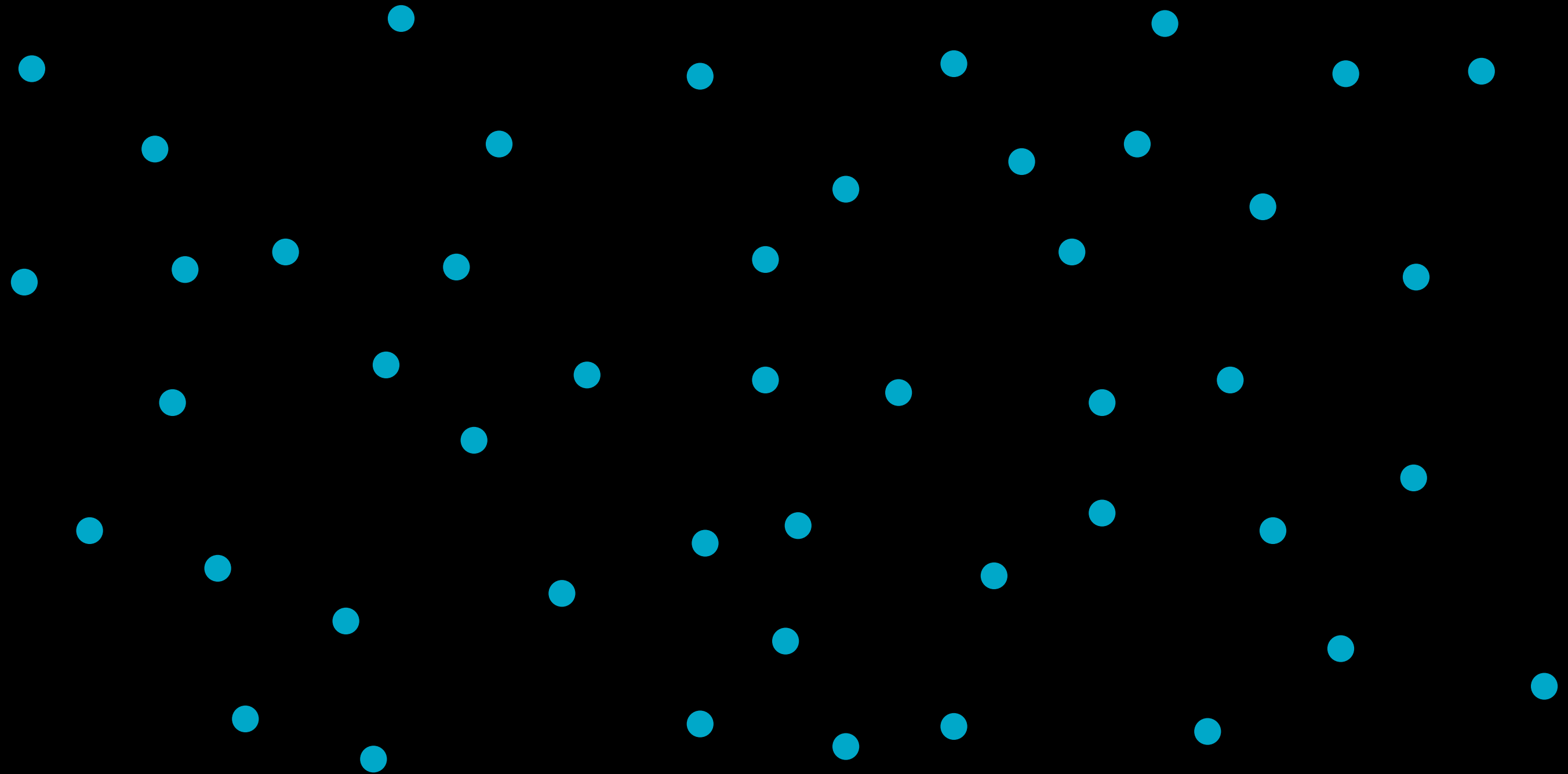
- less foundation; more writing
- less drawing; more diagraming
- less graphic + product; more service + interaction
- less “the look” of screens; more “feel” + behavior
- typography remains essential
- add systems theory and modeling courses
- add ethics, which has roots in system theory
- add animation, video, + sound design courses
- add software + hardware programming courses
- more collaboration with experts outside the arts

The Information Revolution gives us  
**more than new tools and new media.**

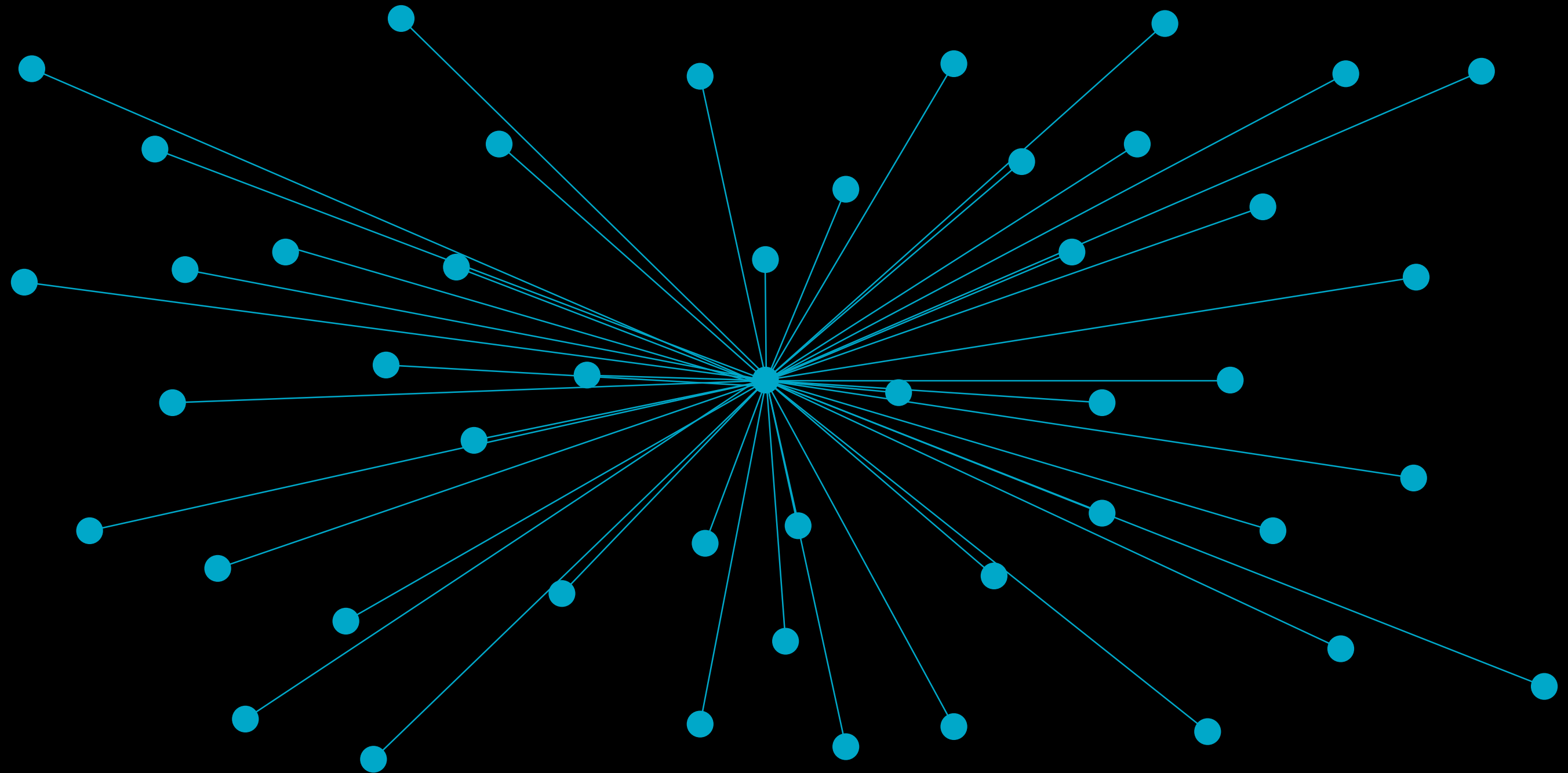
It's about much more than students making e-portfolios or websites.  
It's about much more than online courses and distance learning.

It's about **reconfiguring organizational structures**  
and **re-imaging social networks.**

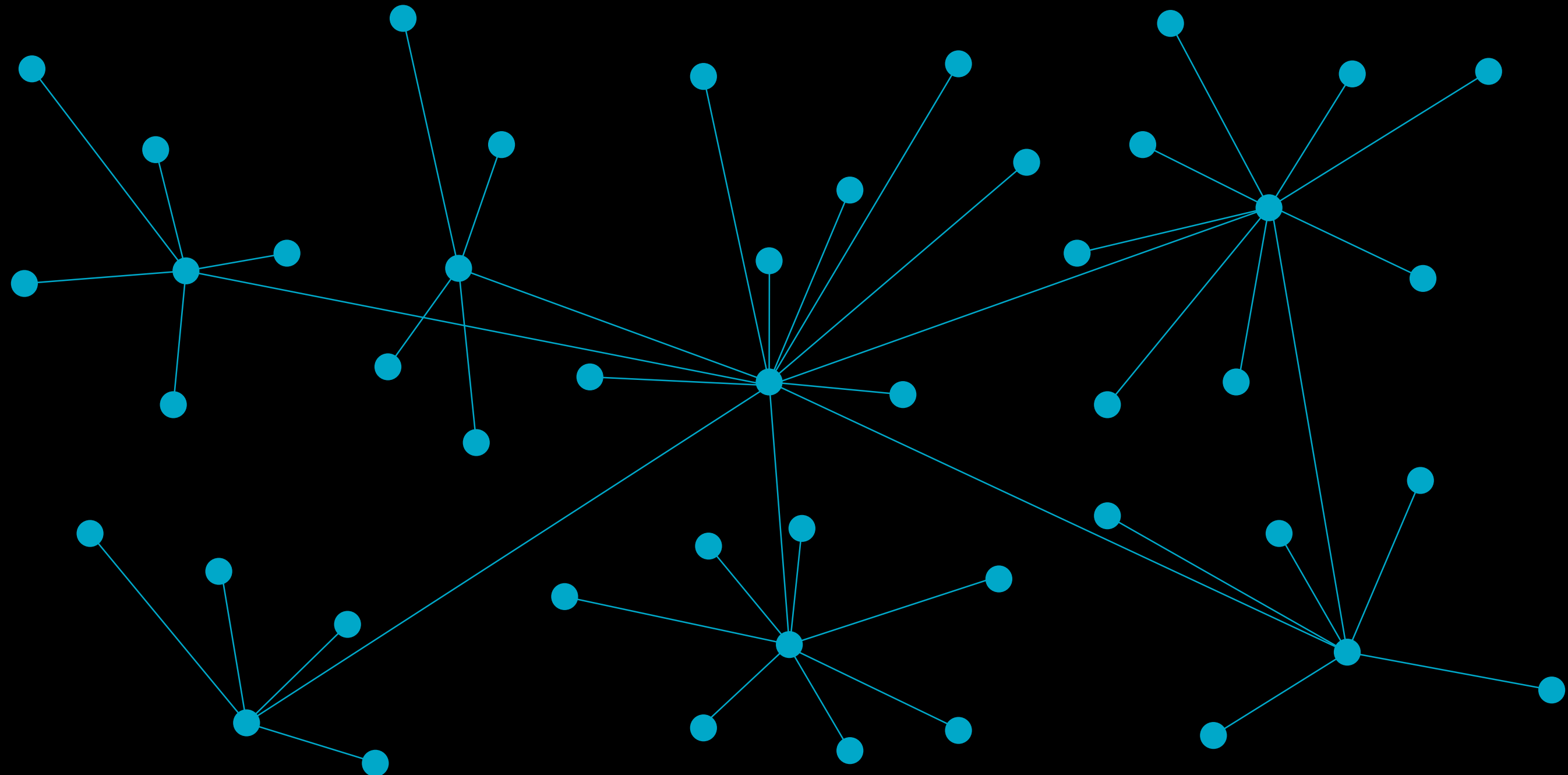
It's no longer enough to focus on **nodes**.  
We have to put at least as much emphasis on **connections**.



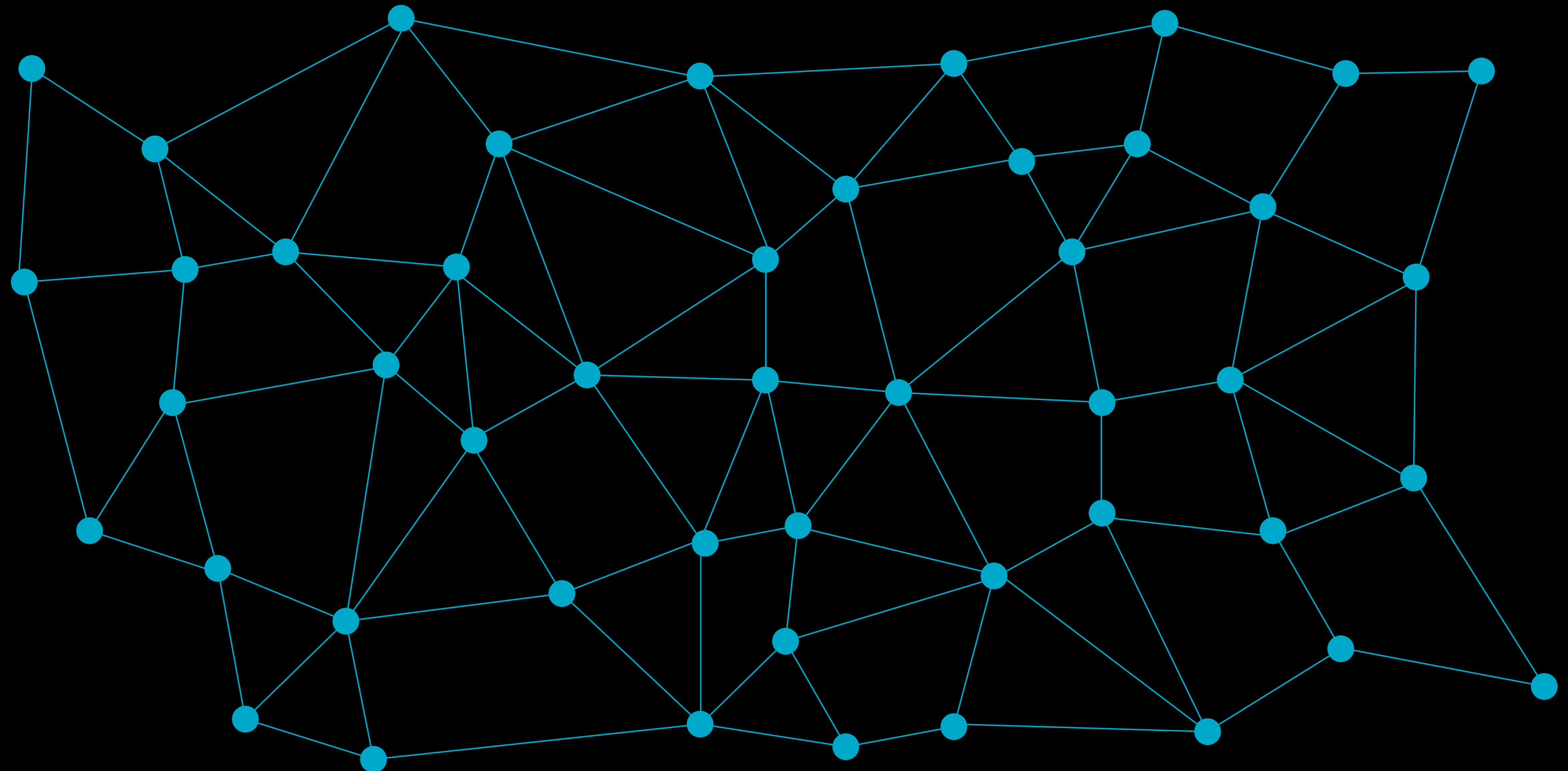
Our traditional organizations are **centralized systems**,  
top-down control, but with imperfect knowledge and bottle necks.



Even our view of knowledge is often **hierarchical**—  
c://university/school/department/faculty\_member/student



Yet, a truly collegial system is a **peer network**.





*“... the most powerful tool  
to advance the cause of progress  
is the peer network ...  
key attributes ... decentralized ...  
dense, in that they involve  
large numbers of participants  
with many interconnections ...  
diverse ... emphasize open exchange ...  
ideas are free to flow ...  
some mechanism for assigning value ...”*

— Steven Johnson, *Future Perfect*



Increasingly **peer networks will challenge universities**  
in domains where universities once enjoyed near monopolies.



**In order to remain relevant,  
universities will need  
to embrace peer networks.**

**Let's look at some  
radical possibilities . . .**

The primary mode  
of academic discourse  
remains the “paper”.  
And in most cases,  
MFA and PhD design students  
must submit a written thesis.

UNIVERSITY OF CALIFORNIA

SAN DIEGO

The Novels of Philip K. Dick

A dissertation submitted in partial satisfaction of the  
requirements for the degree Doctor of Philosophy

in English and American Literature

by

Kim Stanley Robinson

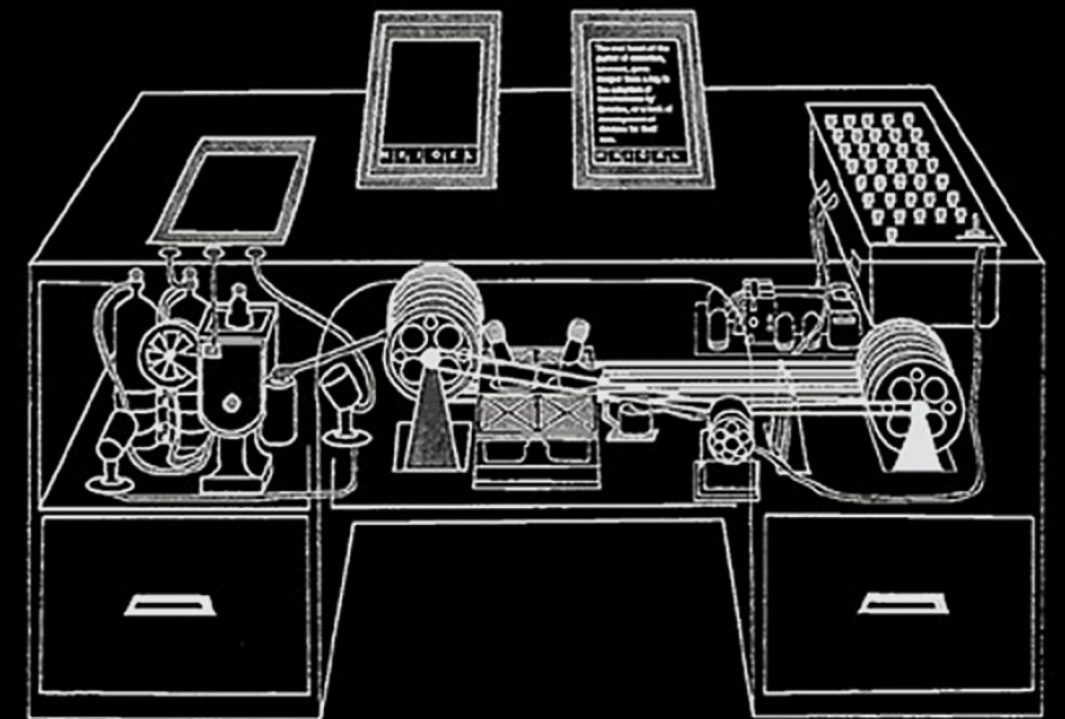
Committee in charge:

Professor Donald Wesling, Chair  
Professor Jack Behar  
Professor Michael Parrish  
Professor Richard Terdiman  
Professor Don Wayne  
Professor Fredric Jameson

1982

Yet, faculty almost universally acknowledge the **multimodal nature of design**—  
design's tendency to combine multiple modes of experience  
and combine multiple media.

On top of that,  
designers since El Lissitzky and Marinetti—  
not to mention Vannevar Bush, Douglas Engelbart,  
and Ted Nelson—  
have theorized about the future of “the book”  
and “re-writing” the nature of writing.



So:

When will we accept video as a standard form of discourse?

And more importantly,

**when will we hold students accountable for producing  
well researched, well reasoned arguments in video?**

**in hypertext?**

**in multiple, mixed media?**

If not in the era of iPad and Kindle, when?



I am not advocating play time.

I'm asking,

**“When will we start to see serious work that uses the tools we are asking students to learn to design to critique the tools they are designing?”**

(This is not a paradox; it is a necessity.

We ask students to write critiques of writing even as they are learning to write.)

In other words, can an annotated portfolio be seen not only as acceptable but actually as preferable to a traditional written thesis?

And how should students be accepted into an academic program?

**Why are admissions decisions made behind closed doors,  
by a small, central group with limited knowledge?**

Would it be preposterous to crowd source admissions?

Suppose for example,  
that all graduates from the last 5 years could vote on candidates.

Would it be preposterous to crowd source evaluations?  
Thesis examinations?

Again, **why is a thesis reviewed by only 2 or 3 advisors**  
who know the candidate intimately?  
Wouldn't the system benefit from a little bit of transparency?

Suppose students couldn't graduate  
until they had raised enough money on Kickstarter  
to build a prototype.

Suppose students had to recruit practicing professionals  
as reviewers.

Why does a student's relationship with an art or design school end upon graduation?

Most professions require **continuing education**.  
And surely **design** is enough of a profession—  
**in the midst of enough change—**  
**to warrant on-going education** for professionals.



Imagine Facebook for education.

**Imagine a platform for tracking your students**

- their interests
- their accomplishments
- their connections

**Imagine a “CRM” system for your school**

- connecting students
- connecting alums
- connecting faculty
- connecting a wider community

**Imagine the “Lifetime Customer Value” of your students.**

In many cases, **practice leads the academy.**  
Often students know more about technology than teachers.  
Often grad students are closer to practice than tenured faculty.

This is not an embarrassment.  
It's a fact of life.

**We should take advantage of student knowledge  
and organize schools as peer platforms.**

We need to **see students as peers who educate us**  
as much as we educate them.

We need to **engage practicing professionals**,  
richly, deeply, meaningfully, in the academic process—  
not just as “advisers” or as “mature learners”,  
but **as co-creators**.

We need to imagine tight feedback loops  
between practice and the academy.

Today, even small design firms have **global practices**;  
yet most universities draw on faculty who live within commuting distance.

Let us imagine a world  
in which design schools regularly engage international faculty  
who are not “in residence”—  
as well as students who are not in residence.

Let us imagine a school  
in which **design education**—and design research—  
**continues throughout a student's lifetime,**  
scaffolded by peer networks  
built on the platform of universities  
engaging students of all ages  
all around the world.



# Let us **design** such a school.

Let us **design** such a school.  
Let us **build** such a school.

**Special thanks to**

**Michael Gallagher**

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**Katherine McCoy**

**Cameron Tonkinwise**

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