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

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A talk in three parts:

PART ONE
Key Technology Trends

PART TWO
Some Implications for Design Practice

PART THREE
Some Implications for Education
PART ONE

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.
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.
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

Rich Media

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

Books

Apps

Physical

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

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

Service

Social
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.
PART TWO

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

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

<table>
<thead>
<tr>
<th>Primary level</th>
<th>Product (&quot;stuff&quot;)</th>
<th>Service (delivering products)</th>
<th>Ecology (connecting services, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Materials</td>
<td>Processes</td>
<td>Networks</td>
</tr>
<tr>
<td></td>
<td>+ Labor (sell)</td>
<td>+ Interaction (coordinate)</td>
<td>+ Cooperation (co-create + co-evolve)</td>
</tr>
<tr>
<td>Meta level</td>
<td>Tools (make more stuff)</td>
<td>Platforms (make new types of products + services)</td>
<td>Language (build knowledge)</td>
</tr>
</tbody>
</table>
Stages of Experience
—Pine & Gilmore

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Goods</th>
<th>Service</th>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans</td>
<td>Roasted and ground</td>
<td>Brewed and served</td>
<td>Treating yourself to something special</td>
</tr>
<tr>
<td>1¢–2¢ Per Cup</td>
<td>5¢–25¢ Per Cup</td>
<td>75¢–$1.50 Per Cup</td>
<td>$2–$5.00 Per Cup</td>
</tr>
</tbody>
</table>
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.
In just a few years, iPhone and other smartphones will become hubs of **body-area networks**.

- **New/Additional sensors and actuators**
  - Activity
  - Blood glucose
  - Blood pressure
  - Cholesterol
  - Heart rate
  - Hydration
  - Weight
  - Medication dosing and monitoring e.g., insulin pump

- **Reinvent meter as health status tracker**

- **Networked enabled services supported by subscription**
  - Connecting with caregivers (e.g., Family, Physician)
  - Joining communities for support and learning
  - Engaging with wellness coach for behavior change
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
PART THREE

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.
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.
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