Wealth, Innovation, Design, & Economic Growth …
and How it Begins with Entrepreneurship

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History Lesson: *What Was and What Will Never Be*

[... and, yes, that is an oblique *Led Zeppelin* reference ...]
(My) Agenda

all individuals in society become wealthier

- economic growth
- innovation & good design
- entrepreneurship
Wealth: Being well off, lazing on a sunny afternoon, also — *having something other people want*

[ ... and, yes, that is an oblique Kinks reference ... ]
What is Wealth?

Wealth

Not Wealth
What is Wealth?

Wealth

Not Wealth
What is Wealth?

“User data integrity is more valuable than the money in our wallets”

Google reliability talk, yesterday
Economic Growth: $0 \rightarrow 1 \rightarrow 2$  (an engineer’s perspective)
Fundamentally, there are (at least) two types of economic growth:

- giving people something they don’t already have, and
- giving people more of something they do already have

My claim: 0 → 1 is significantly more transformative than 1 → 2
Economics of 0 → 1 → 2

0 → 1: Food, housing, communications, transportation, medical care, etc.

1 → 2: Food, housing, communications, transportation, medical care, etc.
Economics of $0 \rightarrow 1 \rightarrow 2$

0 \quad 1

Food, housing, communications, transportation, medical care, etc.

1 \quad 2

Food, housing, communications, transportation, medical care, etc.
Economics of 0 → 1 → 2

For example — access to telecommunications improves the standard of living of everyone.
Economics of \(0 \rightarrow 1 \rightarrow 2\)

**Economics of BETTER:**
Transformative
Innovation-driven
ALL in society benefit

**Economics of MORE:**
NOT transformative
Optimization (cost)-driven
Optimizers benefit
all individuals in society become wealthier

- economic growth
- innovation & good design
- entrepreneurship
Innovation: um ...
Innovation: um … Just be like Apple?
It’s All About Innovation …

“Innovation and trade: the ultimate engines of growth.”
—Economist

“We have to choose to do what past generations have done: shape a brighter future through hard work and innovation.”
—Barack Obama
(ASEE’s “Obama Touts Innovation Agenda At New York Community College”)

“In the new knowledge economy, innovation and knowledge are the most important factors driving economic growth.”
—Progressive Policy Institute: The Innovation Economy

“Innovation is the heart of economic recovery & future prosperity.”
—Roll Call
… But Innovation is **Really** Hard

- “In an era when most technology outfits have tightened their belts to adapt to a slower-growing market, one company stands out for forging ahead on innovation: Apple Computer.” *(BusinessWeek)*

- “Big companies are losing their ‘A’ players, and they’re struggling to attract ‘B’ players. In an industry where everything is about people, large tech companies are in trouble because they are losing the talent war. And keep in mind, an ‘A’ player in an organization can usually produce the same results as three ‘B’ players.” *(VentureBeat)*

- “Lots of companies have tons of great engineers and smart people. But ultimately, there needs to be some gravitational force that pulls it all together. Otherwise, you can get great pieces of technology all floating around the universe. But it doesn’t add up to much.” *(Steve Jobs, on innovation)*
Some Perspective

Big companies cannot innovate, whereas startups **must**.

Startups are engineer-dominated; **founders** (engineers) are rewarded for company’s success.

Upon maturity, startups become management-dominated; **executives** (non-engineers) are rewarded for company’s success.

(althus #1, above)

**Goal: break this cycle**
Some More Perspective

Middle managers believe themselves to be innovators.

“Intrapreneurship” (also termed “corporate entrepreneurship” or “corporate venturing”) tries to foster creativity within corporate environment.

Most studies empower middle management. None investigate rewarding engineers. WTF?

The term *managerial creativity*, a common term in the research literature, probably says it all.
Bottom Line: It Starts with Good Engineers

• Existing trend is to study innovative exceptions (Apple, Google, Fiat, etc.) and try to emulate them.

• Why not emulate an entire industry instead? In particular, the one industry known for innovating regularly.

• What do startups do? They recognize that engineers are their primary innovators, and they PAY them.

Engineers → Innovation → Wealth
Entrepreneurship: DIY, Modern *Engineering 101*

[... a perhaps too-oblique Peter Gabriel reference ...]
Important development in last two decades:
Important development in last two decades:
Important development in last two decades:

Manufacturing as a Service
The Basic Idea

You → Design Blueprint → Factory → Manufactured Device
The Basic Idea

Design Blueprints

Factories

Manufactured Device

Assembly
Some Blueprints
... and what they became
Some (other) Blueprints
... and what **they** became
## Pros & Cons: High-Tech Cottage Industry

<table>
<thead>
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<th>Cons</th>
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<td>- Idea already proven in marketplace (shareware, boutique electronics)</td>
<td>- Can’t Possibly compete with big companies</td>
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<td>- Start soon</td>
<td>- Window of opportunity?</td>
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**Bottom line:** a path well worth exploring
Pros & Cons: High-Tech Cottage Industry

• Can’t Possibly compete with big companies

• Idea already proven in marketplace (shareware, boutique electronics)

• Might fail

• Win/win situation (even company failure is good résumé material)

• Can’t afford it

• Low risk/reward ratio

• Start soon

Bottom line: a path well worth exploring
Design, the Teaching of: Epic Fail (so far)

[... and, yes, that is an oblique Bachman-Turner Overdrive reference ...]
What is Design? What is Innovation?

- Can’t define it, but you know it when you see it …

- Close interaction with **burnout** phenomenon in start-ups

- An inability to eat, think, sleep, care for one’s self while technical problem remains

- Much “innovation” is just good design (… interesting)

- Requires staring at one problem for extended period (much like Ph.D. in that regard)

Image search for “burnout”
Let’s think more on that last point …

**Innovation and design:** Requires staring at one problem for an extended period

**Academia:** Attention flits from topic to topic in a scheduled, often frenetic pace.

Semester concept is both arbitrary and contrived/artificial — false sense of progress (innovation recognizes no schedule)

We’re **training** our students to be poor designers.
But, wait, there’s more …

Students calculate the effort needed to get the desired (or lowest acceptable) grade. They do the minimum work required. We (unconsciously) train them to do this.

Needless to say, this doesn’t fly for design. In design, anything less than full attention = failure.
Put Simply

Design & Innovation — what it demands of you:

- Focus: 100%
- Time: extended period

The Academic Environment — what it demands of you:

- Focus << 100%
- Time ≤ 1 semester (typically, ≤ 1 week)

Conclusion: *Education is counter-productive at the society level?*
It Has Been Borne Out in Reality

- Innovation and design requires staring at one problem for extended period

- Contrast that with academia (undergrad in particular):
  - Attention flits from topic to topic in a scheduled, often frenetic pace
  - Semester concept is both arbitrary and contrived/artificial (innovation recognizes no schedule)

Is it any wonder that SO MANY successful entrepreneurs/innovators dropped out of school?

- Larry Ellison
- Bill Gates
- Stephen Spielberg
- Richard Branson
- Michael Dell
- Steve Jobs
All Is Not Lost, However …

**Necessary Elements:**

- Look at one problem for extended period (years?)

- Personal investment in outcome (reward, pride, etc.)

- Time commitment need not be large on per-week basis

- Need to see **real examples** of both success and failure

- Must be guided by innovators (not academicians, not MBAs)

- Failure is acceptable (grades)
Okay, Let’s Bring It On Home …

[ … a not-so-oblique Led Zeppelin reference … ]
The Argument

| Wealth: | Comes from making something that other people want (please!) |
| Innovation & Design: | Absolutely will not happen without good engineers |
| Economic Growth: | Your vision will succeed if you bring people something that they need but do not have |
| Entrepreneurship: | What kick-starts it all |
Again — the Point of Innovation

To Create Wealth

For you
For others (beneficiaries of your innovations)
For the economy

Wealth is not like energy;
it obeys no laws of conservation
To Recapitulate Yet Again

all individuals in society become wealthier

entrepreneurship

innovation & good design

economic growth
To Recapitulate Yet Again

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Your Part
To Recapitulate Yet Again

Never has it been easier for a designer to get his/her designs into the hands of thousands, millions of people.

The tools are there; the costs are low; and you don’t need anyone’s permission.
Questions?
(thank you for your kind attention)

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... or just Google “professor guitar maryland”