Successful Entrepreneurship for Microsystems

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Create product that solves a real Customer Problem…
A “must-have” for the customer …a Differentiated solution

A systematic approach to planning and execution
HOW AIRBNB STARTED
Or How 3 Guys Went From Renting Air Mattresses To A 10 Billion Dollar Company

2007

two guys in San Francisco can’t pay rent

they think to rent out 3 air mattresses on floor to people and serve breakfast

they make a simple website (a blog with maps) airbedandbreakfast.com

2 men, 1 woman showed up, paying $80 each

after guests left they thought this could be a big idea

they invited former roommate as a co-founder to build the site

2008

(launched at SXSW - got two bookings)

2009

(Brian, I hope it’s not the only idea you are working on)

2010-2011

made $400 a week started to grow

were rejected by a famous VC in New York (Fred Wilson)

Barry Manilow’s (a famous singer) drummer rents an entire house

raised $600,000 seed round from Sequoia

raised $7.2 million, then $112 million from many investors and Ashton Kutcher

2014

$10 BILLION VALUATION

by Anna Vital

Funders and Founders

based on reports in Telegraph, WSJ, and The Atlantic
How DIFFERENTIATE?

How many APP Developers worldwide?? How much Revenue for the Developer??

Sensors
SW Integration Characteristics
Power Dissipation Battery Life …

…Your knowledge of Microsystems could be a key
Anatomy of an IoT Product

Mobile App

Sensor

ADC*
Processor

Battery

Wireless
Tx/Rx+

* Analog Digital Converter
+ Transmitter Receiver

…Your knowledge of Microsystems could be a key
History

Market Drivers

Industry Directions & Challenges

Opportunities
Innovation in Product Development
Integrated Co-Design
Non-LE process
3D / MtM
Fabless
Entrepreneurial
1906 Nobel prize for J.J. Thomson for the “Electron”

Early Addition Machine…Burroughs

Vacuum Tubes in the early 1900’s
1945 ENIAC
The First Electronic, Large Scale General Purpose Digital Computer
...University of Pennsylvania

1995 ENIAC on-a-Chip

Card Reader Service for 80-Column IBM Punch Cards http://PunchCardReader.com
1947 Transistor Invention
1958-1959 First IC, First Planar IC

1947
Bell labs
Schokley, Bardeen, Brattain

1958
First IC, Kilby

1959
First Planar ICs, Hoerni
1970 Intel 4004 ... 2.3 K Transistors
Today ... >2B Transistors
We have come a LONG way! ...yet a LONG way to go!


<table>
<thead>
<tr>
<th>Process</th>
<th>Quantity</th>
<th>Growth Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wafer size</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Technology node</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Typical equipment cost</td>
<td>↑</td>
<td>Thousands</td>
</tr>
<tr>
<td>Price per transistor</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Transistors</td>
<td>↑</td>
<td>2,300</td>
</tr>
<tr>
<td>Computations per kWh</td>
<td>↑</td>
<td>$10^8$</td>
</tr>
</tbody>
</table>

Bill Holt, Intel ISS2012
Semiconductors are everywhere - ... IC for Electronics driven systems meeting society’s needs

(Source: C. Claeys, IMEC)
The Electronics System Industry

~$ 30,000B
Auto, Computing, Comms, Industrial, ...

~$ 1,500B
ELECTRONICS

~$ 300B
SEMI
Semiconductors

~$ 80B
M&E
Materials & Equipment

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Automotive Semiconductor content increasing

TCA CONNE X I O N S
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Electronics Value Chain…Auto Nav System

- Display
- Touchscreen Overlay
- MCU 32 bit 32 MHz 1 MB Flash 64 KB RAM
- 16-Channel 10-bit ADC
- Regulator DC_DC converter
- Power Management IC

- Chrysler 300
- Hyundai Sonata

Source: IHI Electronics360 130813

OMAP Processor, ARM11
Dual core 400 MHz
MCU 32-bit 32 MHz 128 I/Os
MCU 32-bit 400 MHz
Gyroscope
GPS Receiver
Flash 8GB MLC
Flash 4GB
CD/DVD Drive

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Mult-Tiers of Value Chain and Ecosystems

PP Supplier’s Supplier → PP’s Supplier → Product Provider → Customer

Value Chain → Supply Chain

Technology

PP Supplier’s Supplier

Product

Customer’s Customer

PCB
Foundry
Packages

MANY Opportunities for Innovation & Electronics Development
**Example: Amazon FireTV**

Fire TV is a tiny box that plugs into your HDTV. It's the easiest way to enjoy Netflix, Prime Instant Video, Hulu Plus, WatchESPN, low-cost video rentals, and more. With instant access to over 200,000 TV episodes and movies, plus all your favorite subscriptions and streaming services, you can watch what you want, when you want. If you're a Prime member, you get unlimited access to thousands of popular movies and TV shows, including exclusives like Downton Abbey, The Americans, Alpha House, and Under the Dome.

Fire TV has voice search that actually works. The old way of searching with a TV remote—scrolling and clicking one letter at a time on an alphabet grid—is painful. With Fire TV you simply speak the title, actor, or genre into the remote and you're done.

Fire TV may be tiny on the outside, but it has huge hardware specs on the inside. It has a powerful quad-core processor, dedicated GPU, 2 GB of memory, and dual-band, dual-antenna Wi-Fi. With a fast, fluid interface, high definition 1080p video, and Dolby Digital Plus surround sound, Fire TV looks—and sounds—amazing. We also added an exclusive new feature called ASAP that predicts what movies and TV episodes you'll want to watch and gets them ready to stream instantly. No one likes waiting for videos to buffer.

As a bonus, we also added games. With Fire TV you can play blockbuster titles like Minecraft, The Walking Dead, Monsters University, the Amazon exclusive Sev Zero, plus great free games. There are over a hundred titles to explore, with thousands more coming soon. These games are a great value—the average price of paid games is only $1.85.

Source: www.amazon.com
Example: Amazon FireTV

Mobile Wireless Evolution

The Largest Platform in the History of Mankind

Enabling the First:
- Internet experience
- Computing experience

Mobile & Connected
Anywhere, Anytime, for Anyone

Situation Aware
vs.
Location Aware
Let’s educate the people around us, ...about our **complex** business
Mobile Wireless...

...The largest Platform in the history of mankind

Source: Qualcomm

CAGR 35%

17%

11%

Sensors everywhere…
Healthcare
Digital Home
Green Energy

...
Healthcare applications...

Millimeter-Scale Computer for Glaucoma Patients:

Taking charge …many Sensors

Source: University of Michigan, Feb 2011
Entrepreneur Traits Checklist

- Confidence
- Self-Motivation
- Tenacity
- Understand your Limits
- Healthy disrespect for Rules
- Willingness to Fail

Ref: Jenny Q.Ta, Founder and CEO of Sqeeqee
So, if you had an idea, what should you do?  

**…entrepreneurship creation**

- **Internal Development at an IDM**
- **Software or Board level product**
- **License IP**
- **Fabless I.C. company**

**Electronics Idea**

- **Existing**
  - Standard, Technology Market
  - Customer Base
- **New**

..*but*, only a very small fraction of fabless start-ups are successful!!

~1300 fabless IC companies worldwide
The “Productization / Commercialization” Lifecycle

Basic Research

Applied Research

Project “down-selection”

Lab Demo

Funding Market Customer Biz Plan...

Model Prototype

“System”/Produce-able Prototype

Production

Technology Release Levels, Ref. nasa.gov

1 Basic Principle 2 Concept 4 5 7 9

Methodologies
**In-class Quiz 2-1**

1. When was the Transistor invented?
2. When was the first Integrated Circuit invented?
3. How many Transistors on a leading edge Intel μProcessor?
HW 3 – TEAM Entrepreneurial Inventory – Presentation 1

Due on Tuesday, April 14th.
Be prepared to make a 3 minute presentation...we will call on all Teams

1. Introduce your Team

2. Your Entrepreneurial IDEA?

3. What Customer problem does your idea solve?

4. Who are the potential Customers?

5. Who is your Competition? How will you DIFFERENTIATE your product?

6. Who will make it?

7. How big a company do you want to build? Revenue? # people?