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

2008

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

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

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

2009

after guests left they thought this could be a big idea

they launched at SXSW - got two bookings

2014

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

one week later

2010-2011

went door-to-door in NYC and took photos of listed houses

realized photos of places were not pretty

got $20,000 in first funding from Paul Graham’s Y Combinator

made $400 a week started to grow

first money $30,000

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

Aha!

were making $200 a week for months, not growing

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

$10 billion valuation

Creative
Customer Focus
Persistence
....
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

...Your knowledge of Microsystems could be a key

* Analog Digital Converter
+ Transmitter Receiver
Market Drivers

Opportunities

- Innovation in Product Development
- Integrated Co-Design
- Non-LE process
- 3D / MtM
- Fabless
- Entrepreneurial

History

Industry Directions & Challenges
Electronics → Microelectronics → Microsystems

a Historical Perspective

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!

Transistor Growth Needed to Manage, Store and Interpret Data


<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Typical Equipment cost</td>
</tr>
<tr>
<td>Price per transistor</td>
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<tr>
<td>Transistors</td>
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<tr>
<td>Computations per kWh</td>
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Bill Holt, Intel ISS2012
History
Market Drivers
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
Semiconductors

~$ 80B
Materials & Equipment

~$ 30,000B
SYSTEMS
Automotive Semiconductor content increasing

- **Safety**
  - Airbags
  - Electronic Stability Program
  - Collision avoidance and adaptive cruise control

- **Body Electronics**
  - Body control module
  - Seat, door, and window control
  - Remote control
  - HVAC control
  - Lighting control

- **Powertrain Control**
  - Engine control
  - Gasoline management
  - Fuel injection

- **Driver Information Systems**
  - Infotainment
  - Telematics

- **Automotive Networking/Communication**
  - Communication Systems
  - Controller Area Network
  - Local Interconnect Network

- **Chassis**
  - Braking Systems
  - Electronic Power Steering
  - Active Suspension

*Source: Frost & Sullivan*
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
Multi-Tiers of Value Chain and Ecosystems

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

Value Chain ↔ Supply Chain

Technology

PCB
Foundry
Packages

OMAP™ 5 Platform
T I

MANY Opportunities for Innovation & Electronics Development
Mobile Wireless Evolution

Wireless

Mobile Computing

Social Media

Enabling the First:
- Internet experience
- Computing experience

Mobile & Connected
Anywhere, Anytime, for Anyone

Situation Aware
vs.
Location Aware

The Largest Platform in the History of Mankind
Let’s educate the people around us, …about our complex business
Mobile Wireless…

…The largest Platform in the history of mankind

Source: Qualcomm

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The New Paradigm: "Things"

Mobile Connected Smarter...

Sensors everywhere...
Healthcare
Digital Home
Green Energy

©2015 TCX Inc
Healthcare applications...

Millimeter-Scale Computer for Glaucoma Patients:

Taking charge …many Sensors

Source: University of Michigan, Feb 2011
2015 U.S. TECH INDUSTRY OUTLOOK

EMERGING TECHNOLOGIES

WEARABLES: A DEVICE REVOLUTION

SMART WATCHES: $3.1 billion in revenue; 11 million units
SMART EYEWEAR: $181 million in revenue; 125,000 units
FITNESS AND ACTIVITY TRACKERS: Surpass $1.8 billion in revenue in 2015; 20 million units

85% of consumers agree that using a fitness and activity tracker is motivating them to reach their fitness goals, according to CEA’s Wearable Activity Trackers: Engaging Consumers to Monitor Their Health.

SMART THERMOSTATS

$102.6M ($49%) $282 million in revenue

WORLD CHANGERS

Drones: $102.8 million in revenue; 341,000 units
3D Printers: $91 million in revenue

75% of owners use their 3D printers daily/several times a week, according to CEA’s Eye on Emerging Tech report.

SALES LEADERS

CE SALES LEADERS

SMARTPHONES: $51.3 billion in revenue; 169 million units
TABLETS: $24.5 billion in revenue; 79.6 million units

Riding High on New Vehicles

AUTOMOTIVE ELECTRONICS: $14 billion in revenue

BIGGER IS BETTER

4K Ultra HD: $4.9 billion in revenue (106% increase)
4 million unit shipments expected

LCD FLAT PANELS: $17.4 billion in revenue

Television larger than 50 inches will account for 11.3 million units in 2015, up 8.1% percent.

Ref: CEA
In-class Quiz 2-2

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 Thursday, October 8th.
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?