

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**

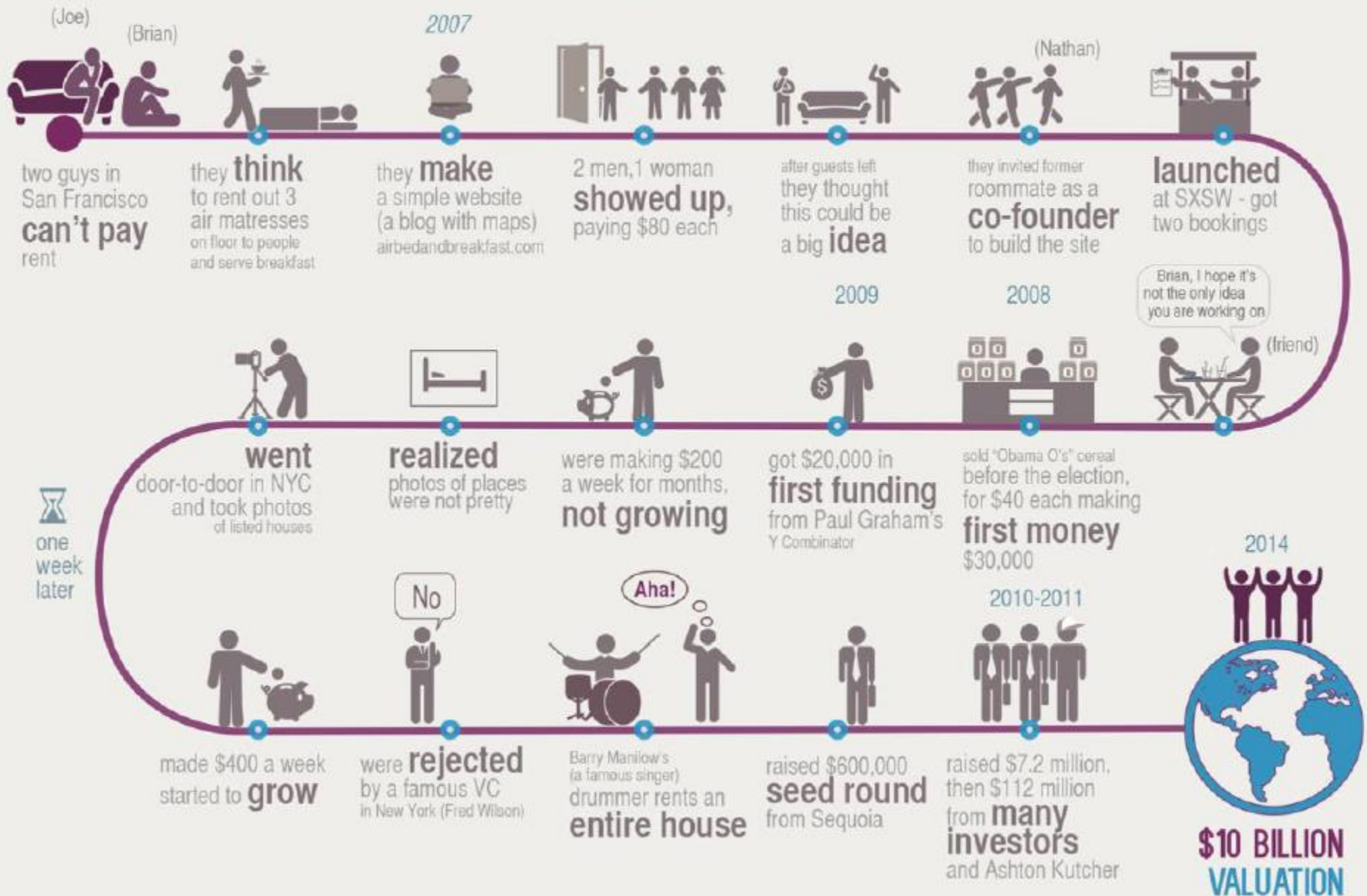
**A systematic approach to
*planning and execution***

**TEAM
IDEA
PRODUCT
EXECUTION**

HOW AIRBNB STARTED

BY ANNA VITAL

Or How 3 Guys Went From Renting Air Mattresses To A 10 Billion Dollar Company



How DIFFERENTIATE?

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

Sensors
SW Integration
Characteristics
Power Dissipation
Battery Life
...



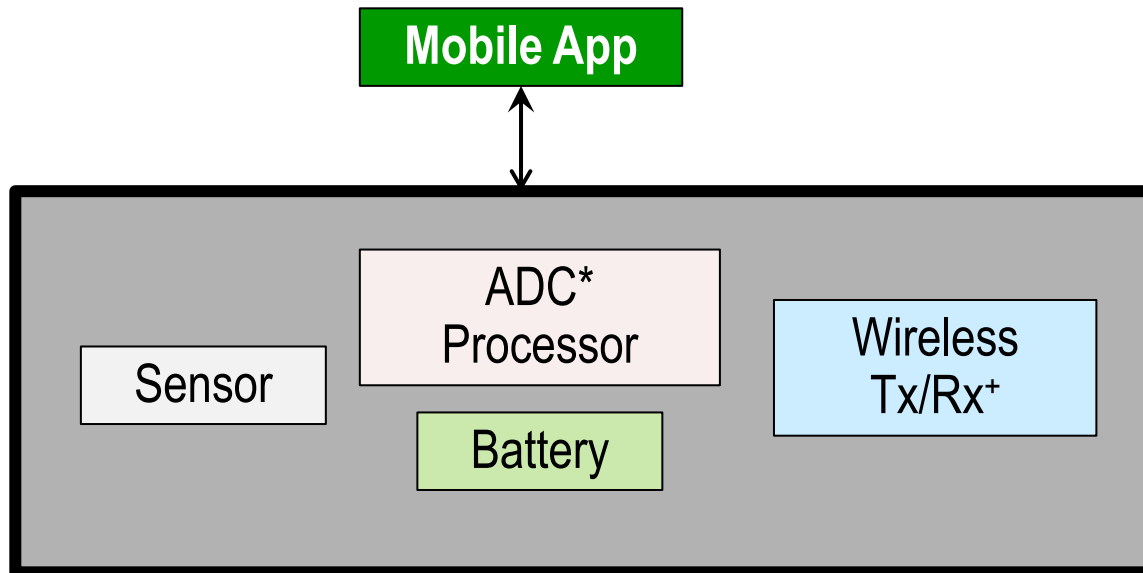
ADDC
ADDC
ADDC
APPS

USER EXPERIENCE



...Your knowledge of Microsystems could be a key

Anatomy of an IoT Product



* 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

Electronics → Microelectronics → Microsystems

a Historical Perspective

1906 Nobel prize for J.J.Thomson for the “Electron”

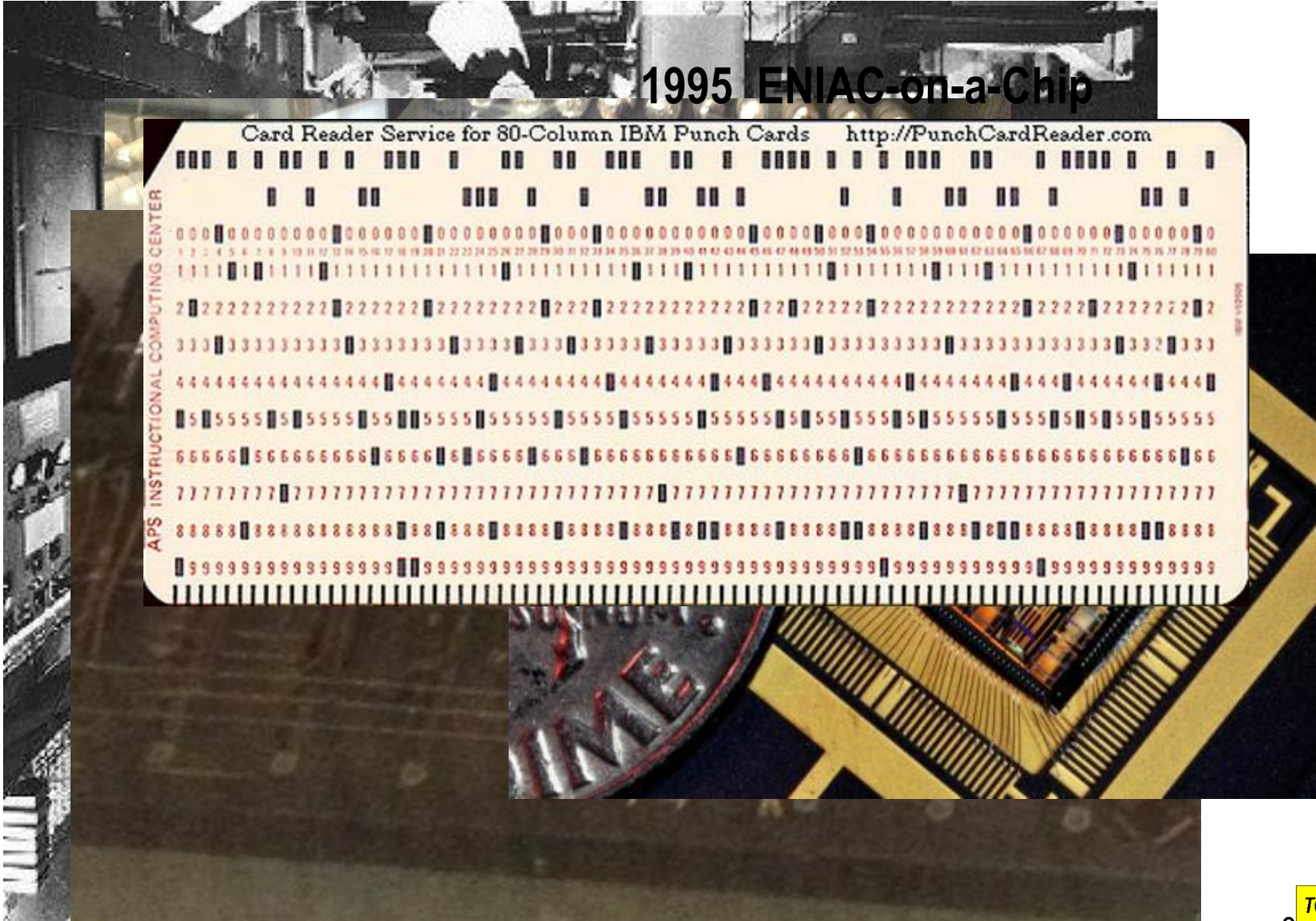
Early Addition Machine...Burroughs

Vacuum Tubes in the early 1900's



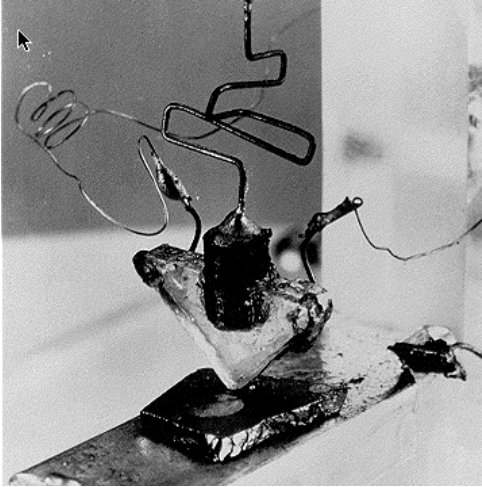
1945 ENIAC

The First Electronic, Large Scale General Purpose Digital Computer
...University of Pennsylvania

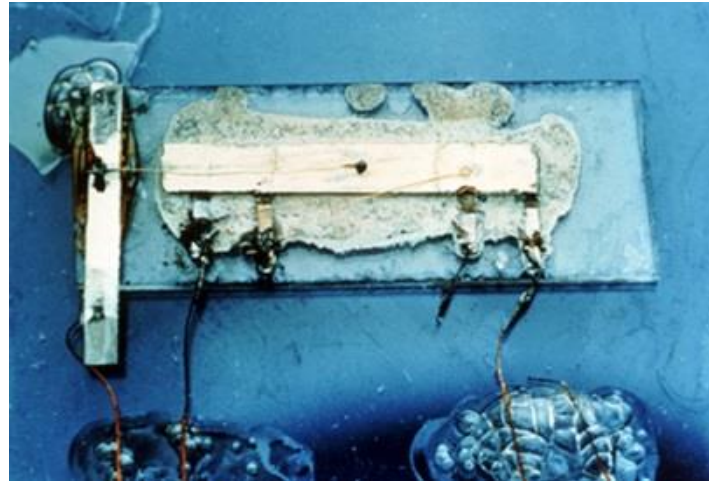


1947 Transistor Invention

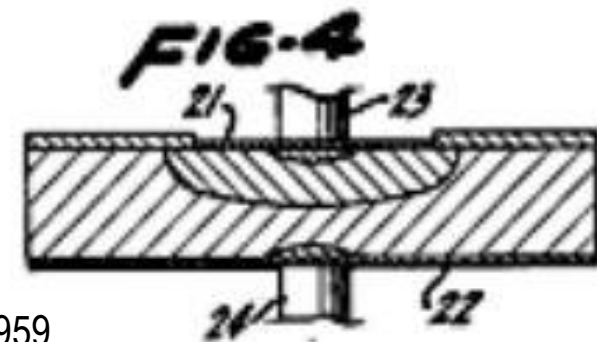
1958-1959 First IC, First Planar IC



1947
Bell labs
Schokley, Bardeen, Brattain



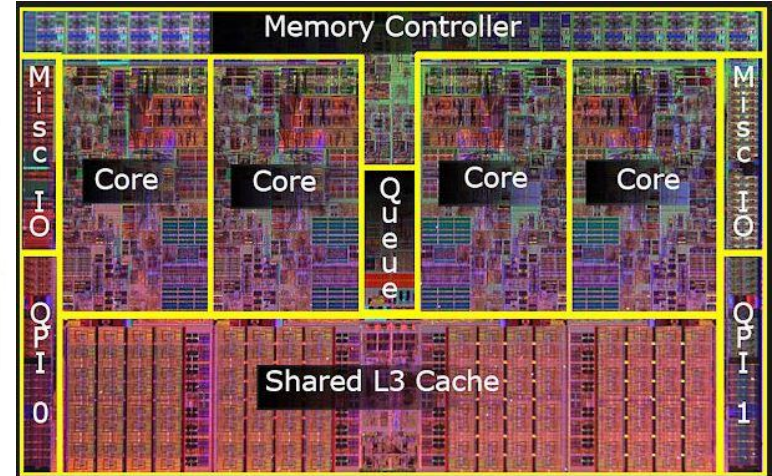
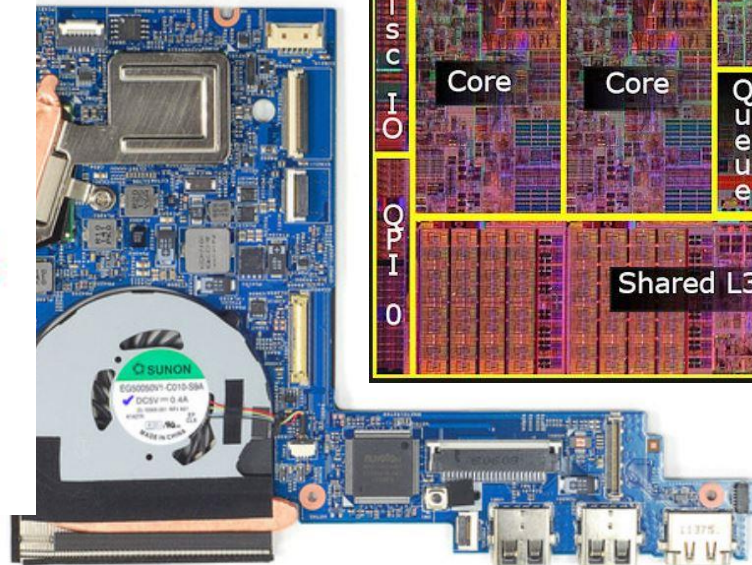
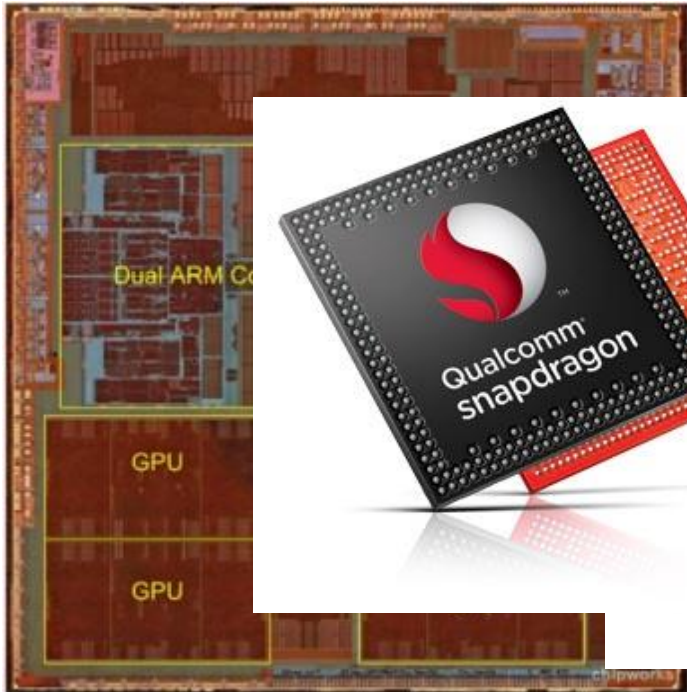
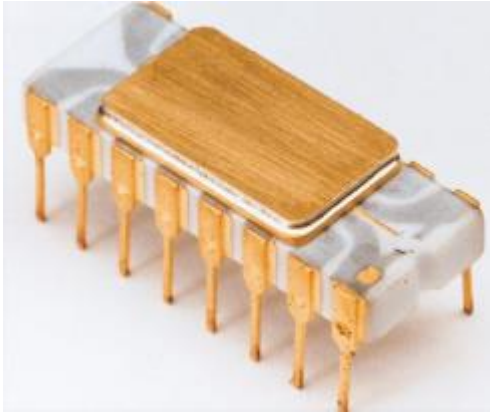
1958
First IC, Kilby



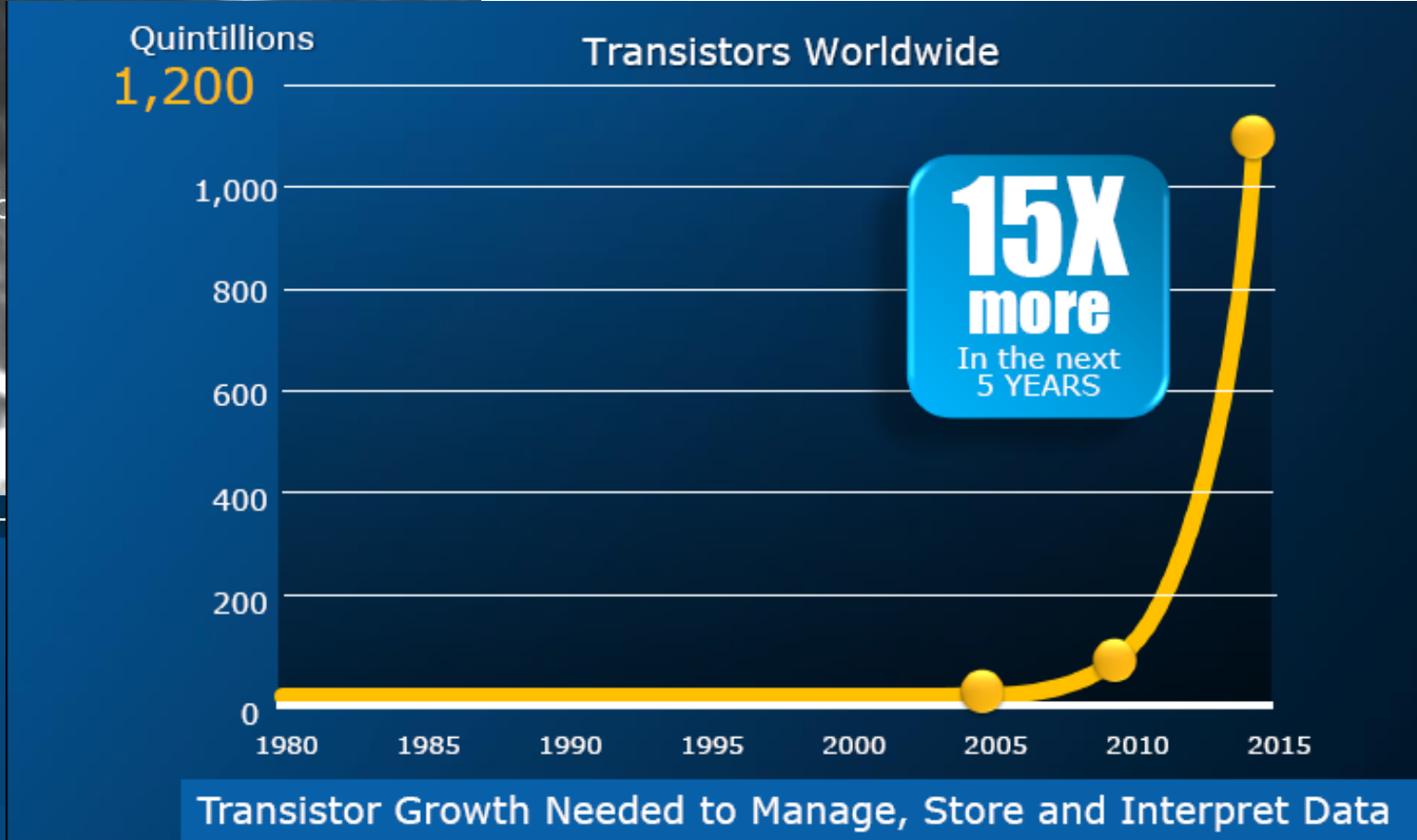
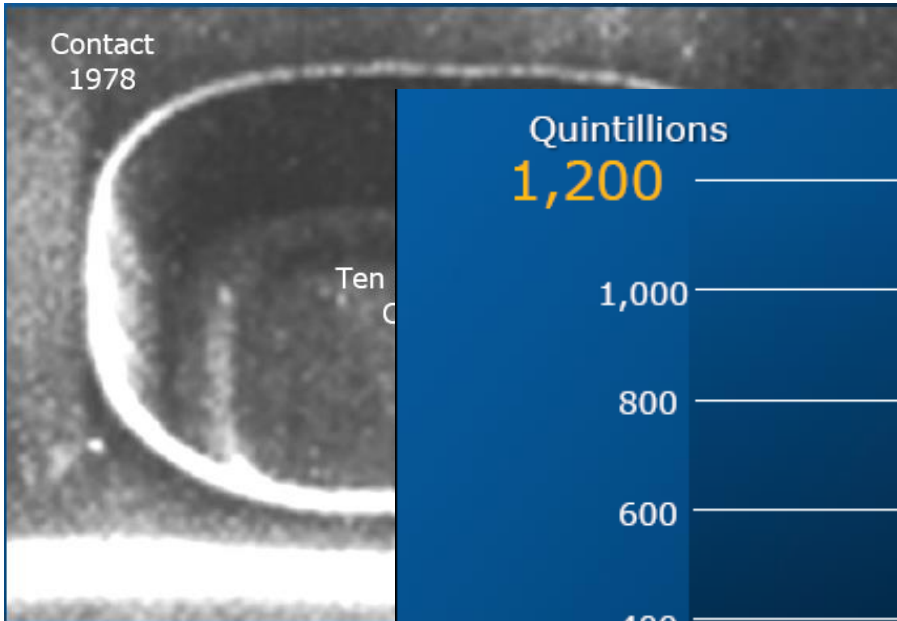
1959
First Planar ICs, Hoerni

1970 Intel 4004 ...2.3 K Transistors

Today ...>2B Transistors



We have come a LONG way! ...yet a LONG way to go!



Source: World Semiconductor Trade Statistics, Intel

Wafer size \uparrow

Technology node \downarrow

Typical Equipment cost \uparrow

Price per transistor \downarrow

Transistors \uparrow

Computations per kWh \uparrow

(1975 to 2009)

Thousands

Millions

1,000x

50,000x

2,300

995 million

>400,000x

10^{15}

10,000,000x

Bill Holt, Intel ISS2012

History

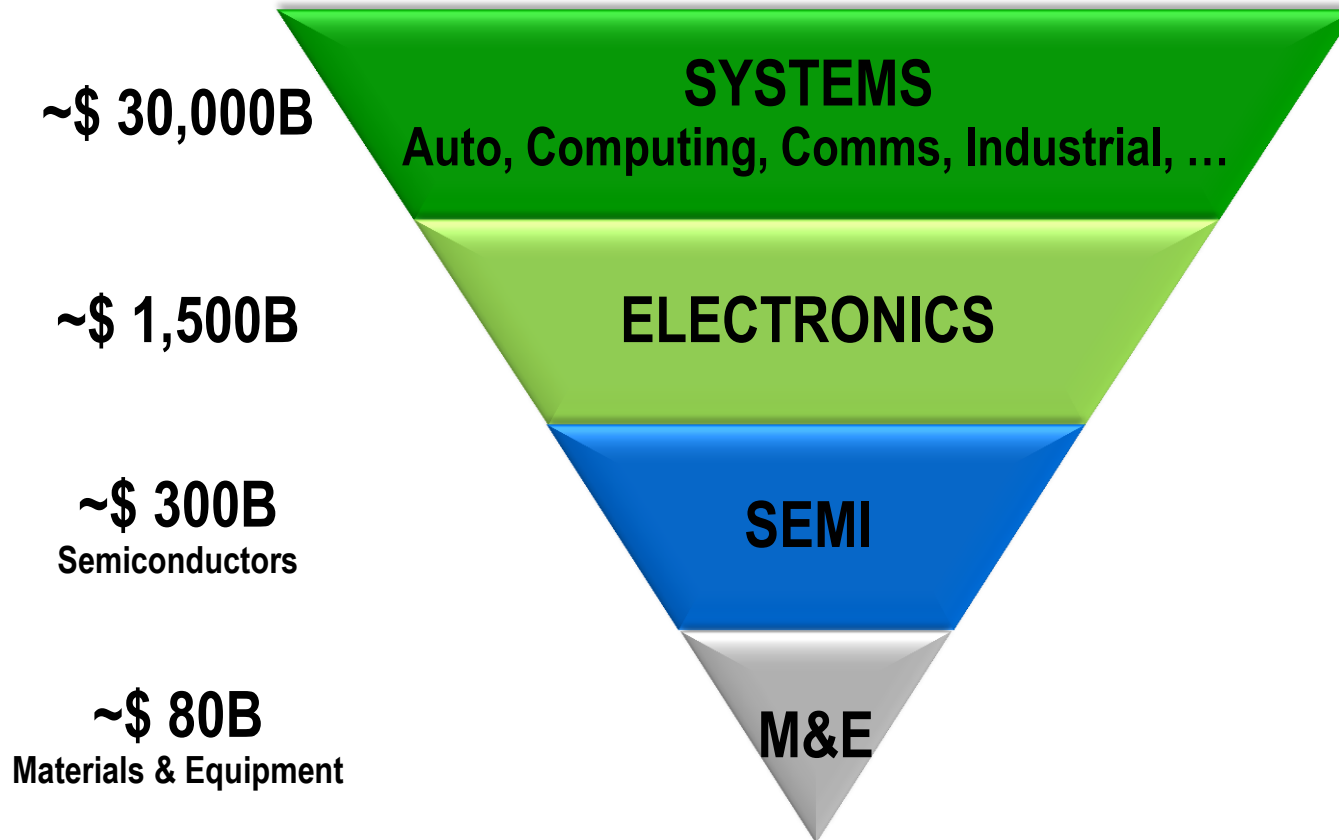
Market Drivers

Semiconductors are everywhere - ... IC for Electronics driven systems meeting society's needs

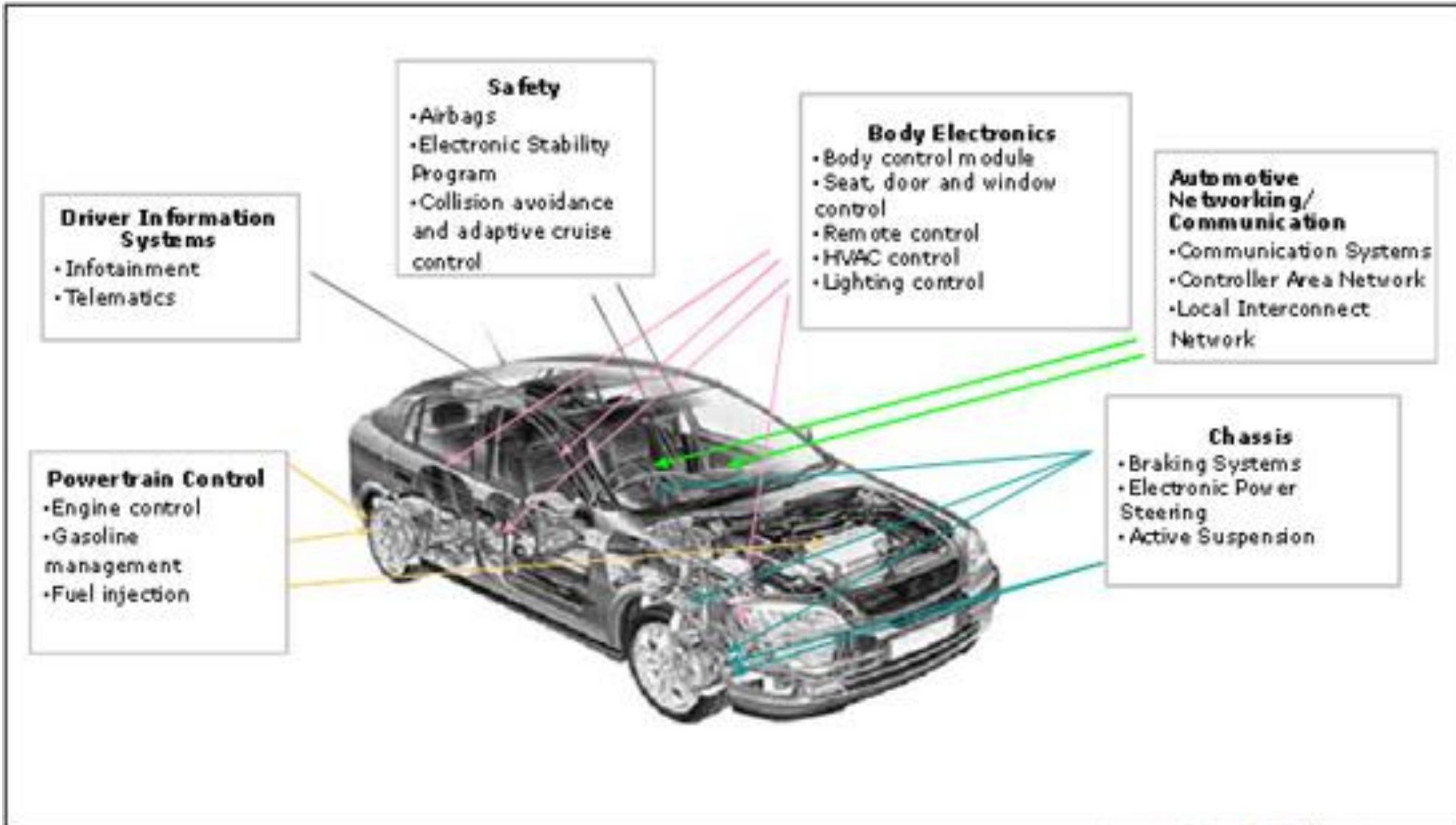


(Source: C. Claeys, IMEC)

The Electronics System Industry



Automotive Semiconductor content increasing



Source: Frost & Sullivan

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

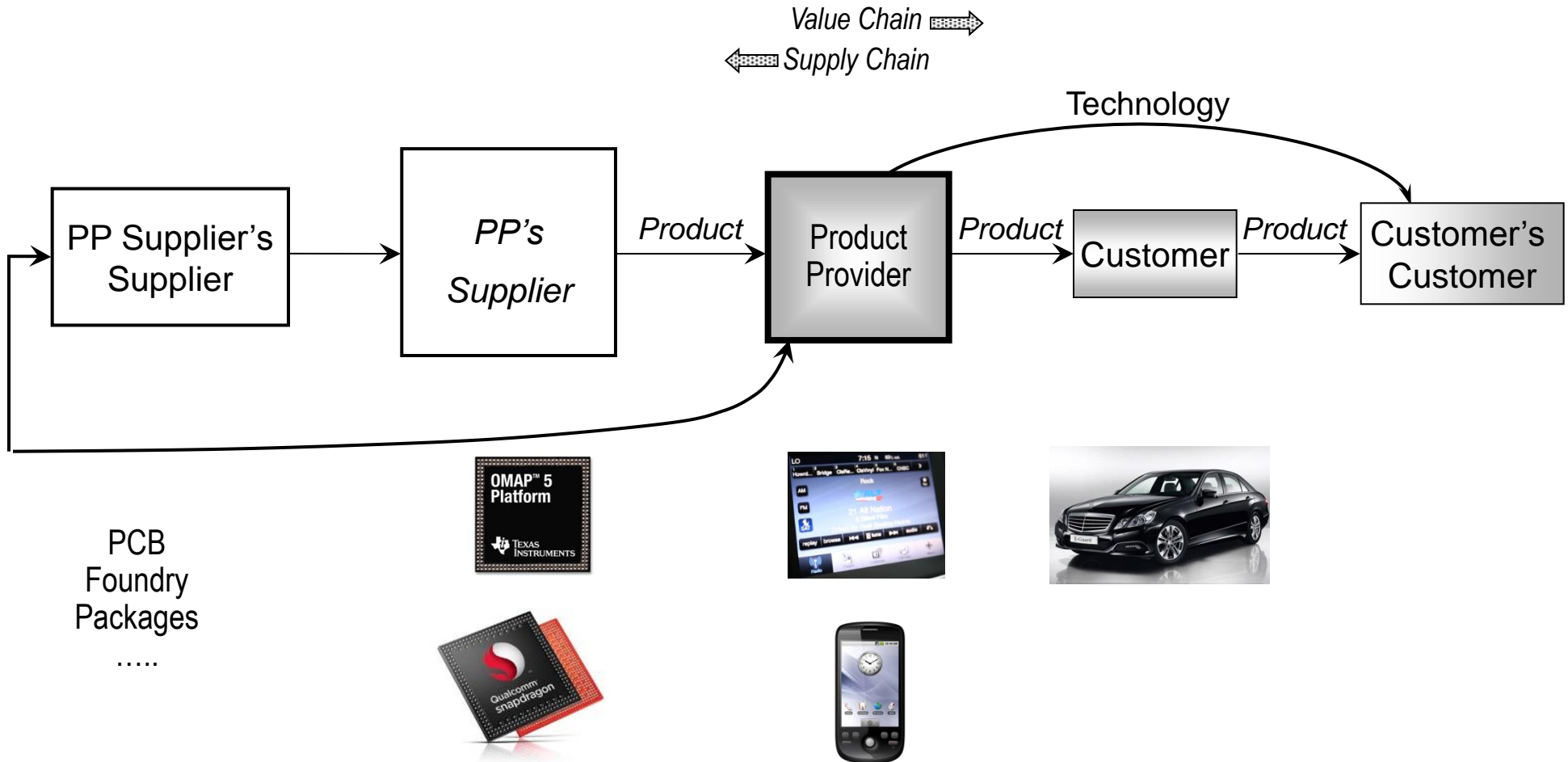


Chrysler 300
Hyundai Sonata
Source: IHI Electronics360 130813



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

Multi-Tiers of Value Chain and Ecosystems



MANY Opportunities for Innovation & Electronics Development

amazon fireTV Only \$99

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.



Jeff Bezos
Founder & CEO

Example: Amazon FireTV



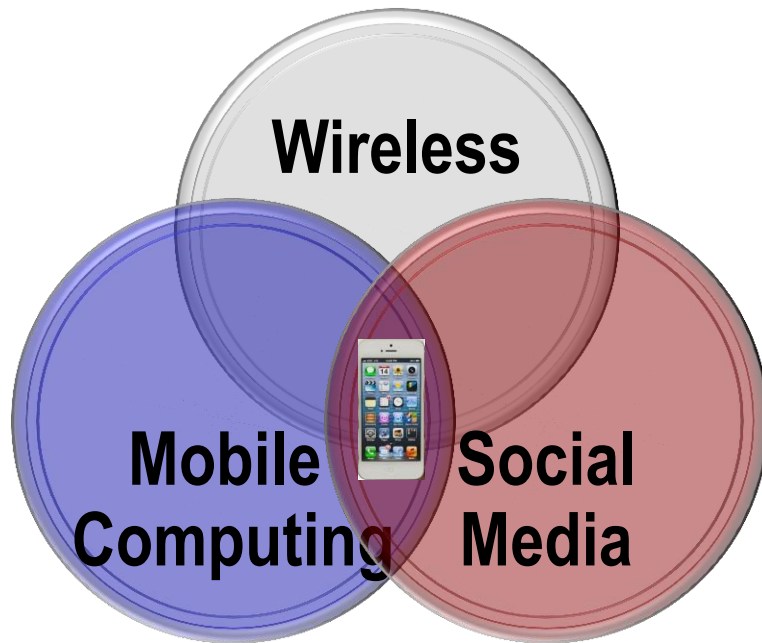
Source: www.amazon.com

Example: Amazon FireTV



Sources: www.cnet.com www.ifixit.com www.icinsights.com

Mobile Wireless Evolution



Enabling the First :

- Internet experience
- Computing experience

Mobile & Connected

Anywhere, Anytime, for Anyone

Situation Aware

vs.

Location Aware

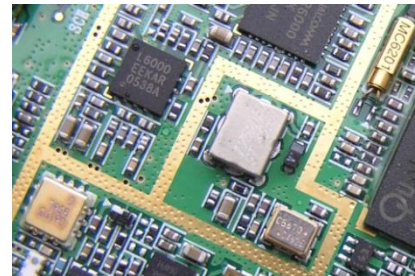
The Largest Platform in the History of Mankind

Electronics Value Chain ...Smartphones

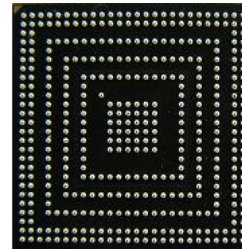
Product



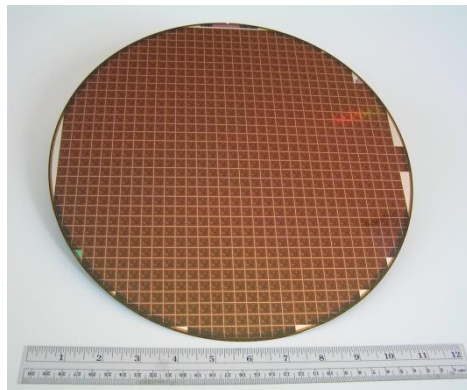
Board



Package



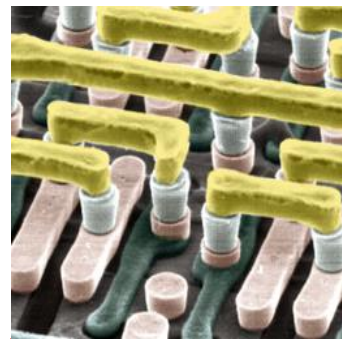
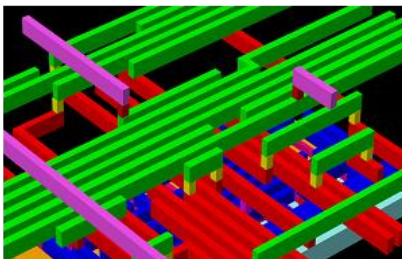
Process



Software

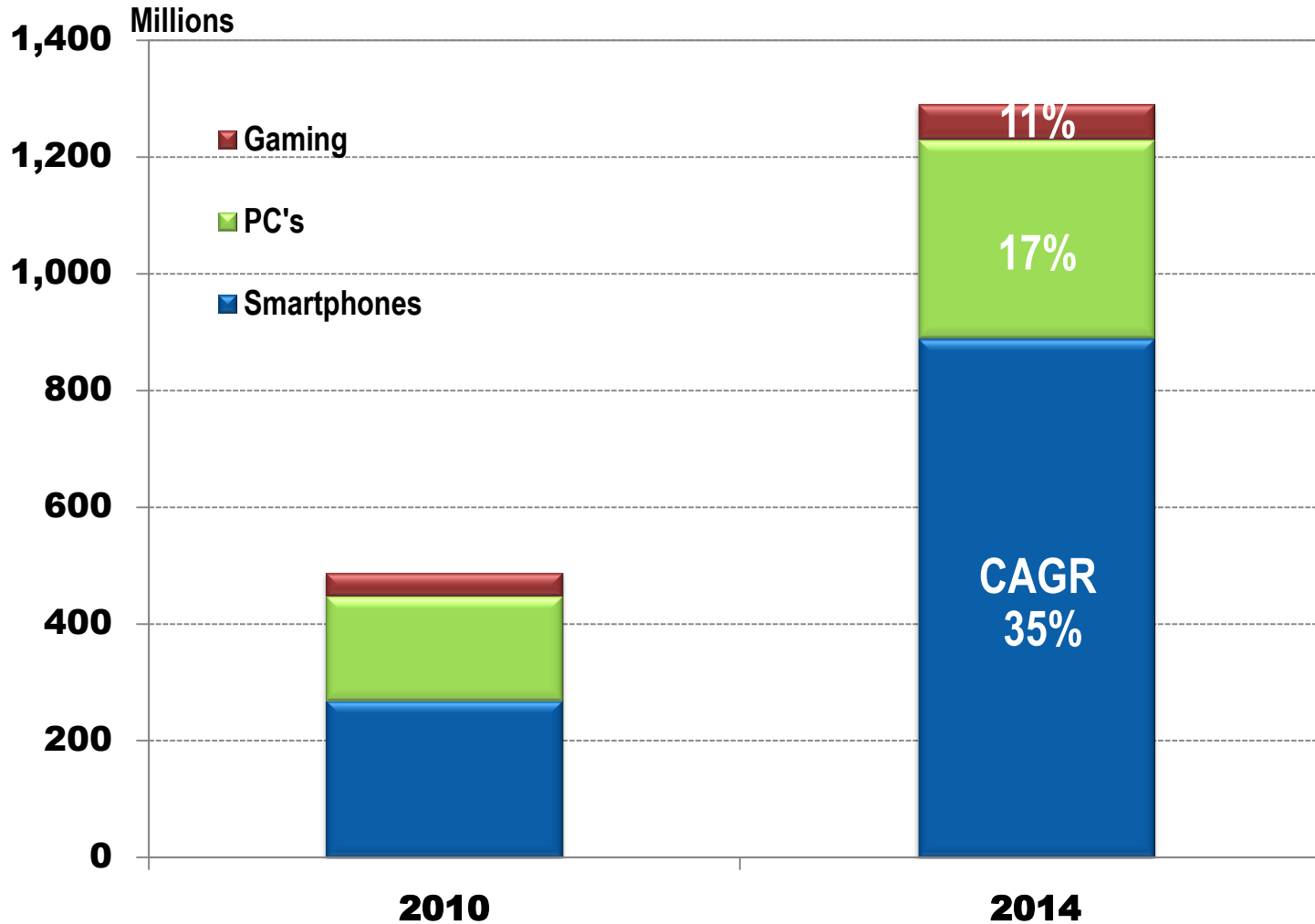
Let's educate the people around us,
...about our complex business

Design



Mobile Wireless...

...The largest Platform in the history of mankind



Source: Qualcomm

Source: Qualcomm



The New Paradigm of Things™

Mobile
Connected
Smarter..

Sensors everywhere...

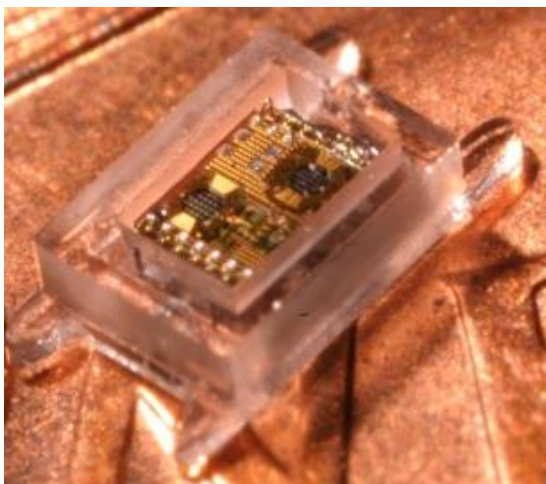
Healthcare
Digital Home
Green Energy

...



Healthcare applications...

Millimeter-Scale Computer
for Glaucoma Patients:



Source: University of Michigan,
Feb 2011

Taking charge
...many Sensors



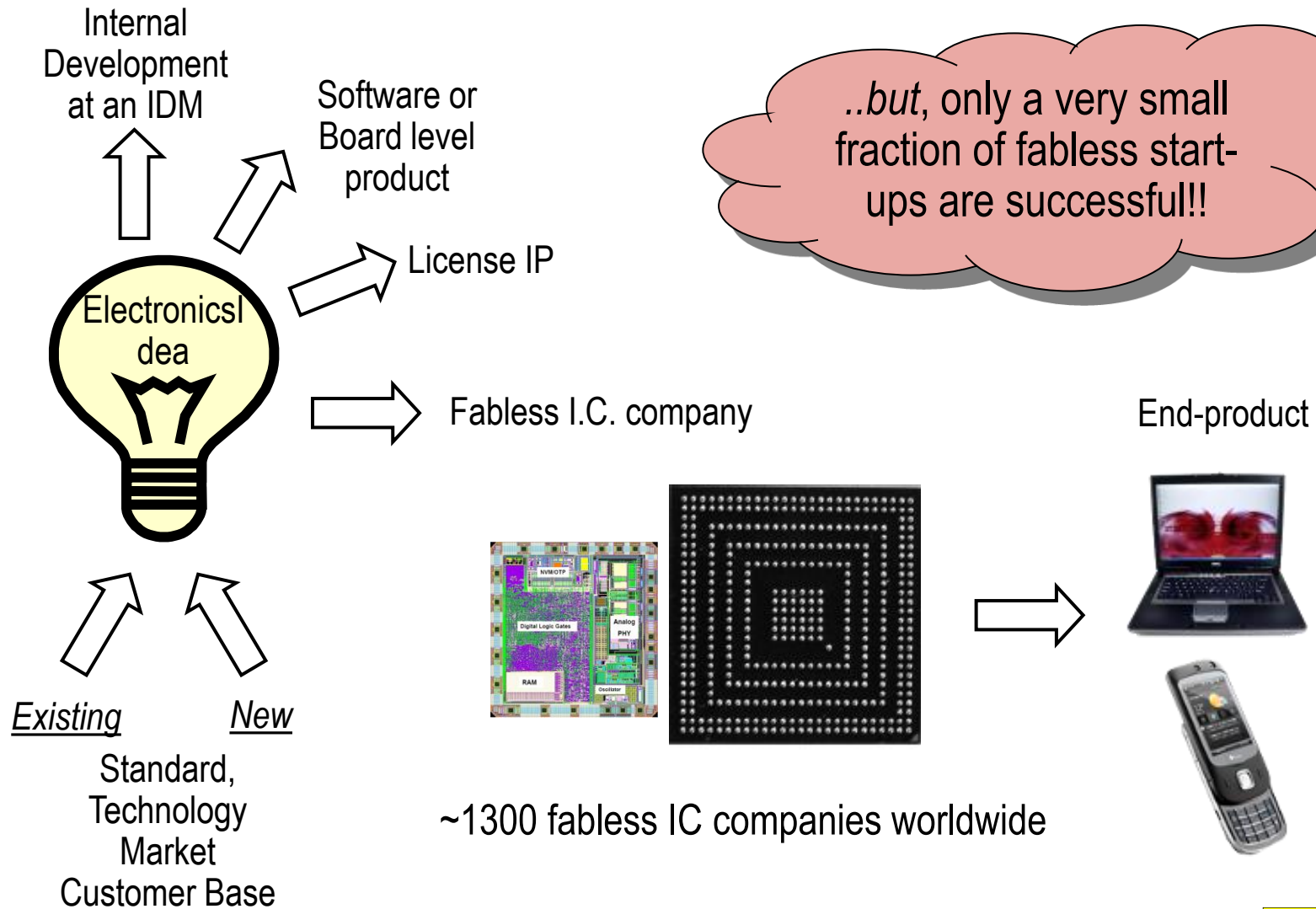
Entrepreneur Traits Checklist

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

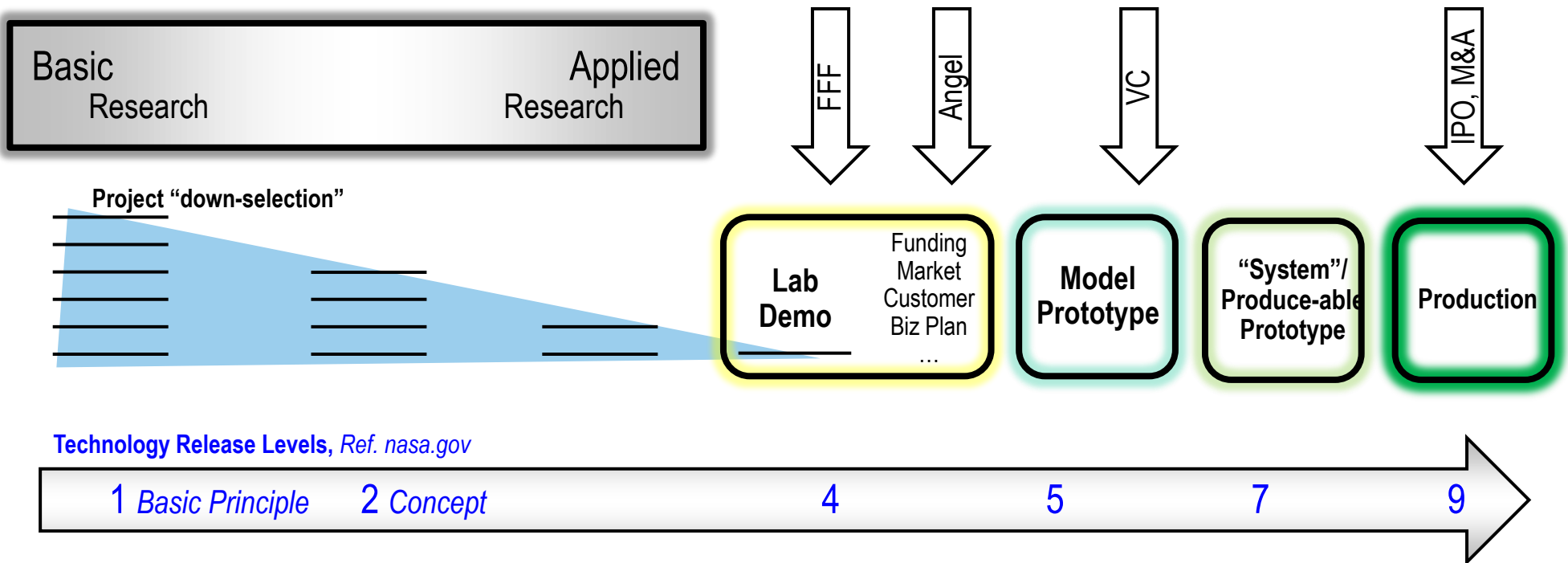
Ref: Jenny Q.Ta, Founder and CEO of Sqeeqee

<http://www.forbes.com/sites/womensmedia/2014/09/03/checklist-of-traits-of-a-successful-entrepreneur/>

So, if you had an idea, what should you do? *...entrepreneurship creation*



The “Productization / Commercialization” Lifecycle



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 μ Processor?

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?