Wearable Technology

And Their Parameters

-Feeding our underlying curiosity to know, to be aware!

- Prepared By

A.Rajamanikam

Wearable Technology Devices

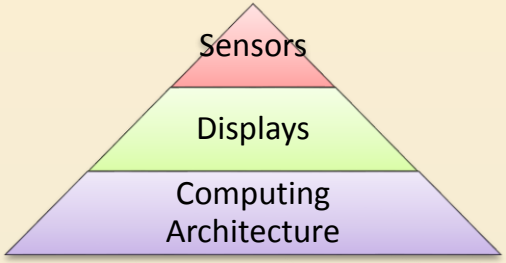
- What is wearable technology?
- History of wearable technology.
- Why Wearables? Why now?
- Industry Projections.
- Landscape – Wearable Technology
- Challenges for Wearable Technology.
- Key Drivers for Wearable Device Adoption.
- A look at some Wearables.
- Investments in wearable technologies.
- Future of wearable devices.

Introduction

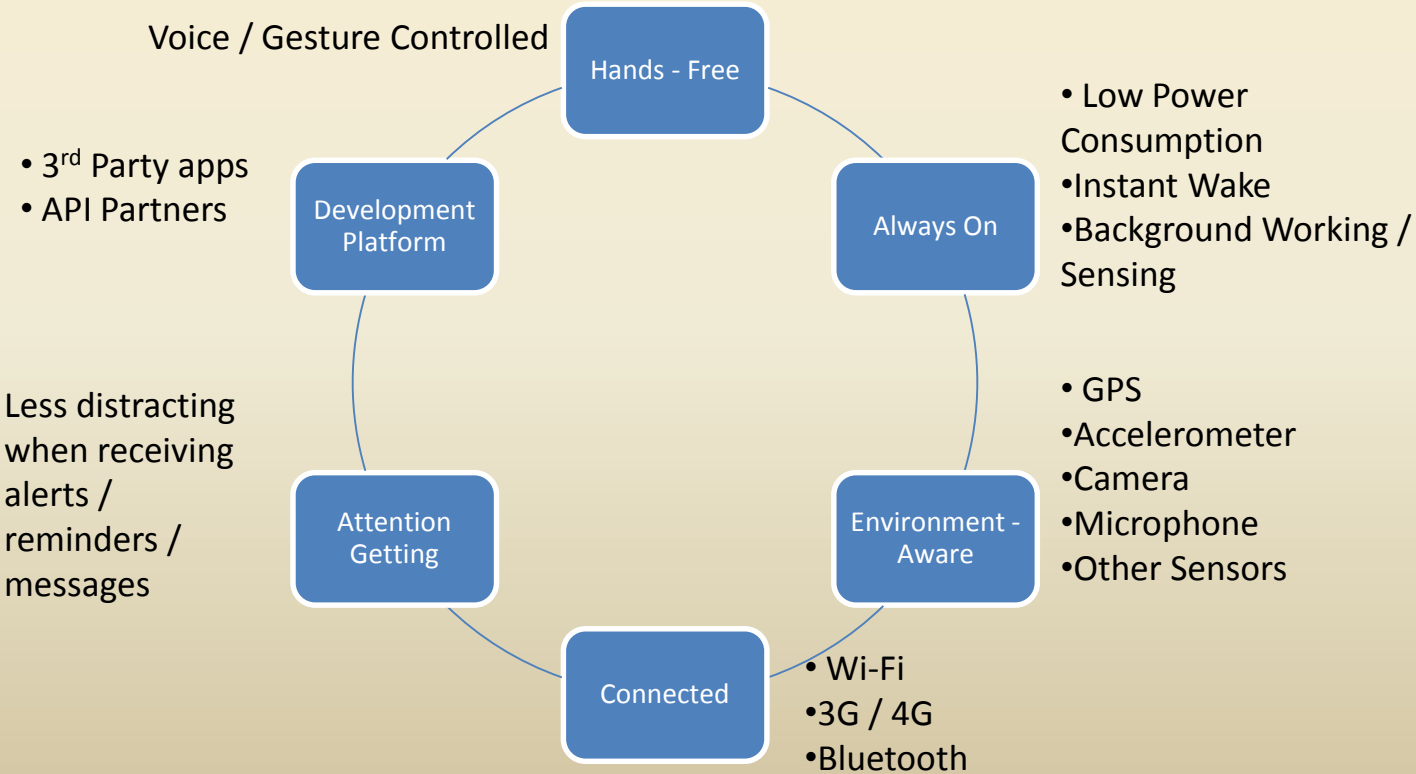
A device is considered wearable if :

- Device is worn for extended period of time
- User inputs and control possible
- Enhancement of user's experience

A wearable device may include one, two or all three functions :



Attributes of Wearable Computers :



Introduction

A wearable can be categorized broadly into the following 6 categories:

Lifestyle
Includes Smart Watches, Smart Glasses and Devices used for Voice and Video calling, Gesture Control, etc.

Entertainment
Devices used for augmented reality, smart gloves, gesture controlled devices, etc.

Medical
Devices used for Cardiac Monitoring, HearingAid, Bionics, Remote monitoring of Patients, etc.

Fitness
Devices used for measuring heart rate, distance travelled, skin temperature, etc.

Gaming
Devices that use augmented reality for gaming.

Industrial
Devices that help in Hands-Free and Remote operation for business and industrial purposes.

Source : Vandrico.com
Some devices can fall into more than one Category.

The current trend is mostly towards activity monitors. Health has been a big driver for wearable technology thus far. It will be interesting to see how far Smart Watches go and how they are implemented in the workplace.

Use cases of Wearable Technology:

*In Australia, firefighters are being outfitted with a data-transmitting pill that can detect early signs of stress. The device was also used to measure skydiver Felix Baumgartner's vital signs during his world-record jump to earth from space

Healthcare Insurance companies may offer policy discounts for members who quantify their healthy lifestyles by wearing fitness-tracking devices

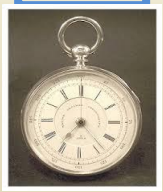
On manufacturing floors, worker can view metrics for an equipment on a smart watch. Augmented Reality Overlays in a warehouse can guide a worker to find, move, pick, pack and ship products.

Field Installation, service and maintenance professionals are being outfitted with smart glasses to access documentation, procedural tips, and skilled advice **

History of Wearable Technology

1644 — The Abacus Ring

1762 — Marine Chronometer Pocket Watch



1961 — The Gambling Shoe

1977 — HP releases the HP 01 algebraic calculator watch

1987 — The Digital Hearing Aid

1994 — Edgar Matias debuts a "wrist computer"

2000 — Bluetooth Headset

2004 — Microsoft launches SPOT Smartwatch

2008 — Fitbit

2012 — The Oculus Rift

2012 — Nike FuelBand

2012 — Pebble Kickstarter Record

2013 — Samsung Galaxy Wear

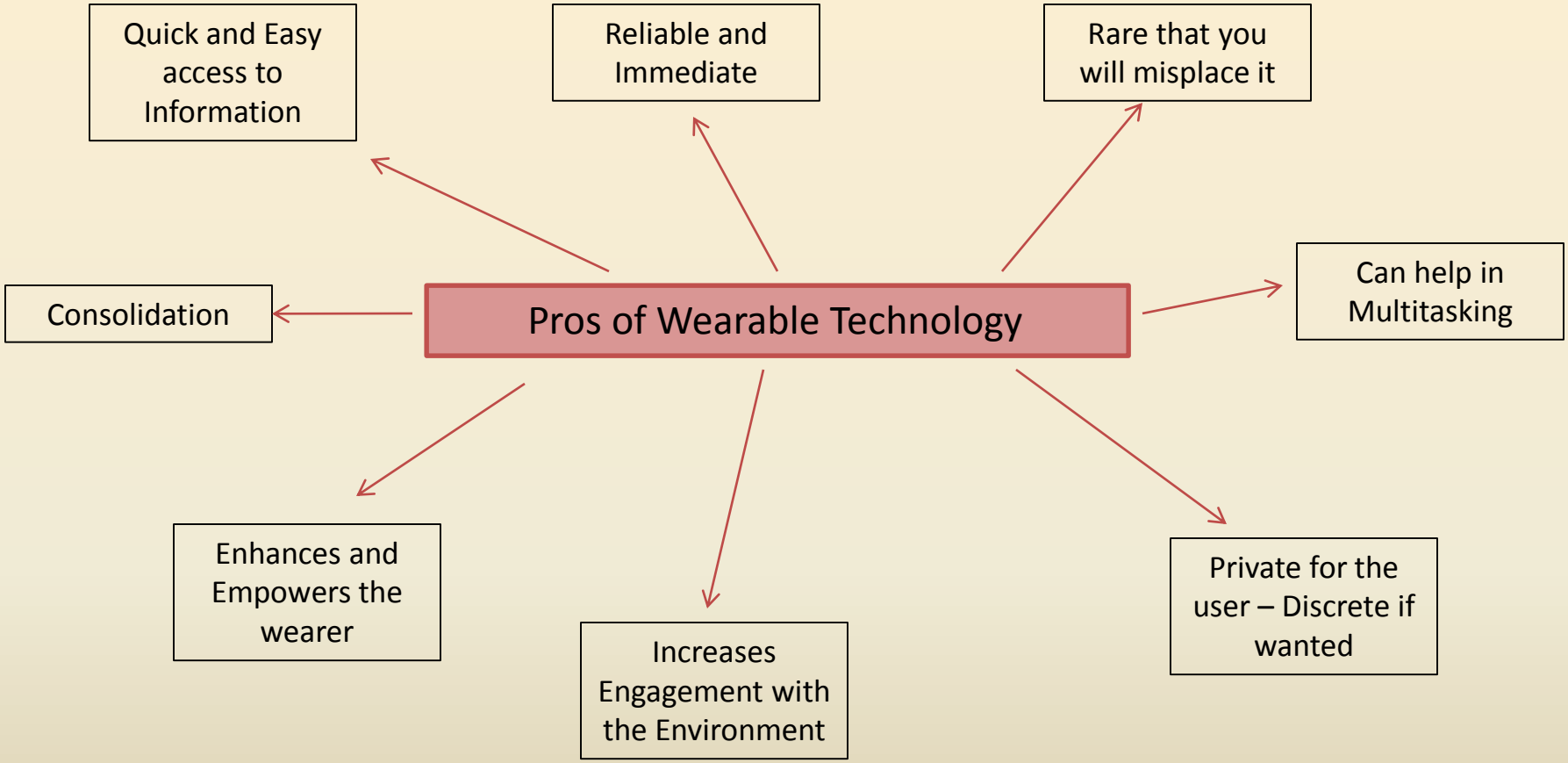
2013 — Google Glass

2014

- Specialized Visual Aids
- Medical Grade Monitors (on wrist)
- Smart Safety Glasses
- Augmented Reality

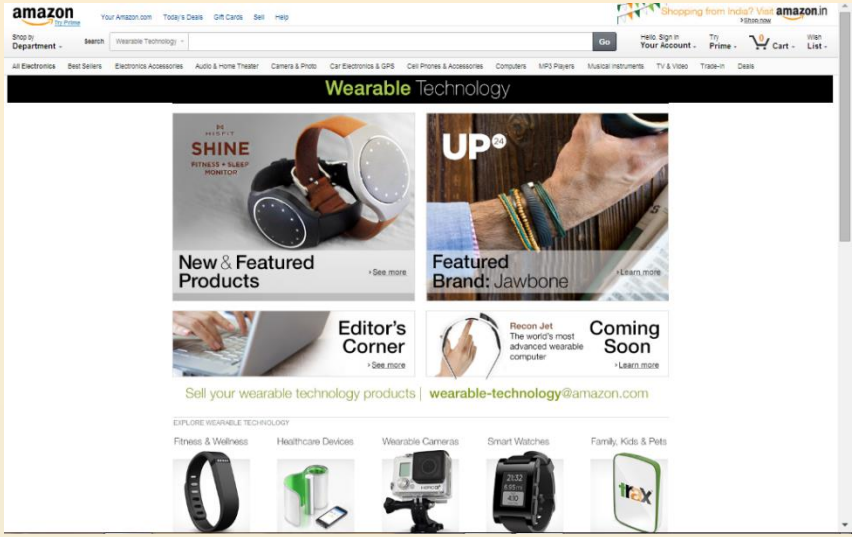
Source : Vandrico.com and http://www.media.mit.edu/wearables/lizzy/timeline.html

Why Wearables?



Focus on Wearables – Why Now?

On April 30, 2014 , Amazon.com added a separate section to buy a Wearable Device

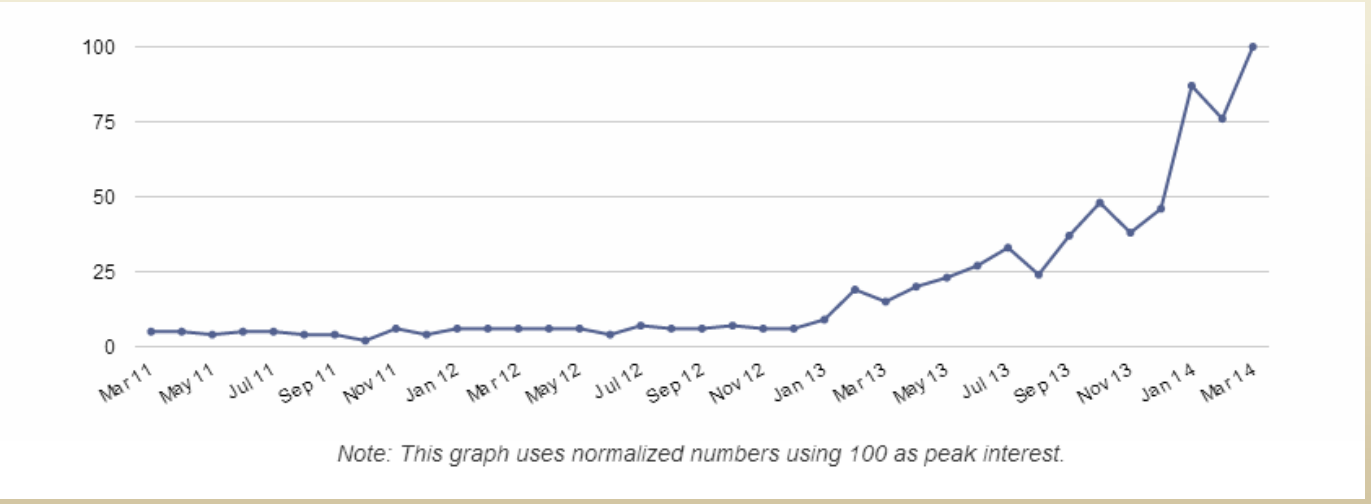


1 in 10 Americans over 18 now owns an activity tracker – (*Endeavour Partners, September 2013)*

Walgreens's Mobile App now connects to Wearables and uses Wearables to reward Healthy Behavior

53% of the millennials said they would rather Give Up their Sense of Smell, than Give Up their Technology Source: Mediabristro

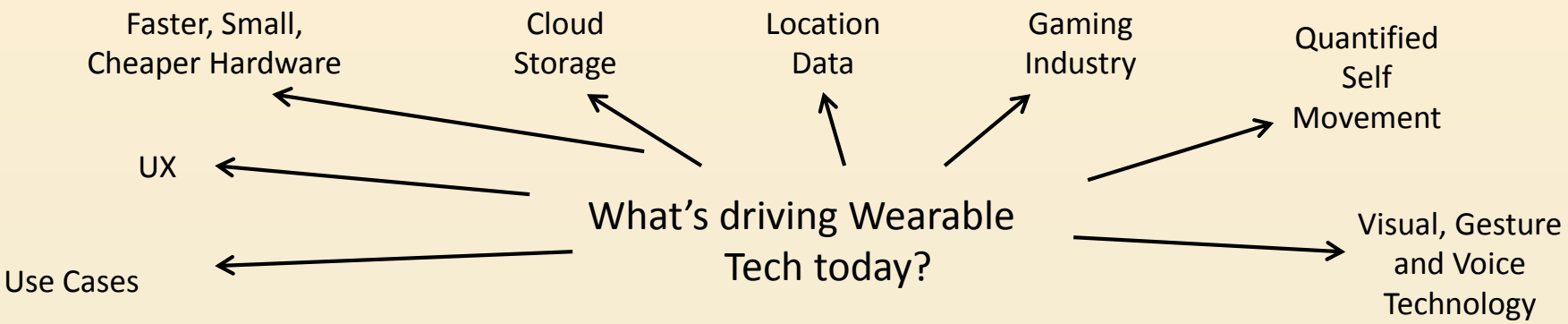
Some of the Biggest Manufacturers of Tech such as Google, Apple, Microsoft and a host of fitness-device manufacturers are making significant investments in this area



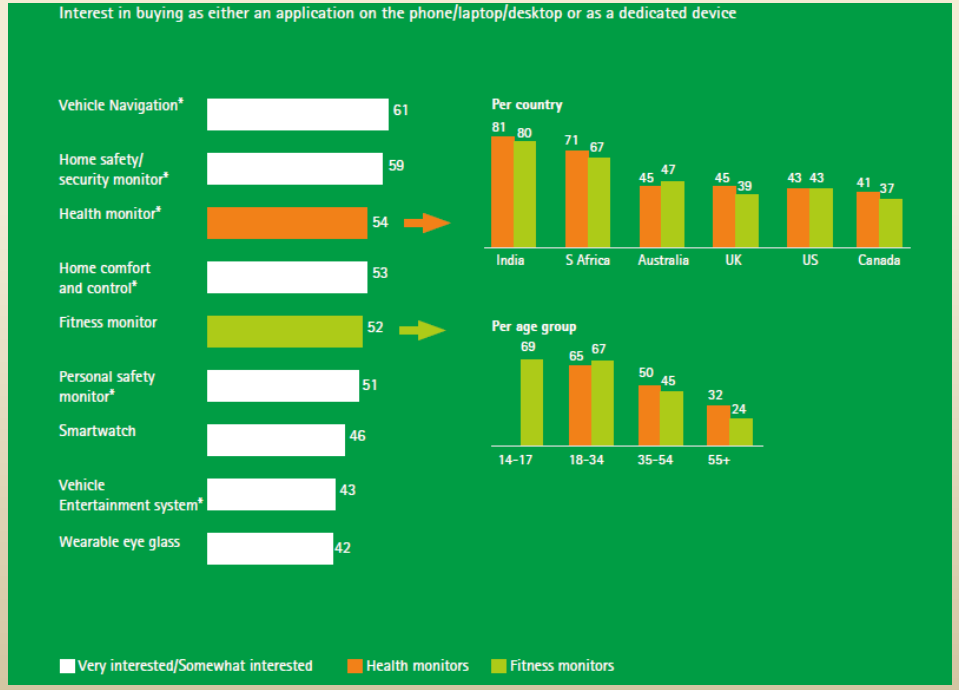
Global Interest in Wearable Technology

Source : Vandrico.com

Focus on Wearables – Why Now?



Healthcare provides a Powerful Use Case:



Source : Accenture Digital Consumer Tech Survey, 2014
Figures are in percentage

Industry Forecasts for the Future

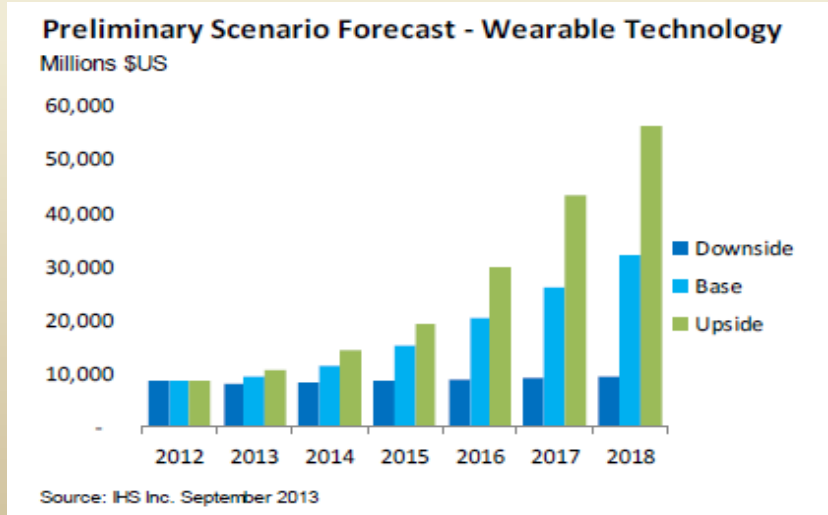
Function of Wearables:

	WRISTBAND	JEWELRY	GLASSES	CLOTHING	EMBEDDED
2014	SUPPORT RECORD NUDGE				
2015	COMMUNICATE CONTROL VERIFY MIRROR		AUGMENT	NUDGE SUPPORT	
2016		NUDGE AUGMENT	COMMUNICATE CONTROL	RECORD	
2017		ALIGN		RESTORE MIRROR ALIGN	SUPPORT NUDGE AUGMENT
2018					RECORD CONTROL VERFIY RESTORE ALIGN

Source : Psfk Labs & iq intel

Support : Data-Streamed Care manages ones Personal Health
Record : Catalog One's Personal Experience to Cloud Memory
Nudge : Responsive Coaching leads to better behaviour (tailored ecosystem)
Communicate : Connected Experiences promote long distance togetherness
Verify : Password provided by One's Authenticated Self
Control : Interact with the World through an On Board Interface
Augment : Enhance Natural Abilities through Augmented Sensory Perception
Restore : Regain Movement with the aid of Bespoke Biotech
Mirror : Reflect One's well being through an Emotional Mirror
Align : Biometrically Attuned Systems Personalize One's Surroundings

Industry Size for Wearables:

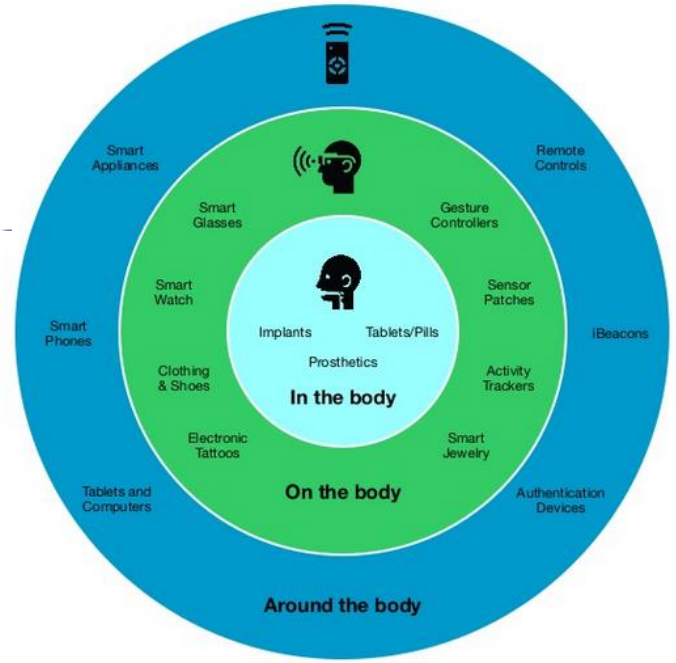


Source : IHS Inc. September 2013

Wearable Devices –Landscape

Vendor Landscape

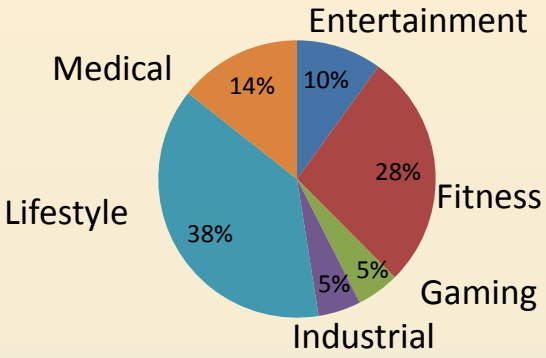
Source: IHS World Market for Wearable Technology – 2012, 2013



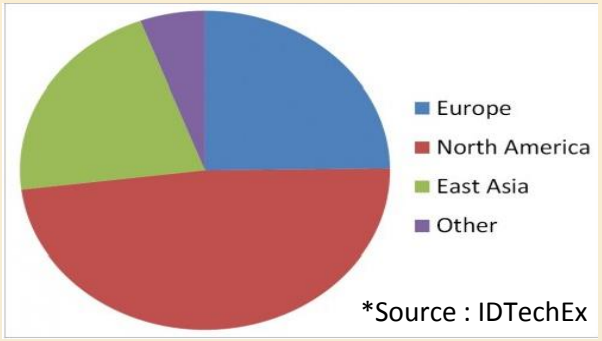
Wearables as a part of ‘Internet of Things’

Wearable Devices - Landscape

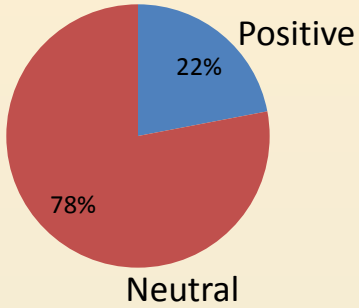
Area of Market Focus:



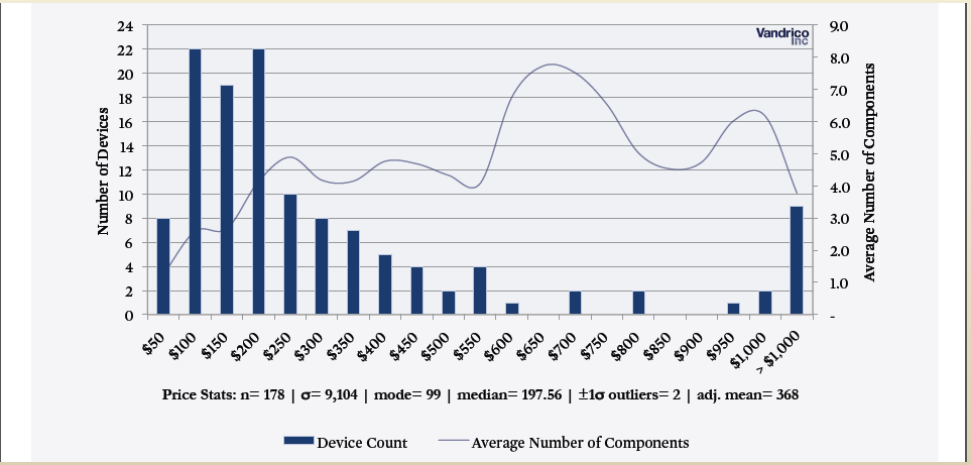
Area Wise developers and manufacturers for Healthcare:



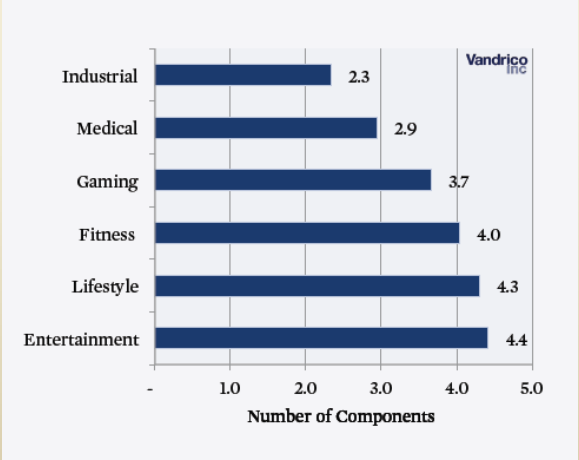
Social Sentiment:



Pricing of Wearables:



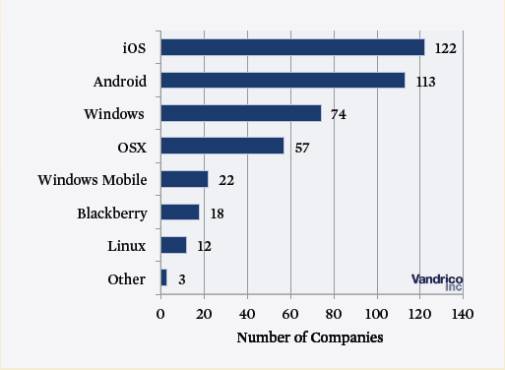
Component Usage:



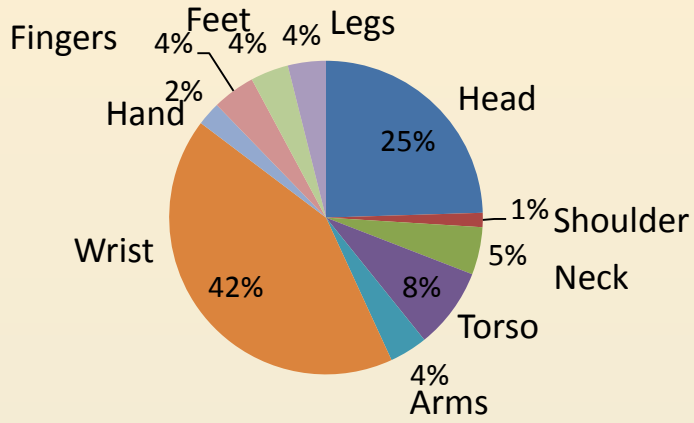
*Source : Vandrico.com / Report by Vandrico

Wearable Devices - Landscape

Device compatibility:

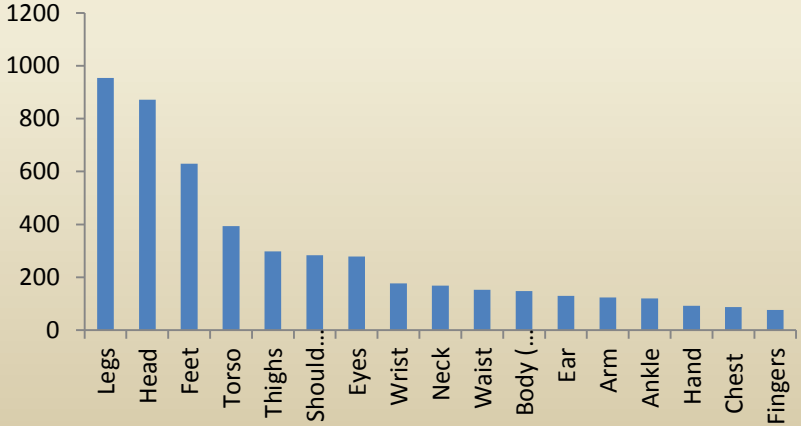


Area of Body Parts:



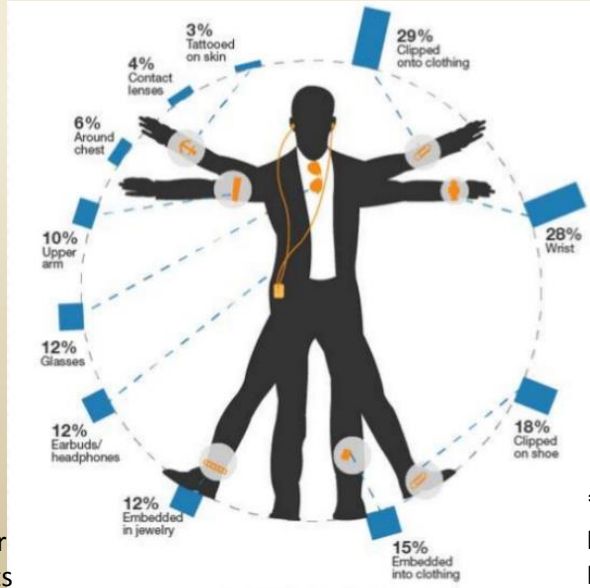
Pricing by Industry :

Pricing (in $ USD) according to Body Location:



*Source : Vandrico.com / Report by Vandrico

How would you be interested in a wearable device assuming it was a brand you trust, and offered a service that interested you?



Study for US Adults

*Source : Forrester Research

Wearable Devices – Current Users

Six Distinct Profiles of Wearable Technology Users:

Curious

They are 'Playing' with these devices.

Controller

Will purchase a device only when that it will do what they want it to do.

Quantified Self

'Zoomed in' focus on tracking themselves not just for diet or health, but for academic purpose.

Self Medic

Uses devices to control own health and well-being. Often a super-user, using Multiple accounts to get accurate account of health.

Finish Line Fanatic

Really excited at the adoption stage, but shine wears off when realize device needs to be calibrated, charged, synced, etc

Ubiquitous Future

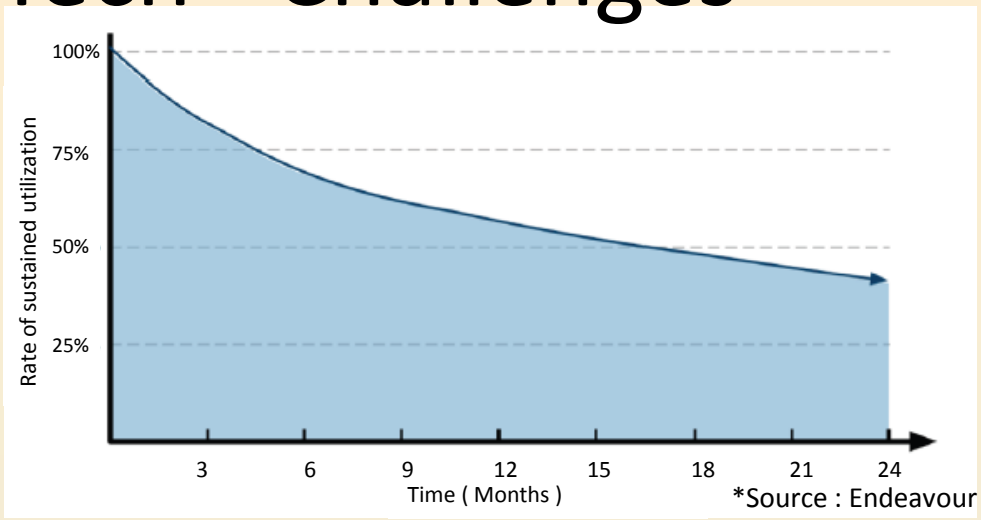
Digital Natives that will grow up with the next generation of wearable technology

*Source : The Human Cloud, Rackspace, June 2013

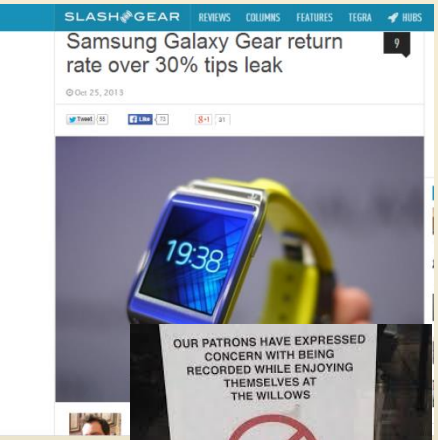
Wearable Tech - Challenges

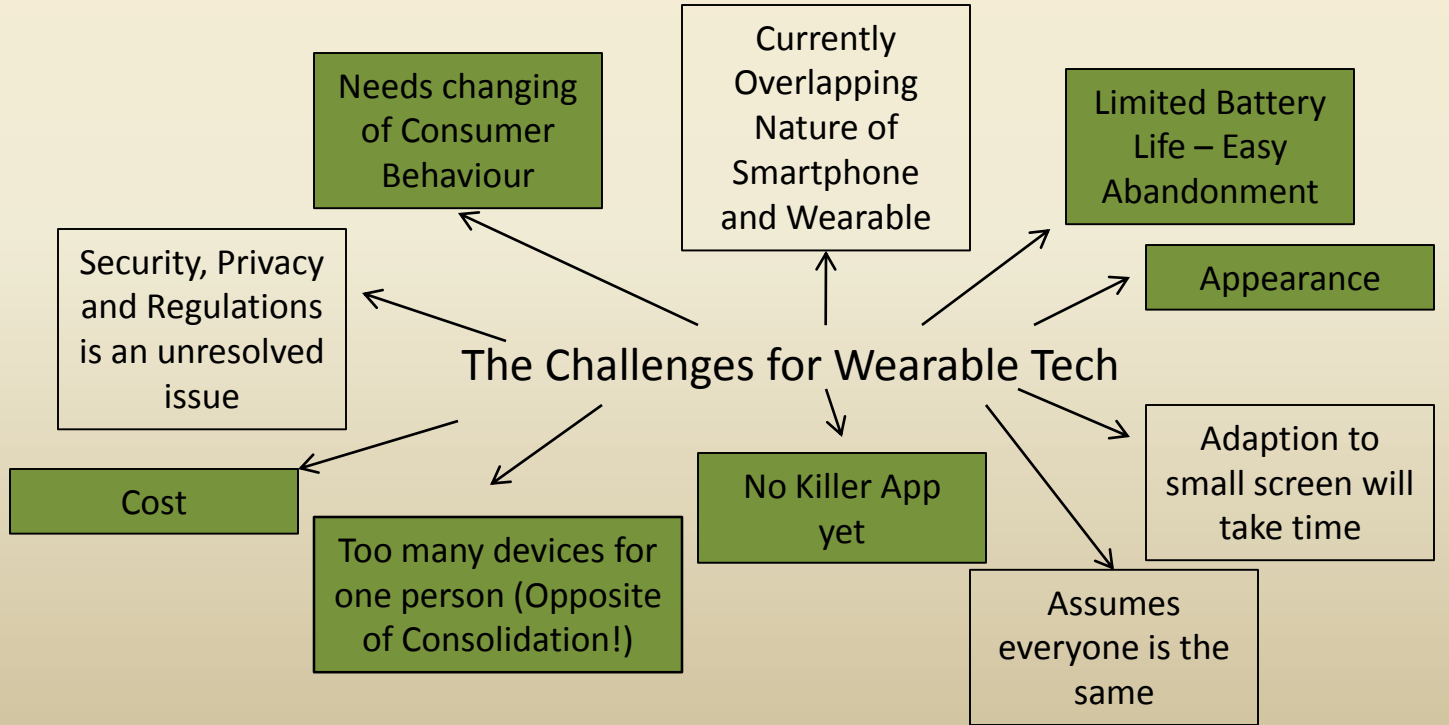
The Dirty Secret of Wearables:

- **50% +** of the U.S consumers who have owned a Wearable no longer use it.
- **33%** of U.S. consumers who have owned a Wearable stopped using the device within six months of receiving it.



*Source : Endeavour Partners White Paper, Jan 2014



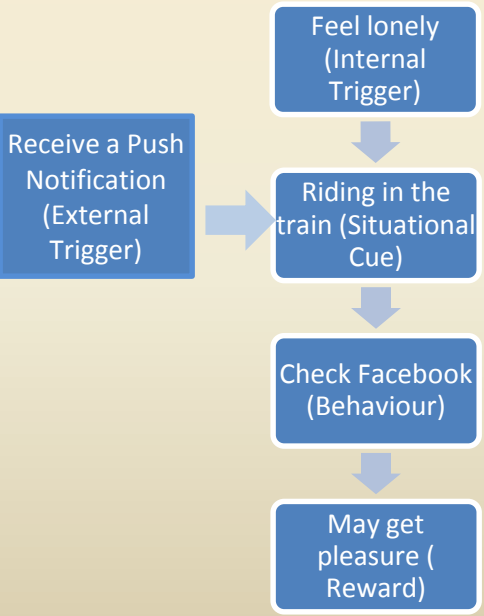


Key Factors Driving Wearables

Human Factors | Cost and Design | Chips and Batteries | Sensors | Broad Ecosystem of Connected Technologies

In addition to the more well-known factors (such as Aesthetics, Quality, Set-up Experience, Lifestyle Compatibility) that influence adoption, there are many other lesser-known behavioral factors that are as important – or perhaps more so – to long-term sustained engagement.

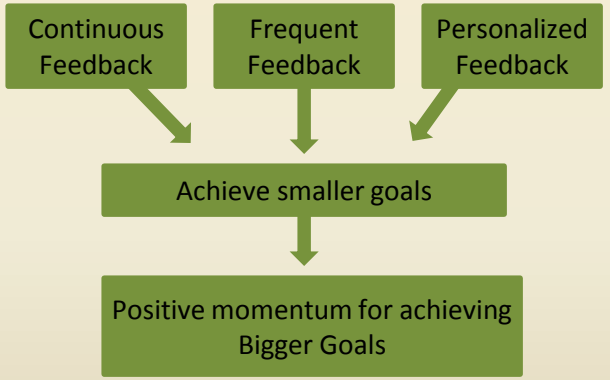
Habit Formation



- Go beyond presenting data (steps, calories, stairs)
- Address elements of habit loop (cue, behaviour, reward)

Social Motivation

Goal Reinforcement



Important Factor for

Lifestyle Wearables
Fitness Wearables
Entertainment Wearables

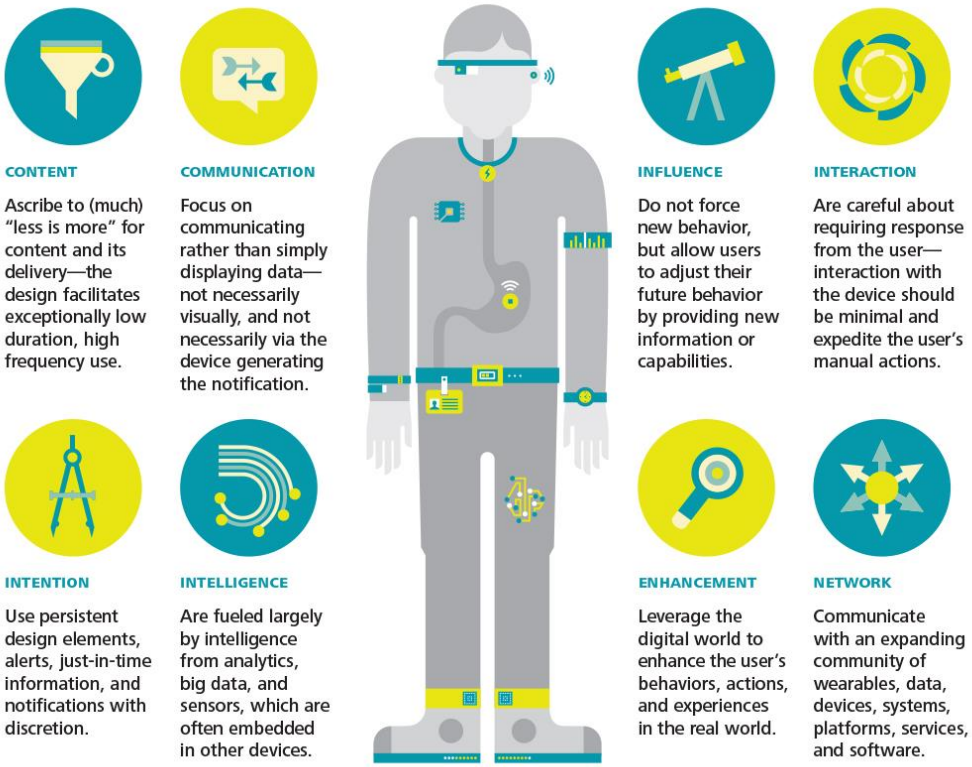
Key Factors Driving Wearables

Human Factors | Cost and Design | Chips and Batteries | Sensors | Broad Ecosystem of Connected Technologies

Wearables - As much a fashion choice as a functional choice!

A Wearable is a highly visible and personal device.

Design Principles of Wearables :



*Source : Delloite University Press, Feb 21, 2014

Cost – Affects Purchase Intent

Change in Purchase intent of young consumers after learning current price of product

*Source : Mobile Marketing Magazine

Important Factor for

Lifestyle Wearables
Fitness Wearables
Medical Wearables

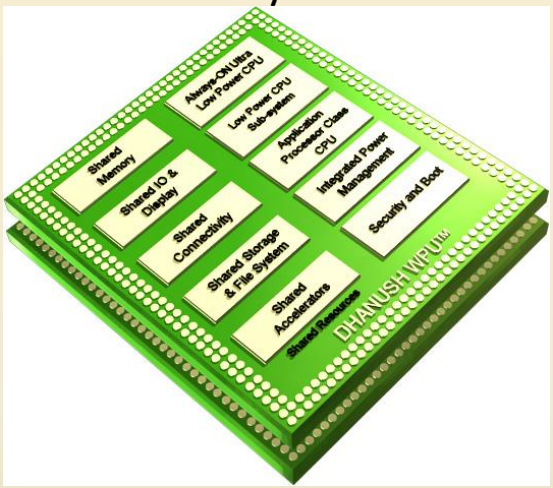
Key Factors Driving Wearables

Human Factors | Cost and Design | **Chips and Batteries** | Sensors | Broad Ecosystem of Connected Technologies

- Continuous need to recharge the battery is one of the most important reasons for less “stickiness”.
- Currently, smart-phone chips and batteries are being used.

*Source : http://techivian.com/battery-important-factor-buying-new-smartphone-idc/

Ineda Systems



Designed a SoC (System on Chip) that can give a 30+ days battery life.

- Always-connected
- Always-on speech recognition
- Always-on sensor analysis
- Always-on Contextual Computing

Important Factor for

Lifestyle Wearables
Fitness Wearables
Medical Wearables
Industrial Wearables

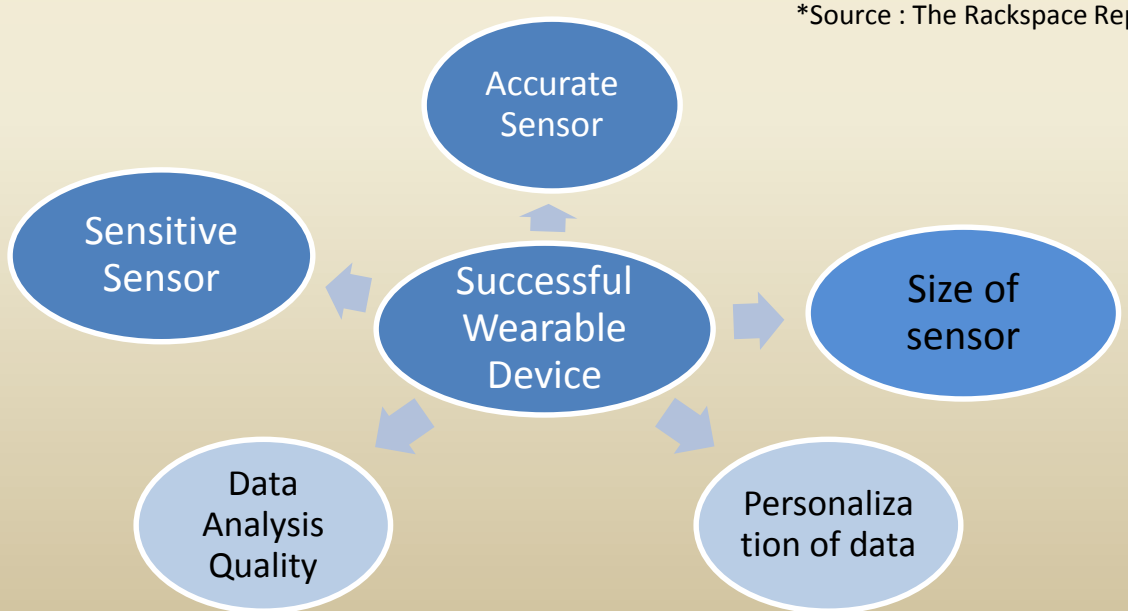
Key Factors Driving Wearables

Human Factors | Cost and Design | Chips and Batteries | **Sensors** | Broad Ecosystem of Connected Technologies

Wearable technology is only as good as the data it delivers

- Paul Boag, a 42 year old web strategist, tried the Jawbone UP and was originally impressed with the device because it looked good, had a simple design and was light to wear.
- However, frustration set in once he starting monitoring the data tracked by the device.
- He found analysis around his calorie consumption inaccurate.
- Additionally, he was frustrated that the device did not track all of the fitness activity he engaged in – for example weight training was not monitored.
- Additionally, he was annoyed that the information he entered manually to track his mood was not included in the data analysis provided by the vendor.

*Source : The Rackspace Report on 'The Human Cloud', June 2013



Important Factor for

Entertainment Wearables
Fitness Wearables
Medical Wearables
Industrial Wearables

Key Factors Driving Wearables

Human Factors → Cost and Design → Chips and Batteries → Sensors → Broad Ecosystem of Connected Technologies

- Wearable Tech will form a part of 'Internet of Things'
- Enterprises are finding ways to include the Wearables as a part of their HR Corporate Strategy

  Example:
  - The cloud broker Appirio rolled out an opt-in program ' CloudFit' in 2013
  - To help get staff active and setting fitness goals.
  - They also enlisted help of a wellness coach.
  - Appirio has seen high levels of participation in this program.

  Source : RackSpace report 'The Human Cloud' , June 2013
- Success of a Wearable however will depend on the platform that these wearable devices provide.
- The switching cost will come from the software and the applications on the wearable device.
  - Provide a platform where developers can easily create apps and find users.
  - Provide a platform where users provide find many applications
  - Pebble opened it's app store for developers to develop apps. At that point, they had developed over 1000 apps for the platform

    Source : appleinsider.com, 03 February 2014
  - Currently, smartphones have over 8,00,000 apps

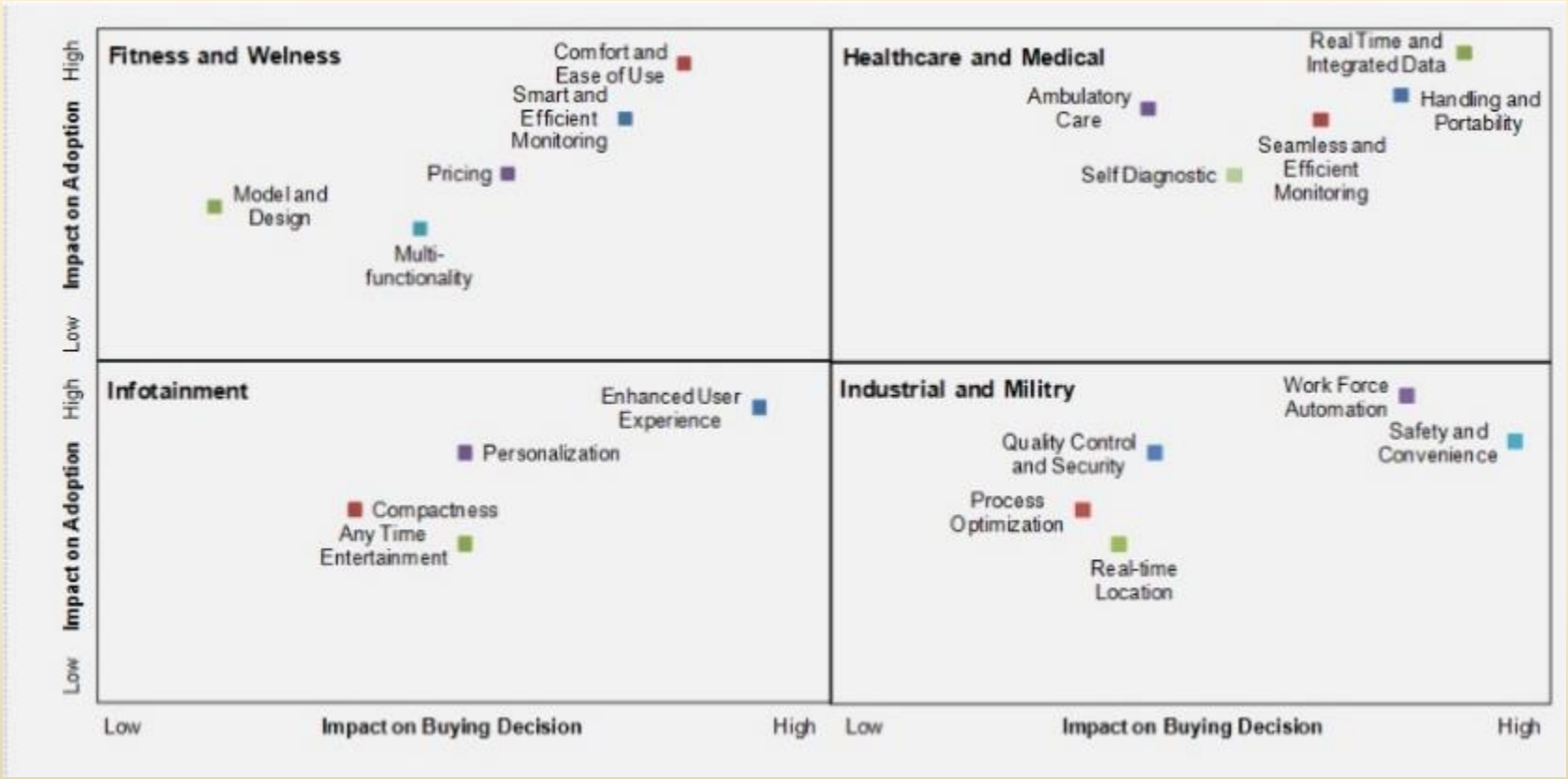
    Source : techland.time.com, 16 April 3013

Important Factor for

Entertainment Wearables
Fitness Wearables
Gaming Wearables
Lifestyle Wearables

Key Factors Driving Wearables

Human Factors | Cost and Design | Chips and Batteries | Sensors | Broad Ecosystem of Connected Technologies



*Source : Transparency Market Research

A Look at Some Devices- FitBit

Battery

Battery: Good (Charge once every 5 days)
Battery Life: Average (6 months)

Sensors

Accuracy: Good
Sensitivity: Very Good (Feature to improve it, add stride length etc.)
Type of Sensors: Average
Waterproof: No
(Water resistant: Yes)

Cost

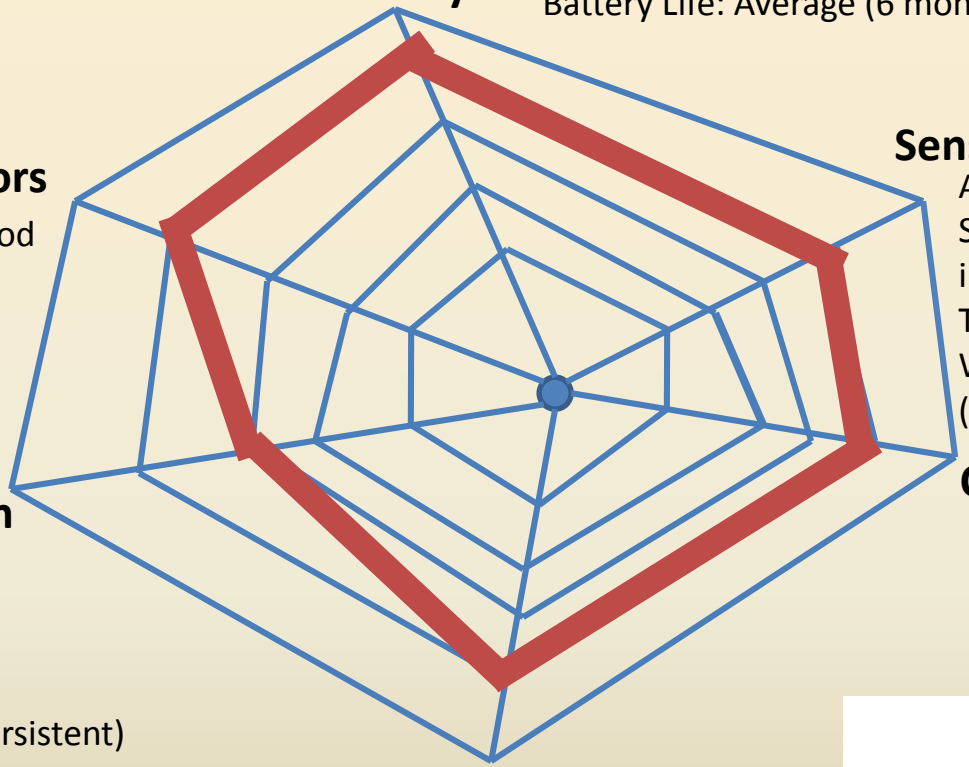
Cost: Good ($100 approximately for most)

Human Factors

Lifestyle Compatibility: Good
Habit Formation: Average
Social Motivation: Good
Goal Reinforcement: Good

Design

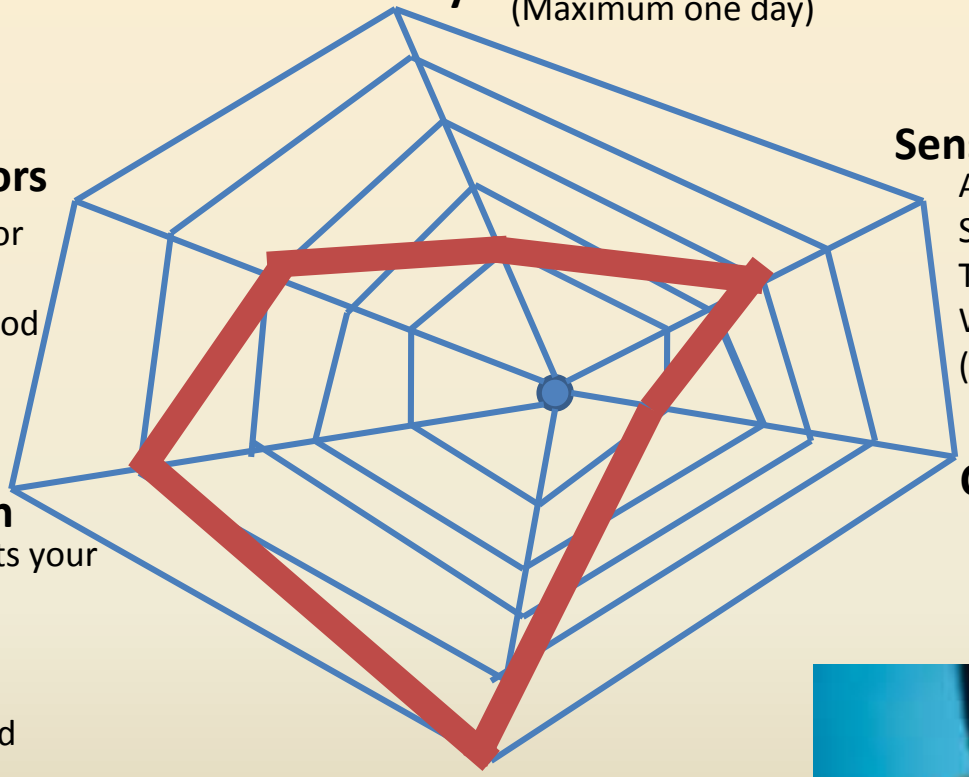
Aesthetics: Average
UI/UX: Average
Intelligence: Average
Communication: Good
Intention: Average (Not persistent)



Software

Connect to others: Very Good
Apps already present: Average
Open Platform for developers to develop Apps: Very Good

A Look at Some Devices– Google Glass



Battery

Battery: Very Poor
(Maximum one day)

Sensors

Accuracy: Average
Sensitivity: Average
Types of sensors: Very good
Waterproof: No
(Water resistant: Yes)

Cost

Cost: Very poor($1500)

Human Factors

Lifestyle Compatibility: Poor
Habit Formation: Average
Social Motivation: Very Good
Goal Reinforcement:
Not present

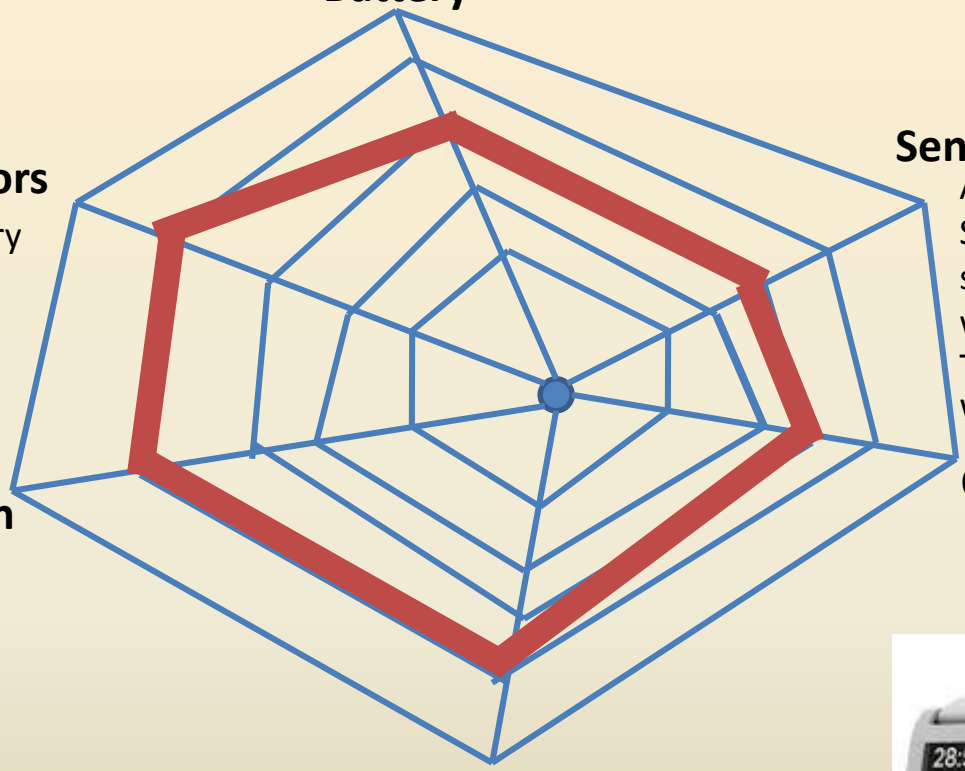
Design

Aesthetics: Average (Affects your looks due to glass)
UI/UX: Very Good
Intelligence: Very Good
Communication: Very Good
Intention: Average (Not persistent)

Software

Connect to others: Very Good
Apps already present: Very Good
Open Platform for developers to develop Apps: Very Good

A Look at Some Devices – Pebble



Battery

Battery: Average (5-7 days)

Sensors

Accuracy: Average
Sensitivity: Bad (Not very sensitive to other types of workouts)
Types of sensors: Average
Waterproof: Yes

Cost

Cost: Average($150)

Human Factors

Lifestyle Compatibility: Very Good
Habit Formation: Average
Social Motivation: Good
Goal Reinforcement: Not present

Design

Aesthetics: Good
UI/UX: Good
Intelligence: Good
Communication: Good
Intention: Average (Not persistent)

Software

Connect to others: Good
Apps already present: Good
Open Platform for developers to develop Apps: Very Good

A Look at Some Devices - GetActive

Battery

Battery: Good (Charge once every two weeks)
Battery Life: Average (6-8 months)

Human Factors

Lifestyle Compatibility: Good
Habit Formation: Average
Social Motivation: Good
Goal Reinforcement:
Not present

Sensors

Accuracy: Good (95%)
Sensitivity: Average (Set own stride length, no heart monitor)
Types of sensors: Poor
Waterproof: No

Design

Aesthetics: Average
UI/UX: Average
Intelligence: Below Average (Only measures, doesn't compute)
Communication: Below Average (Mainly uses desktop, not mobiles)
Intention: Average (Not persistent)

Cost

Cost: Very good ($50 approximately-Very cheap compared to many devices)

Software

Connect to others to compare performance : Good
Apps already present: Poor
Open platform for developers to develop apps: Very poor

A Look at Some Devices - Fin

Battery

Battery: Good (Charge once every weeks)
Battery Life: Good (1 year)

Human Factors

Lifestyle Compatibility: Good
Habit Formation: Average
Social Motivation: Good
Goal Reinforcement:
Not present

Sensors

Accuracy: Average
Sensitivity: Poor
Types of sensors: Average
Waterproof: Yes

Design

Aesthetics: Average
UI/UX: Good
Intelligence: Average (Can configure)
Communication: Good
Intention: Average (Not persistent)

Cost

Cost: Average ($120)

Software

Connect to others to compare performance : Very Good
Apps already present: Poor
Open platform for developers to develop apps: Average

A Look at Some Devices - Goquii

Battery

Battery: Average(Charge once every 4-5 days)

Human Factors

Lifestyle Compatibility: Good
Habit Formation: Very Good
Social Motivation: Good
Goal Reinforcement: Very Good (They have a 'Coach')

Sensors

Accuracy: Average
Sensitivity: Average
Types of sensors : Average
Waterproof: No
(Water resistant : Yes)

Design

Aesthetics: Average
UI/UX: Good
Intelligence: Average
Communication: Average
Intention: Good

Cost

Cost: Very good ($60 approximately-Very cheap compared to many devices)

Software

Connect to others to compare performance : Good
Apps already present: Average
Open platform for developers to develop apps: Poor

Investments in Wearable Technologies

Crowdfunding : Reducing Entry Barriers and Helping to validate Product

- 5 of the top 10 KickStarter Funding Campaigns were for Wearable Devices
- Combining 300 Campaigns from KickStarter and Indiegogo, till date almost $50 Mn have been raised

#1 Pebble Watch

Intended Raise : $100,000

Final Raise : $10,266,845

#2 Dash Headphones

Intended Raise : $260,000

Final Raise : $2,912,500

#3 Emotiv Insight

Final Raise : $1,600,000

#8 Omate TrueSmart

Final Raise : $1,000,000 +

#10 Agent

Final Raise : $1,012,742.

Fin - on Indiegogo

Intended Raise : $100,000

Final Raise : $202,547

2011 : 6 campaigns : Raised less than $400,000

2014 : 45 campaigns : Raised over $8,000,000 (in Jan-Mar2014)

High Media Interest and Strong Projections for the future has generated a lot of Investor Interest:

Get Active :

Infosys Director TV Mohandas Pai invested in this device

Ineda :

Raised Series B Funding of $17 Mn from Samsung and Qualcomm

Investments in Wearable Technologies

2013

$ 458 M Raised in Funding Across 49 Deals in 2013 :

Recent/ Upcoming Major Deals :

Jawbone : rumored to be raising financing at a valuation over $3 billion

Intel : Recently acquired smartwatch maker Basis Science for $100M

Wearable Tech Financing Trend by Geography – since 2012

	S. Valley	So Cal	NY Metro	Mass.	TX	Pac-NW	Colorado	Other
% of deals	42.62%	6.56%	3.28%	13.11%	3.28%	0%	0%	31.15%
Avg deal size	$17.59M	$23.39M	$4.01M	$8.06M	$3.09M	$0M	$0M	$4.45M
Median deal size	$5M	$9.28M	$4.01M	$7.8M	$3.09M	$0M	$0M	$0.45M
Deal growth (yoy)	+320%	+200%	N/A	+66.67%	N/A	N/A	N/A	+71.43%

Wearable Tech Financing Trend by Stage

	Seed / Angel	Series A	Series B	Series C	Series D	Series E+
% of deals	32.35%	32.35%	17.65%	8.82%	5.88%	2.94%
Avg deal size	$1.75M	$8.51M	$24.24M	$10M	$31.41M	$12M
Median deal size	$1.3M	$7M	$13.48M	$10M	$31.41M	$12M
Deal growth (yoy)	+166.67%	+350%	+400%	-50%	N/A	-100%

*Source : www.cbinsights.com, March 6,2014

Acquisitions in Wearable Technologies

Company	Company Acquired	When	Amount	Remarks
Facebook	Moves, Smartphone App	Apr 2014	Not declared	ProtoGeo Oy is a outfit that offers a fitness-tracking App. Thus Facebook is looking to enter into the fitness market, and maybe later into Wearables.
Intel	Basis Science	Mar 2014	Approx $100 Mn	Basis Band accounts for about 7% of the Health Tracking Wearables
Covidien , the medical device manufacturer	Zephyr Technology	March 2014	Not declared	Zephyr originally manufactured devices for military personnel and athletes to gain insights, it moved into helping hospitals with remote patient monitoring.
Facebook	Oculus	Mar 2014	Approx $2 Bn	Oculus is in the VR Gaming Space. Facebook will look to be a leading casual and social gaming platform. In the future, this acquisition may be viewed as a direct competition to Google Glass.
Under Armour, sports apparel company	MapmyFitness app maker	Nov 2013	Approx $150 Mn	Mapmyfitness is one of the most used app on fitness tracking wearables.
Google	WIMM Labs	Aug 2013	Not declared	WIMM Labs specializes in wearable computing devices built on the Android operating system
Jawbone	BodyMedia	Apr 2013	Not declared	BodyMedia will help in innovation in health and wellness, as well as uncover new applications for wearable computing. BodyMedia's devices have also received FDA clearance and are backed by clinical outcomes.

Future Outlook

Wearable Devices should be developed since they enhance the user's lives, and not just due to the easier availability of the required technology.

- Developed ecosystem
- Standalone Wearables have a potentially larger market
  - Currently Smartphone act as a hub for Wearable, which limits penetration of Wearables (that are priced lower)
- Reduction in the overlapping nature of Wearables and Smartphones
- Privacy concerns will be addressed soon
- Consumers aged 16-24 most likely to adopt this technology first (Always On, Always Connected Generation)

Short Term Outlook

Increase in competition and entry of established brands (mainly in proven markets).

Increase in innovation from start-ups. Crowdfunding will continue to be popular.

Emergence of workplace wearables.

Medium Term Outlook

Explosion of Medical Wearables- To assist doctors with diagnosis

Addition of gamification

Move from Inertial Measurement Units (inaccurate) to Heart Rate Monitors and Temperature Sensors in the Fitness Devices (Can't place multiple sensors on body)

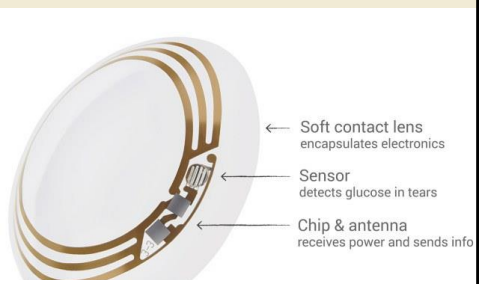
Long Term Outlook

Devices will evolve to be a passive entity alongside humans, it's presence will become unnoticed.

Implantation will become possible and advantageous.

Life expectancy will increase a lot since we will identify and treat diseased at an early stage.

*Source : Wearable Market Insights : 1st Quarter 2014 : Vandrico Solutions Inc.

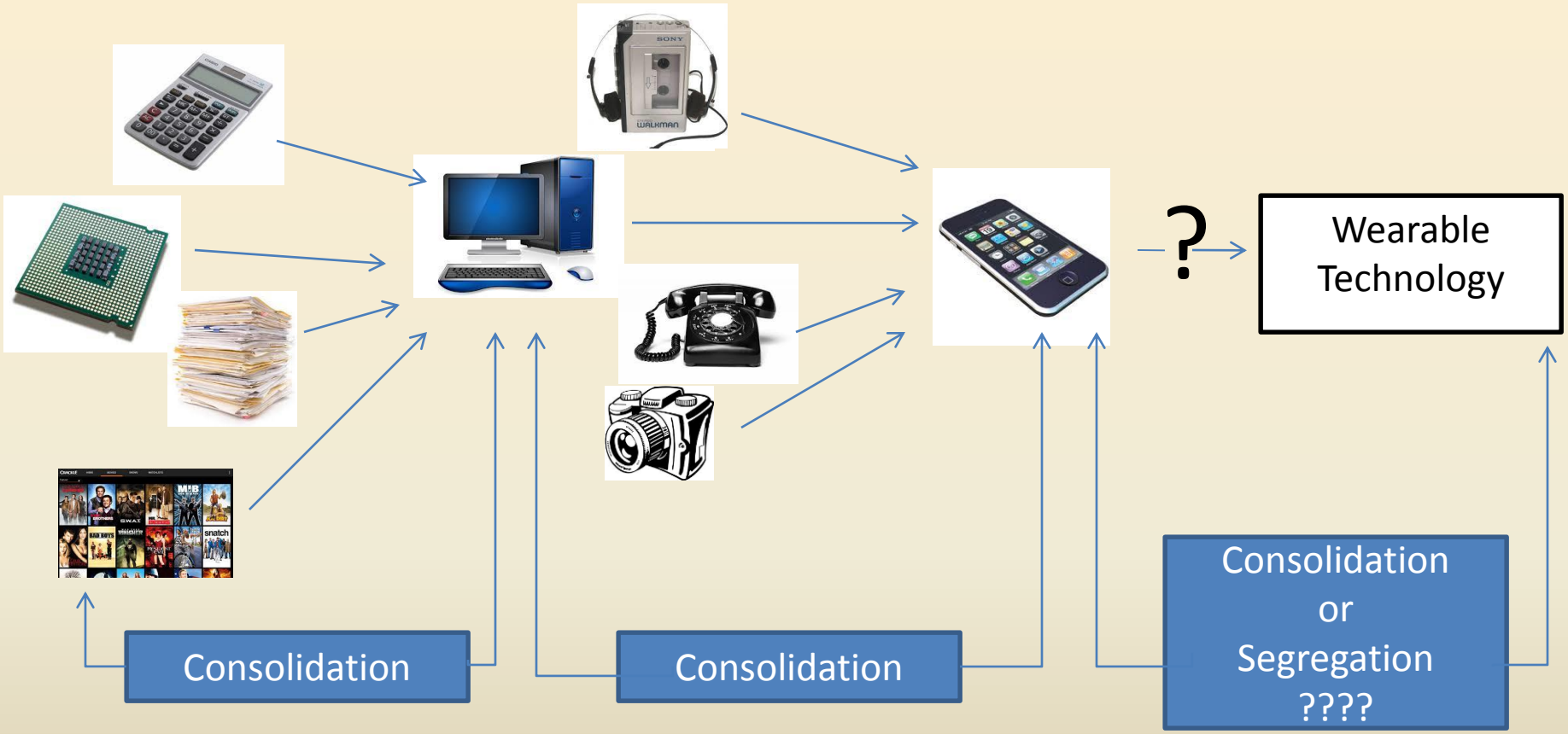


Google has patented a Smart Contact Lens

*Source : Tech crunch, Jan 16, 2014

Future Outlook

People want to move towards simplicity, not complexity



The future isn't just the right software; it's the right hardware in the right places doing the right thing.

Thank You!