

**This is 2015.  
Things change.**

Digital Business is the goal, and not a description of the problem.



# Presentation Structure

1. Disruptive Digital Technologies
2. Digitalization and the Crumbling of Empires
3. Conclusion

# The Internet

- Often overlooked...but
- Principal enabler of Digital Technologies
- Relatively young technology
  - Impacted world citizens
  - Shorter adoption cycles
- Comparison: Years to reach 100 million users

Telephone: 50 years

Aeroplane: 70 years

Facebook: 2 years

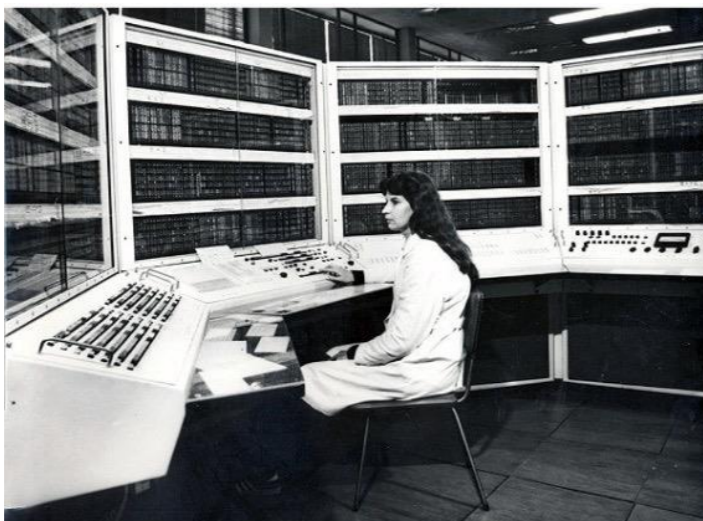
# Processing Power

- More power, cheaper prices
- Moore's law still holds





- Fits in pocket
- Affordable
- Integrated in ecosystem
- Lay-users

vs.



- Requires entire room
- Costs millions of dollars
- Disconnected
- Expert users

## State of the art in personal computing

	IBM PC 	Apple iPhone 5 
Year of manufacture	1981	2012
Cost	\$2,000 with monitor and two drives	\$199 for 16G model
Processor	Intel 8088 processor	Apple A6 dual core
Performance	4.77 MHz	1.3 GHz
Memory	256 kilobytes	1G LPDDR2 DRAM
Storage	One or two floppy drives using 360 kilobyte double-density disks	16, 32 or 64G Flash memory
Operating System	IBM BASIC / PC-DOS 1.0	iOS 6.1.3
Graphics Display	Either an 11.5-inch monochrome 5151 CRT or a color model (with a CGA card) that had a 640-by-200 resolution and could display 16 colors	4-inch 1,136 by 640 LCD at a 16:9 aspect ratio that is capable of showing millions of colors
Connectivity	Most had none, but a 14.4 kilobits/sec modem and eventually a 56k model could be added	EDGE networks in the 850, 900, 1,800, 1,900 MHz band, most cellular networks, Bluetooth 2.1 and all Wi-Fi bands (802.11 a/b/g/n)

# Disruptive Digital Technologies

- 3-D Printing
- Internet of Things
- (Cloud)

# 3D-Printing



# 3D-Printing

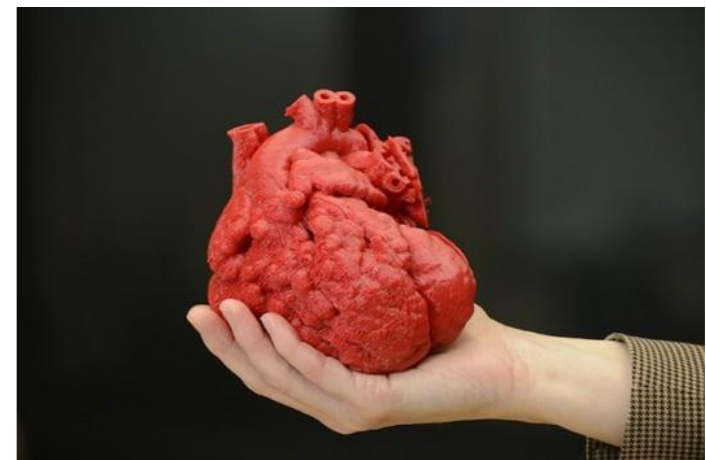
- Manufacturing since industrial revolution



- Manufacturing without factories?
- Reality with 3D-Printing
- Reshapes manufacturing
- Individuals, SMEs, become manufacturers
- Product development simple as “printing a Word document”

# 3D-Printing Applications

- Started with plastic
- Growing range of printable materials
  - Ceramics, glass, ...food, human tissues
- More diverse products



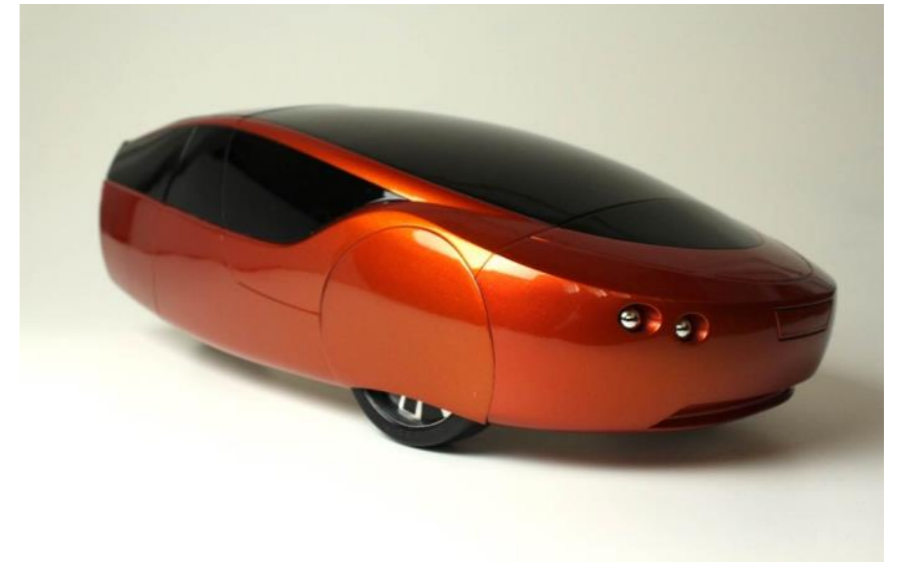
# 3D-Printing Applications (cont)

- Aerospace
- ECD
  - Complex internal structure, manufactured/assembled as 20 parts
  - 3D-Printed as 1 piece
- 3D-Printing Benefits
  - Reduced inventory size
  - No assembly -> improved inspection, maintenance times
  - Lighter 3D-printed parts -> fuel economy
- 3-D Printing Entire Plane



# 3D-Printing Applications (cont)

- Automotive
- Urbee
  - World's 1st printed car
- BMW
  - 3D-Printing assembly tools
  - More ergonomic, lighter
  - Increased worker productivity



# 3D-Printing Applications (cont)

- Photovoltaic
- Recent interest in Organic Photovoltaic (OPV)
  - More energy efficient for cloudy weather
  - Based on organic polymers
- 3D-Printable!
  - Shorter supply chains
  - Reduction in inventory
- Individuals, SMEs as OPV manufacturer
  - Threat to ISSO market share?



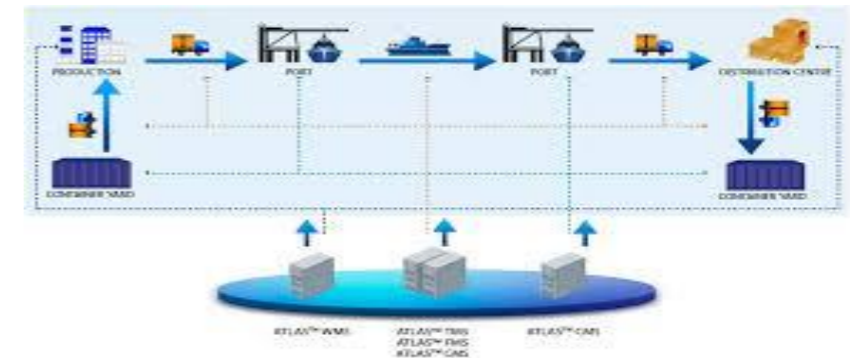
# 3D-Printing Applications (cont)

- 3D-Printed Solar Panels strengths
  - 20% more efficient than flat solar panels
  - Eliminating waste costly materials (glass, polysilicon, indium) -> reduction total production costs
  - Produced “on-demand”, less transport, distribution costs
  - High degree of customization
  - Can be made lighter, more flexible, useful for wearable c
- In a similar vein:
  - 3D-Printing entire house in China
  - Massive impact on construction industry, social



# 3D-Printing: Main Disruptions

- Product variety from single machine, without
  - Product line customization
  - Investment in tooling
  - Factory downtime
- Printing/manufacturing near consumption
  - Shorter supply chains
  - Reduction in shipping, distribution times
  - Reduction in inventory
  - MadeInSpace 3D-Printing trials on Int. Space Station for NASA parts
- Customization
  - Enabling novel product creation strategies (collaborating consumers in product co-creation )
  - Engagement, co-creation essentials for sales, revenues generation



# 3D-Printing in a Nutshell

## UNIQUE ADVANTAGES

- Affordable customization
- Allows manufacture of more efficient designs — lighter, stronger, less assembly required
- One machine, unlimited product lines
- Very small objects (nano)
- Efficient use of raw materials (less waste)
- Pay by weight — complexity is free
- Batches of one, created on demand
- Print at point of assembly/consumption
- Manufacturing accessible to all — lower entry barriers
- New supply chain and retail opportunities



## AREAS OF FURTHER DEVELOPMENT

- Printing large volumes economically
- Expanding the range of printable materials
- Reducing the cost of printable materials
- Using multiple materials in the same printer, including those for printing electronics
- Printing very large objects
- Improving durability and quality

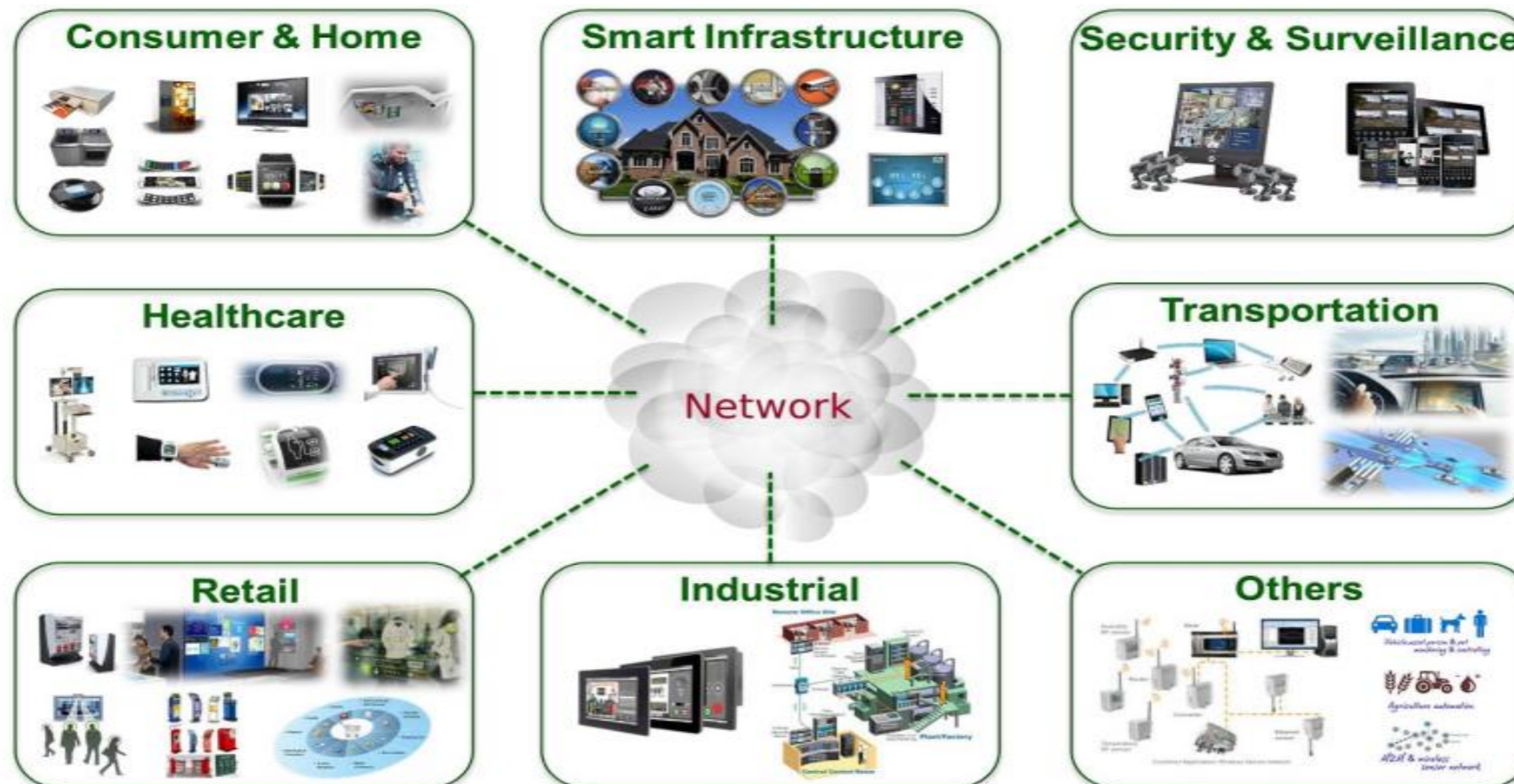
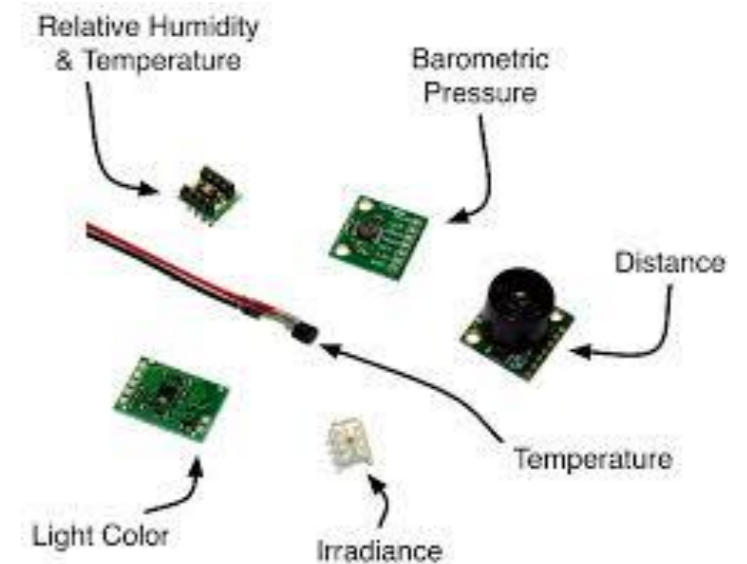




# Internet of Things (IoT)

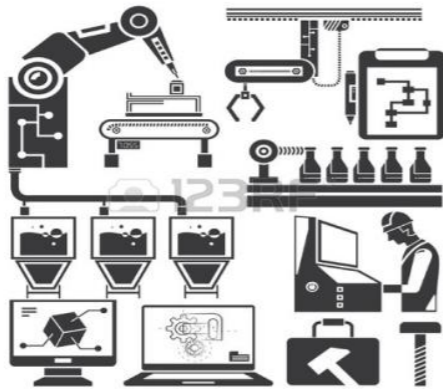
# IoT

- Sensors, microchips embedded in everything
  - Products, raw materials, machines, ...
- Digital voice to passive objects
  - Sense, interpret environment
  - Communicate status
- IOT: Network of interconnected devices
- 5 billion of connected device end 2015



# IoT Applications

- Top-3 industry verticals for IoT (Gartner report)



- 736 million connected things in use
- Communicate autonomously
  - Machine-to-Machine (M2M)



# IoT Applications (cont)

Broad reach

A snapshot of M2M's diverse potential

Sector	Example applications	Major driver
Smart buildings	Automated monitoring of heating, ventilation and cooling	Reduced energy costs
Smart cities	Street lights that dim when roads are empty	Cost savings
Automotive	Emergency calling and accident alerts	Regulatory requirement
Leisure	Leisure vehicle and boat tracking	Safety and security
Consumer electronics	Connected satellite navigation devices to monitor traffic jams	Product innovation
Health	Remote monitoring of patients and personal health monitoring	Cheaper, home-based care
Utilities	Smart meters and energy demand response	Regulatory requirement
Transport and logistics	Fleet optimisation and supply-chain tracking and tracing	Cost savings
Retail	Wireless payments	Retail innovation
Manufacturing	Predictive maintenance through improved system monitoring	Reduced maintenance costs
Construction	Monitoring usage of equipment to improve efficiency and cut fuel usage	Cost savings
Agriculture and extraction	Remote monitoring of farm or mining operations and equipment	Proactive maintenance
Emergency services and national security	Disaster response and critical infrastructure protection	Faster response times

Sources: Machina Research; Economist Intelligence Unit.

# IoT Applications - Utilities

- British Gas wireless, smart meter rollout
- Operational efficiency
  - Automated meter readings
  - Better load balancing
- Smart meter data analytics
  - Consumer behavior insights
  - Opportunities, revenue streams
  - E.g. detect bad insulation
- Integrating with mobile; remote
  - Heat control
  - Switch appliances on/off
  - Camera monitoring



Smart Home

# IoT Applications (cont)

## Bedroom

Smart books interact with the house's 3D and virtual reality system, bringing to life what you read.



## Bathroom

Doctors will be able to give you virtual medical checks  
Toilets will analyse waste for medical problems such as colon cancer.



## Roof

Power collected through solar panels and stored in backup resources to power house and car.



## Bedroom

Clothes made with smart fabrics regulate your temperature and monitor your health  
E-commerce will become F-commerce - online consumers will be able to enjoy a tailored shopping experience based on Facebook 'Likes'.

## Kitchen

Smart surfaces identify what's on them and have the ability to react accordingly - keeping coffee cups warm and iced-tea cold.  
Refrigerators will advise on recipes based on whats in stock and creates personal diets.



## Living Room

All appliances connected through invisible networking system  
Entertainment system creates life like sounds, images and experiences to completely envelop you in near 4D experience.



## Garage

Camera at entrance has facial recognition software which is linked to criminal database  
Car which is able to drive itself.



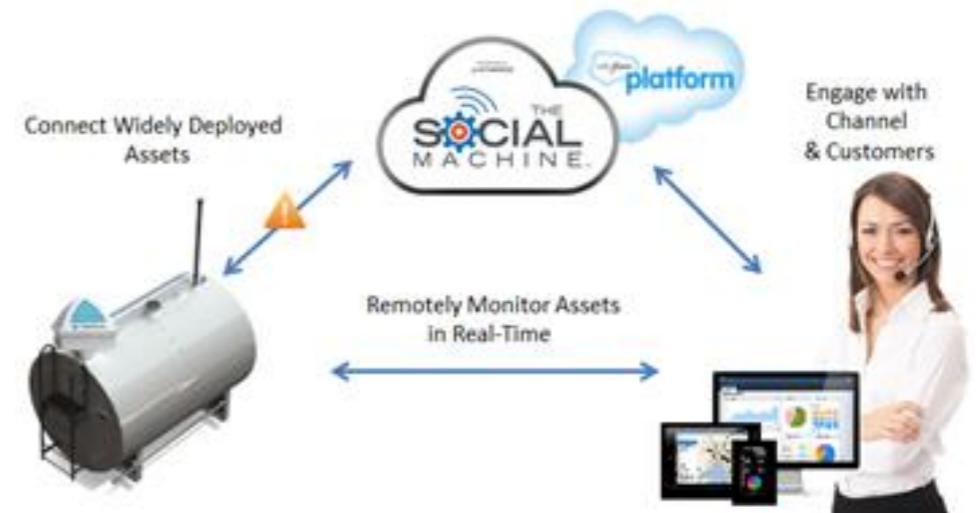
## Office

See-through electronics, screens, touch panels and tactile displays deliver 3D holographic experiences  
Contact lenses allow you to access infinite information resources instantly before your eyes.



# IoT Applications - Manufacturing

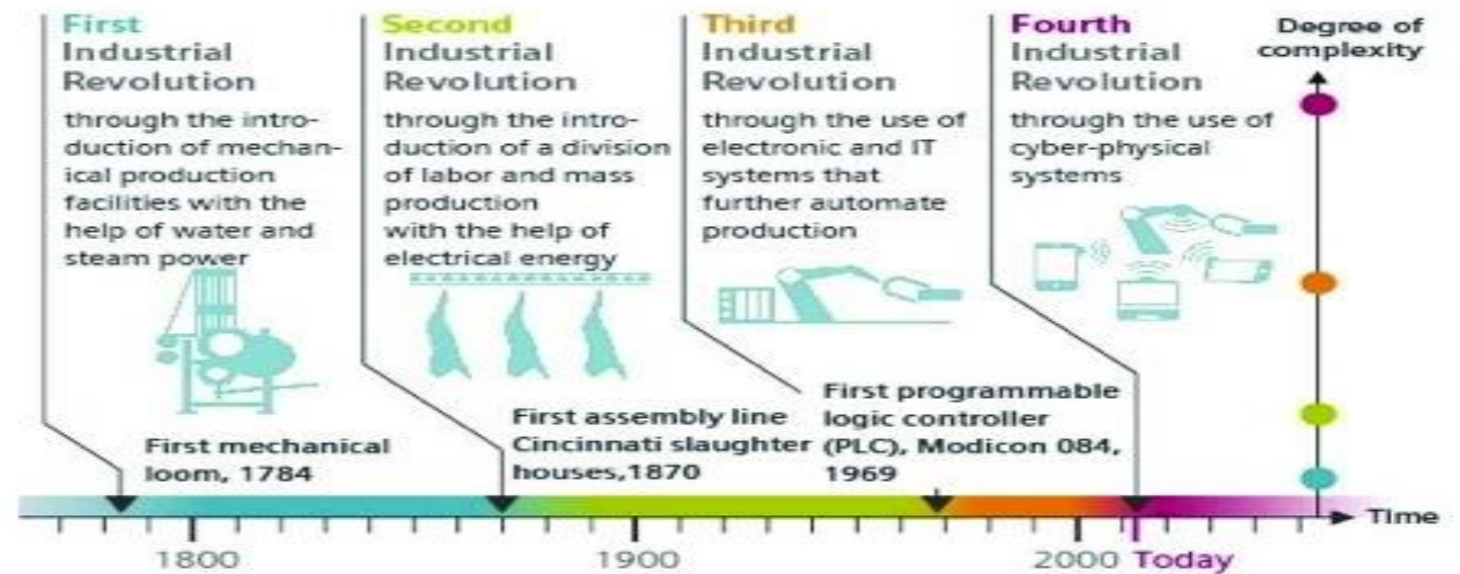
- Sensor, chips → smart machines
  - Sense, interpret, measure, report data
  - Autonomous communication
  - Rise of social machines
- Trumatic 6000 Punch-Laser
  - Independent operation in unmanned shifts
  - Sends completed orders to ERP
  - Detects, removes jammed parts
  - Stop faulty production
  - Email line manager



# IoT - Industry 4.0

- IoT as Industry 4.0 catalyst
- Industry 4.0
  - Coined by German govt.
  - 4th industrial revolution

From Industry 1.0 to Industry 4.0



Source: DFKI (2011)

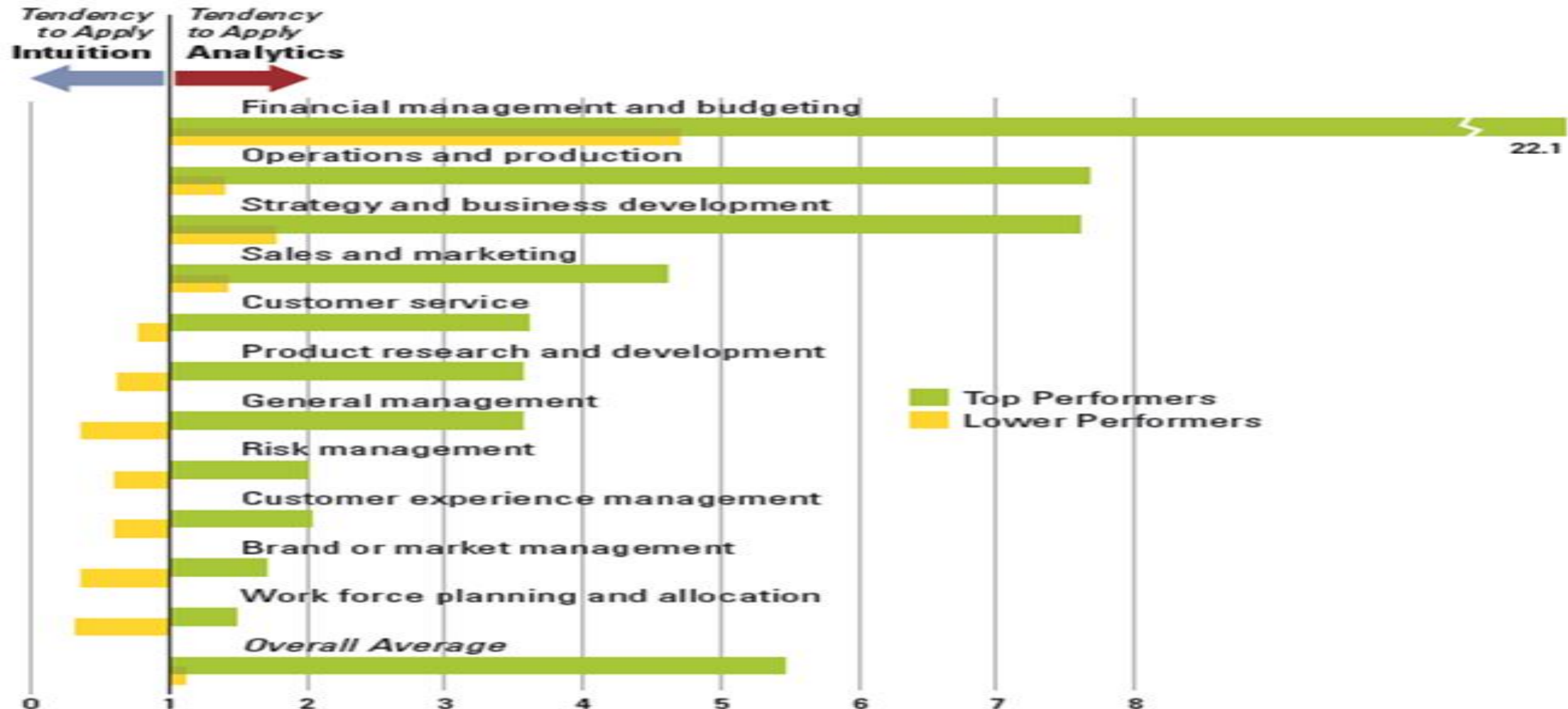
## INDUSTRY 4.0





# Industrial Big Data & Analytics

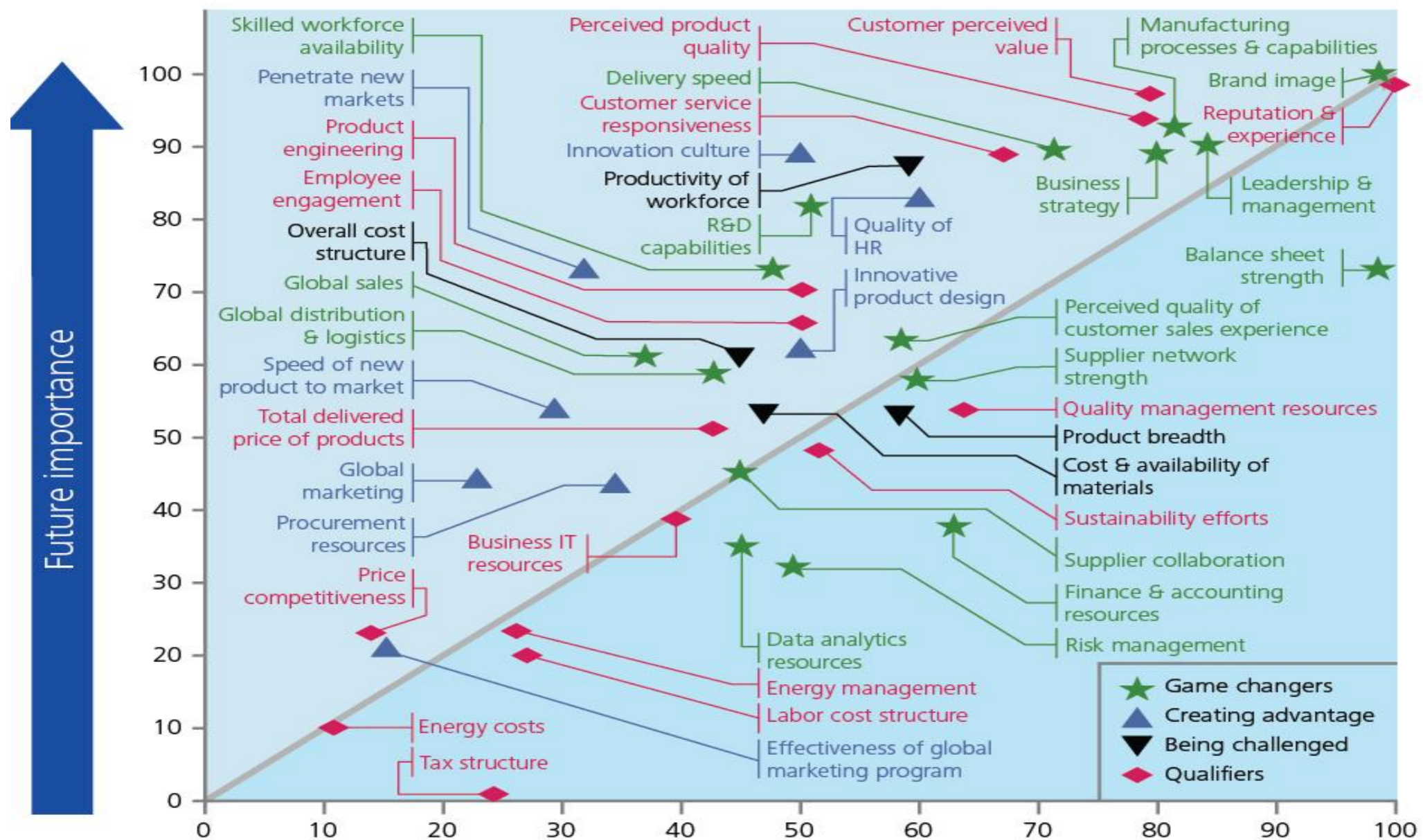
- Huge data volumes from inter-connected machines, devices,...
- Industrial Big Data
- Discovering information nuggets with analytics
- Data-Driven Manufacturing
- Data-Driven Decision-Making
- Data trumps intuition
- Top-Performers 5 times more likely to employ analytics (MIT Report)



# Industrial Big Data & Analytics (cont)

- Deloitte survey of 1100 CEOs
- Data Analytics as a “game-changer” -> increasingly important role

Average values for high performers: current capabilities (x-axis) and relative importance in the future (y-axis)



# Rise and Fall of Business Models

- Numerous industrial applications digital technologies
  - 3D-Printing
  - IoT (Big Data, Analytics)
- Need time to mature , flourish ...but
- Businesses, manufacturers start bracing for digital disruption
- Characteristics of disruptive tech?
  - Simpler
  - Cheaper
  - Smaller
  - More convenient
  - (Prof. Christensen, Harvard Business School)

# Rise and Fall of Business Models (cont)

- History repeating itself
  - Disruptive tech (PC) gradually outperformed established tech (minicomputers)
  - Adoption occurs much faster than anticipated
- Digitalization = threat
  - Reshaped industries
  - Failure to surf digital wave -> collapse
  - Examples?
- Digitalization = opportunity
  - Properly harnessed
  - Emergence of new entrants
  - Fundamentally disrupted existing businesses
  - Business models built upon digital tech
  - Examples?



# Digitalization Threat

- Music Business: HMV
- Business Model
  - Bulk sales CDs, DVDs, games
- More sales=more profits=more physical shops
  - Brick and Mortar
  - 300 stores worldwide
  - £1 billion valuation



# Digitalization Threat – HMV (cont)

- Rise of Digital Music
- Several desiderata
  - Lower barriers of entry
  - Search (artists, titles, genres, ...)
  - Available immediately
  - Streamed anywhere (mobile phones)
  - Can be shared
  - Much lower (even 0) distribution costs
  - Easily replicated
- Failed to recognize threat
- Feeling of invincibility, arrogance
- S.Knott, “I don't ever see them (online retailers, downloadable music) as being a real threat. Downloadable music is just a fad and people will always want the atmosphere and experience of a music store.”



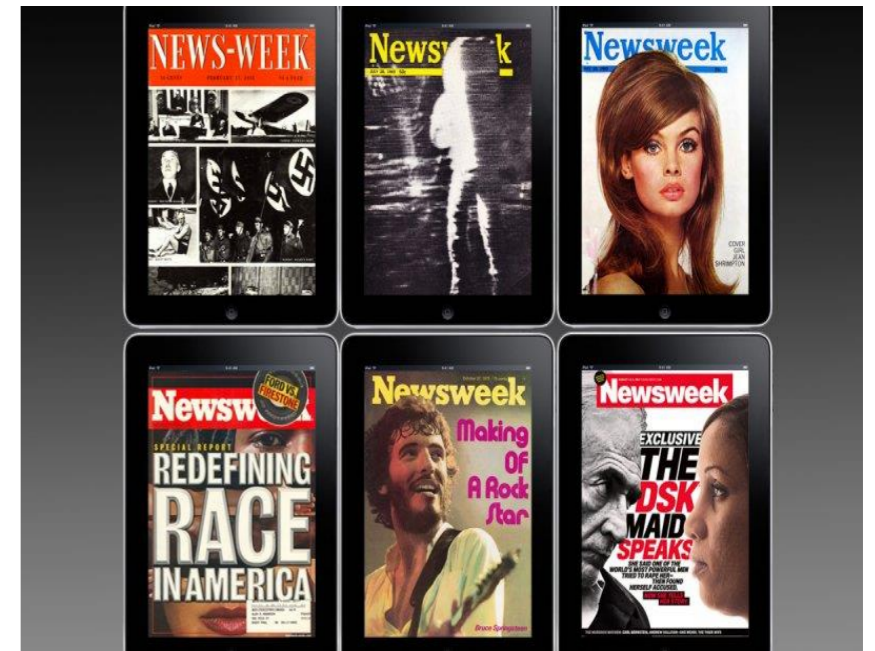
# Digitalization Threat – HMV (cont)

- Digital Music disrupted music business
  - New players: Spotify, iTunes Store, Youtube
- HMV Digital Encroachment
  - Loosing of market share
  - Overtaken by technology
  - Last store closed down in 2014



# Digitalization Threat – Newsweek

- Publisher of (paper) news magazine
- , Ignore digital newspaper threat
- Easier search, update, remix
- Permanent
- Reader interactions (forums)
- Suitable for personalized ads
- Lower production, distribution costs
- Newsweek drop in circulation
  - 3 million in 2007 to 1.8 million in 2010
- Compelled to go digital in 2012





# Digitalization Opportunity

- New market entrants
- Business Model based on digital tech



- Characteristics
  - Valued at > \$10 billion
  - No real operating income
  - Smaller than established players (Uber vs. transport companies, AirBnB vs hotel chains)
  - Core strength in digital disruption

# Digitalization Opportunity - Uber

- Transport business?
- Strictly speaking...no
  - No cabs, drivers ownership
- Intermediary
  - Matches driver/car to customer
  - Receives commission
- Business model more akin to tech company
  - Not transport company



dreamstime.com

# Digitalization Opportunity – Uber (cont)

- Uber strategy
- Identified opportunity
  - Customer frustration with cabs
  - Customers willing to pay premium prices
- Realized “technological incompetence” of existing players
- Realized smartphones, apps ubiquity
- Exploited digital tech
  - Challenge transportation industry



# Digitalization Lessons Learnt

- Dominant market players vulnerable to digitalization
  - Feeling of invincibility, arrogance, ignore digital tech
  - Lack of investment in digital tech, initiatives
- Scaling is less important than before
  - Digital news, music easy replication
- Common behavior to digital tech threat
  - Ignore tech, hope of hype fading away
  - Find flaws, reasons to resist adoption
  - Attempt synergies between digital tech and existing products...
  - But often too late!
- New entrants disruption of market
  - Identifying opportunity; Leveraging on tech
  - Disruptive innovation vs. Sustaining innovation
  - (Prof Christensen, Harvard Business School)

# Conclusion

- Making integration a particular challenge is the fact that most businesses weren't integrated before the arrival of big data, mobility and cloud.
- Most enterprises are still stuck in a world of spaghetti infrastructure that has significant cost in simply maintaining the status quo.
- This reality will create real pain as the world struggles to be a digital business.
- The haves and have nots of the digital era will be divided along the lines of those who have the integrated infrastructure to handle new technology and information and those who won't.