
VISA
26
Allianz
NVIDIA
CHARGE
SPEED
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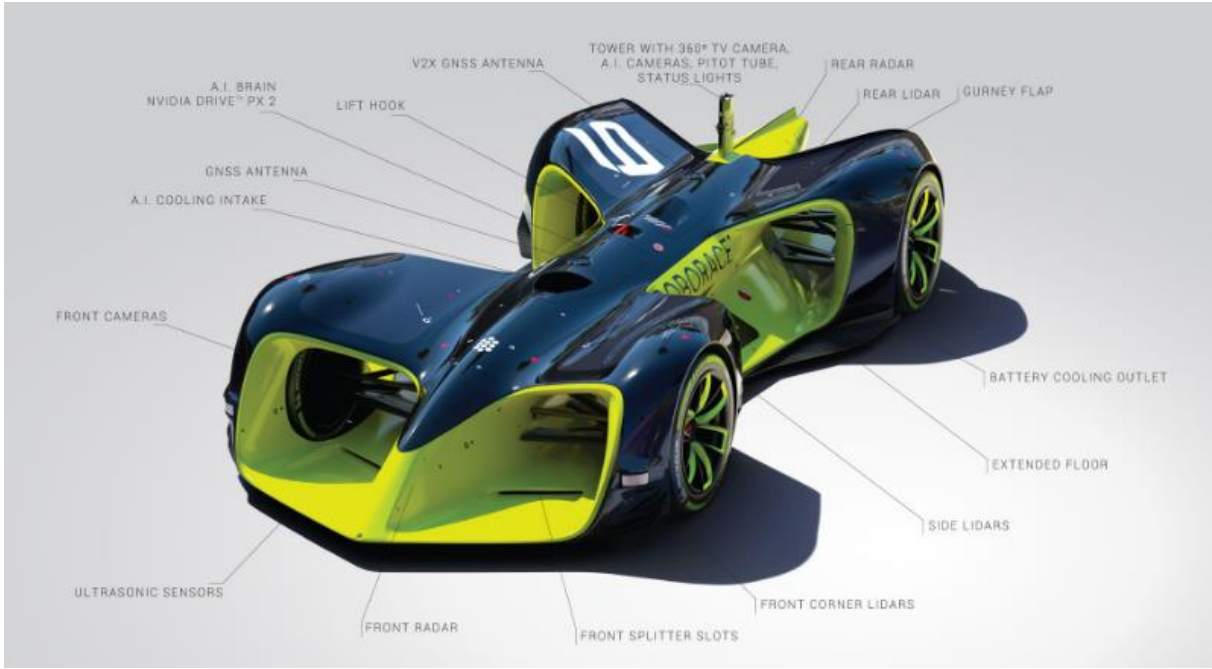
Roborace

- The world's first driverless electric racing car.
- The first Roborace 'shows' will take place during the 2016/2017 Formula E season.
- “I passionately believe that the future of cars is about software; driverless, electric and connected and Roborace will help to make that a reality.”

- Denis Sverdlov, CEO of Roborace



http://roborace.com/

INFO5992 Understanding IT Innovations

Week 2: Introduction to Technological Innovation

A/Prof Jinman Kim

Semester 1, 2017

THE UNIVERSITY OF SYDNEY

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INFO5992: Teaching Team

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  - Unit coordinator and lecturer

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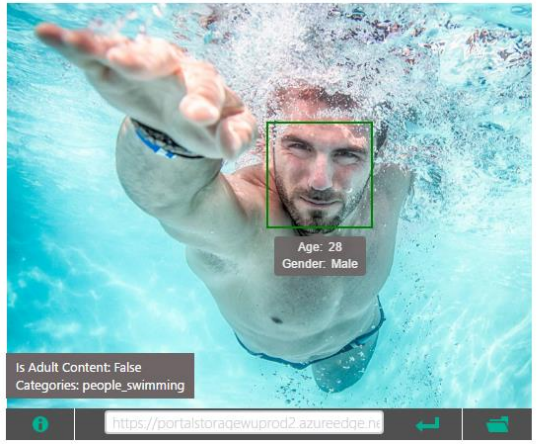
- Shilpa Shetty – Link 122
- Tran Ha Phan – Link 222 (South)
- Kritika Joon – Madsen Lab 226
- Tian Steven Xia – Madsen Lab 211

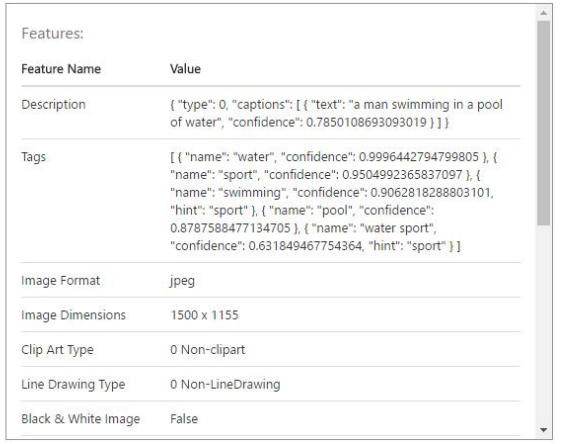
UoS Outline

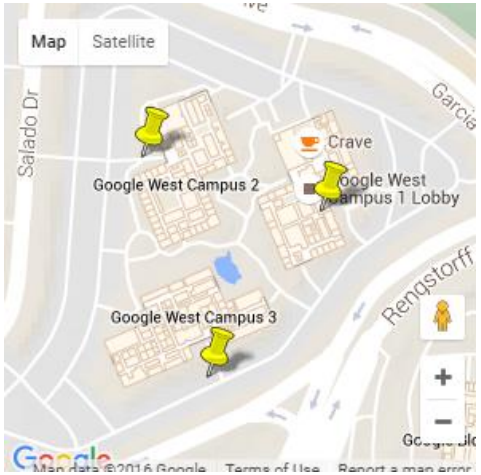
Week	Lecture Topics	Activity
1. 6 Mar	UoS Introduction; Definition of Innovation; Innovation System; Innovation in Australia	*N/A*
2. 13 Mar	Introduction to Technological / IT innovation	***Tute 1*** *– Massive Open Online Courses – Enabling technologies and Peer-review*
3. 20 Mar	Dynamics of Technological / IT Innovation; Source of Innovation; Adoption of Technology; Dominant Design	***Tute 2*** *– Design Dominance in the Smartphone market*
4. 27 Mar	Disruptive Innovation; Industry Value Chain; Value Network analysis	***Tute 3*** *– Innovative Tech Practice – Cognitive services* *Group Presentation Introduction – Topics Released*
5. 3 Apr	Distributed innovation I: Open / Closed innovation; Platform innovation; Web APIs; Crowdsourcing / crowdfunding	*Mid-semester Quiz* *Group Presentation – Topic Selection* *Individual Assignment Introduction*
6. 10 Apr	Distributed innovation II: User innovation; Free and Open source software; Open Data	***Tute 4*** *– Innovative Tech Practice – Open source Geolocation and Maps*
	Easter (Break)	
7. 24 Apr	Innovation ecosystem; Sydney's innovation ecosystem	Group Presentations I – IT Innovation Case Studies *Peer-review of Group Presentations*
8. 1 May	Group Presentations II – IT Innovation Case Studies	*Peer-review of Group Presentations*
9. 8 May	Group Presentations III – IT Innovation Case Studies	*Peer-review of Group Presentations*
10. 15 May	Innovation in Industry sectors **(Lawrence – Microsoft* Dr Ashnil Kuamr)**	***Tute 5*** *– Judging IT Innovation (Example in the Healthcare sector)*
11. 22 May	Organisational Culture; Structure supporting innovation **(Bill Simpson – Data61)**	***Tute 6*** *– Sharing Economy* *Individual Assignment Submission*
12. 29 May	Innovation by Start-up companies and Opportunities	***Tute 7*** *– Business Model Canvas*
13. 5 Jun	UoS Review	*UoS comments / questions*

Tutorials

- ***Massive Open Online Courses – Enabling technologies and Peer-review***
- Design Dominance in the Smartphone market
- *Innovative Tech Practice – Cognitive services*
- *Innovative Tech Practice – Open source Geolocation and Maps*
- *Sharing Economy*
- Judging Innovation *(Example in the Healthcare sector)*
- Business Model Canvas







Agenda

- Recap of What is Innovation / Why is IT innovation important?
- What types of Innovation are there?
  - Many examples of Technological Innovation
- Case Study: MOOCS
  - Technological innovation
  - Peer Assessment

- ***Massive Open Online Courses – Enabling technologies and Peer-review***

The importance of IT innovation

Week 01 Recap – Definition of innovation

"Innovation is not simply invention; it is invention put to use. Invention without innovation is a pastime."

Sir Harold Evans, journalist and writer on the history of innovation

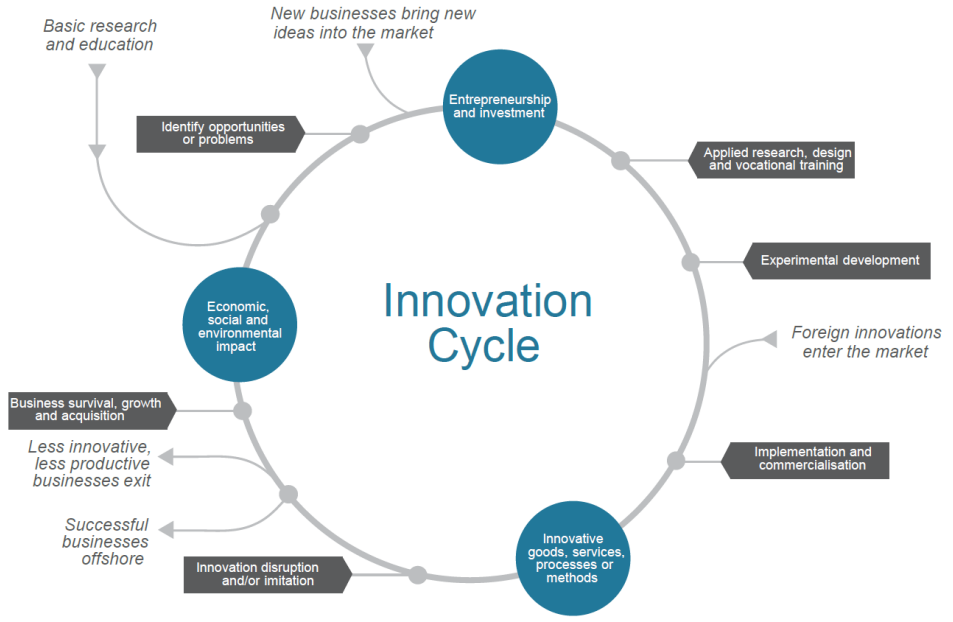
Week 01 Recap – Definition of innovation

- *Innovation is the implementation of a new or significantly improved product (good or service), process, new marketing method or a new organisational method in business practices, workplace organisation or external relations.*

- OECD (2005) *Oslo Manual: Guidelines for collecting and interpreting innovation data*, 3rd edition, OECD and European Commission

Week 01 Recap – The Australian Innovation System Report

- The innovation system plays a crucial role in the long-term economic growth of a country. The *2016 Australian Innovation System Report* presents new indicators that measure and analyse the impact of innovation, focusing on networks and framework conditions which form the essence of the innovation system. This year's report provides both a historical record of the measures and comparisons across the OECD countries.

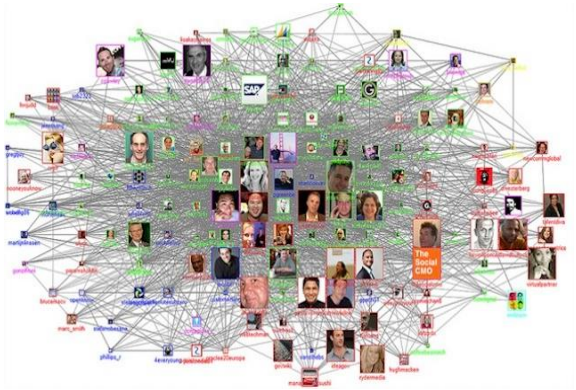


*Source:*Department of Industry, Innovationand Science (2016)

http://www.industry.gov.au/Office-of-the-Chief-Economist/Pages/National-Innovation-Map.html

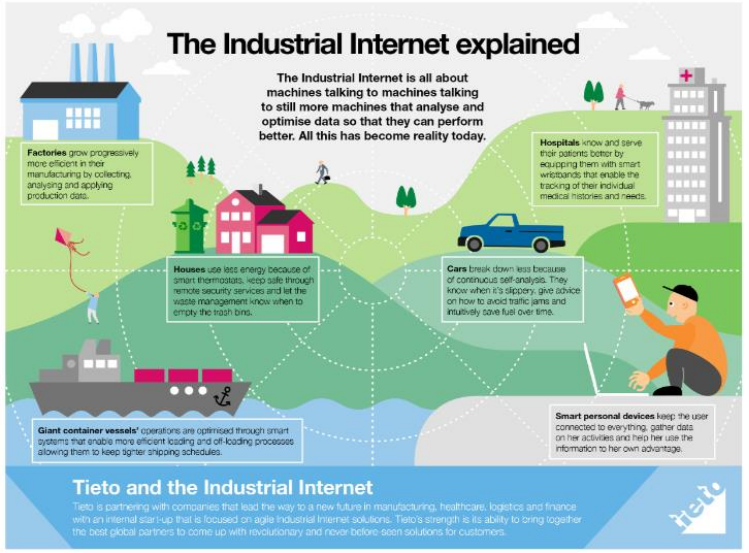
http://www.innovation.gov.au/Innovation/Policy/AustralianInnovationSystemReport/

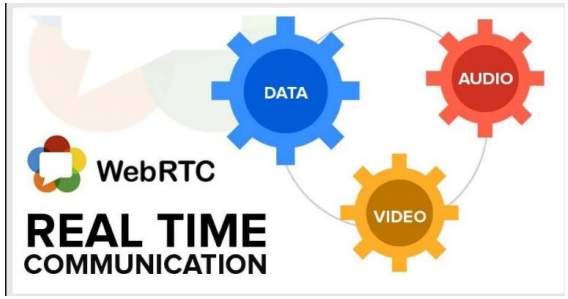
What is invention and what is innovation?

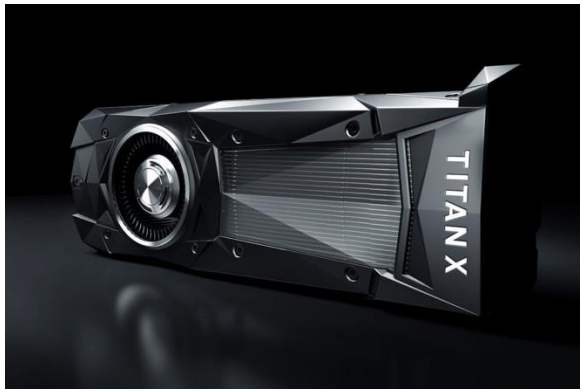


Graph databases

Image: beedesign.org







IT as an enabling technology

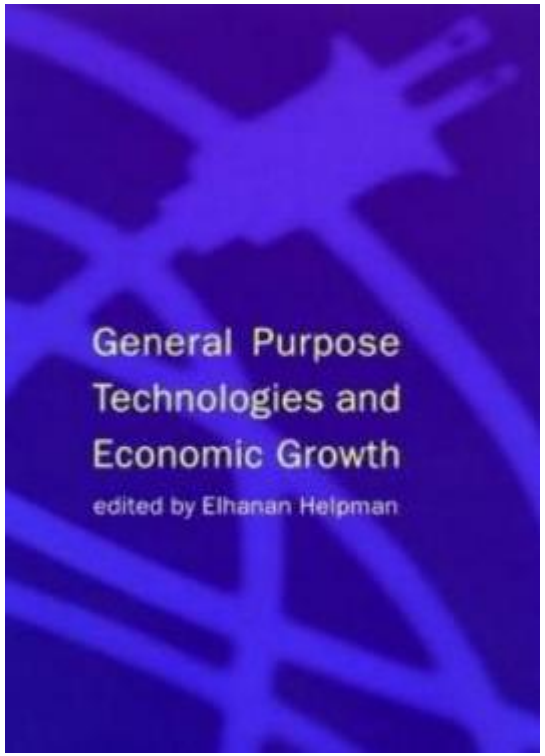
- IT is a "General Purpose Technology" (GPT)
- Like electricity – it enables other technologies
- GPTs differ from other technologies and:
  - Are pervasive – spreading to most sectors
  - Continually improve in usefulness and lower in cost
  - Spawn innovation in other areas – making it easier to invent and produce new products or processes

Source: ITU, *Measuring ICT for Social and Economic Development*, 2006.
(based on Bresnahan and Trajtenberg, "General purpose technologies", 1995)

General Purpose Technology

- GPT is a term coined to describe a new method of producing and inventing that is important enough to have a protracted aggregate impact. Electricity and information technology (IT) probably are the two most important GPTs so far.

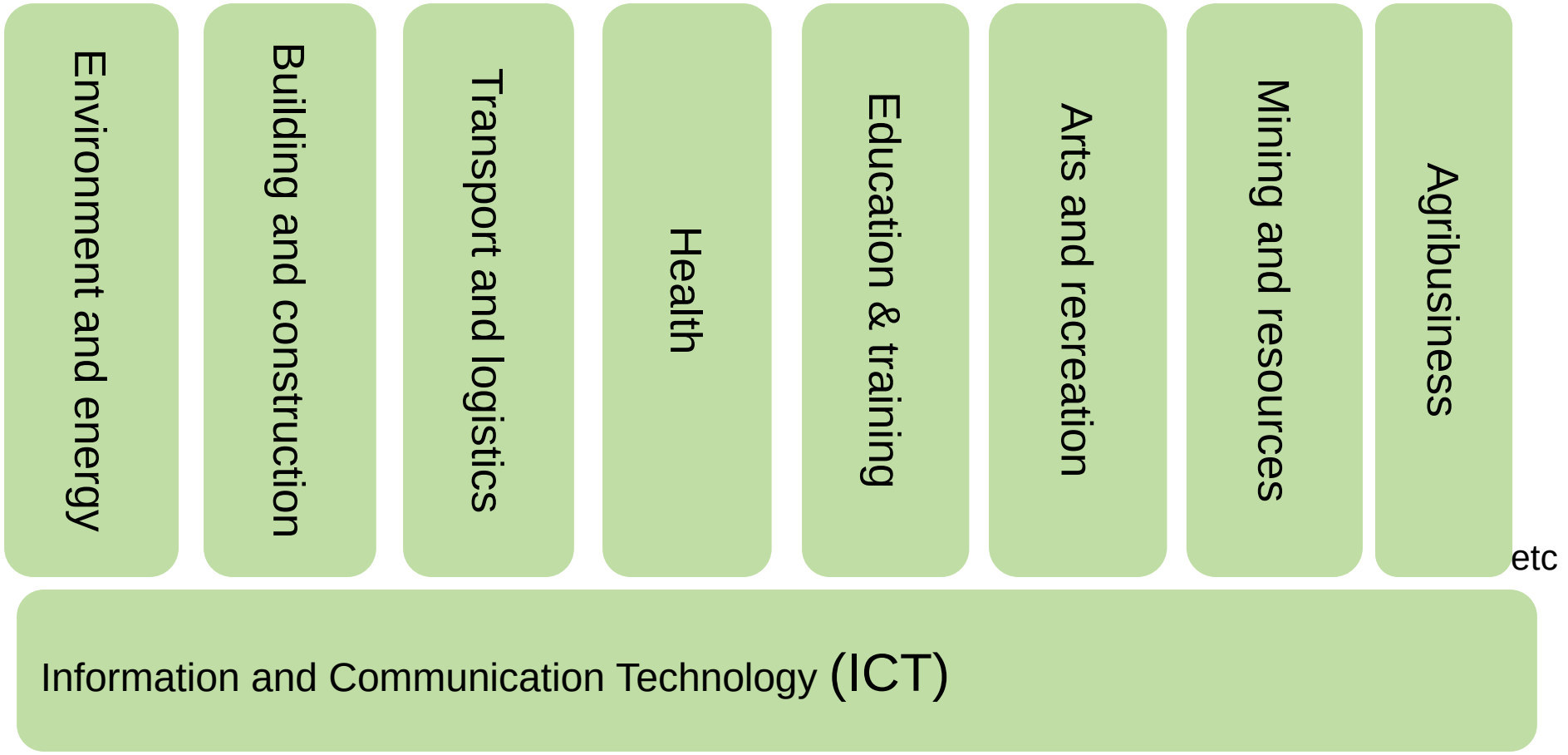
- A GPT has the potential to affect the entire economic system and can lead to far-reaching changes in such social factors as working hours and constraints on family life. Examples of GPTs are the steam engine, electricity, and the computer.



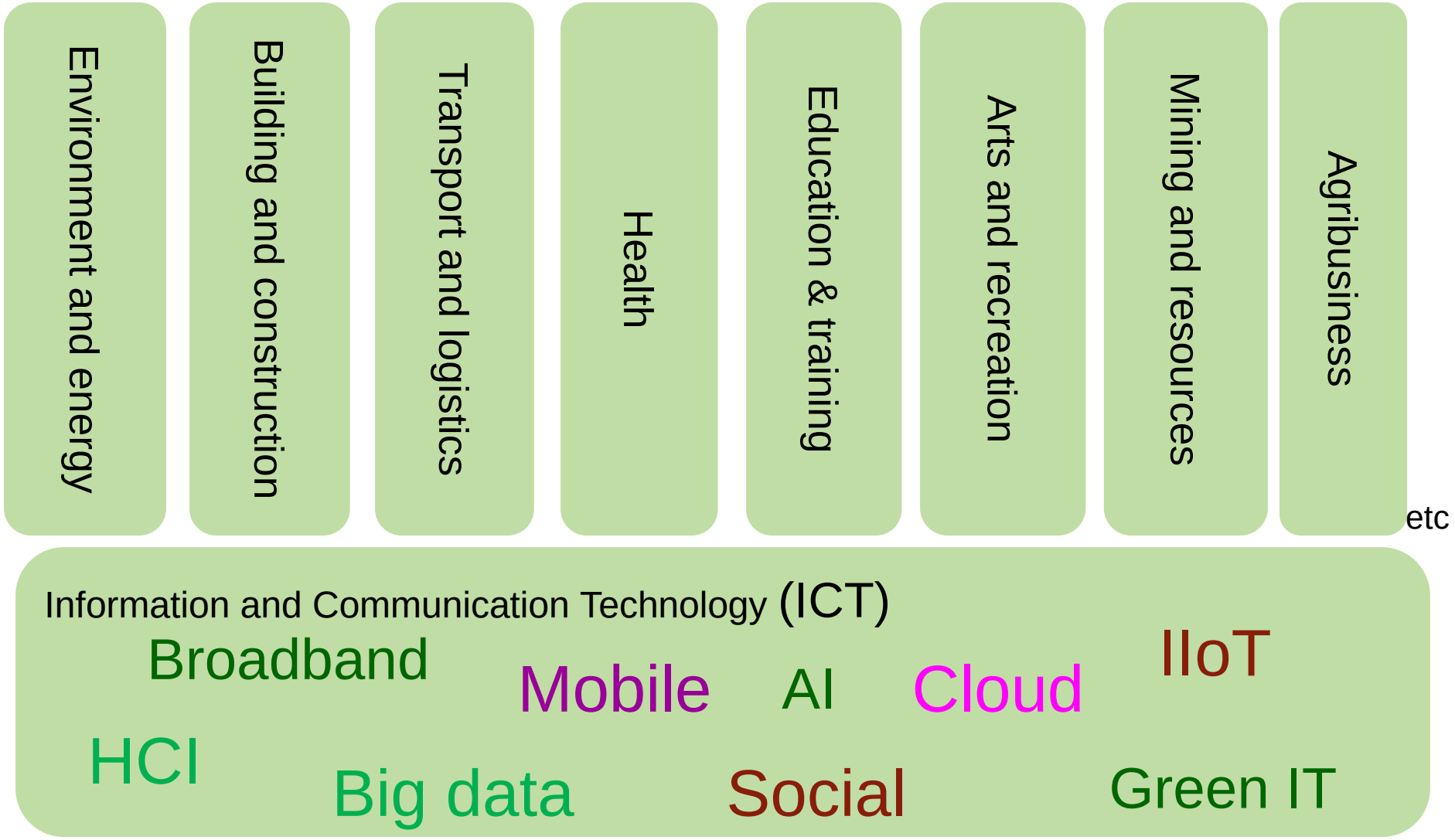
B. Jovanovic, General purpose technologies, New York University and Nber, Peter l. Rousseau, Vanderbilt University and NBER http://www.nber.org/papers/w11093.pdf

General Purpose Technologies and Economic Growth, edited by Elhanan Helpman Cambridge, Mass. : MIT Press, c1998.

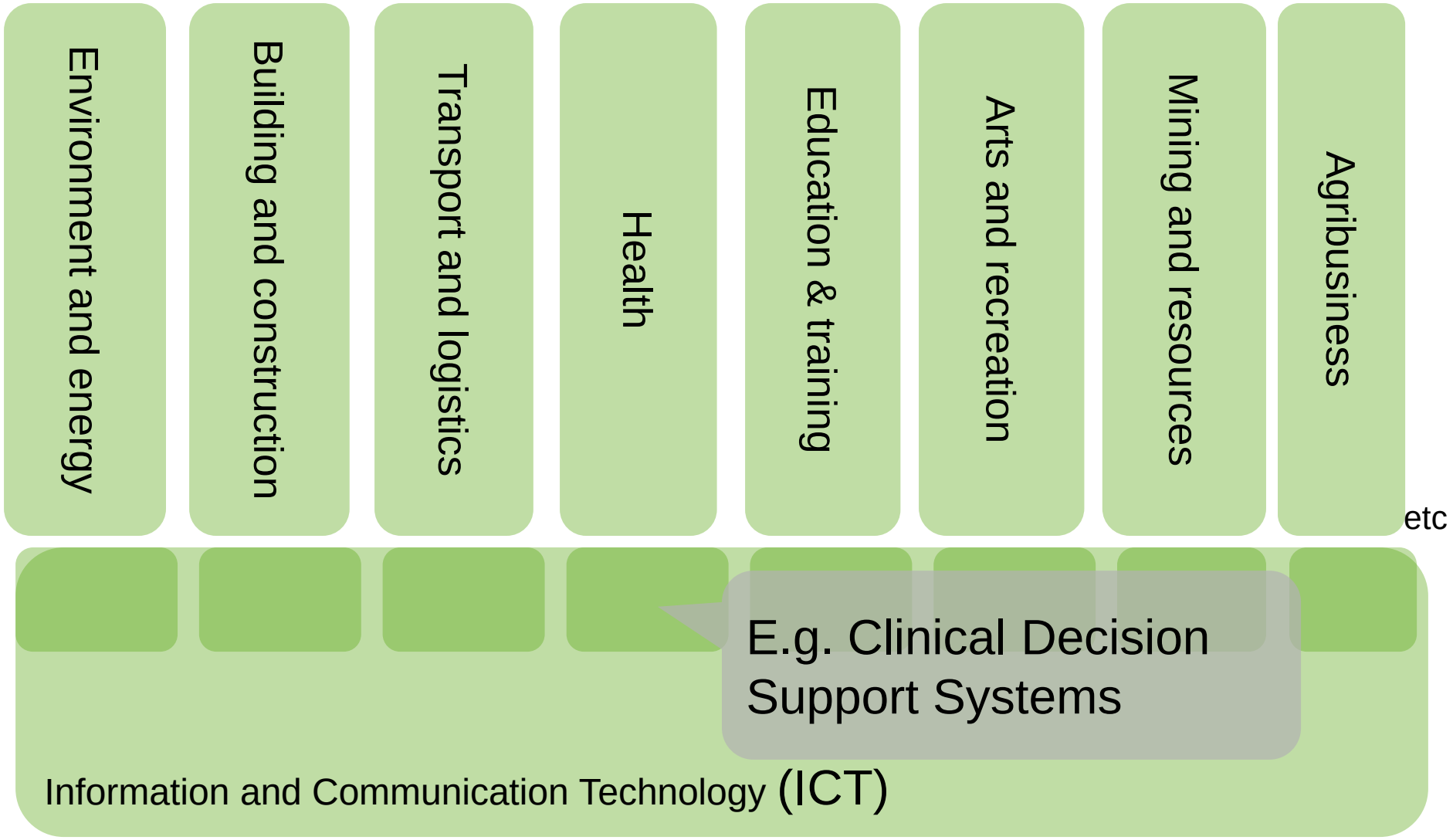
ICT and vertical industries



Some hot areas of current ICT Innovation

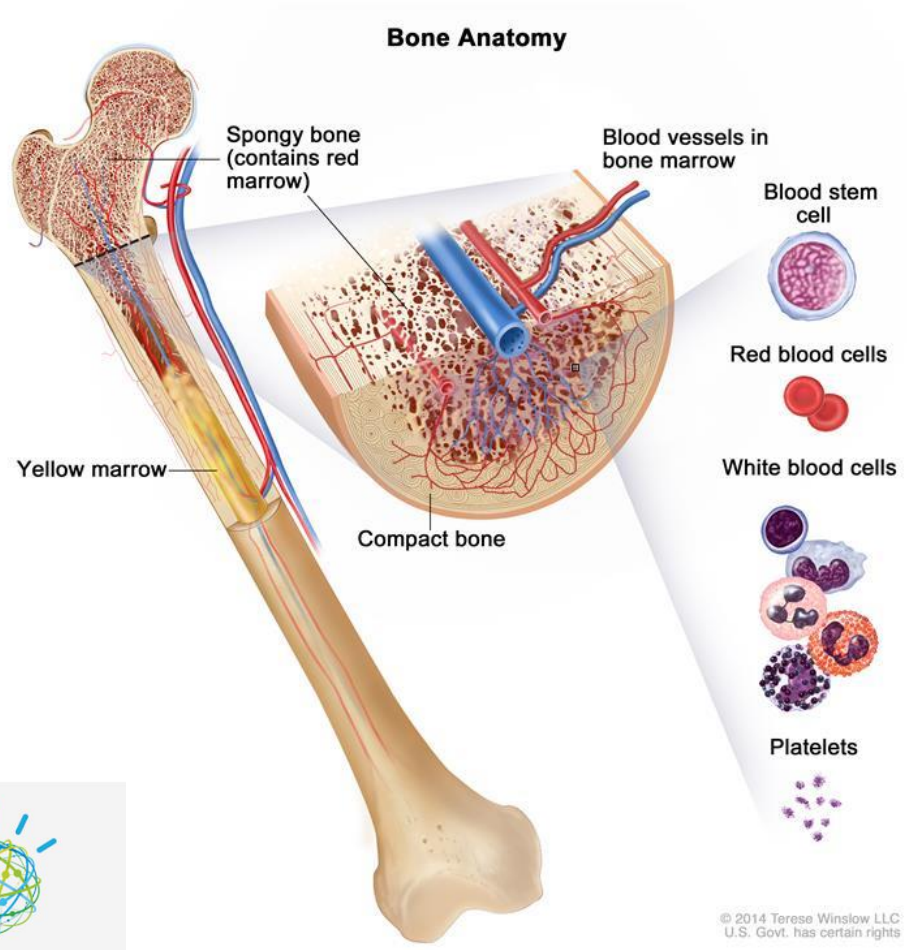


Industry-specific ICT innovation



Leukemia (Japan)

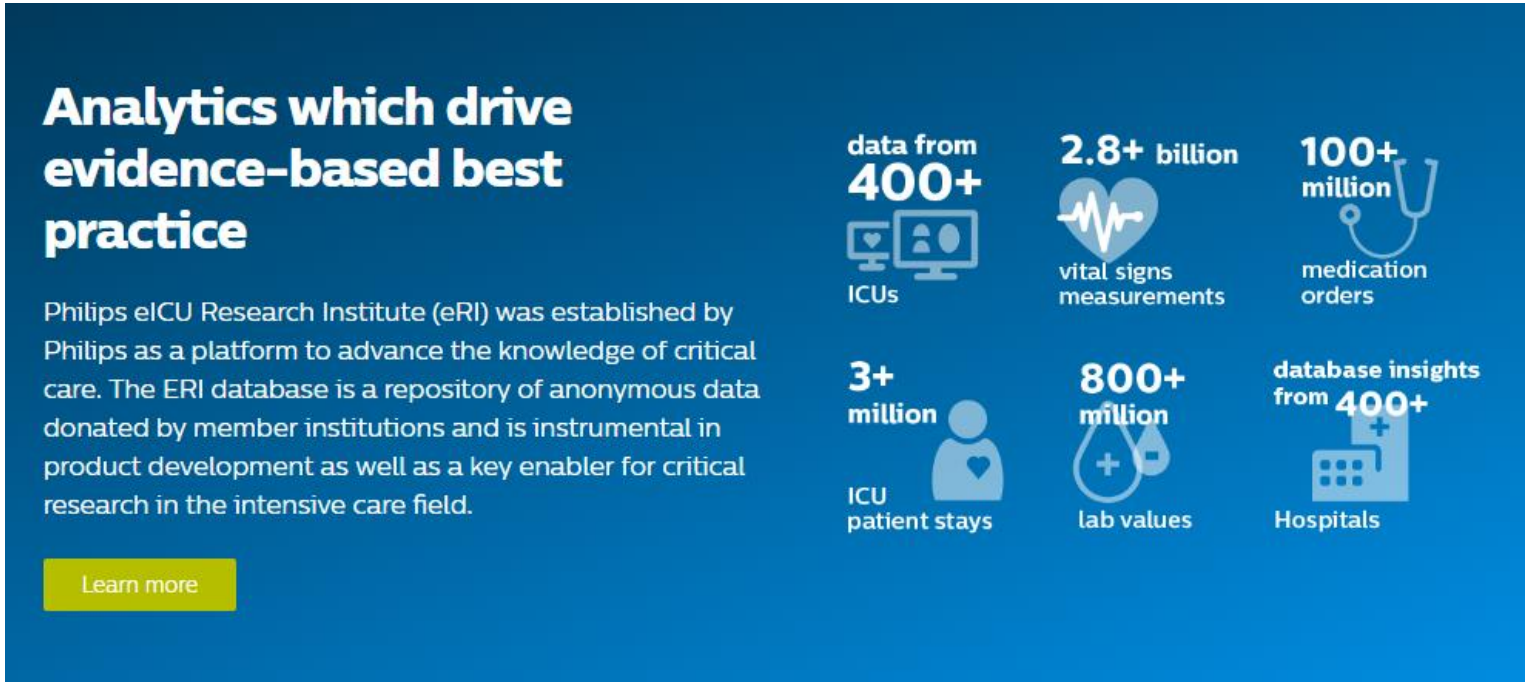
- Diagnosis: acute myeloid leukemia
- Standard treatment not effective
- Gene testing: 1000 mutations
  - Hereditary?
  - Related to disease?
- Watson compared mutations to literature and other data
- Actual diagnosis: myelodysplastic syndrome
- 10 minutes vs. several weeks



http://www.japantimes.co.jp/news/2016/08/11/national/science-health/ibm-big-data-used-for-rapid-diagnosis-of-rare-leukemia-case-in-japan/
https://www.cancer.gov/types/myeloproliferative/patient/myelodysplastic-treatment-pdq

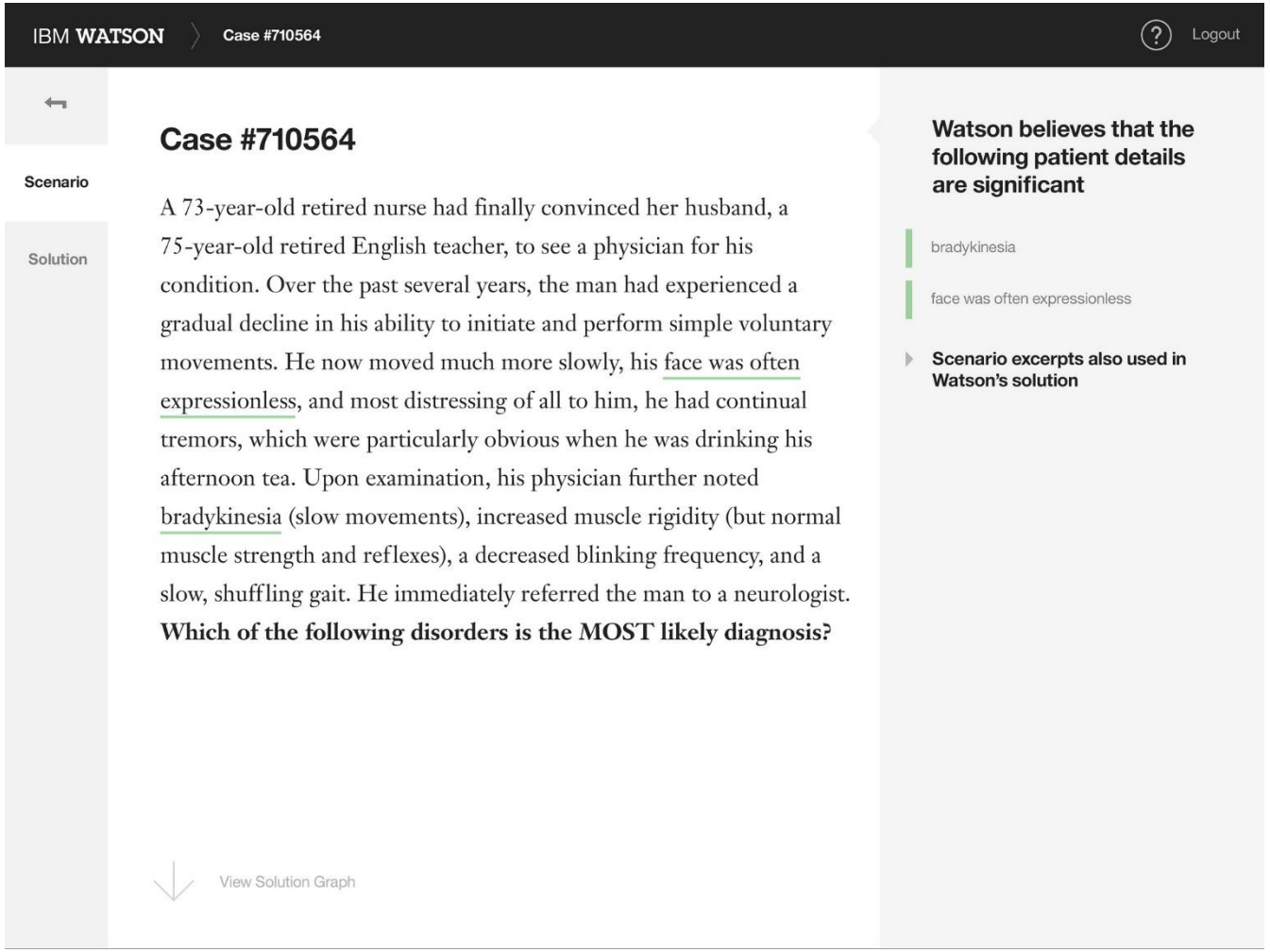
Philip's electronic Intensive Care Unit (eICU)

- he eICU program is a transformational critical care telehealth program that combines A/V technology, predictive analytics, data visualization and advanced reporting capabilities



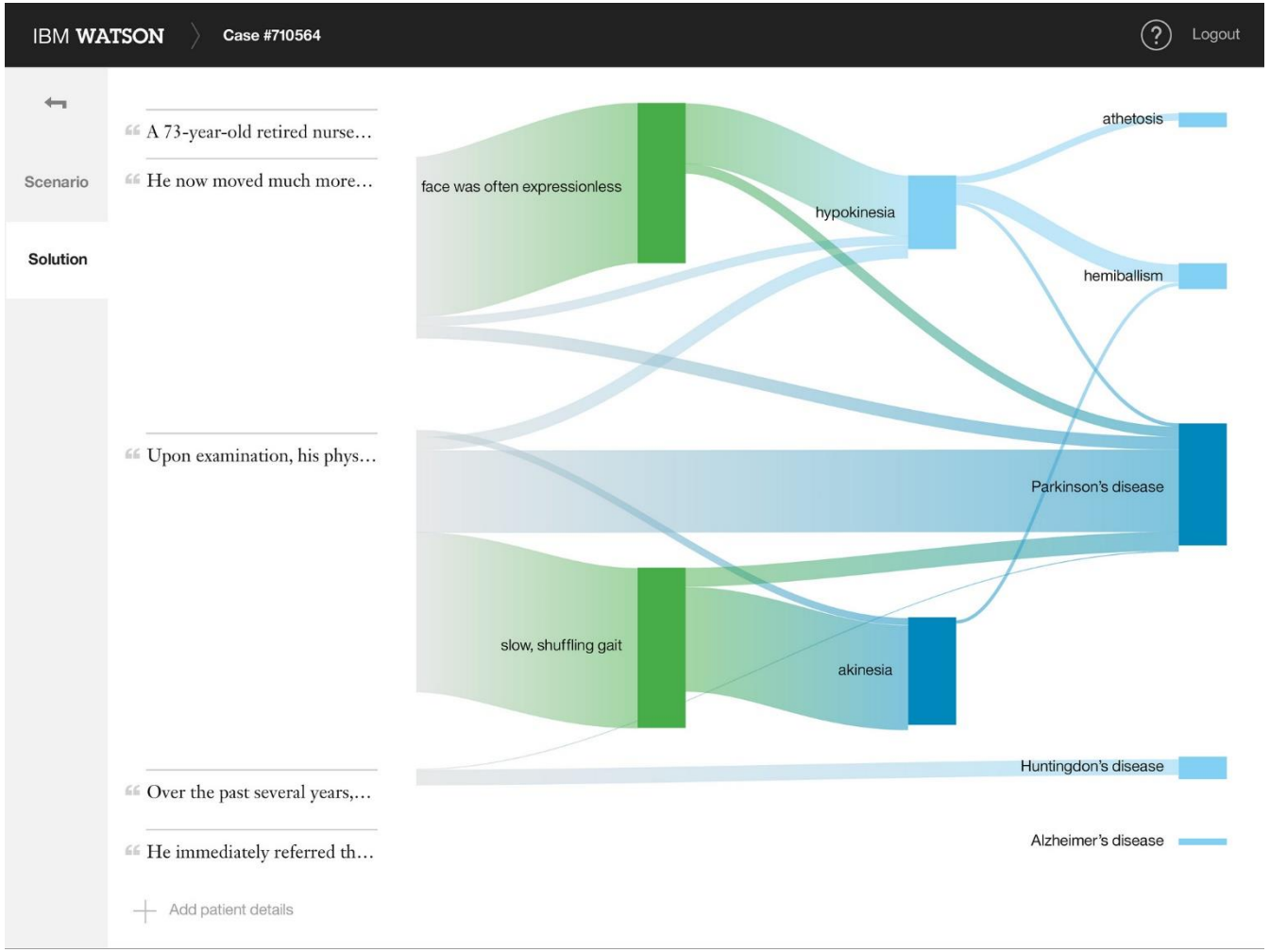
http://www.philips.com.au/healthcare/product/HCNOCTN503/eicu-program-telehealth-for-the-intensive-care-unit

IBM WatsonPaths



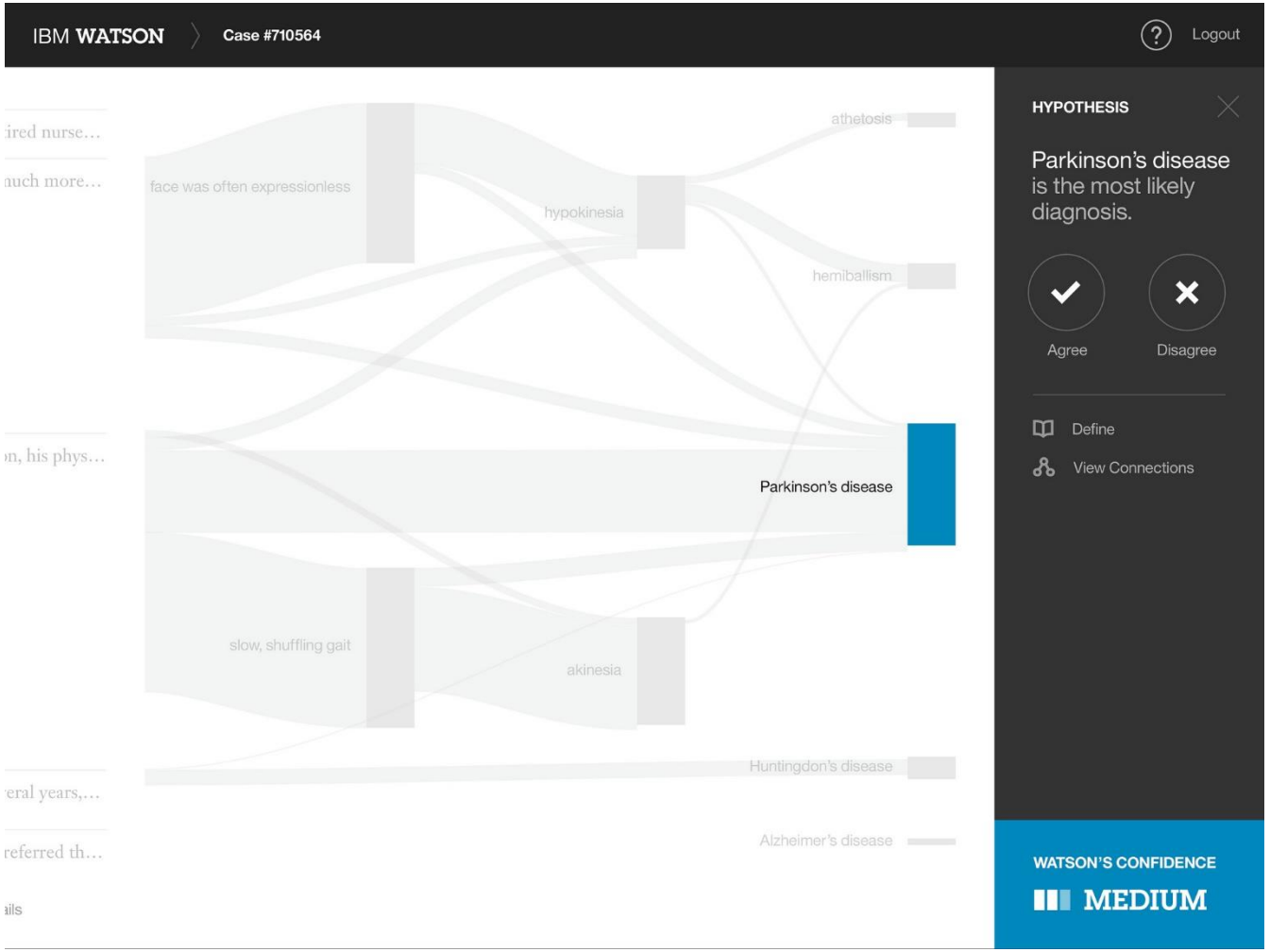
https://www.research.ibm.com/cognitive-computing/watson/watsonpaths.shtml

IBM WatsonPaths



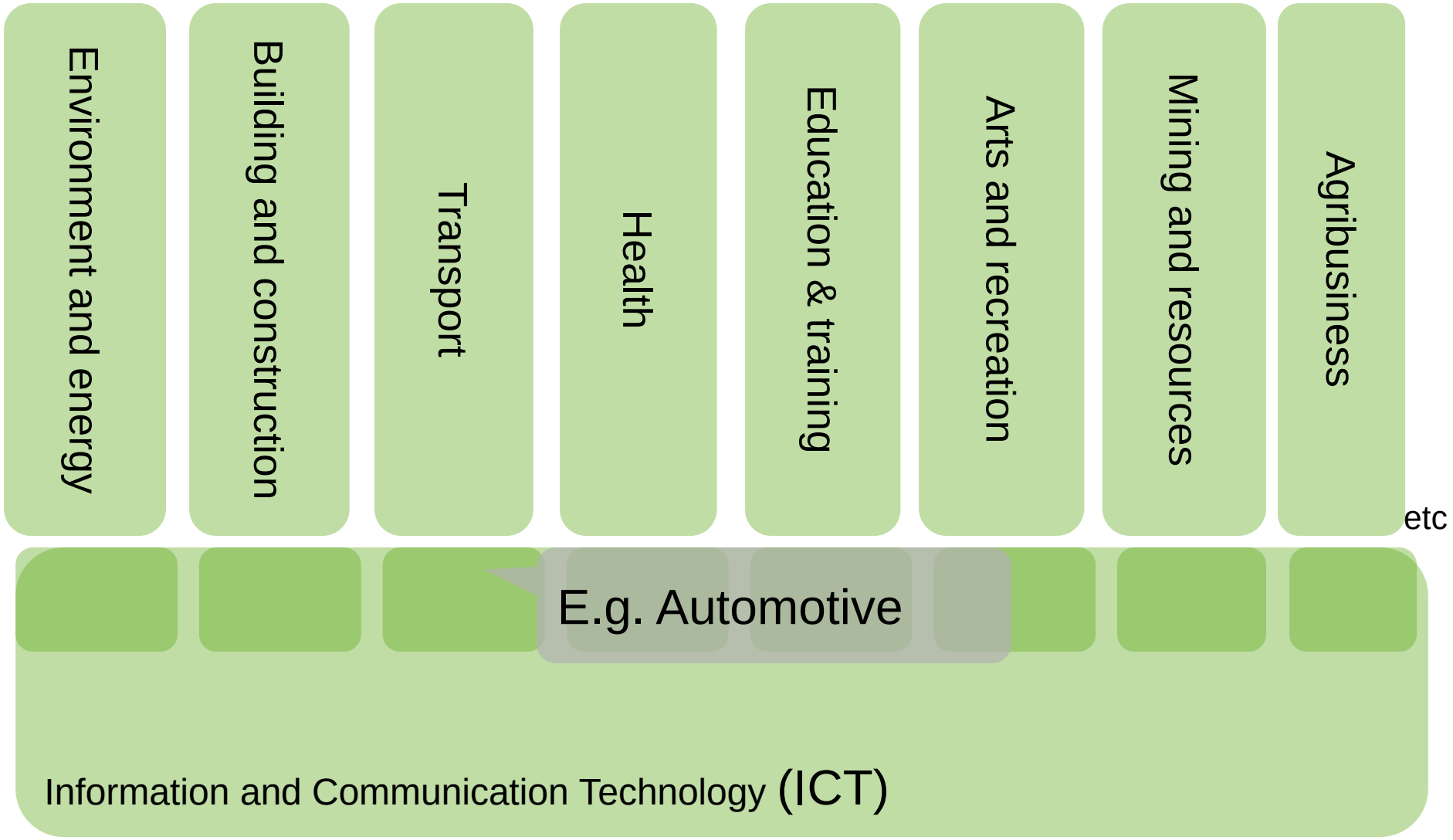
https://www.research.ibm.com/cognitive-computing/watson/watsonpaths.shtml

IBM WatsonPaths



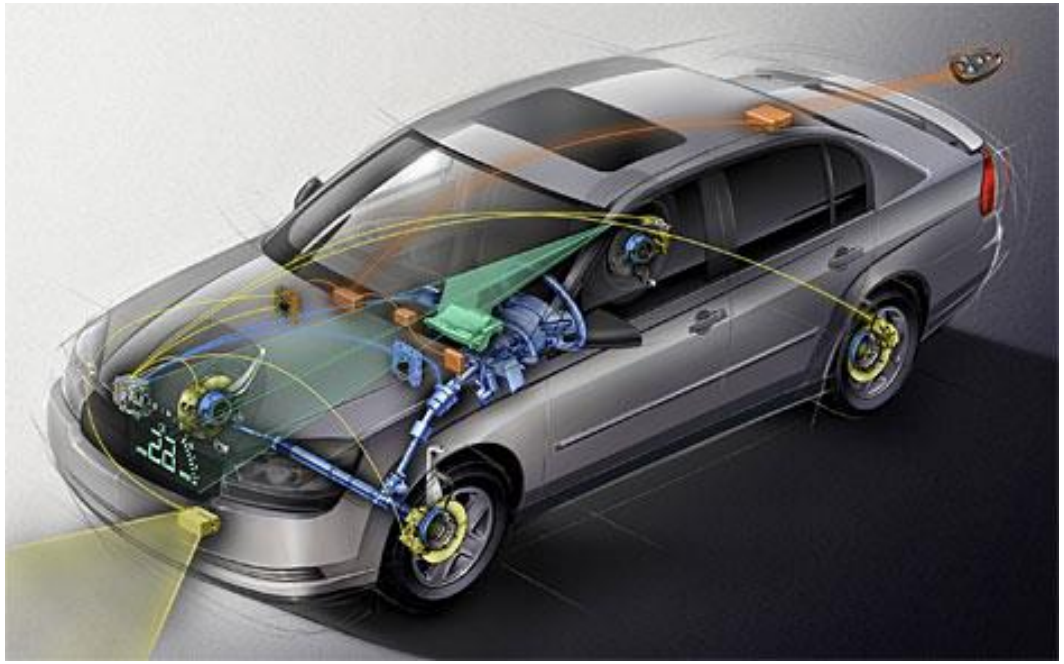
https://www.research.ibm.com/cognitive-computing/watson/watsonpaths.shtml

Industry-specific ICT innovation



Example: Software in cars

- Today, high-end cars have:
  - Up to 100 microprocessors
  - Up to 100 million lines of software source code
  - Software development is up to 15% of the total cost



Source: IEEE Spectrum http://spectrum.ieee.org/green-tech/advanced-cars/this-car-runs-on-code
Image source: General Motors

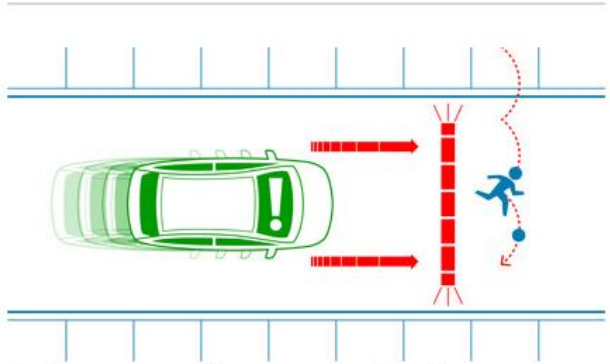
Example: Software in cars

– What does software do in a car?

Air-bag system	Antilock brakes	Automatic transmission
Alarm system	Climate control	Collision-avoidance system
Cruise control	Communication system	Dashboard instrumentation
Electronic stability control	Engine ignition	Engine control
Electronic-seat control	Entertainment system	Navigation system
Power steering	Tire-pressure monitoring	Windshield-wiper control

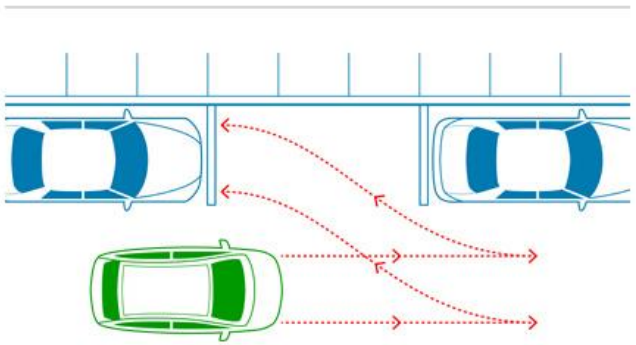
- For cars, software development is not just simple implementation
- E.g. for the hybrid transmission system in GM's Yukon, 70% of the time was spent on software development
- For modern cars, 80% of innovations come from software/computer systems
- For self-driving cars, this will be even higher due to greater number of sensors, greater need for data analytics, more AI, etc

Source: IEEE Spectrum http://spectrum.ieee.org/green-tech/advanced-cars/this-car-runs-on-code, 2009



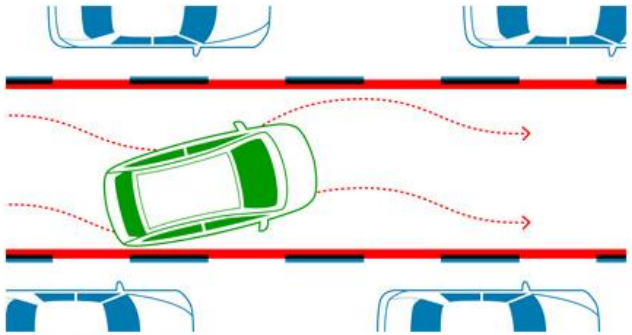
Autonomous Emergency Braking

Humans are still a factor in the adaptation of automatic braking.



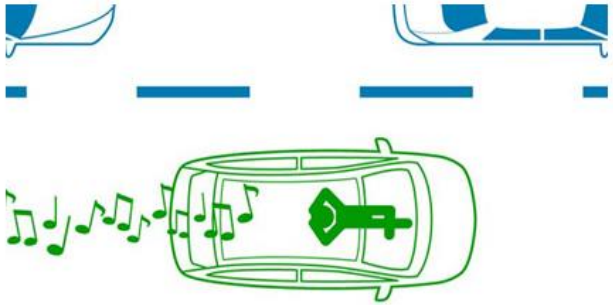
Self-Parking

Carmakers keep trying to simplify the experience.



Lane Keeping

Systems for keeping inside the lines are growing up, but they're still not perfect.

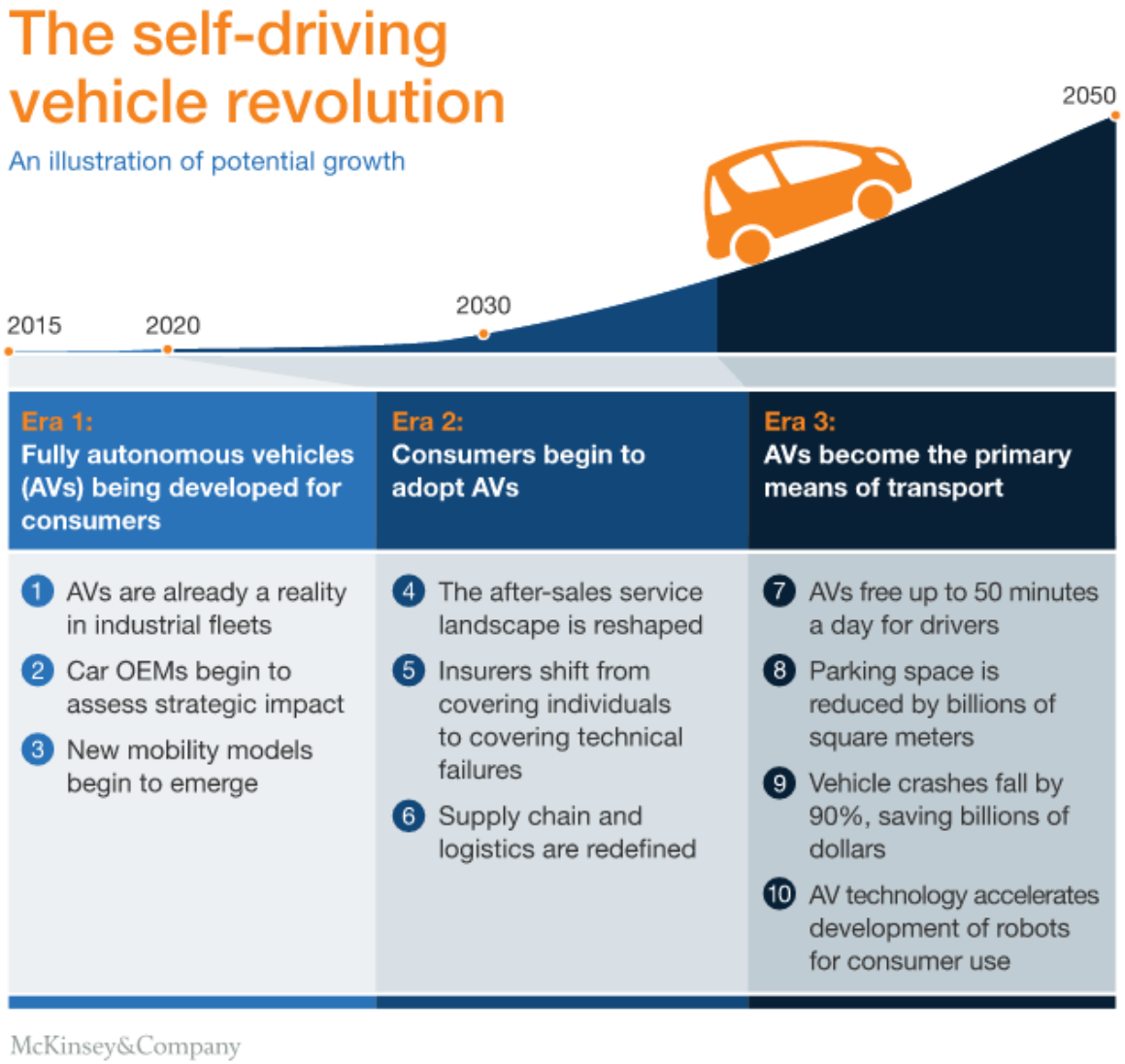


Adaptive Cruise Control and Traffic-Jam Assistants

Lock on to cars with radar, but switch to other sensors in traffic.

http://spectrum.ieee.org/static/the-self-driving-car 2013

Autonomous Vehicles



http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world
2015

Toyota

First Autonomous Test Vehicle Developed Entirely by Toyota Research Institute Displayed at Prius Challenge Event at Sonoma Raceway

New platform expands sensor array and advances autonomous vehicle research

Developed for flexible, plug-and-play testing of 'Chauffeur' and 'Guardian' research tracks

March 03, 2017

Palo Alto, Calif., March 3, 2017 – The Toyota Research Institute (TRI) today displayed its 2.0 generation advanced safety research vehicle at the company's Prius Challenge event in Sonoma California. The all- new test vehicle will be used to explore a full range of autonomous driving capabilities.

Research Areas

Artificial Intelligence and Computer Science

From perception to action and in-between, TRI is looking at novel approaches to machine learning and deep neural networks that will permit safe and reliable partnering between machine and human drivers.

Home Robotics and Assistive Technologies

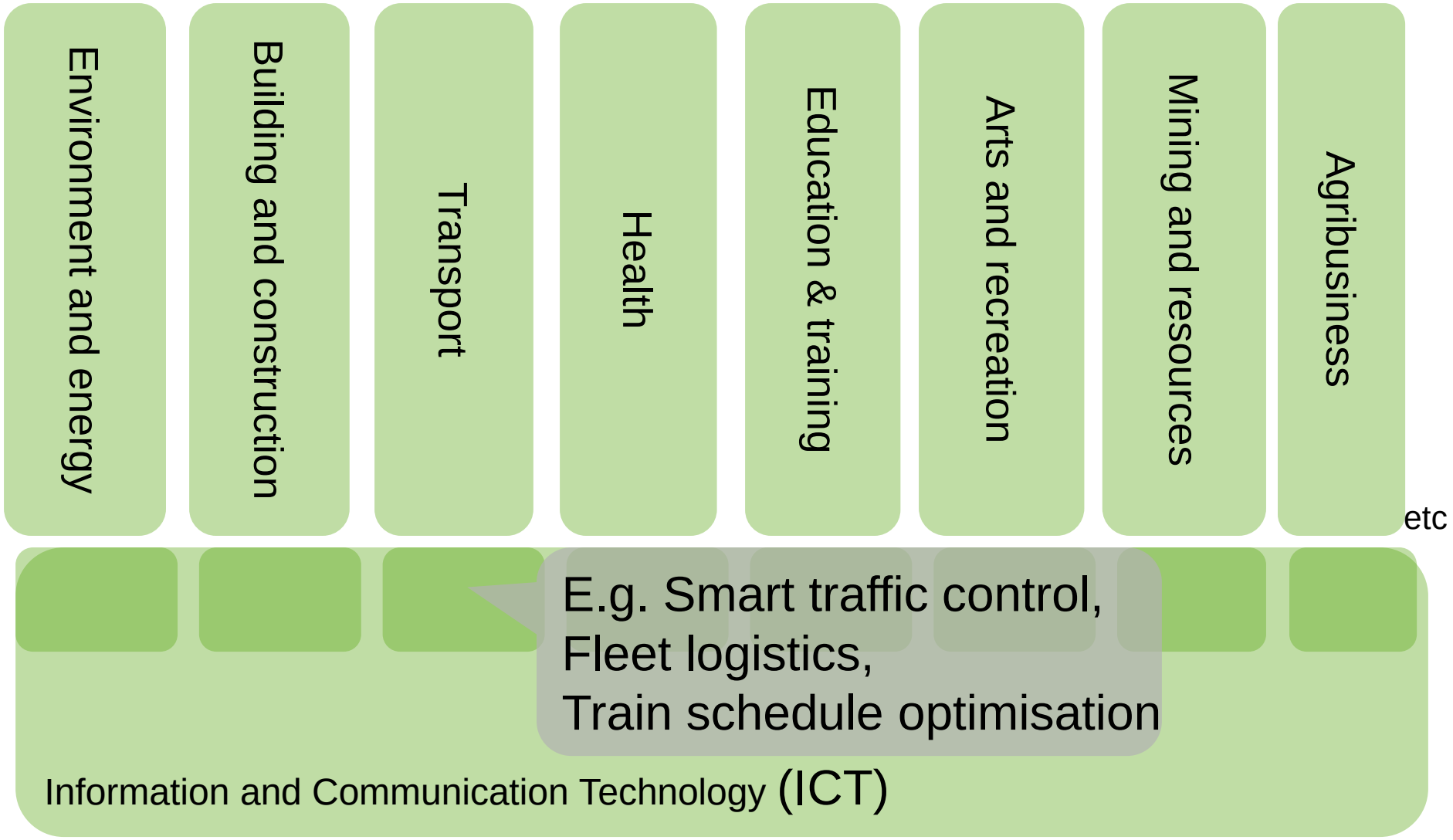
As the need for more in-home care increases with an aging population, what are the types of assistive technologies that will bring the most happiness and value to the home? What kinds of machines, and what types of interactions will be seen as helpful - with robotic devices to handle mundane household tasks?

Materials Design and Discovery

How can we identify - or design - novel materials that break through barriers that are accepted as fact? What visual or other interactive techniques can help humans see new approaches, guided by AI technologies, to discover breakthrough materials?

http://pressroom.toyota.com/releases/tri+autonomous+test+vehicle+sonoma+raceway+prius+challenge.htm
http://www.tri.global/research/

Industry-specific ICT innovation



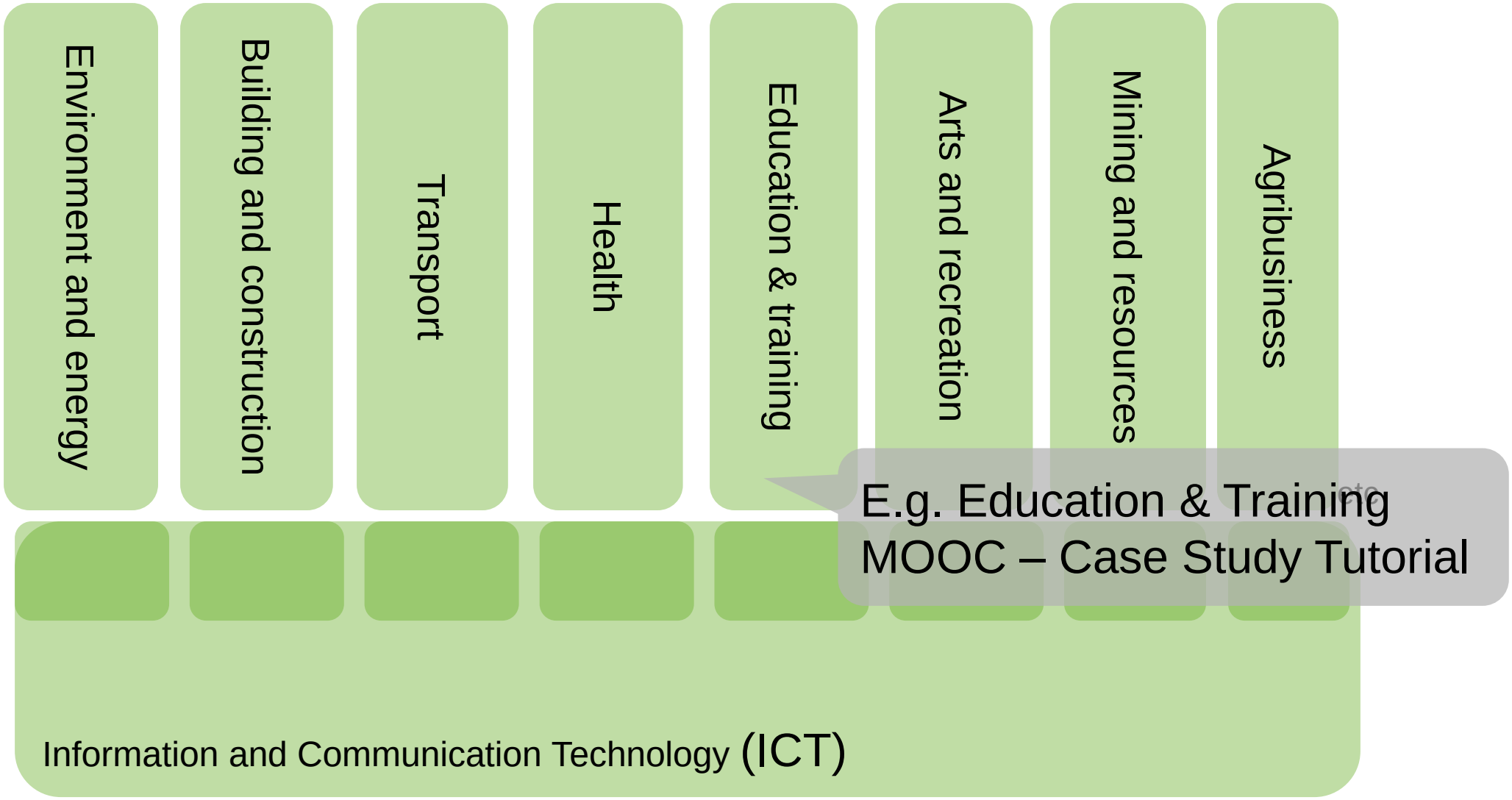
IIoT Consortium

- Industrial Internet of Things technology infrastructure
  - http://www.iiconsortium.org/

- GE IIoT Example
  - https://www.ge.com/digital/industrial-internet

https://youtu.be/KzXfFDJWgmQ

Industry-specific ICT innovation



Creative Destruction

Recap Week 1 - Innovation as "Creative Destruction"

Schumpeter

- "the opening up of new markets… and the organizational development … illustrate the same process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one".
- Schumpeter called this process "creative destruction".
- Creative destruction – waves that restructure entire industries and markets in favour of those who grasp and adapt to technological **discontinuities** faster!

IT Innovation as Creative Destruction

- "Why software is eating the world" (2011)
- More major businesses/industries are being run on software and delivered as online services
- Technology required to transform industries through software finally works and can be delivered globally
- Front end: billions of people with smartphones
- Back end: software tools to launch global software-powered start-ups with no need for infrastructure

- So, software innovation is now key to innovation in many industries

Marc Andreessen
Co-founder of Netscape
Co-founder of Andreessen-Horowitz
Early investors in Facebook, Groupon, Twitter, Skype, Zynga, Foursquare, etc

https://medium.com/software-is-eating-the-world

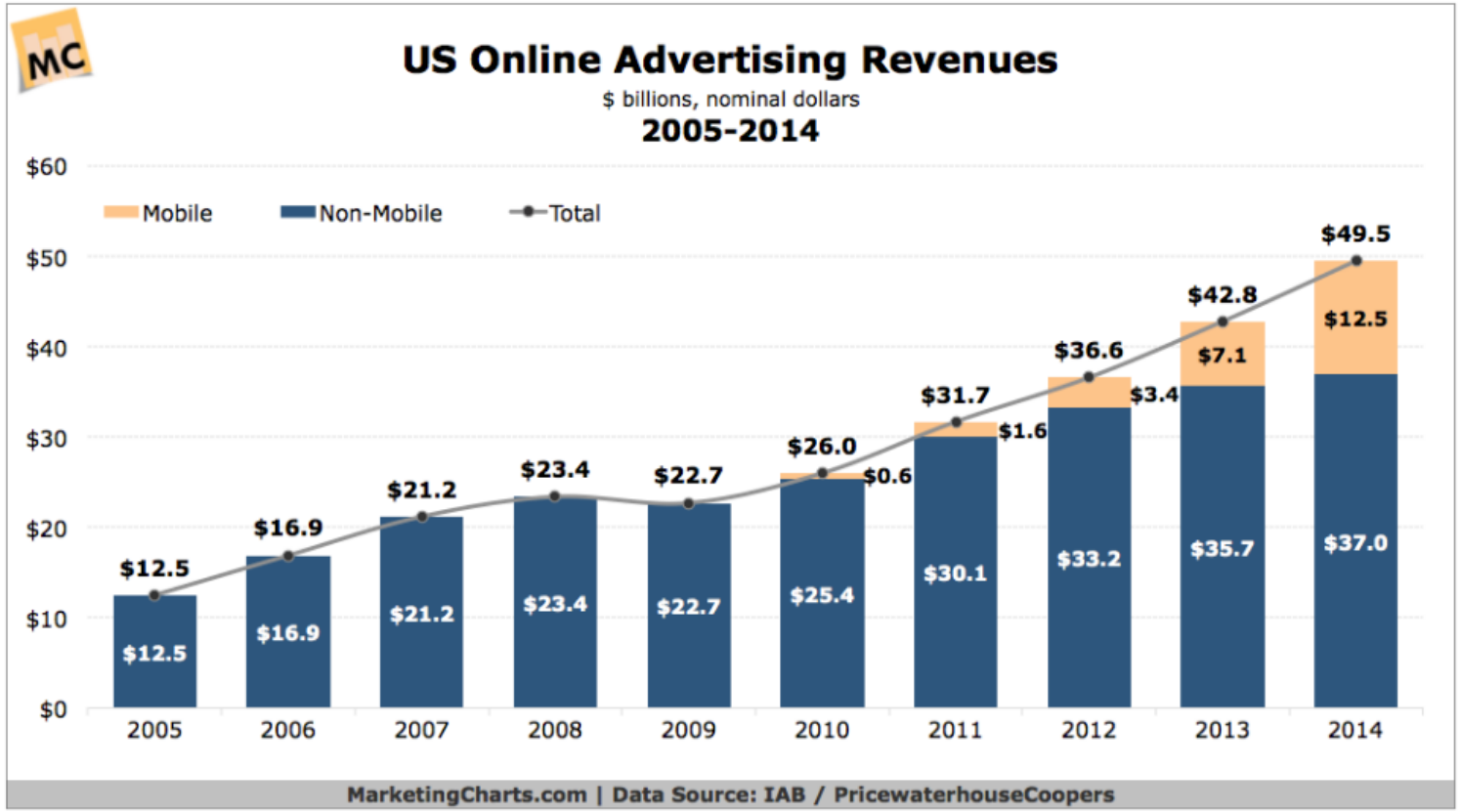
M. Andreessen, Why software is eating the world, WSJ, 2011 http://www.wsj.com/articles/SB10001424053111903480904576512250915629460

IT Innovation as Creative Destruction

- Examples:
  - Largest bookseller in world is a software company
    - (Amazon – while Borders went bankrupt)
  - Largest video service is a software company
    - (Netflix – while Blockbuster went bankrupt)
  - Dominant music companies are software companies
    - (Apple, Spotify, Pandora – traditional record companies exist to provide them with content)
  - Fastest growing game company is a software company
    - (Zynga who make Farmville)
  - Largest direct marketing company is a software company
    - (Google)

IT Innovation as Creative Destruction

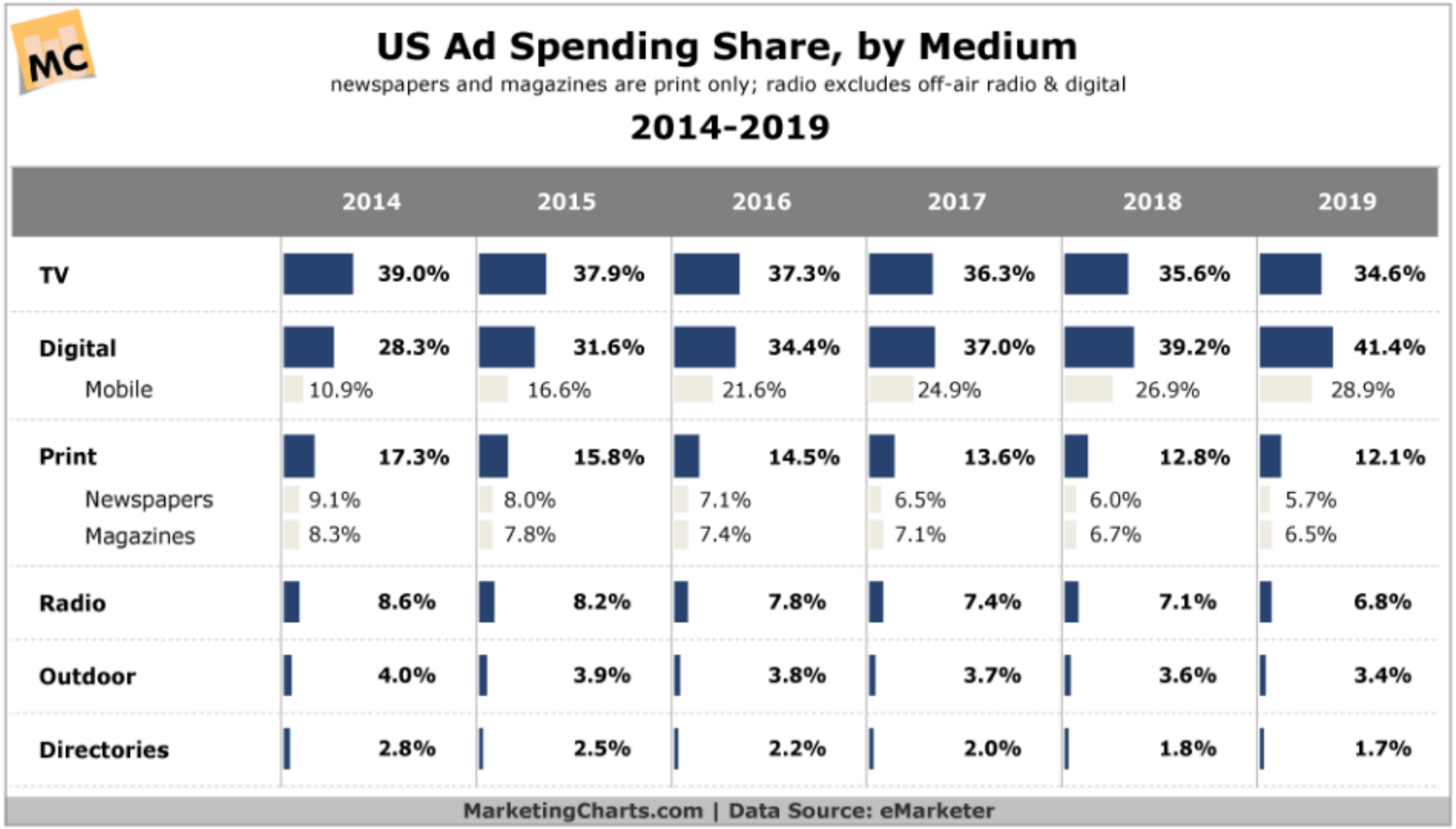
– Improvements in IT can change whole industries – e.g. Media industry



http://www.marketingcharts.com/online/4-trends-in-us-online-advertising-spending-53895/attachment/iabpwc-online-ad-revenues-2005-2014-apr2015/

IT Innovation as Creative Destruction

– Improvements in IT can change whole industries – e.g. Media industry



US Ad Spending Share, by Medium

newspapers and magazines are print only; radio excludes off-air radio & digital

2014-2019

	2014	2015	2016	2017	2018	2019
TV	**39.0%**	**37.9%**	**37.3%**	**36.3%**	**35.6%**	**34.6%**
Digital	**28.3%**	**31.6%**	**34.4%**	**37.0%**	**39.2%**	**41.4%**
Mobile	10.9%	16.6%	21.6%	24.9%	26.9%	28.9%
Print	**17.3%**	**15.8%**	**14.5%**	**13.6%**	**12.8%**	**12.1%**
Newspapers	9.1%	8.0%	7.1%	6.5%	6.0%	5.7%
Magazines	8.3%	7.8%	7.4%	7.1%	6.7%	6.5%
Radio	**8.6%**	**8.2%**	**7.8%**	**7.4%**	**7.1%**	**6.8%**
Outdoor	**4.0%**	**3.9%**	**3.8%**	**3.7%**	**3.6%**	**3.4%**
Directories	**2.8%**	**2.5%**	**2.2%**	**2.0%**	**1.8%**	**1.7%**

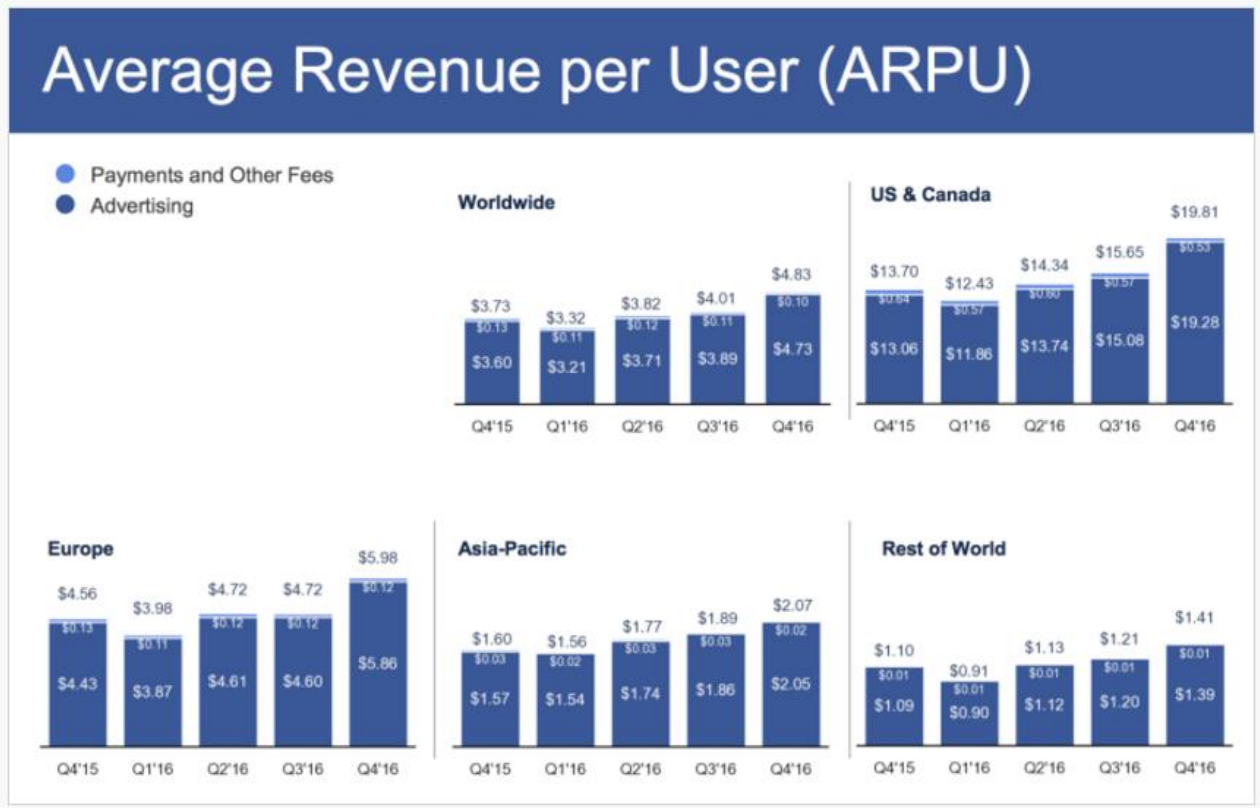
MarketingCharts.com | Data Source: eMarketer

Creation of one industry
Destruction of another

http://www.marketingcharts.com/online/mobile-to-surpass-print-ad-spend-in-2015-58798/attachment/emarketer-us-ad-spend-share-by-medium-2014-2019-sept2015/

IT Innovation as Creative Destruction

- Facebook example



https://techcrunch.com/2017/02/01/facebook-q4-2016-earnings/

IT Innovation as Creative Destruction

- Do you agree with the concept of software eating the world?
- Do you agree with the concept on the innovations that will be important?

Types and Source of innovation

Different dimensions

Different dimensions in talking about an innovation…

1) **What type** of thing is being innovated?
2) How **different** is it from what's already available?
3) What **impact** will it have on the **consumer**?
4) What **impact** will it have on the **market or industry**?
5) What **scope** of the product/service/process does it affect?
6) What **impact** will the innovation have on the **producers**?

Innovation System / System Thinking (wk01)

Different dimensions

1) **What type** of thing is being innovated?
   - Product/service innovation vs process innovation vs business model innovation
2) How **different** is it from what's already available?
3) What **impact** will it have on the **consumer**?
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5) What **scope** of the product/service/process does it affect?
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Product innovation

- the development of **new products, changes in design of established products, or use of new materials or components** in the manufacture of established products
- Examples:
  - New software innovation e.g., search algorithm
  - New hardware/software features in cars, e.g., intra-car communication

Policy Studies Institute, University of Westminster. "Small Firms' Innovation" (PDF). Retrieved 27 May 2010.

Product innovation: Example - Video Games

Source: gizmodo.com

http://www.xbox.com/en-AU/project-scorpio
https://supermariorun.com/en-gb/index.html
https://www.oculus.com/

Product innovation: Example – iPod

Source: gizmodo.com

http://www.apple.com/au/ipod/compare-ipod-models/

Process innovation

- Process innovation involves the discovery and implementation of a new or improved **production or delivery method**
- The process could be related to production/engineering or related to business processes
- Examples:
  - Process for making a prototype product

Injection moulding

Source: http://www.avplastics.co.uk/njection-moulding-history

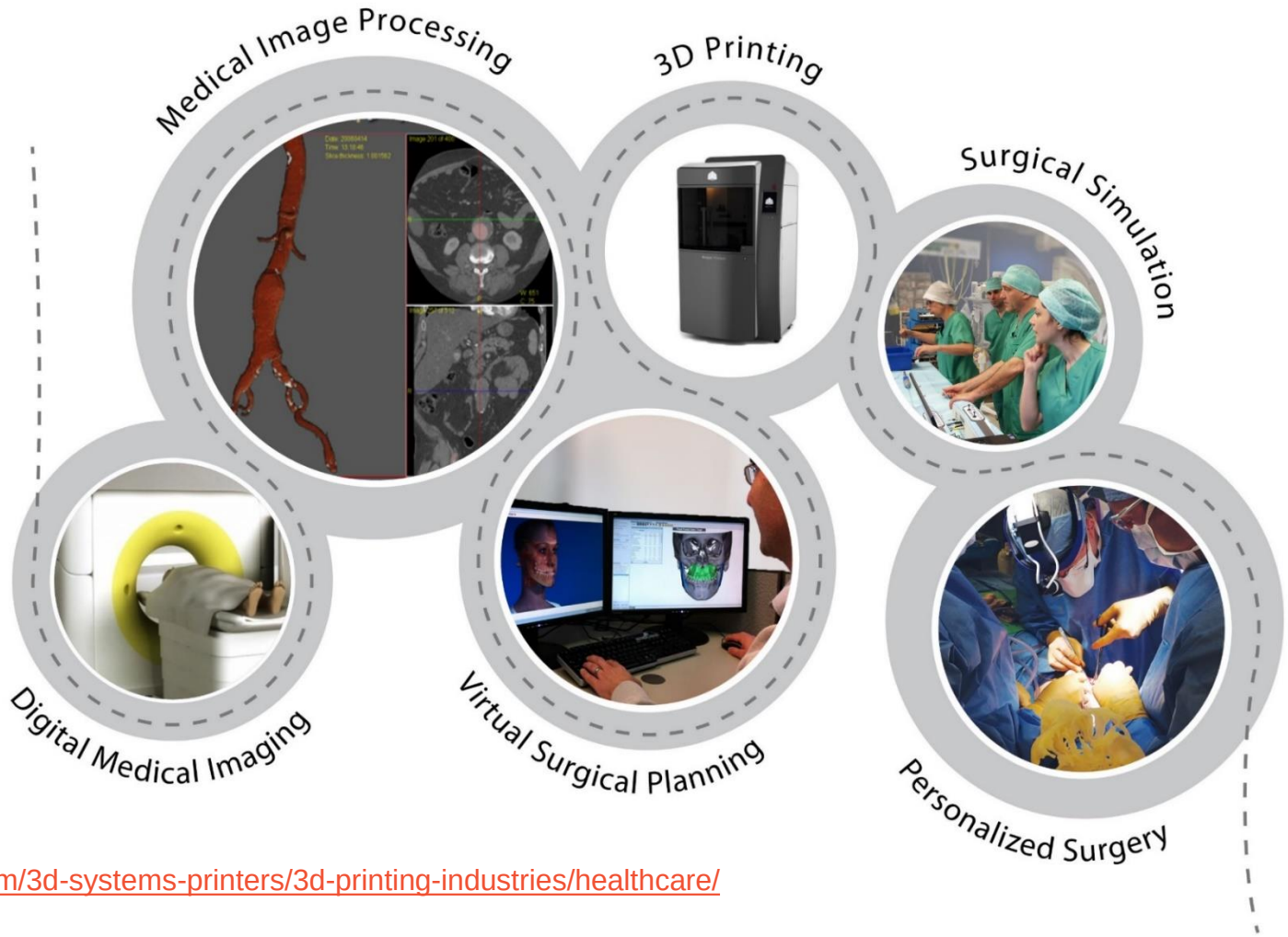
3d printing

Relation between product and process innovations

- *Product innovations* can enable *process innovations*
  - E.g. 3D printer enables cheaper prototyping

- *Process innovations* can enable *product innovations*
- What is a *product innovation* for one organization might be a *process innovation* for another
  - E.g., a package delivery service creates a new distribution service (*product innovation*) that enables its customers to distribute their goods more widely or more easily (*process innovation*)

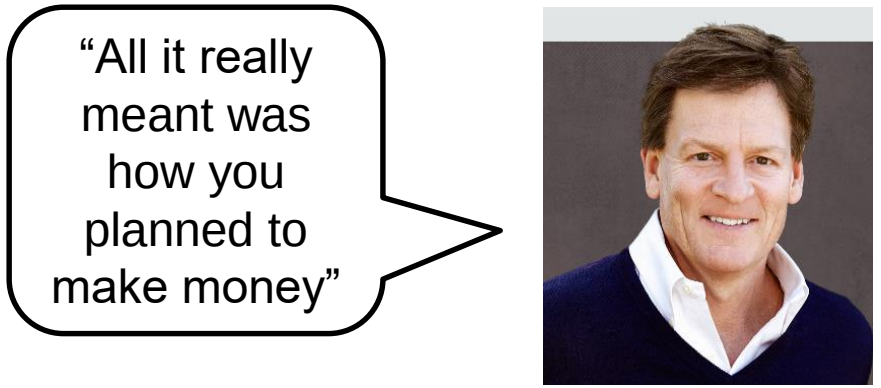
Product and Process innovation Example: Personalised Surgery



http://objexunlimited.com/3d-systems-printers/3d-printing-industries/healthcare/

Business Model Innovation

- New and radically new business models



Michael Lewis, Financial Journalist
https://hbr.org/2015/01/what-is-a-business-model

- Many web-based innovations are built around business model innovations, e.g.,
  - Uber, Airbnb – sharing economy
  - Freemium – paying for premium
  - Google – personalized ads
  - Groupon – group buying
  - Amazon Web Services – cloud services

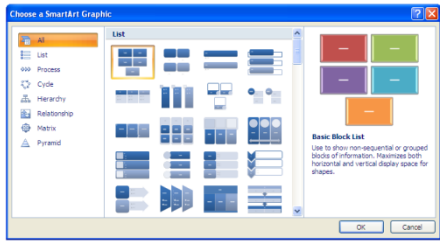
Different dimensions

1) **What type** of thing is being innovated?
   - Product/service innovation vs process innovation vs business model innovation
2) How **different** is it from what's already available?
   - Radical vs incremental innovation
3) What **impact** will it have on the **consumer**?
4) What **impact** will it have on the **market or industry**?
5) What **scope** of the product/service/process does it affect?
6) What **impact** will the innovation have on the **producers**?

Radical vs incremental innovation

- The *radicalness* of an innovation is the *degree to which it is new and different* from existing products and processes.
  - E.g. 3D printer

- *Incremental innovations* may involve only a minor change from (or adjustment to) existing practices.
  - E.g. a new feature in Microsoft Word



- The radicalness of an innovation is relative; it may change over time or with respect to different observers.

Different dimensions

1) **What type** of thing is being innovated?
- Product/service innovation vs process innovation vs business model innovation

2) How **different** is it from what's already available?
- Radical vs incremental innovation

3) What **impact** will it have on the **consumer**?
- Life-changing vs incidental innovation

4) What **impact** will it have on the **market or industry**?

5) What **scope** of the product/service/process does it affect?

6) What **impact** will the innovation have on the **producers**?

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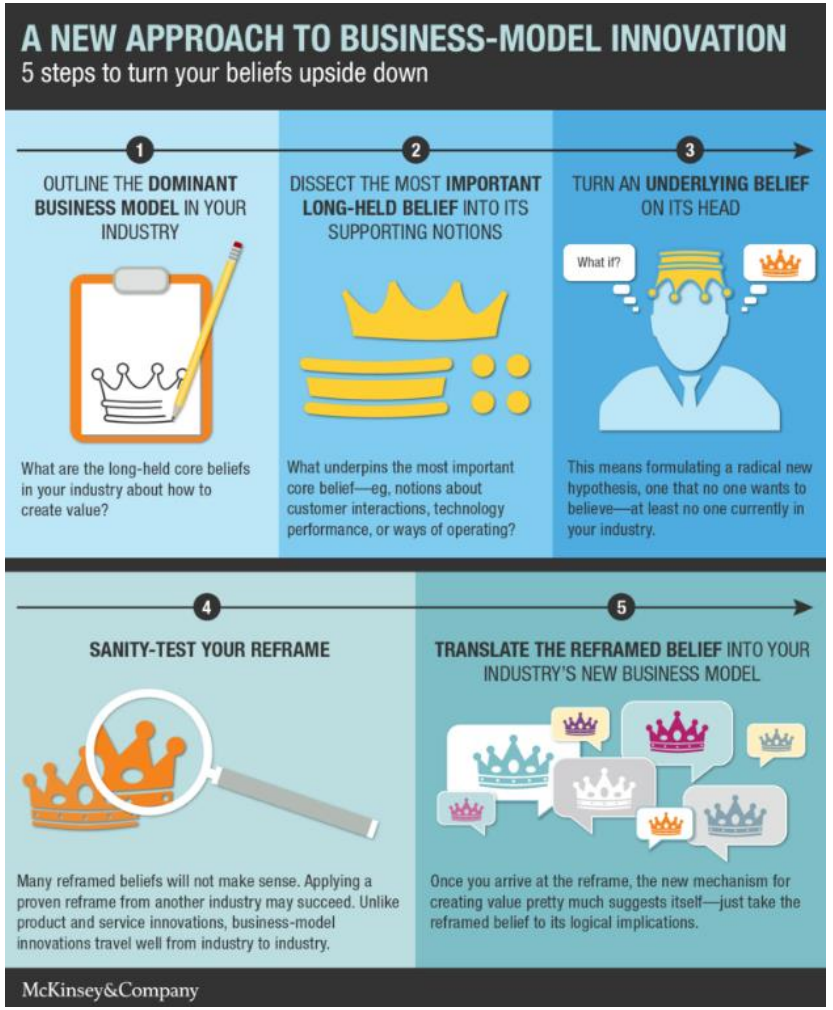
   - Life-changing vs incidental innovation
4) What **impact** will it have on the **market or industry**?
   - Disruptive vs sustaining
5) What **scope** of the product/service/process does it affect?
6) What **impact** will the innovation have on the **producers**?

More in later lecture

Disrupting beliefs: A new approach to business-model innovation

- business models are subject to rapid displacement, disruption, and, in extreme cases, outright destruction
- Examples:
  - Bitcoin bypasses traditional banks and clearinghouses with blockchain technology.
  - Coursera and edX, among others, threaten business schools with massive open online courses (MOOCs).
  - Uber sidesteps the license system that protects taxicab franchises in cities around the world.



http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/disrupting-beliefs-a-new-approach-to-business-model-innovation

Different dimensions

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5) What **scope** of the product/service/process does it affect?
- Architectural vs component innovation

6) What **impact** will the innovation have on the **producers**?

Architectural vs Component Innovation

- An **architectural innovation** entails changing the overall design of the system or the way components interact.
  - E.g. cloud computing
  - E.g. the system of allowing "signals" to be added to Google
- A **component innovation** involves changes to one or more components of a product system without significantly affecting the overall design.
  - E.g., changing the algorithm for face detection in a camera for higher performance
  - E.g., adding a new "signal" in the Google search engine
- Most architectural innovations also require changes in the underlying components.

Different dimensions

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6) What **impact** will the innovation have on the **producers**?
- Competence-enhancing vs competence-destroying innovation

Competence-Enhancing vs Competence-Destroying Innovation

- **Competence-enhancing** innovations build on the firm's existing knowledge base
  - E.g., Intel's Pentium 4 built on the technology for Pentium III.
- **Competence-destroying** innovations render a firm's existing competencies obsolete.
  - E.g. Kodak invented the first digital camera
  - But they struggled to make the transition from analog film to digital photography as most of their competence related to analog film (rather than micro-electronics).
- Depends on the perspective of a particular firm.
  - E.g. digital cameras were not competence-destroying for Sony or Canon as they already had microelectronics expertise.

Summary of topics covered

- Definition of innovation:
  - Innovation involves idea + application of that idea ("ideas successfully applied")
- The importance of innovation:
  - Innovation is important for countries and companies
  - Innovation as driver of competitive success
  - Innovation as creative destruction (Schumpeter)
  - IT as enabler of innovation in other fields (eg logistics, bio-informatics)
  - "Why software is eating the world"
- Different dimensions for understanding types of innovation

Case Study

MOOCS – Technological Innovation

THE UNIVERSITY OF SYDNEY

Massive Open Online Courses

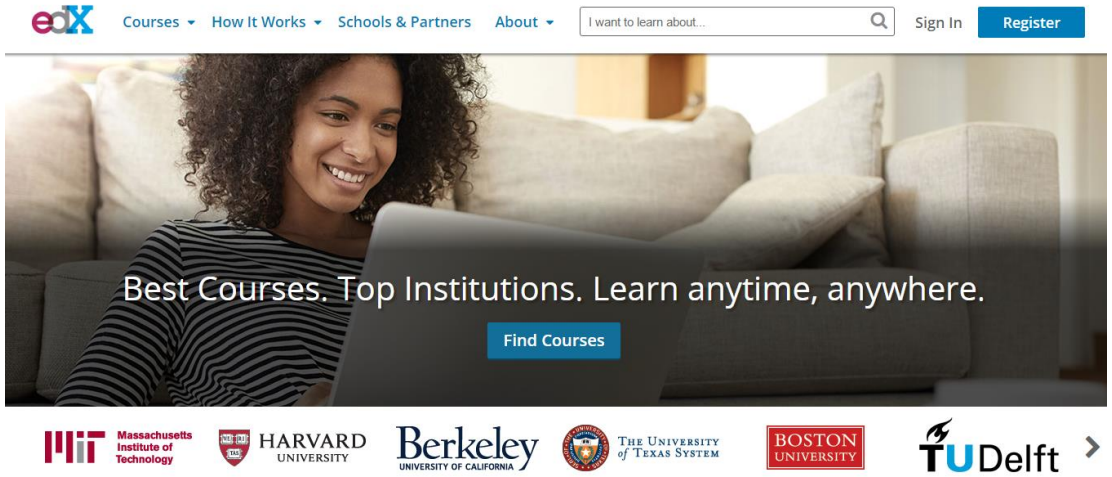
"We're nearing the point where it's a superior educational experience, as far as the lectures are concerned, to engage with them online"

David Malan, Harvard computer scientist

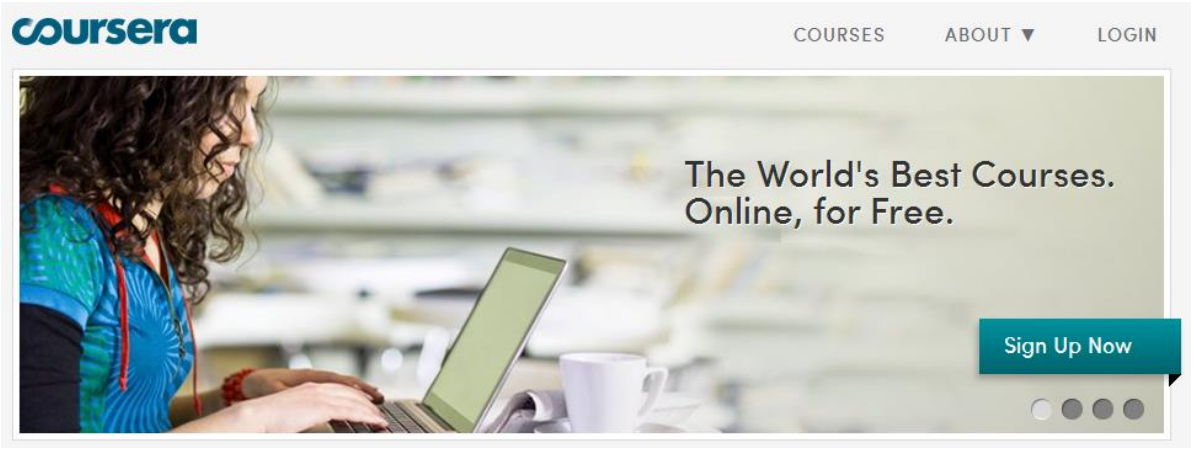
– If that's true, traditional universities will have to show that most of the other things they offer on campus can't be replaced by technology.

https://www.technologyreview.com/s/533406/what-are-moocs-good-for/

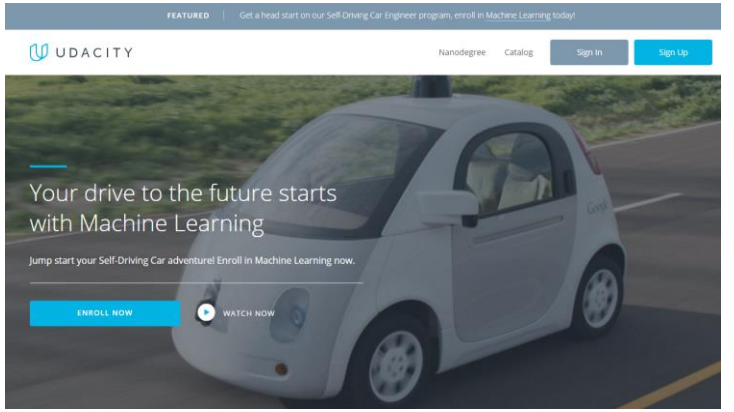
Popular offerings



https://www.edx.org/



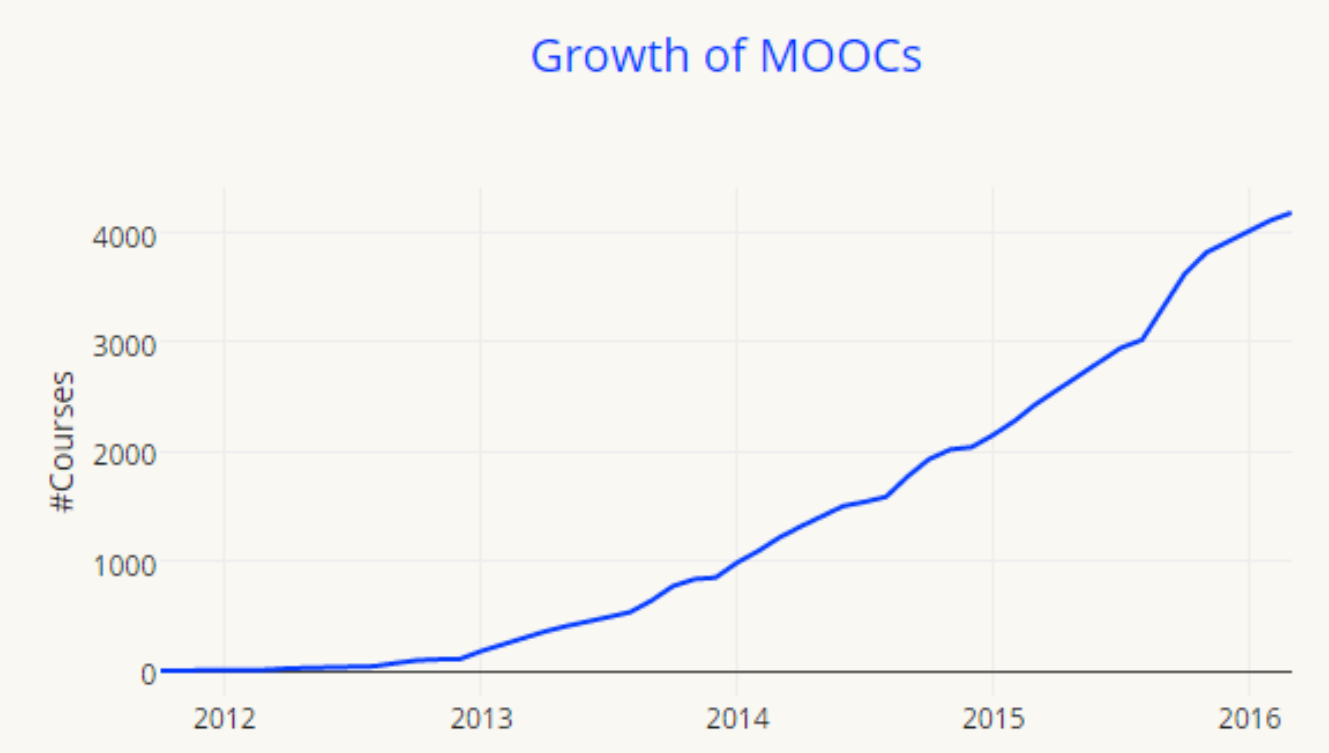
https://www.coursera.org/



http://www.udacity.com/

MOOCS by the numbers

- 500+ Universities, 4200 courses, 35 Million Students
- Coursera, the largest online course provider in the world (MOOC or otherwise), added 7 million new students to its userbase (and so it now has 17 million students in total).



https://www.class-central.com/report/moocs-2015-stats/

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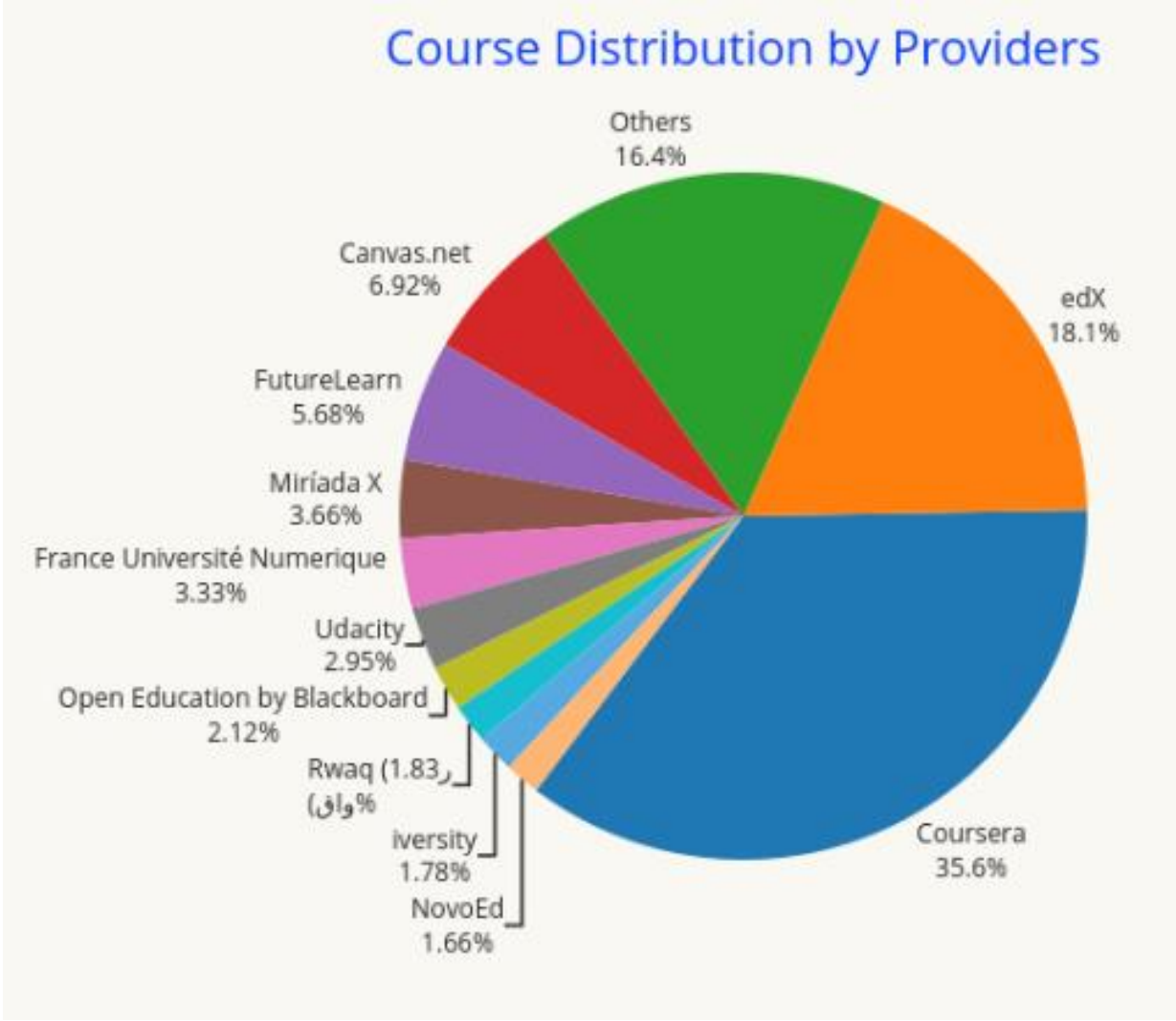
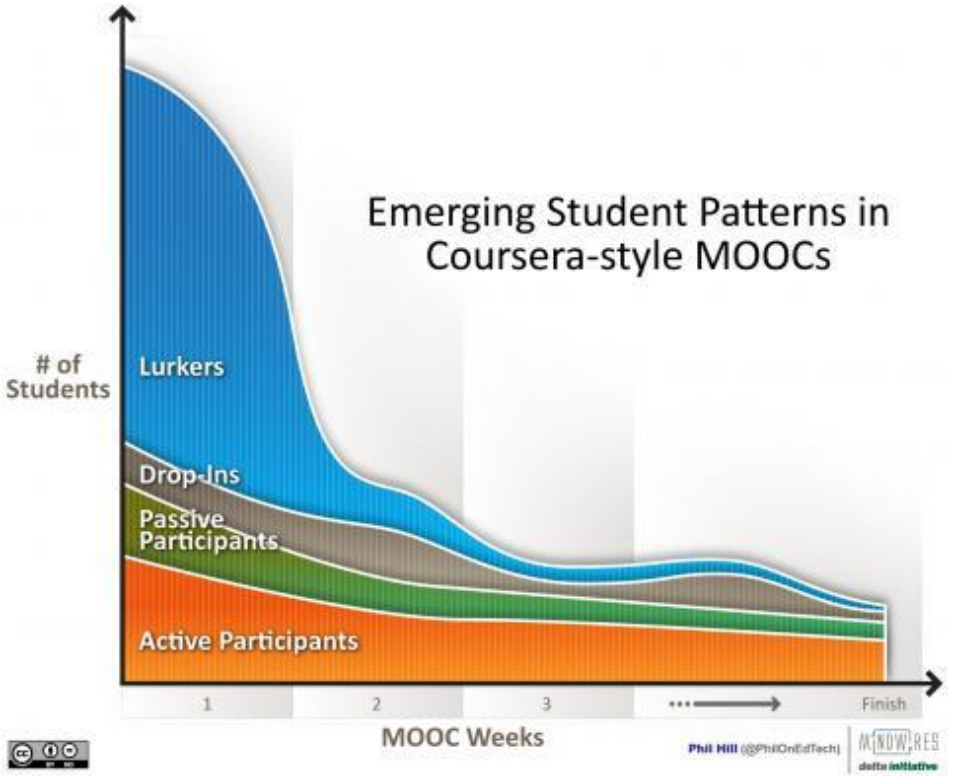


https://www.class-central.com/report/moocs-2015-stats/

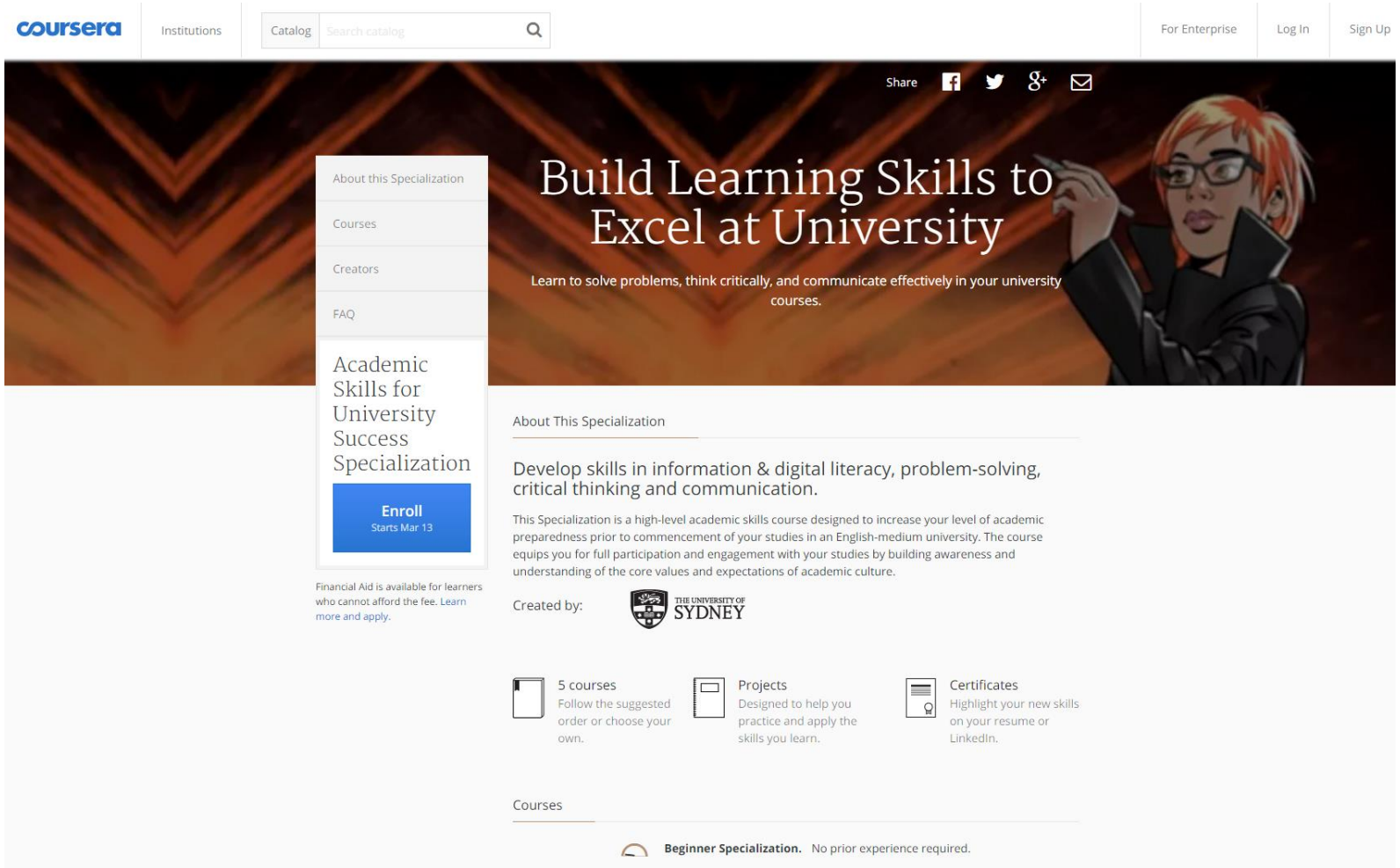
Online Teaching Revolution

- **Lurkers** – These students are the majority of xMOOC participants, where people enroll but just observe or sample a few items at the most.
- **Drop-Ins** – These are students who become partially or fully active participants for a select topic within the course, but do not attempt to complete the entire course. Some of these students are focused participants who use MOOCs informally to find content that help them meet course goals elsewhere.
- **Passive Participants** – These are students who view a course as content to consume and expect to be taught. These students typically watch videos, perhaps take quizzes, but tend to not participate in activities or class discussions.
- **Active Participants** – These are the students who fully intend to participate in the MOOC, including consuming content, taking quizzes and exams, taking part in activities such as writing assignments and peer grading, and actively participate in discussions via various forms of social media.



http://edf.stanford.edu/readings/emerging-student-patterns-moocs-graphical-view

MOOCS and USYD



https://www.coursera.org/courses?languages=en&query=university+of+sydney

Using multimedia to create contents

- Videos
- Graphics
  - Decorative Graphics
  - Relational Graphics
  - Transformational Graphics
  - Interpretive Graphics
- Simulations and Games
- Social platforms, including Blogs, Forums, Chatting, Video Conferencing, etc
- Software such as Python, Web, etc.

Features in MOOC Platforms

Table 1. Key features for artificial intelligence in education (AIED), across a sample of major massive open online course (MOOC) platforms.

Features	edX	Coursera	Google Course Builder	Class2Go	udemy	Lernanta
Video lectures						
Where are they stored?	YouTube	Coursera	YouTube	YouTube and Amazon S3	udemy or YouTube	N/A
Quizzes integrated with video?	No	Yes	No	Yes	No	N/A
Discussion on video page?	Yes	No	No	No	Yes	N/A
Additional files and features	Subtitles	Subtitles files	Subtitles files	Subtitles	Subtitles video and slide mashup	N/A
Quizzes						
Are there quizzes outside of videos?	Yes	Yes	Yes	Yes	No	N/A
Question types						
Multiple choice	✔	✔	✔	✔		
Short answer	✔	✔	✔			✔
Numeric				✔		
No. of attempts allowed	Limited	Limited	Unlimited	Limited	N/A	N/A
Discussion forums						
Can posts be rated?	Positive	Positive/negative	N/A	None	None	None
Grading and analytics						
Student's view of progress	Raw marks with graph	Raw marks	None	Raw Marks	Progress percentage	Progress percentage
Teacher's view of progress	Unknown	Unknown	CSV* export Google analytics (CSV)	Multiple types of detailed CSV reports	N/A	Can see and edit progress

*CSV = comma-separated value.

J. Kay et al., "MOOCs: So Many Learners, So Much Potential ...", AI and Education, IEEE Intellligent Systems, 2013

App Platform

- The XBlock specification is a component architecture designed to make it easier to create new online educational experiences.
  - Making course content to go far beyond simple text, images and videos to achieve various interactive learning experience, and improving the flexibility of MOOCs layout.
- Coursera App Platform - open up integrations into the Coursera Education Platform for additional customization and to enable further advances in pedagogy.

http://edx.readthedocs.io/projects/xblock-tutorial/en/latest/sdk/get_started_sdk.html
https://building.coursera.org/app-platform/

Assessment Tools for MOOCS

- Peer Assessment
  - students are organized anonymously into small groups to grade each other's submissions. The groups are double-blind and random
- Automated Essay Grading
  - Machine learning at edX
  - Given a rubric and 15 graded assignments, the system learns when the marks are given and when not
- Proctoring MOOC Exams
  - testing centers for on-site proctoring
  - require that students hold up a picture ID on camera prior to beginning the exam; someone then remotely watches the student
  - checking the speed and style of typing against previous samples from the same student

[Short article] Linda L. Briggs, "Assessment Tools for MOOCs, Campus Technology", 2013
https://campustechnology.com/Articles/2013/09/05/Assessment-Tools-for-MOOCs.aspx

Peer Review for an international conference

- Reviewers are invited to be ‘Program Committee’ (PC)
- Papers are submitted by Authors
- PCs bid for papers
- PCs are assigned to papers

- PCs submit reviews
- All reviews are assessed by the conference Program Chair
- Acceptance / Rejection sent to the Paper authors

http://web.it.usyd.edu.au/~cgi14/welcome/index.php

Easy Chair

http://www.easychair.org/

- EasyChair is a conference management system that is flexible, easy to use, and has many features to make it suitable for various conference models.
  - management and monitoring of the committee;
  - flexible management of the access of PC members and referees to papers and conflicts of interests;
  - paper assignment based on the preferences of PC members;
  - submission of reviews;

- teaching students paper writing and peer reviewing
- teaching HCI students

Tutorial

Peer Assessment in MOOCS

- Providing Personalized, Qualitative Feedback on Assignments

- Giving students feedback about their grading bias increased subsequent accuracy
- We introduce short, customizable feedback snippets that cover common issues with assignments, providing students more qualitative peer feedback
- data-driven approach that highlights high-variance items for improvement

[Long article – pre-reading] C. Kulkarni et al., "Peer and Self Assessment in Massive Online Classes", Design Thinking Research, Part of the series Understanding Innovation, pp 131-168, 2015 http://link.springer.com/chapter/10.1007%2F978-3-319-06823-7_9

Tutorial

- Discuss the following points:
- Identify the key enabling innovative IT technology used in MOOCS
- Peer-assessment for MOOCS is an area which needs further development – what are its challenges and innovative solutions?
- What are the next major innovative technological breakthrough for MOOCS?
- Discuss the evolution of the education industry due to the introduction of MOOCS. You may apply 'Innovation System' concept into your discussion.
-

  Towards the end of the class, a member from the group will present the group's findings. Summary of the discussion will be available after the tutorial.

References

- M. Andreessen, “Why Software Is Eating The World,” *Wall Street Journal*, Aug. 2011. http://online.wsj.com/article/SB10001424053111903480904576512250915629460.html
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- White & Bruton, *The Management of Technology and Innovation – A Strategic Approach,* Thomson Learning (2007).

The Flipped Classroom

BEFORE

Students prepare to participate in class activities

GOAL

OUT OF CLASS

DURING

Students practice applying key concepts with feedback

GOAL

IN CLASS

AFTER

Students check their understanding and extend their learning

GOAL

https://facultyinnovate.utexas.edu/teaching/flipping-a-class