UoS Semester Outline

Week	Learning Outcomes	Lectures
Module 2: Innovation Framework		
Week 01	L01, LO2, LO3	Unit of Study Introduction, Administrivia, Definition of IT Innovation, Importance of Innovation to a Country, General Purpos e Technologies, Overview of Emerging Technologies
Week 02	LO4, LO5	Innovation Frameworks I: Dynamics of IT Innovation, Dominant Design
Week 03	LO6	Innovation Frameworks II: Disruptive Innovation, Innovator's Dilemma, Value Chain & Value Network
Module 2: Development of Key Intellectual Property in the Modern Age		
Week 04	LO7	Introduction to Open Innovation and Closed Innovation Distributed Innovation I: Product Platforms, Web APIs
Week 05		Distributed Innovation II: Crowdsourcing, Free and Open- Source Software, Open Data
Week 06		Distributed Innovation III: Platform Ecosystems, User Innovation
Module 3: Commercialisation Process and Business Strategies for Emerging Technologies		
Week 07	LO8	Commercialisation I: Startup vs Traditional Companies, Lean Startup Methodology and Agile Development
Week 08		Commercialisation II: Customer Development Process, Value Proposition Canvas
Mid semester break		
Week 09	LO8, LO9	Commercialisation III: Innovation Management, Business Model Canvas Commercialisation IV: Capital & Fundraising for IT Innovation
Week 10	LO11, LO12	Organisational Cultures and Structures Supporting Innovation, Judging IT Innovation
Module 4: Innovation At-Scale		
Week 11	LO10	Innovation Ecosystem: Silicon Valley and Australia
Week 12	N/A	Guest Lecture
Week 13	N/A	Course Review | Innovation Pitch Presentation
Final Exam		

Some questions the unit will answer

What is technological innovation?

What different types of innovation are there?

Why do companies care about innovation?

Why do countries care about innovation?

How does innovation happen?

How do innovations spread?

How should established companies organise themselves to create innovations?

What makes some innovations successful and others not?

How should my company know which innovations to adopt?

What jobs will still exist in the future?

How do I get a new idea for a startup company?

How do I get funding for my startup company?

And lots more!

Relevance to IT careers

A. Enterprise IT	Understand IT innovations so you can analyse likely impact from new technologies and plan for their adoption
B. R&D of IT technologies	Understand IT innovations so you can lead the development of new technologies within an established organisation
C. IT start-up	Understand IT innovation so that you can create (e.g.,) a software start-up company

Innovation vs. Invention

Joseph Schumpeter, Economist and political scientist (1883 – 1950)

- *Innovation involves (1) a new idea that is (2) applied commercially – Schumpeter (1930s).*
- *"Invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice."*
- *Jan Fagerberg, Oxford Handbook of Innovation, 2004*

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.*

- Organisation for Economic Co-operation and Development (OECD) - to **promote policies** that will improve the economic and social well-being of people around the world
- OECD (2005) *Oslo Manual: Guidelines for collecting and interpreting innovation data*, 3rd edition, OECD and European Commission

Impact of High-Growth Firms

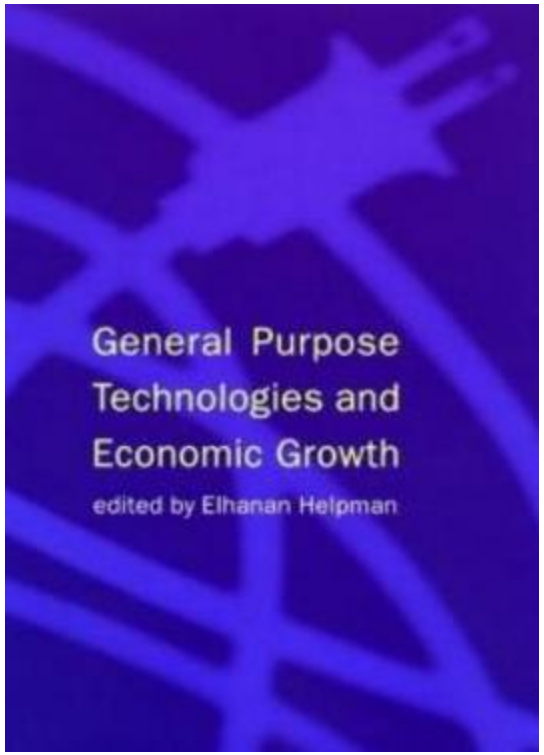
The Australian Innovation System Report explores the impact of innovation on business, industry and national performance.

High-growth firms: A relatively small proportion of firms in the economy are responsible for a significant share of growth in employment and revenue (9% of all firm but contributed 46% of employment growth).

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 (Feb'25)
General Purpose Technologies and Economic Growth, edited by Elhanan Helpman Cambridge, Mass. : MIT Press, c1998.

IT as an enabling technology

- IT is a "General Purpose Technology" (GPT)
- Like electricity – it **enables** other technologies
- GPTs differ from other technologies and:
  1. **Are pervasive – spreading to most sectors**
  2. **Continually improve in usefulness and lower in cost**
  3. **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)

A 4th measure for GPT

– GPTs are those technologies that **impact** economic growth, and transform both household life and the ways in which firms conduct business.

4. **Is the GPT fundamentally disruptive and foundational**? Electricity displaced the technologies of lighting, mechanization and processing that came before it. It is also foundational to many of the GPTs we consider absolutely necessary nowadays (**telephony** and the **Internet** are two GPTs that **wouldn't exist without electrification**).

Example of emerging GPTs

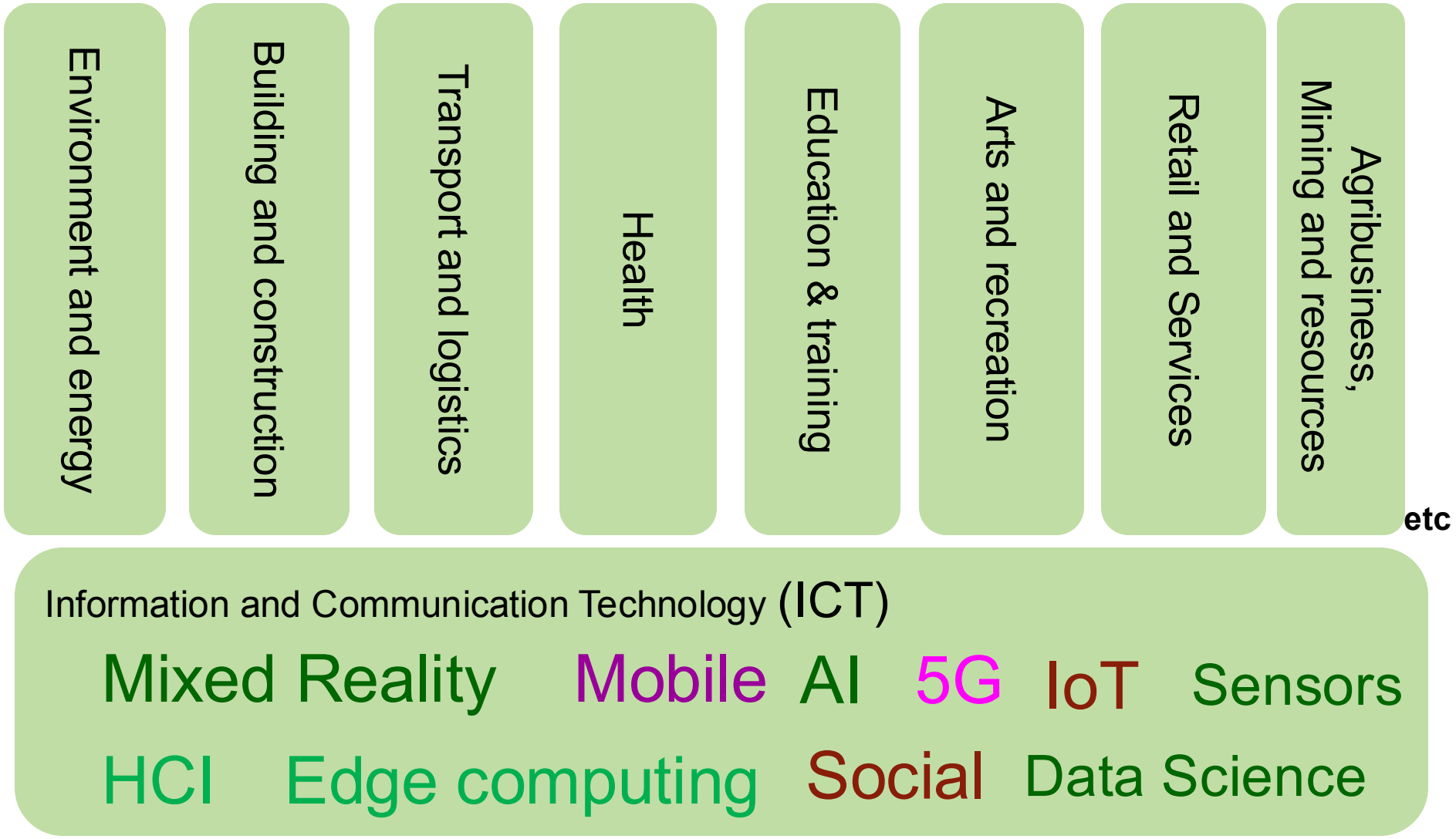
Likelihood of becoming GPT Over 2-5 Year Timeframe

	Artificial Intelligence	Blockchain & Cryptocurrencies	Intelligent & Connected Devices	Quantum Computing	Clean/ Sustainable Energy	AR/VR
Definition	Theory and devt of computer systems able to perform tasks that normally require human intelligence	List/ledger of records, called blocks, which are linked and secured using cryptography	Equipment/machines that have their own computing capability and are connected to other devices/the internet	Computation systems that make direct use of quantum-mechanical phenomena to perform operations on data	Energy obtained from renewable resources, naturally replenished on a human timescale	Superimposition of computer-generated imagery on a user's view of the real world, providing a composite view
Pervasive?	✓	–	✓	✗	✓	–
Improve Over Time?	✓	–	✓	✓	✓	✓
Spawn Innovation?	✓	✓	✓	✓	✓	✓
Fundamentally disruptive?	✓	✓	–	–	–	–

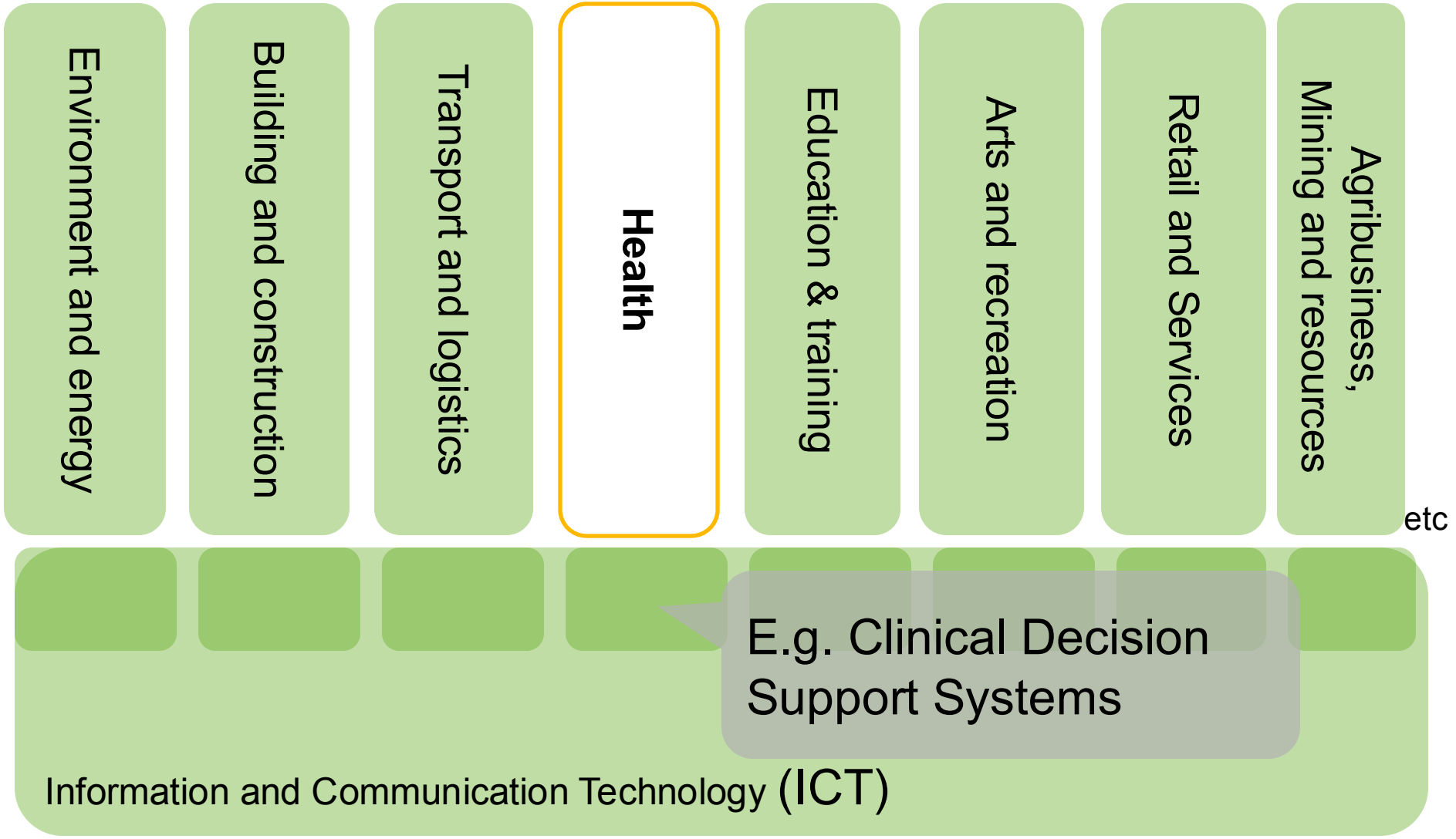
✓ Yes ✗ No – Unsure

https://hackernoon.com/ai-blockchain-ar-vr-etc-which-one-is-a-general-purpose-technology-9b5510ca25e3 (Feb'25)

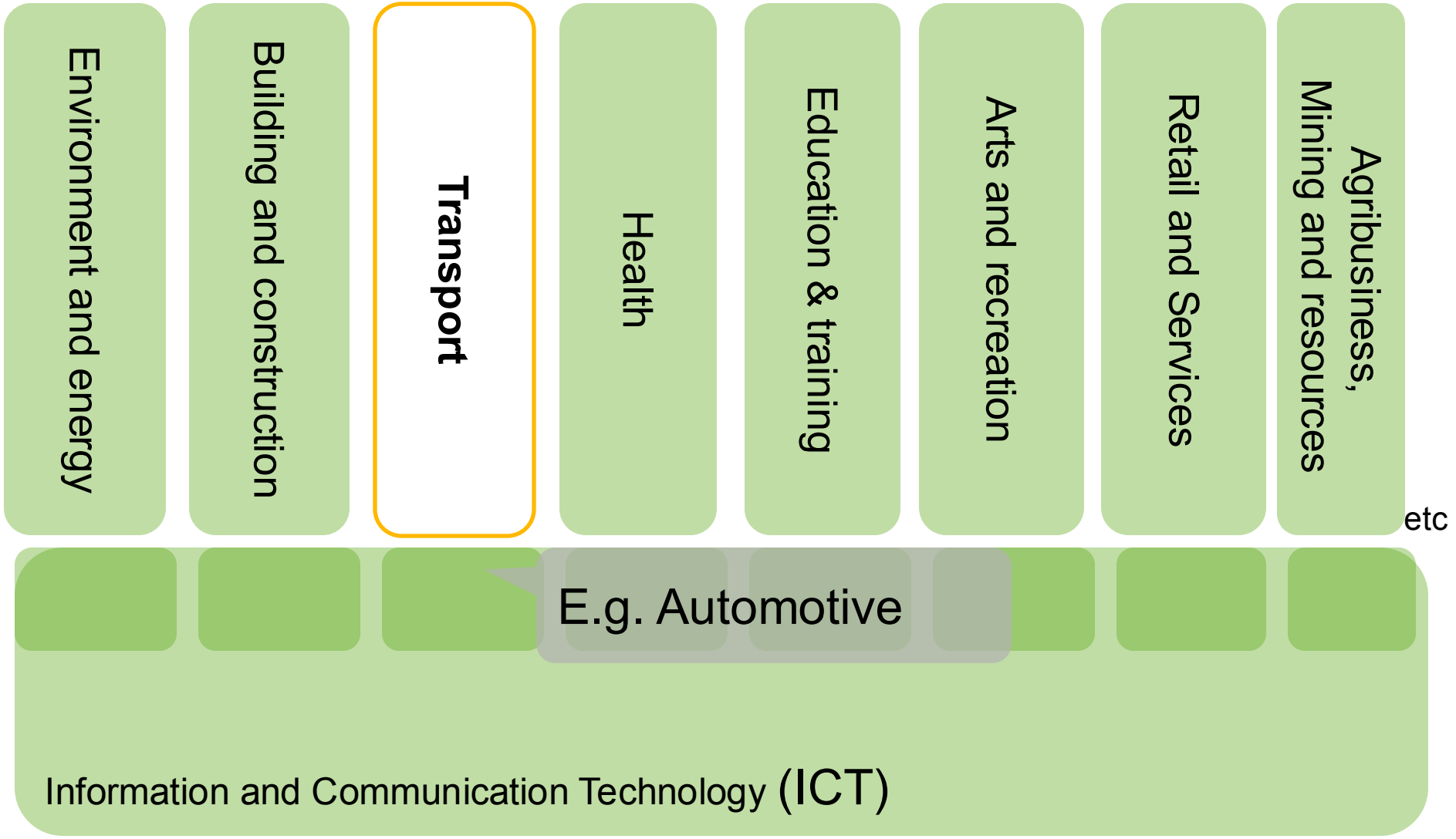
Some hot areas of current ICT Innovation



Industry-specific ICT innovation

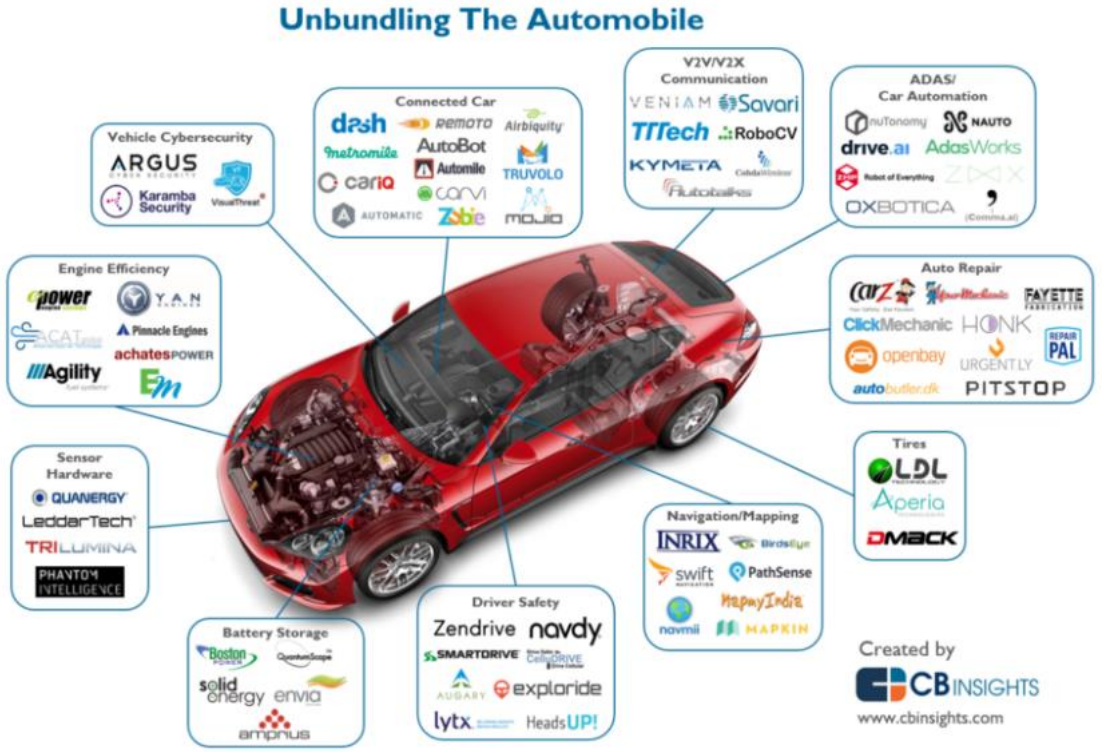


Industry-specific ICT innovation



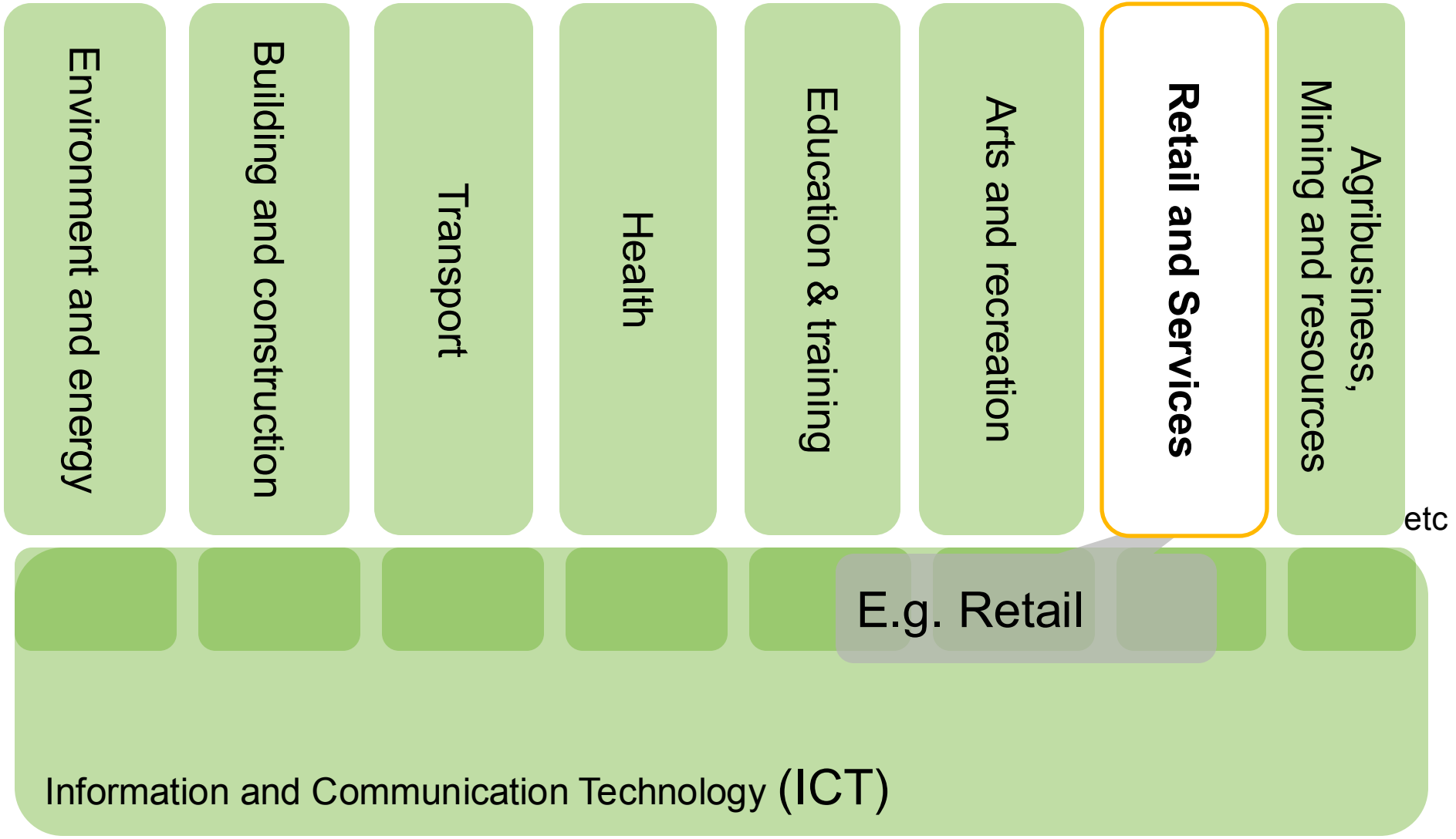
Example – Software in cars

- What does software do in a car?
  - 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.



https://medium.com/@josephstockholm/auto-tech-startups-in-stockholm-101febca5661 (Feb'25)

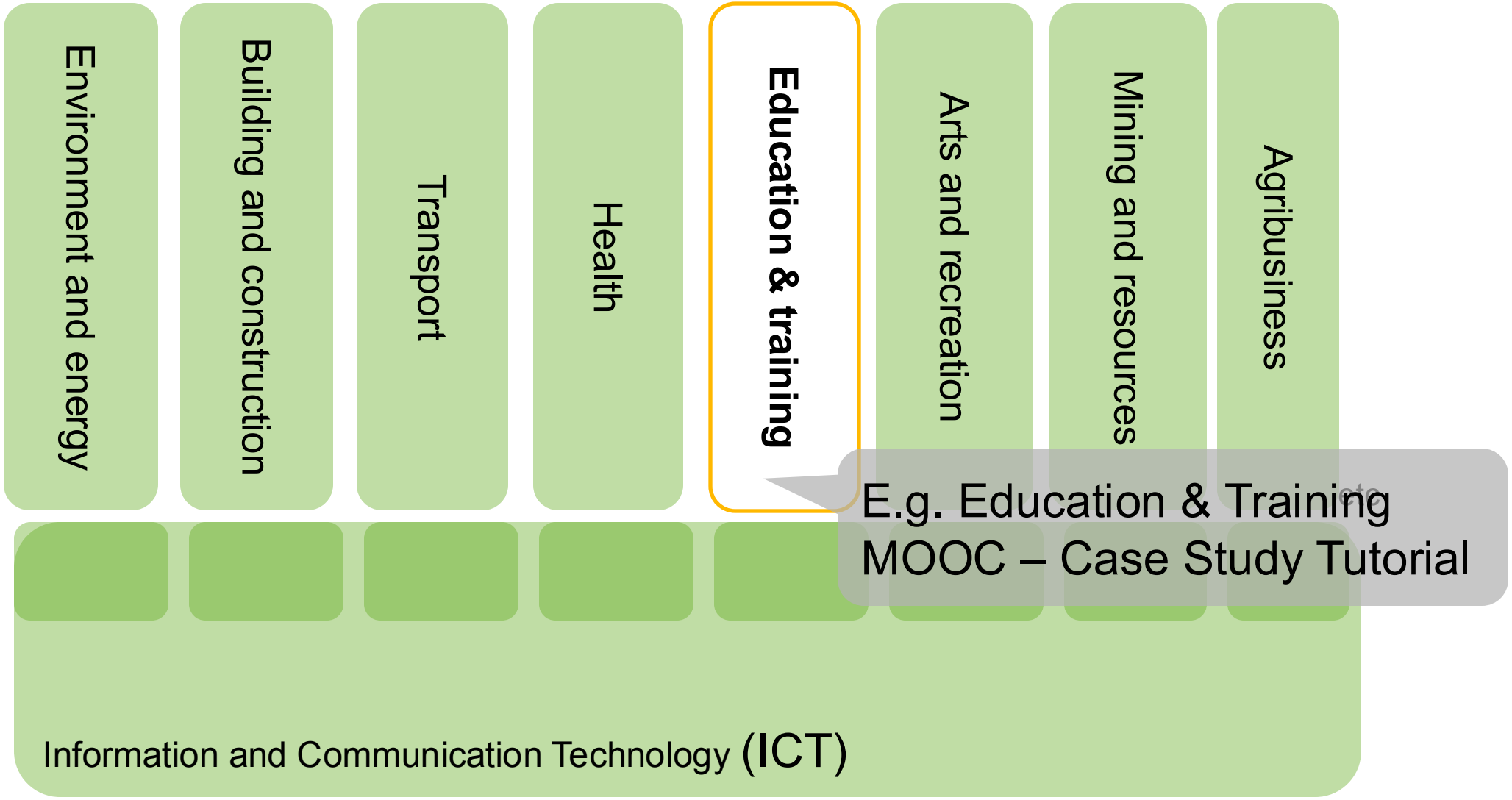
Industry-specific ICT innovation



Amazon Go

https://www.amazon.com/b?ie=UTF8&node=16008589011 (Feb'25)

Industry-specific ICT innovation



Micro credentials

- A microcredential is any one of a number of new certifications that covers more than a single course but is less than a full degree.
- The edX platform was the first to launch a microcredential, the XSeries, in 2013. Udacity and Coursera followed in 2014 with the Nanodegree and the Specialization, respectively.
- Every MOOC platform now offers at least one type of microcredential, and some platforms offer as many as three different types.

- "More workers and employers will find value in credentials that are smaller than degrees, especially as they begin to coalesce around models with recognizable features, structures, and meaning."

https://www.class-central.com/report/moocs-microcredentials-analysis-2018/ (Feb'25)

MicroMasters - a three-way arrangement between educator, student and employer

- "MicroMasters" certificate programs on edX, to which 1.7 million students have registered in a year.
- MicroMasters certificates (MMs) are online, examined and graded, credit-eligible graduate-level courses that involve about a quarter of the coursework of a traditional Masters degree. At edX they cost about $1,000.
- But, as important as expanding educational access is, what's at stake here is even more radical and future-disruptive. **Because, it's apparent most students won't pursue the full degree. They'll walk with the MM.**
- Each MicroMasters is sponsored by at least one industry partner, currently a list of 40 which includes GE, MicroSoft, IBM, Hootsuite, Fidelty, Bloomberg, Boeing, WalMart, PWC, Booz-Allen Hamilton, and Ford.

https://www.forbes.com/sites/adamgordon/2018/02/13/voice-of-employers-rings-out-as-moocs-go-from-education-to-qualification/#e7fdd1f564b6 (Feb'25)

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 (Feb'25)