



Centre for Innovation

# Effective AI Innovation

**Week 3 – LECTURE. AI IN INNOVATION**



# Which innovation was the most transformational?

Rank the following from **least** (bottom) to **most** (top) transformational.

| Innovation                 | Approximate date | What it changed                             |
|----------------------------|------------------|---------------------------------------------|
| The plough                 | c. 4000 BCE      | Settled farming and food surpluses          |
| The telescope              | 1608             | How we understand our place in the universe |
| The lightbulb              | 1879             | Work and life after dark                    |
| Penicillin                 | 1928             | Survival from bacterial infection           |
| The semiconductor          | 1947             | The basis of all modern computing           |
| AI (large language models) | 2022             | How we find, create and use information     |



# Register your attendance

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- Sign in with your university username and password
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- If prompted, enable location services
- Tap 'Check in' for this class, then 'Finish'
- Your attendance confirmation will be displayed

*Or go to [app.bristol.ac.uk](https://app.bristol.ac.uk) for web check-in*

Apple App Store



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# Module: week by week structure

## Part 1: AI Fundamentals

- Week 1: AI in innovation – history, present, future
- Week 2: AI and humans – ethics, impact
- **Week 3: Effective AI innovation**

## Part 2: Discovery

- Week 4: Market research and opportunity mapping
- Week 5: Problem discovery and user needs analysis
- Week 6: Consolidation week

## Part 3: Building, Testing and Implementing

- Week 7: Building ideas – ideation and solution building
- Week 8: Distributing ideas – marketing, design and creative
- Week 9: Testing and evolving ideas – user testing
- Week 10: Effecting change – implementing AI effectively

## Part 4: Assessment

- Week 11: Group assessment – learning conversations
- Week 12: Individual assessment – learning conversations

# Lecture overview

0–10m

First principles thinking

10–25m

AI is a tool, and humans love tools!

25–35m

Good and bad AI innovation

35–45m

Why AI innovation is tricky

45–50m

Wrap up

# AI as a tool for future innovation

Large language models are remarkable innovations in their own right.

But in this lecture, we are talking about AI as a **tool**: something people and organisations use to create the next wave of innovation.

| AI as the innovation       | AI as the TOOL                            |
|----------------------------|-------------------------------------------|
| ChatGPT, Claude, Gemini    | Triaging thousands of customer queries    |
| Image and video generators | Discovering new drugs and materials       |
| Speech recognition models  | Helping a small team test a business idea |



*Hargreaves' Spinning Jenny –  
Invention, Innovation and Tool*

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PART 1

# First principles thinking

# #1 Humans want to solve problems (and get used to things quickly!)

**Experiment:** Researchers at the University of Virginia asked volunteers to sit alone in a room for 15 minutes with nothing but your thoughts and a button that gives you an electric shock.

| Participants | Chose to shock themselves |
|--------------|---------------------------|
| Men          | 67%                       |
| Women        | 25%                       |

Source: Wilson et al. (2014), Science

*“All of humanity’s problems stem from man’s inability to sit quietly in a room alone.”*

Blaise Pascal, Pensées (1670)



**Think:** when was the last time you got so frustrated by something that you decided to do something about it?

## ...and we love taking shortcuts (#1a)

### The principle of least effort

People naturally choose the path that takes the least effort to reach their goal (Zipf, 1949).

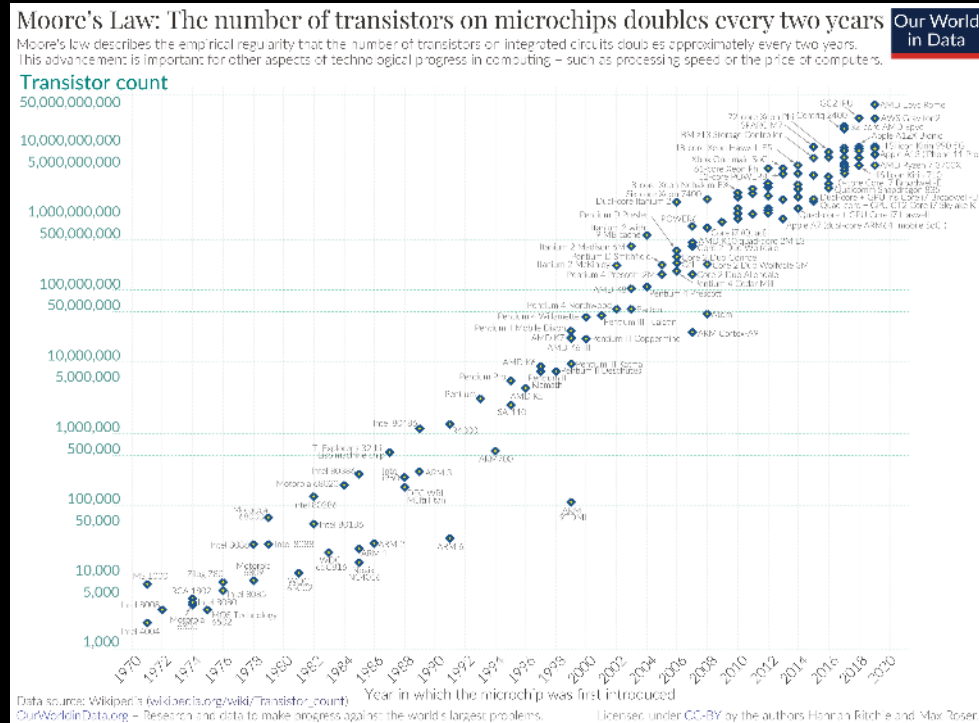
### Desire paths

The worn tracks across grass where people ignore the designed route. Some universities now wait to see where these appear before laying paths.

**Think:** when could you have done a job 'properly', but took a shortcut instead?



## #2 Technology's natural state is progress



*Once you've taken the toothpaste out of the tube, you can't put it back in.*

### Moore's law

Transistors per chip have doubled roughly every two years: from 2,300 in 1971 to over 200 billion today.

### No going back

Once a technology exists, it cannot be un-invented. Like toothpaste, it does not go back in the tube.

## #3 The fundamental purpose of business is to grow

| Growth lever            | Leads to                  | Where AI fits                            |
|-------------------------|---------------------------|------------------------------------------|
| Increase <b>revenue</b> | New products and services | New offers, personalisation, new markets |
| Decrease <b>costs</b>   | Greater efficiency        | Automating routine work, fewer errors    |



*“Capitalist economy is not and cannot be stationary... it is incessantly being revolutionized from within.”*

Joseph Schumpeter, Capitalism, Socialism and Democracy (1942)

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PART 2

**AI is a tool, and humans like tools!**

# What is a tool?

*“An object that can extend an individual’s ability to modify features of the surrounding environment or help them accomplish a particular task.”*

Wikipedia

**3.3m years**

Age of the oldest known stone tools  
(Lomekwi, Kenya)

Every tool extends what a  
human can already do, or  
wants to do



# Artificial Intelligence is the most wonderful tool

*“Any sufficiently advanced technology is indistinguishable from magic.”*

Arthur C. Clarke's third law, Profiles of the Future (revised edition, 1973)

For many people, using a large language model for the first time feels like magic. The challenge for innovators is to look past the magic and ask what the tool is actually for.



## Less of a hammer, more of a Swiss army knife



### A hammer

One tool, one job. Excellent at it, but little use for anything else.



### A Swiss army knife

One tool, many jobs. General purpose AI can write, analyse, summarise, code and more.

# Artificial general intelligence (AGI) – the ultimate Swiss Army Knife

**AGI** is a hypothetical AI system that could match or exceed human ability across most cognitive tasks, and learn new tasks without being specifically trained for them.

|              | Narrow AI                 | General purpose AI (today)       | AGI                       |
|--------------|---------------------------|----------------------------------|---------------------------|
| What it does | One specific task         | Many tasks, with human direction | Almost any cognitive task |
| Example      | Spam filter, chess engine | Large language models            | Does not yet exist        |
| Tool analogy | The hammer                | The Swiss army knife             | A colleague               |

# Innovation categories

**1** Humans can do it, but AI can do it quicker  
(or cheaper!)

**2** Humans can do it, but AI can do it better

**3** Humans can do it, *and* AI helps them do it  
better

**4** Humans can't do it

# Match the innovation to the category

| # | Category                                                 |
|---|----------------------------------------------------------|
| 1 | Humans can do it, but AI can do it quicker (or cheaper!) |
| 2 | Humans can do it, but AI can do it better                |
| 3 | Humans can do it, and AI helps them do it better         |
| 4 | Humans can't do it                                       |



# Humans can do it, but AI can do it quicker (or cheaper!)

AI takes a task humans can already do and completes it in a fraction of the time, or at a fraction of the cost.

| AI examples             | What is it                                                                                                  |
|-------------------------|-------------------------------------------------------------------------------------------------------------|
| Image to text           | Turns scanned pages, receipts and photos into editable text in seconds.                                     |
| Sorting emails          | Reads, tags and routes incoming messages without anyone opening them.                                       |
| Customer service triage | Identifies what a customer needs and sends them to the right answer or person.                              |
| Coding                  | Drafts, explains and debugs code. In one trial, developers using GitHub Copilot finished a task 55% faster. |

## A BIT LIKE...



### Calculators

Arithmetic we could do by hand, done instantly.



### Printing press

Copying text by hand, done at scale from c. 1440.



### Sewing machine

Stitching by hand, done many times faster.

# Humans can do it, but AI can do it better

AI takes a task humans can already do and performs it more accurately or consistently than a person could.

| AI examples              | Examples                                                                                                            |
|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| Medical scans            | In a Swedish breast screening trial, AI support found 20% more cancers and cut radiologist reading workload by 44%. |
| Fraud detection          | Monitors millions of transactions in real time and flags patterns no human team could spot.                         |
| Spotting document errors | Checks contracts and reports for inconsistencies more reliably than tired eyes.                                     |

A BIT LIKE...



Barcodes

More accurate than typing in every price.



Compass

More reliable than reading the sun or stars.



Thermometer

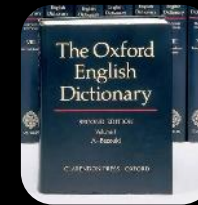
More precise than judging temperature by touch.

# Humans can do it, and AI helps them do it better

AI works alongside a person, who stays in charge of the judgement, the choices and the final result.

| AI examples                    | Examples                                                                               |
|--------------------------------|----------------------------------------------------------------------------------------|
| <b>Brainstorming and ideas</b> | Offers a wide range of starting points; humans select, combine and refine.             |
| <b>Business plan analysis</b>  | Stress tests assumptions and spots gaps; humans make the call.                         |
| <b>Drafting and editing</b>    | Produces a first draft or tightens prose; humans shape the voice and message.          |
| <b>Research</b>                | Finds and summarises sources quickly; humans check, interpret and decide what matters. |

## A BIT LIKE...



### Dictionaries

You still write; it helps you write better.



### Staple gun

You still do the job; it makes it easier.



### Hearing aids

Amplify an ability you already have.

# Humans can't do it

AI makes possible something that people could not achieve on their own, at any speed or cost.

| AI examples         | Examples                                                                                                                              |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Protein structures  | AlphaFold has predicted the structures of over 200 million proteins. Its creators shared the 2024 Nobel Prize in Chemistry.           |
| New materials       | Google DeepMind's GNoME identified 2.2 million new crystal structures, around 380,000 of them predicted to be stable.                 |
| Weather forecasting | GraphCast produces a 10-day global forecast in under a minute, and beat the leading conventional system on over 90% of test measures. |

A BIT LIKE...



**Flying**  
Something the human body simply cannot do.



**X-rays**  
Seeing inside the body without surgery (1895).



**Telephone**  
Talking across any distance (1876).

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PART 3

# Good and bad AI innovation

# What is good innovation?

**Something new, that gets used, and improves people's lives.**

**1**

## **New**

A new product, process or way of doing things, or an existing one applied in a new context.

**2**

## **Gets used**

An idea only becomes an innovation when people actually adopt it.

**3**

## **Improves lives**

It leaves the people who use it, and those around them, better off.

# Innovations: good or bad?



**Segway**



**Post-it note**



**Google Glass**



**OpenAI Sora**

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**Just because it's innovative  
doesn't guarantee it's any good.**

# The best AI innovation helps us be more human

- 1 Less time on repetitive tasks, more on things we enjoy e.g. much less admin!
- 2 Making new discoveries that improve quality of life e.g. drug discovery
- 3 Helping us embrace our natural curiosity e.g. chatbots!
- 4 Helping create community and connection e.g. Timeleft
- 5 Lowering the barriers to human-led innovation e.g. agentic business creation

# The worst AI innovation

## 1 Solutions looking for a problem

e.g. AI toothbrushes

## 2 Engagement traps

e.g. infinite scroll, flattering chatbots

## 3 Replacing humans

e.g. much of education, care and customer support

## 4 Deskilling humans

e.g. outsourcing the skills that make us valuable ('Your brain on ChatGPT')

## 5 AI slop

e.g. mass-produced, low-quality images, videos and articles



# AI innovation checklist

| # | Ask yourself                                | ✓                        |
|---|---------------------------------------------|--------------------------|
| 1 | Are you solving a real problem?             | <input type="checkbox"/> |
| 2 | Is AI the best tool to solve this problem?  | <input type="checkbox"/> |
| 3 | Does it make a human's life <b>better</b> ? | <input type="checkbox"/> |



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PART 4

# Why AI innovation is tricky

# Why AI innovation is tricky

| Challenge                                       | Why it matters                                                                                                                              |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Businesses are full of humans</b>            | People have their own habits, worries and priorities, and a new tool only works if people choose to use it.                                 |
| <b>Institutional knowledge locked in brains</b> | Much of how an organisation really works is never written down, so AI cannot learn from it.                                                 |
| <b>Unstructured data</b>                        | Most organisational information sits in emails, documents and chats rather than tidy databases, which makes it hard for AI to use reliably. |
| <b>Jumping on the AI bandwagon</b>              | Organisations adopt AI because competitors are, rather than to solve a clearly defined problem.                                             |
| <b>Organisational inertia</b>                   | Existing processes, budgets and structures resist change, even when the case for it is clear.                                               |

**Innovation is tricky, regardless of the tool!**

**A lesson from history**

Factories took around 40 years to see productivity gains from electricity, because they first had to redesign how work was organised (David, 1990).

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## SECTION 5

# Key takeaways

## What to remember from today

### 1 Innovation never stops

Humans solve problems and take shortcuts, technology keeps progressing, and businesses must grow.

### 2 AI is a general purpose tool

It can do things quicker, do them better, help us do them better, or do what we cannot.

### 3 Innovative is not the same as good

The best AI innovation helps us be more human. Use the checklist before you build.

### 4 AI innovation is tricky

People, locked-in knowledge, messy data, hype and inertia all get in the way, whatever the tool.

## Before next week

- Look back over today's four categories and think about about which ones apply to your case study.
- Use the AI innovation checklist on one AI tool you already use. Does it pass?
- Book office hours: your tutors are always happy to talk about the module, the Evidence Deck or careers.
- Explore the additional resources on Blackboard.
- Finally, get outside and explore Bristol!



# Reminder - Book Office Hours!



**Laura Coates**  
Unit Director



**Stephen Barnett**  
Lecturer



**Francis Chan**  
Lecturer



**Rob Stringer**  
Teaching Associate



**Nenie Anetekhai**  
Teaching Associate



**Hollye Kirkcaldy**  
Teaching Associate

**Book Office Hours**

## Seminar time!

| Session Times and Room numbers   |                                  |
|----------------------------------|----------------------------------|
| <b>A</b> 1pm – 3pm in Room 2.405 | <b>D</b> 4pm – 6pm in Room 1.405 |
| <b>B</b> 1pm – 3pm in Room 5.430 | <b>E</b> 4pm – 6pm in Room 2.405 |
| <b>C</b> 1pm – 3pm in Room 1.620 | <b>F</b> 4pm – 6pm in Room 3.315 |