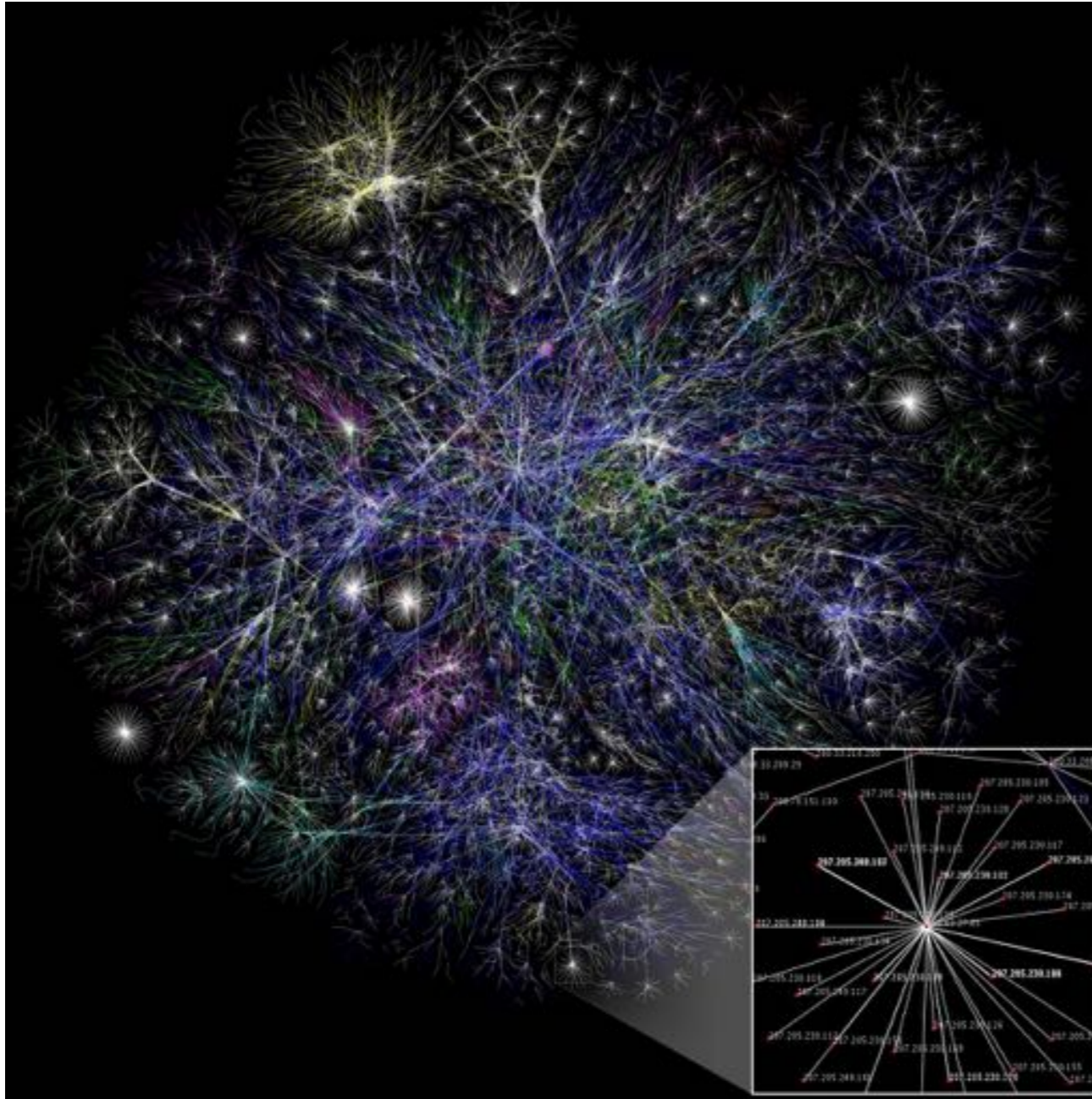# The fundamental principles of innovation
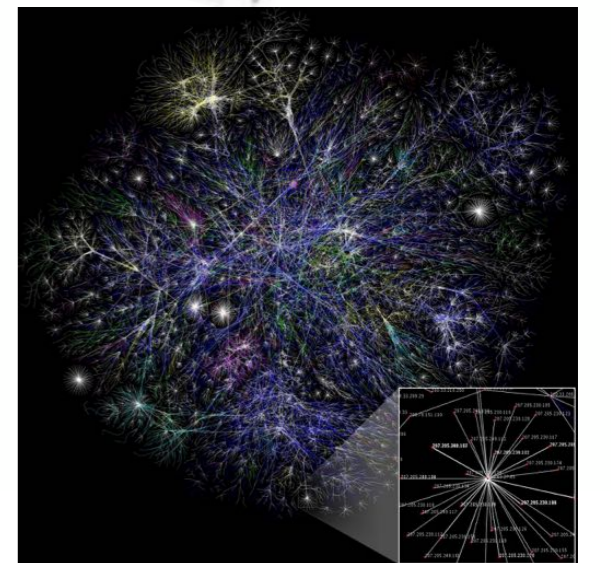Dr Iarla Kilbane-Dawe

*

What do these things have in common?

What do these things have in common?

They are all novel, innovative ideas that have transformed some area of human activity. Each is the culmination of deep technical innovations developed over years, decades or (perhaps) millennia.
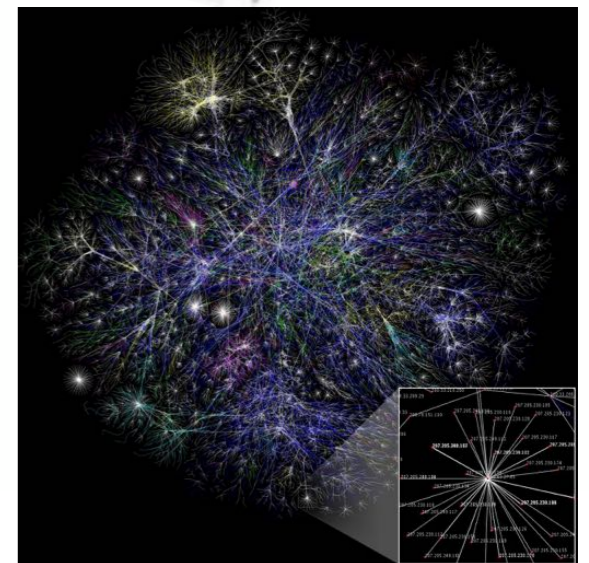
These are all **disruptive innovations.**

These talks cover two topics

What an innovation is, and what processes are used to develop innovations.

The role that human factors play in innovation development.

This is interactive!
Today & tomorrow:

You'll work as a team to **refine** and **present** your ideas.

You'll refine the **product idea** developed in your assignment by testing **examing the market that it will operate in.** You'll pitch it to your potential investors.

On Thursday, **you'll work on making your pitch better.**

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The winning team gets a prize they'll love!

*

THE ALLTIME OLYMPIAN MICHAEL PHELPS

Sports Illustrated
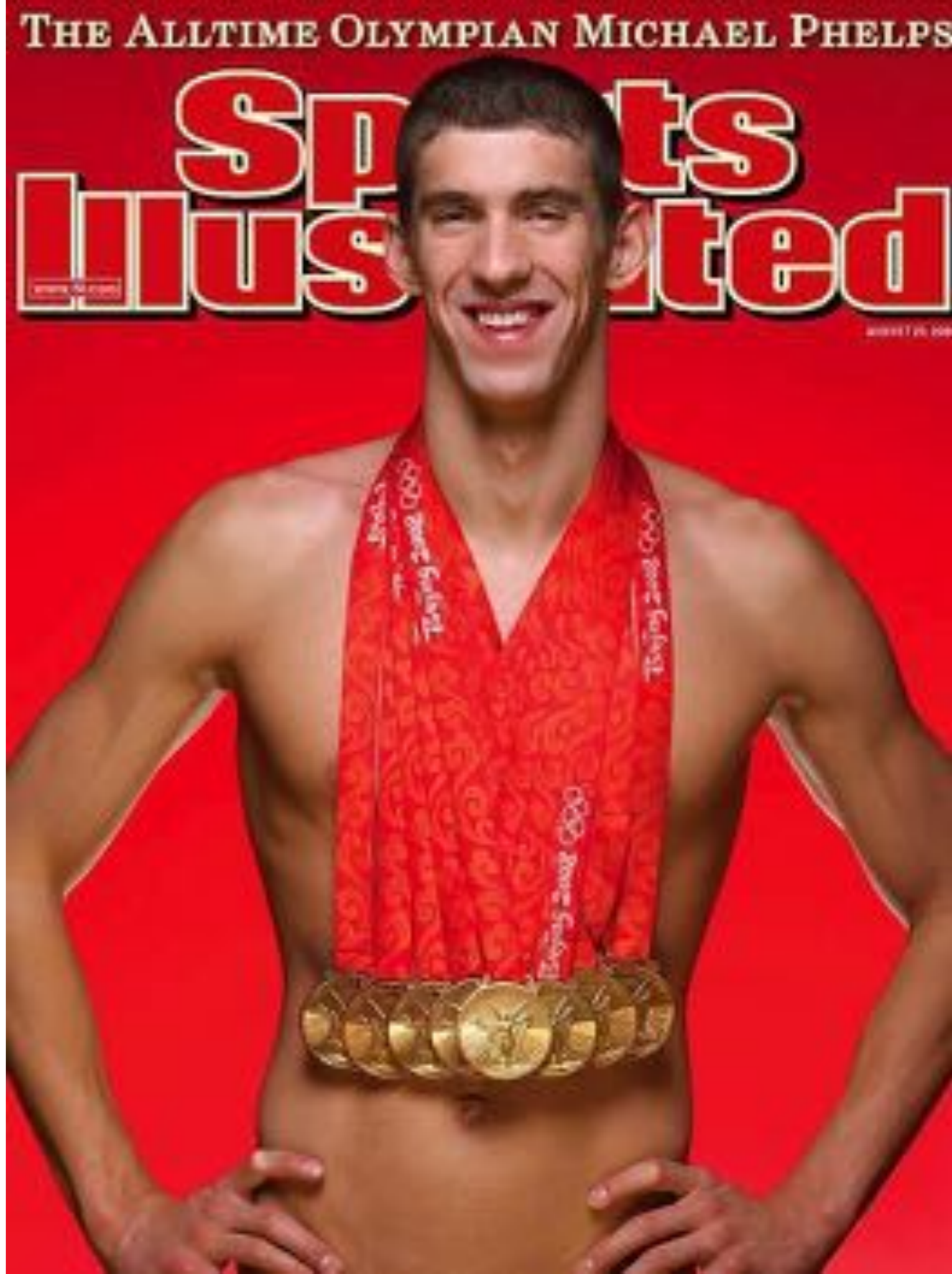
Now, what do these things have in common?

What do these things have in common?

They are all products or services that are broadly similar to previous innovations, but which exploit a new aspect of the services or a new market.

They are incremental innovations.

A rough classification of innovation types

1. New to the organisation.

2. New to the market.

3. New to the World.

4. Disruptive innovations that change the World or market.

*

A rough classification of innovation types

1. New to the organisation.

2. New to the market.

   99% of innovations

3. New to the World.

   0.99% of innovations

4. Disruptive innovations that change the World or market.

   < 0.01% of innovations

*

Economists largely agree on this...

Schumpeter 1934
5 types of innovation
•new products
•new methods of production,
•new sources of supply,
•opening of new markets,
•new ways of organizing businesses.

OECD 2005
An innovation is the implementation of a new or significantly improved
•product (good or service),
•process,
•a new marketing method
•a new organisational method (in business practices, workplace organisation or external relations).

*

First principle of innovation

Innovations need only be novel in the market where they are sold.

Yesterday you gave me 100 word abstracts
My 1 minute research exercise told me…

| Proposal	Existing service(s) or product(s)
D-SEAS	CNES Satellite monitoring of epidemics
Dr Happy	Workplace Safety & Prevention Services
ForMore Time	Forest Monitoring for Action (FORMA)
IDAR	ETC Advanced Disaster Management Simulator
MEFITIS	UASatCom (an ESA project)
MUSSEL	BMT SHOAL
Playground	CIA Aerial Analysis Challenge, NRC Image Quiz
Sat-BIO Food	See Wikipedia entry "Satellite Crop Monitoring"
TreeDMap	PANORAMIO
Tresorometry	Ummm … this is called sonar!
WecoM	Oregon Scientific Anywhere Weather Station
Weather or Not	Dark Skies App

5 minute exercise

Consider the innovation you developed in your Assignments. Working online for the next 5 minutes...

- Find examples of a product like your one already out there. What makes your idea different from the other examples?
- Now consider whether there really is a market for your idea.
- **Can you really justify presenting this idea to a group of investors?**

Why are economists so interested in innovation? Indeed, why innovate at all?

Why are economists so interested in innovation? Indeed, why innovate at all?
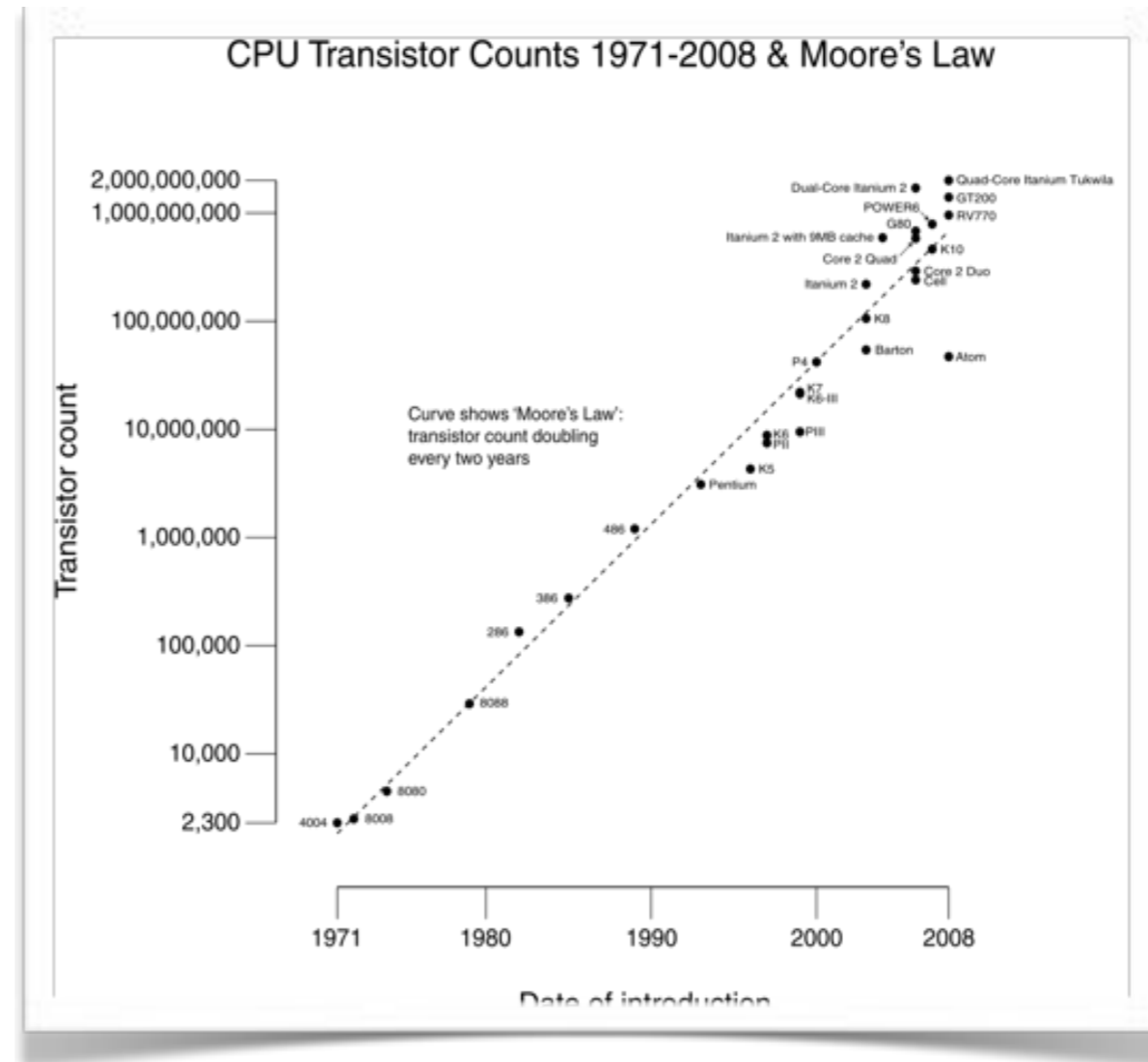
- Efficiency

CPU Transistor Counts 1971-2008 & Moore's Law

Why are economists so interested in innovation? Indeed, why innovate at all?

- Efficiency

- Obsolescence

Why are economists so interested in innovation? Indeed, why innovate at all?

- Efficiency

- Obsolescence

- Competition

*

Why are economists so interested in innovation? Indeed, why innovate at all?

- Efficiency

- Obsolescence

- Competition

- Growth

1/3rd

of growth comes from new products and services.

*

The second fundamental principle of innovation
Example

High-res air pollution forecast maps

In 2003, CERC developed an air pollution forecasting system that generated daily forecasts down to 5m resolution. These used an early GMES data chain that assimilated satellite data and used high resolution inventories of traffic emissions to deliver forecasts for a persons individual location. These were **state-of-the-art** in terms of science, accuracy and utility.

The second fundamental principle of innovation
Example

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In 2003, CERC developed an air pollution forecasting system that generated daily forecasts down to 5m resolution. These used an early GMES data chain that assimilated satellite data and used high resolution inventories of traffic emissions to deliver forecasts for a persons individual location. These were **state-of-the-art** in terms of science, accuracy and utility.

Nobody bought one.

*

The second fundamental principle of innovation

Any suggestions?

The second fundamental principle of innovation

A new or good idea ≠ **An innovation**

*

The second fundamental principle of innovation

A new or good idea ≠ **An innovation**

An innovation = A new idea that **meets a need**

*

The second fundamental principle of innovation

A new or good idea ≠ **An innovation**

An innovation = A new idea that **meets a need**

[Innovations] ≈ [New ideas] x <5%

*

Management consultants agree .. **successful new products matches skills to deliver with needs**

	Booz Allen Hamilton	De Brentani	Cooper & Kleinschmidt	Duerr
Fits company's strongest resources	✔	✔	✔	✔
Match customer needs	✔	✔	✔	
Screening for growth potential		✔	✔	✔
Top management support	✔		✔	✔
Uses new product process	✔		✔	✔
High value to customer		✔	✔	
Innovative		✔	✔	
Technical superiority	✔		✔	
Communication amongst company functions		✔	✔	
Avoids unnecessary risk		✔	✔	
Favourable competitive environment	✔			

*

SpaceX Vehicles

SPACEX

Falcon 1

Falcon 9

Dragon Spacecraft
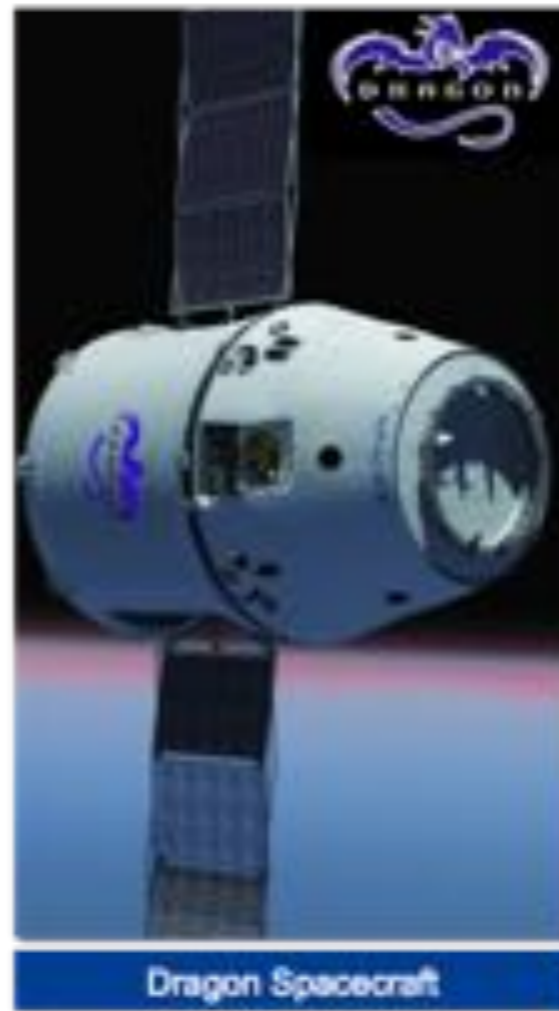
Market opportunity
Retirement of Space Shuttle. Competitors very expensive.

Market penetration
Be cheaper but reliable.

Market development
Develop new products.

Small satellite launcher with 1 Merlin motor

15 customers signed up

Conventional LEO & GTO

Evolution of Falcon 1 (x9 Merlin motors)

ISS Servicing

Dragon Evolution

SpaceX Vehicles
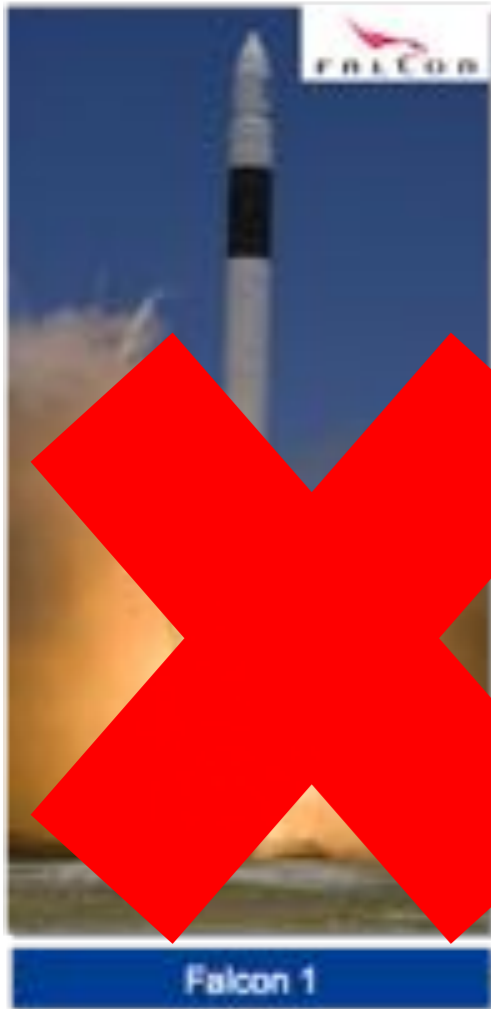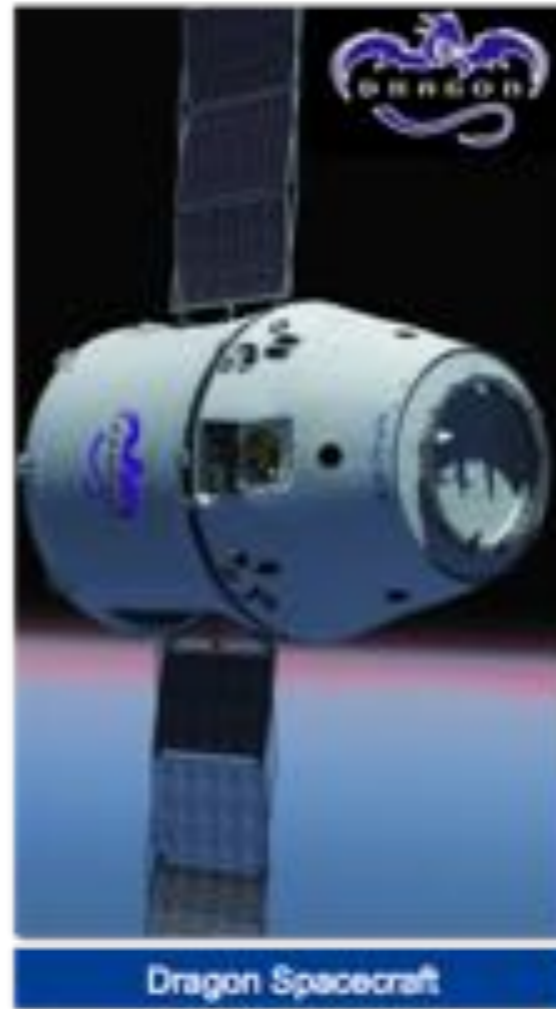
Small satellite launches

Conventional LEO & GEO

ISS Servicing

15 customers signed up – where do they go now?

Other launch options for small satellite market?

1. Russian ICBMs (military, no commercial focus)

2. Virgin Galactic (never demonstrated)

What does this mean?

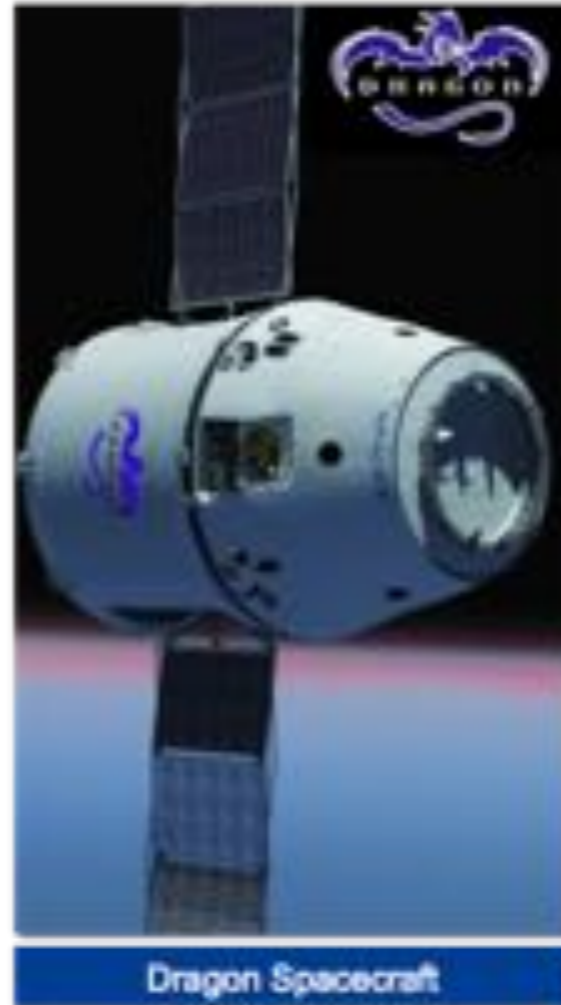**There's a market opportunity**

*

Competitors have developed to fill the gap

Firefly alpha

Falcon 9

Dragon Spacecraft

New small satellite launchers to cater for the market opportunity created by Space X

Conventional LEO & GEO

ISS Servicing

5 minute exercise

Working in your team and researching online, answer these questions about your idea:

1. How many potential customers are there for your product in the market in which you will sell?
2. If 0.5% of these purchased in the first year, what would your revenue be?

Redraft your 100 word pitch to include answers to these 2 questions.

*

Presenters
You have one minute to give your pitches …

Proposal	Presenter
D-SEAS	Dimitris Marmanis
Dr Happy	Thomas Danckaert
ForMore Time	Kati Anttilla
IDAR	Qingling Wu
MEFITIS	Helena Los
MUSSEL	Héctor Espinós Morató
Playground	Sian Williams
Sat-BIO Food	Piero Campalini
TreeDMap	Julien Chimo
Tresorometry	Christina Surdu
WeCoM	Kristof Van Tricht
Weather or Not	Paul Staten

Presenters, please come up to the front ...

Everyone else .. you have just joined an investment bank. **By coincidence, its the bank where your parents pension fund of €100,000 is invested.**

You are in charge of awarding €100,000 to an investment. **Your job, future career and chances of marrying a hot guy or girl depends on getting this choice right!**

You be asked to vote - by show of hands - on whether you think an idea is viable.

Assignment for tonight - conduct a focus group

Tonight you will team up with another team.

Over a 20 minute period, your presenter will ask the group four questions about your product. The rest will listen to the answers. Then you swap.

Between now and 6pm, write your four questions.

Group 1	D-SEAS	Playground
Group 2	Dr Happy	Sat-BIO Food
Group 3	ForMore Time	TreeDMap
Group 4	IDAR	Tresorometry
Group 5	MEFITIS	WeCoM
Group 6	MUSSEL	Weather or Not