



The Business of Innovation

Decide what's over the
horizon

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What do these things have in common?

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They are all ideas that people want to believe in. They believe in them so much, they will cast that vote, buy that iPad, sign up on Facebook and dance in their bedroom to the music, or spend €300m on a satellite launch.



What else do these things have in common?

They are all **different from what came before.**

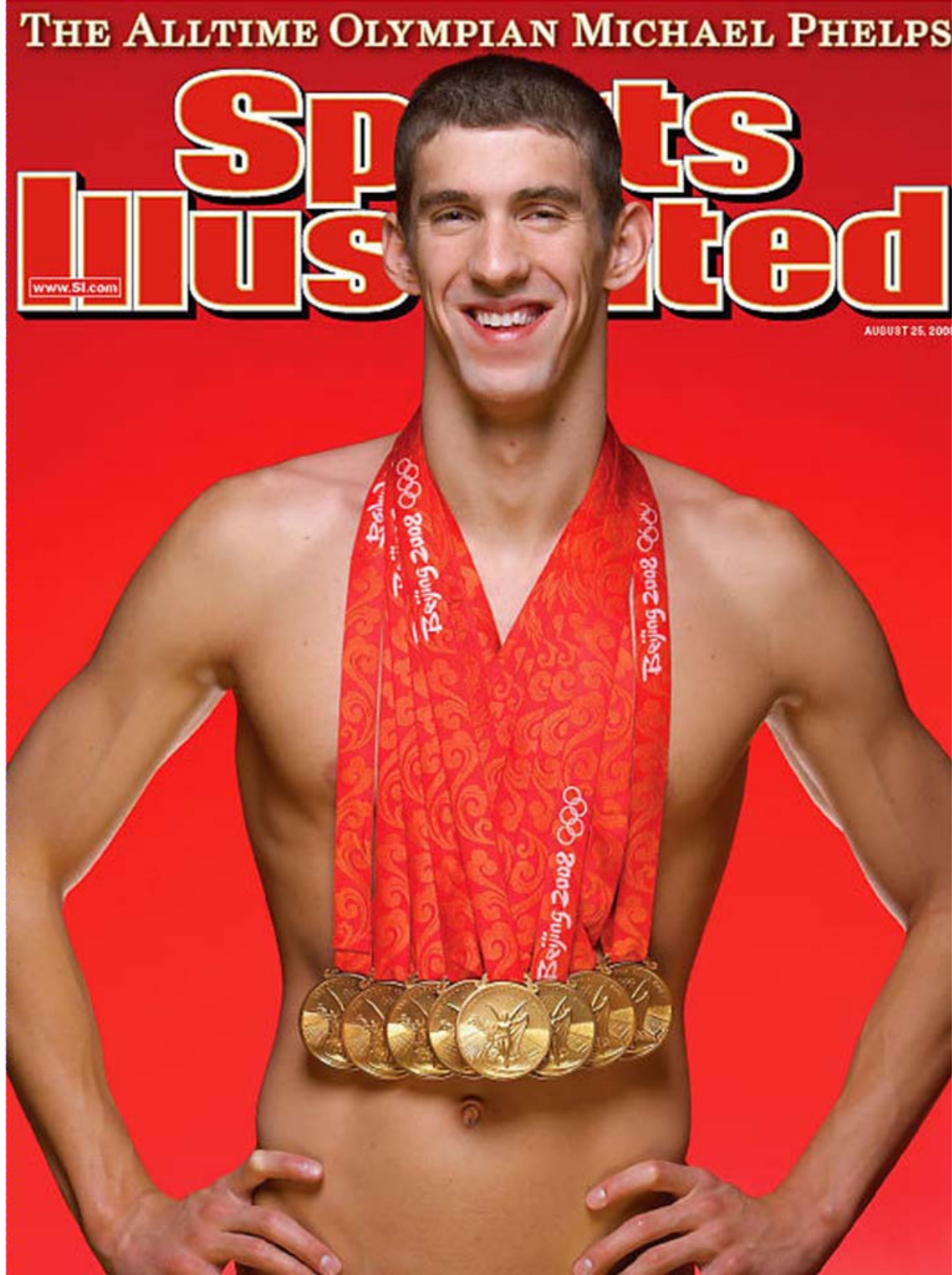
They are all **innovations**, new ideas.

These three talks are about how to make ideas successful so that people believe in them enough to **act on them, pay for them, or support them.**



The next 3 days:

- Today, you'll develop a new **product idea** in an **idea creation** session. Then you'll give it an **initial pitch**.
- Tomorrow, you'll **refine** that idea by testing it with a **focus group of potential customers**.
- On Wednesday, you'll give your final **pitch to the market**. The winning product idea gets a prize.
- Every day **you'll work as a team** to **refine** and **present** your ideas.



What else do all these things have in common?

They are the product of **teamwork**.

Even Michael Phelps has a team - his parents and family, his school that supported him, his coach, his swimming team mates who race against him, his PR agent ...



Exercise 1: Build your team

In the next 5 minutes:

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In the next 5 minutes:

Form a team with the 5-7 people nearest to you.

Agree a name for your team.

Agree the following team members.

The **Presenter**.

S/he should be the person most happy to present back to the group.

The **Recorder**.

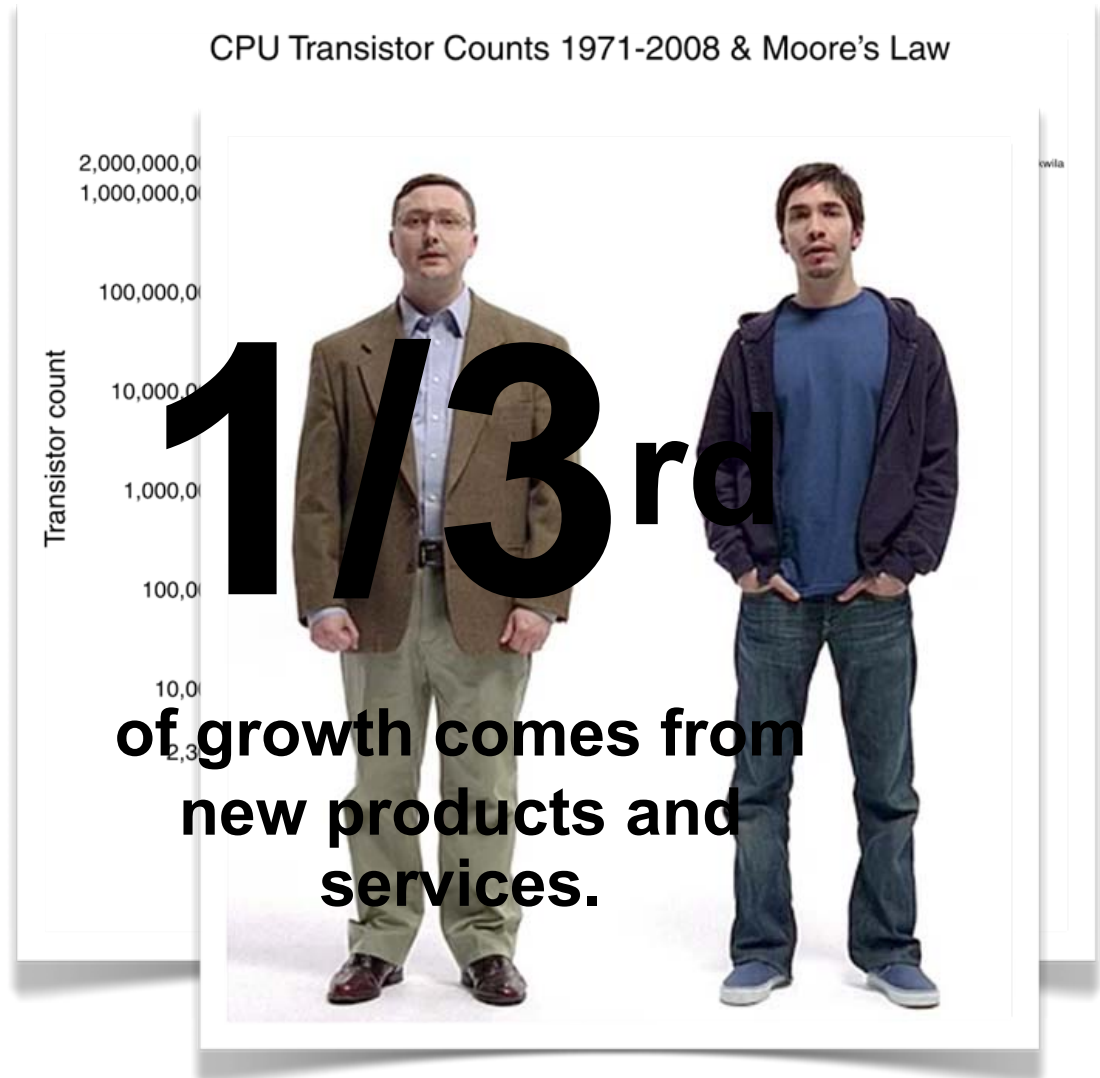
Should be someone who is most happy to take notes.

Consider also who in your team is **creative, artistic** or can **write well**. Every good product needs a good brochure or logo ... consider who can do this in your team.

Report your **Team Name** back to the group.

Why innovate at all?

- Efficiency
- Obsolescence
- Competition
- Growth



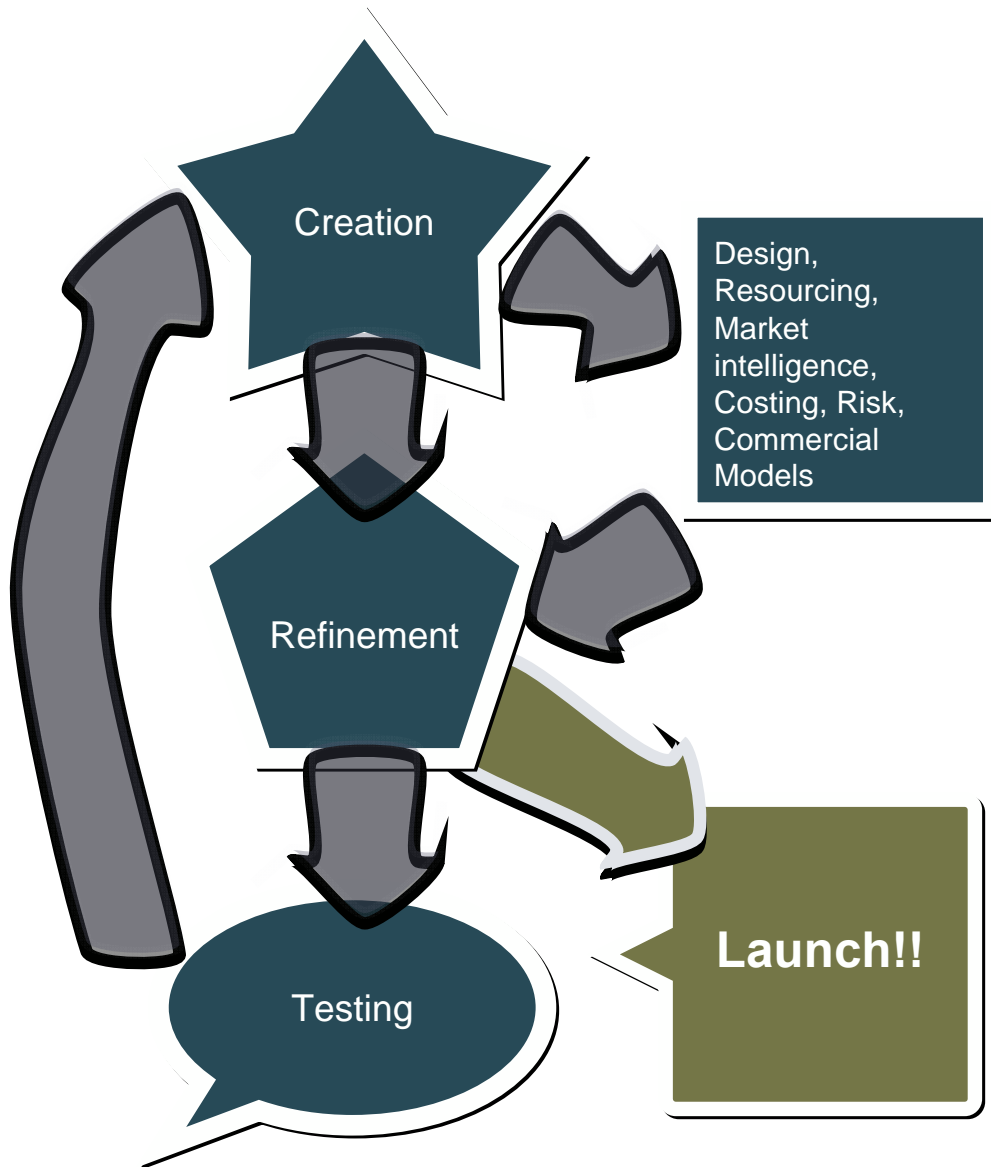
The key insight of successful innovation

A good idea \neq **A successful idea**

**A successful idea = A good idea that
meets people's needs**

[Successful ideas] \approx [Good ideas] x 0.05

Developing innovations comprises 3 main activities



Innovation is a cyclical process of **creation, refinement** and **testing**.

These are interspersed by work on **design, market intelligence, costing, risk,** and **commercial models,** and completed when the idea becomes a product that's finally **launched**.

Successful innovation comprises 3 main activities

Innovation is a cyclical process of **creation**, **refinement** and **testing**.

Idea Creation

Develop new ideas that are informed and constrained by your **knowledge resources** and by **market intelligence**. This can be conducted using rapid techniques like **client workshops** or **brainstorming sessions**, or through longer slower techniques like **scientific** or **market research**.

Refinement

Refining your ideas requires detailed research and development. Your refined idea should have a **precise definition** including a **plan of how to construct or deliver the final product** that has been **costed**, tested for **risks** to your organisation, and a plan for how to **bring the product to market**.

Testing

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Successful innovation requires 3 main supports

Innovation requires the **right resources**, good **design** and **market intelligence**.

Resources

Your resources are primarily the **skills and knowledge** of your people and their ability to **execute the technical or management tasks needed**. It also includes your **mechanical equipment and facilities**, **supply chain** and **components** it can provide, and the **financial support** your organisation can muster.

Design

With each cycle of the process, the design of your idea will be refined, but even the initial designs must address the essential question of **how the idea can be put into practice**. This must include a realistic assessment of how much it will **cost to execute and to sell** and how much people will **pay for it**.

Market Intell:

The more complete your understanding of the market you're working in, the more likely you are to succeed in creating an idea that will succeed in that market. Large companies spend € billions to develop market intel, from **consumer research** to **industrial espionage** to **political lobbying**.

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Exercise 2: Audit your resources (5 minutes)

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Ask each team member to explain their list of skills and interests. Don't be exclusive or limited - **you are more than a data assimilation student.**

Everything you know and are able to do is a resource, whether

- professional skills,
- your education,
- your hobbies,
- sports you do,
- musical, artistic, creative design, photographic or cinematic skills,
- manual skills.

Ask your **Presenter** to say when you're finished.

Market intelligence

This your knowledge of the market that you operate in.

It includes the legal and financial constraints of potential buyers, their needs, their desires and the competitive landscape within which you operate.

Consider an example: putting things into space

SpaceX Vehicles



Falcon 1



Falcon 9



Dragon Spacecraft

Dragon Evolution



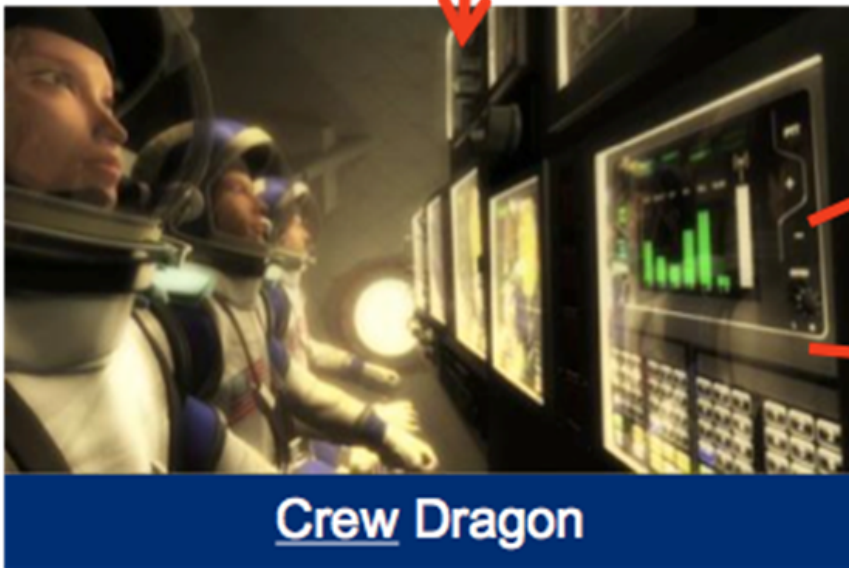
ISS Cargo Delivery

DragonLab Micro-gravity

Rendezvous & Inspection

Boost/ De-Orbit

Robotic Servicing



ISS Crew Service

Life-boat

Crewed Servicing

Orbital Tourism

Another way to look at the market ...



J-2X

HLLV Propulsion

- Merlin 2 uses scaled-up, flight proven Merlin 1 design
- SpaceX can develop and flight qualify the Merlin 2 engine in ~3 years at a cost of ~\$1B. Production: ~\$50M/engine
- J-2X development already in progress under Constellation program



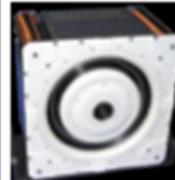
Merlin 2

	Merlin 2	J-2X
Propellant	LOX/RP	LOX/LH ₂
Thrust (vac) [klbf]	1,700	292
Isp (vac) [sec]	322	448
T/W [lbf/lbm]	150	55

Solar Electric Propulsion for Cargo Tug



NEXT Ion Thruster



Busek BHT-20K Hall Thruster



NASA 457M Hall Thruster

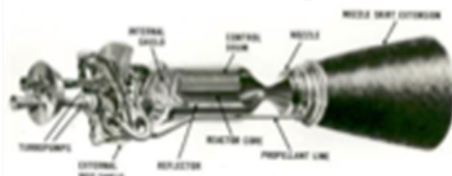
- Cluster of ~5 high TRL thrusters process 100 kWe solar power
- Next generation tug uses single high power thruster, such as NASA 457M
- Third generation tug uses nuclear electric propulsion at megawatt levels

	NEXT	BHT-20k	457M
Propellant	Xenon	Xenon	Xenon
Power [kWe]	7	20	96
Thrust [mN]	236	1080	3300
Isp [sec]	4100	2750	3500
Efficiency [%]	70	72	58

Nuclear Thermal Propulsion for Mars Stage



- NERVA derived technology
 - Total thrust ~ 60 klbf, using 2 to 6 NDR
 - Propellant: hydrogen, Isp ~ 930 sec
- ISRU or pre-deployed propellant for return mission
- Technology has been verified with >17 Hours of hot-fire tests, including restarts. No additional developmental, terrestrial tests (with nuclear) fuel are required.
- Extensive Russian knowledge can be leveraged.



LOX/Methane Propulsion for Ascent/Descent

- ISRU-derived methane will be used for ascent/descent propulsion
- Strong developmental programs currently underway at Aerojet, ATK/XCOR
- SpaceX Merlin 1 engine may be reconfigurable to for LOX/methane, providing a large (~100 klbf) GG cycle engine for ascent/descent



Aerojet, T = 5.5 k-lbf, Isp = 350 sec



ATK/XCOR, T = 7.5 k-lbf, Isp = ?

Successful innovation - key attributes

	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	✓			

Exercise 3: Ideation (15 minutes)

Objective 1: (10 minutes) 5 new ideas

Suggest 5 possible ideas for new products or services. Anything is permitted but **people in your team must have the resources and knowledge to discuss the idea realistically**. Record the ideas below.

Objective 2: (5 minutes) Pick your best idea

Pick the best idea from the 5 you came up with. Give it a **name**. Now summarise it in 100 words or fewer. This is your **pitch**. Record the **name** and **pitch** below.

Presenters, give your pitches ...

Everyone else .. show of hands for who thinks this is a good idea.

Exercise 4: Cost & Value (lunchtime or overnight, no more than 30 mins)

Objective: Estimate the cost of your idea and it's value to your client.

Be realistic. Do some googling if you have to, to estimate time required, cost of materials, cost of the labour.

Taking into consideration it's cost of manufacture and it's value to the client, **estimate what price you would sell it for.**