Graphene Technologies in Advanced Manufacturing

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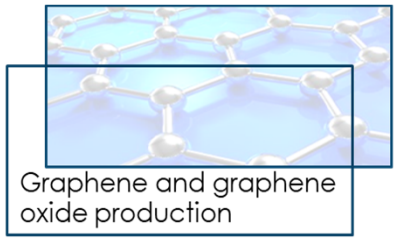
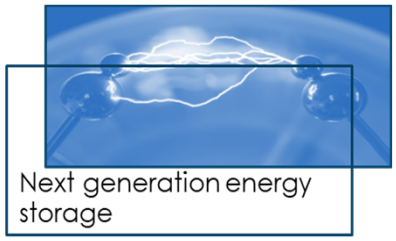
Simon Savage, Managing Director, Ionic Industries and Founding Director of the Australian Graphene Industry Association

Ionic Industries is a technology platform based on our unparalleled knowledge and research capabilities in the field of graphene materials. Leveraging the depth of talent in Australian universities, Ionic aims to commercialise university-born technologies in water treatment and energy storage applications.





The Australia Graphene Industry Association (AGIA) is a Peak Industry Body, established at the end of 2017, to represent Australian companies, researchers and community voices interested in the economic value that will be driven by graphene.

Advocacy, representation to government, standardisation, content and facilitation.

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What is graphene?

The strongest and hardest material in the world. Harder than diamonds and 200 times stronger than steel.

Amazing optical properties. A one atom thick sheet will absorb only 2.3% of visible light, making it transparent.

Graphene is exceptionally light and stretchable. Graphene weighs only 0.77 milligrams per square metre and is stretchable up to 20% of its initial length.

Completely impermeable. Even helium atoms cannot pass through it.

Very high thermal conductivity. 5 times the conductivity of graphite.

1,000,000 better electrical density than copper and conducts electricity close to the speed of light with virtually no resistance.

Chemically inert however it can “absorb” different atoms and molecules, leading to changes in its properties. Can be functionalised to create materials such as GO and fluorinated graphene.

Graphene is also capable of self-healing.

HYPE

Everyone is incentivised to promote the hyperbole around graphene

Media need stories

Universities and researchers need funding and publications

Brokers, companies and marketeers want to capitalise on the hype

Vs

REALITY

But reality is different

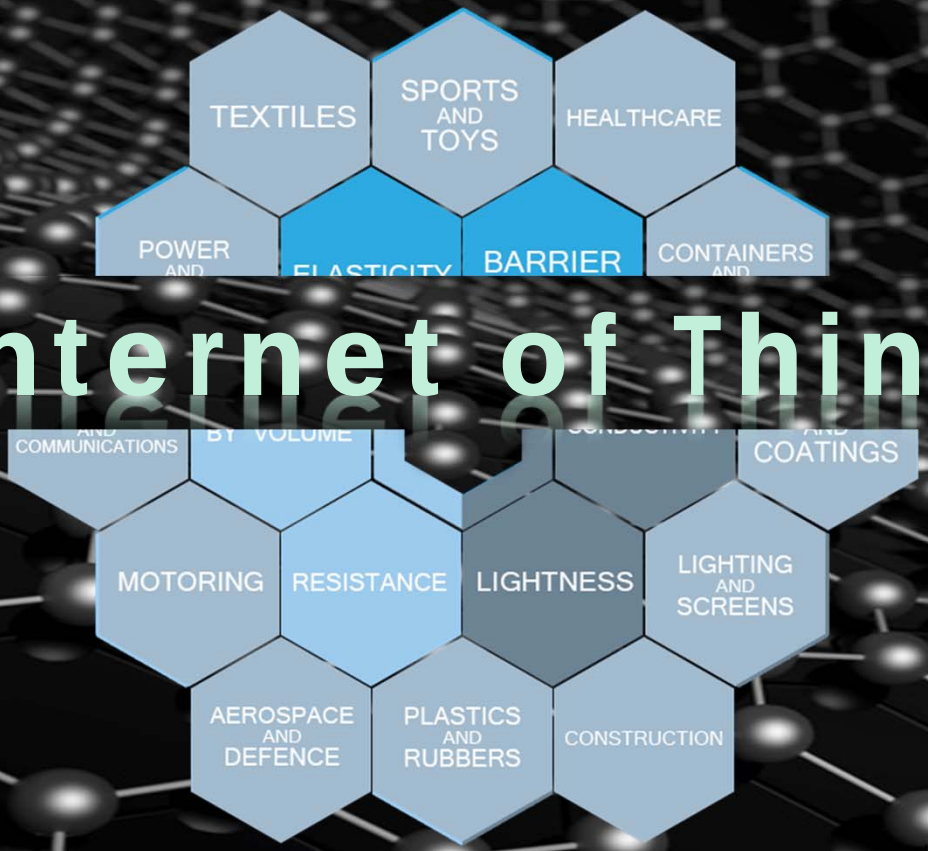
Research takes time

Scaled production is really difficult

Technologies, applications and knowledge must evolve

BUT HYPERBOLE IS NOT NECESSARILY FALSE

Internet of Things



https://www.thegraphenebox.com/graphene-applications-23

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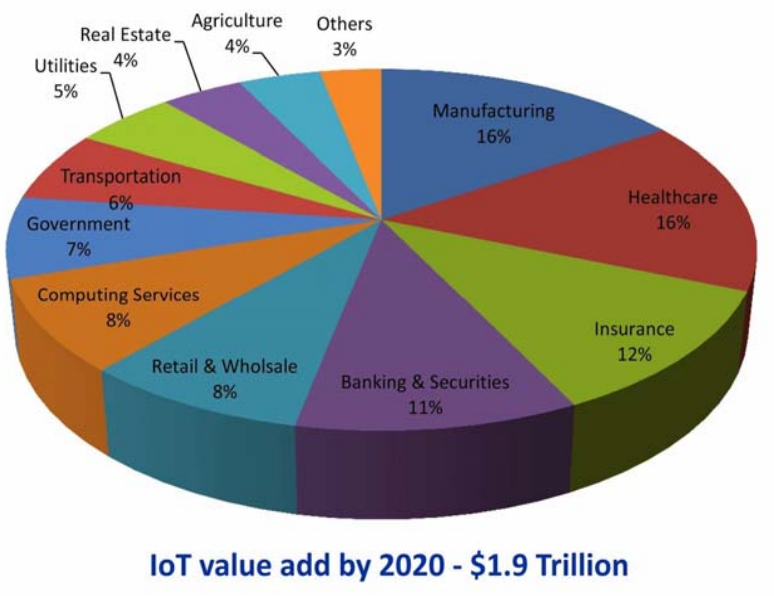
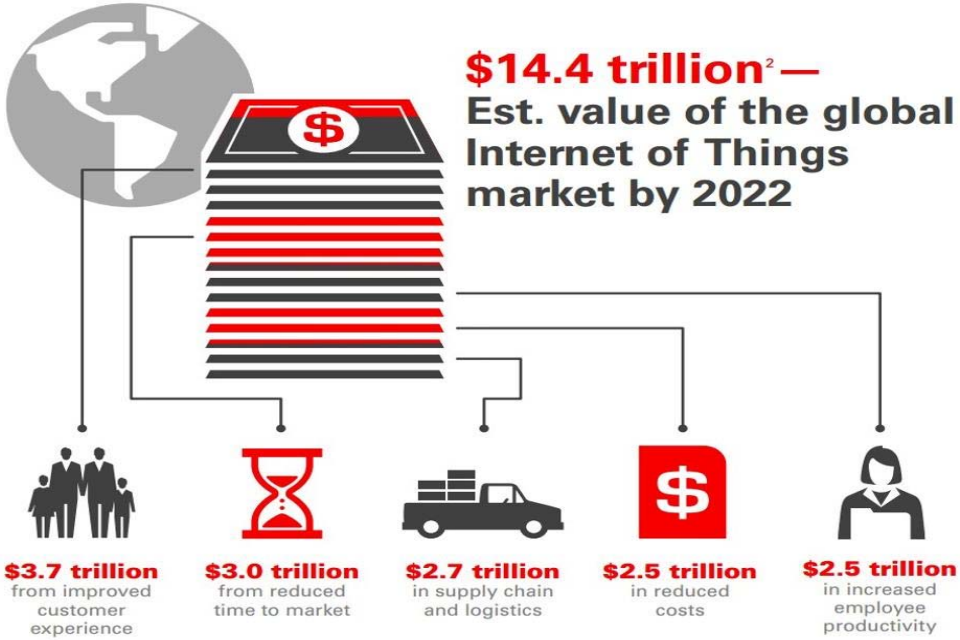
The "Internet of Things"



Gartner



Forbes

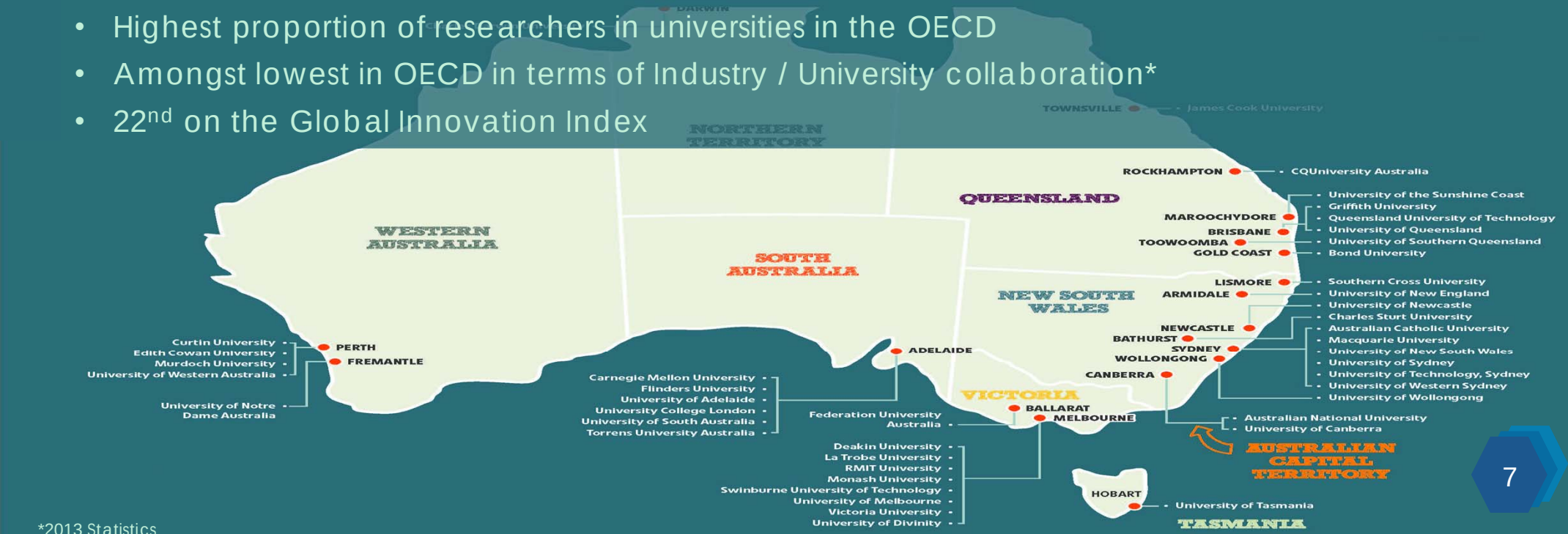
Cisco believes the market size will be $19 trillion by 2025. By comparison, world military expenditure is about $1.8 trillion.

Because graphene can be used to create "smart" objects, it will central to building out the technologies upon which the IoT is built.

The Opportunity: Australia's R&D Resources

While Australian Manufacturing evolves to leverage advances in additive manufacturing, digital manufacturing and robotics, there is an extraordinary wealth of graphene knowledge that can facilitate and strengthen of offering of Australian manufacturers.

- 44 Universities, the majority of which have some programs focused on graphene
- Highest proportion of researchers in universities in the OECD
- Amongst lowest in OECD in terms of Industry / University collaboration*
- 22nd on the Global Innovation Index



*2013 Statistics

There is much opportunity, but with opportunity comes risk

Extraordinary amount of work being done globally on graphene technologies – Manchester, EU Graphene Flagship, Samsung in Korea, Chinese companies for graphene production etc…

The challenge will be to leapfrog existing technology, not incrementally improve on it

Potential for catastrophic disruption if these opportunities are not pursued

IP protection and strategy will be critical to avoid conflict and mitigate risk of IP theft

"The 4th Industrial revolution is set to swiftly alter the competitiveness of nearly all industrial sectors across the world, as well as change long-held dynamics in commerce and global economic balance of power"

www.prnewswire.com/news-releases/industry-40-market-will-reach-214b-by-2023-300583073.html.

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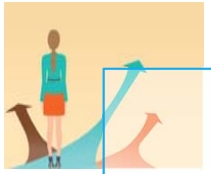
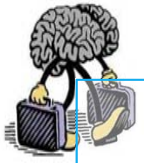
What can we do to realise this opportunity?

Collaborative consortia for R&D



Refocus and realign existing resources

Target global markets with high value manufacturing utilising graphene technology, particularly those technologies around IoT applications



Beat the brain drain by working to identify talent and incentivise them to stay in Australia

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Thank You

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