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How universities will get us to the future first

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MELBOURNE

It was the best of times, it was the worst of times...

A lively debate has broken out in social media in recent weeks: *could 2016 be the worst year of all time?*

In other words: out of all the 108 billion or so human beings who have ever lived, is this the very worst time to be alive that our species has ever known?

Raise your hand if you agree.

For my part, I think there's a stronger case for a year sometime around 72,000 BC – when a volcano on the island of Sumatra exploded with the force of 1.5 million atomic bombs.

It triggered a nuclear winter that devastated every living species and reduced the human population to fewer than 10,000 people.

Every one of the seven billion people on the planet today is descended from those ancestors. I'd say they probably had it worse than us.

I'd *also* say that those ancestors must have known a thing or two about agility, disruption and reinvention – or else we wouldn't be complaining about how bad things are on Twitter today.

Let's face it, our ancestors never planned for a nuclear winter. Nevertheless, they had skills that gave them the capacity to cope.

And that, to me, is both the pattern of history and the essence of being human.

True, we rarely face the enormity of an existential threat. But as a society, we are always preparing for a future we can't foresee. As individuals, we are always training for jobs we never expect to do.

No-one gets a cake walk through history, or through life.

And we don't have to look as far back as 72,000 BC to find human beings coping with things their parents could barely conceive.

Think of the builders of Silicon Valley. They didn't learn coding at school! Shock and horror, many of them didn't study IT! Their parents never put a laptop in their hands! In all likelihood, they never had so much as a desktop calculator.

But they weren't *unprepared* for the roles they stepped up to play in companies like Intel, Apple and Microsoft. They came to California with degrees in physics, engineering, and maths. And they saw new ways for that knowledge to be applied.

The best of them found success where it usually lies: in the places no-one else expects.

And that is why I say that the Factory of the Future is not just this building: but the institution of the university itself!

Every university worthy to be called a university can claim to be a Factory of the Future. That's how they get to the future first!

It's not by predicting it, but by *training the people who make it unpredictable*.

Which means that they have to be *adaptable*. Well trained students adapt to the jobs that are available. They transfer their skills. They capitalize on their core knowledge.

Success down winding paths

But perhaps you think that moving from engineering into management is a little too... easy. Let me raise the stakes.

Exhibit A: I give you the story of a commonplace electrical engineer.

He was born in London in 1899, the son of a greengrocer.

He learned his trade at the London County Council School of Engineering.

Then he got a job with a cable company – a telegraph cable company – and served a stint in the British Army's Royal Engineers.

So far, so boring.

But then this engineer started writing articles for the cable's company's in-house magazine.

He became intrigued by photography and got a script-writing job with a film production house.

From there, he pioneered sound recording technology. He made Britain's first sound feature film.

He went to Hollywood and made *Rebecca*. *Suspicion*. *Strangers on a Train*. *Rear Window*. *Vertigo*. *The Birds*. *Psycho*.

And so he became Alfred Hitchcock, Master of Suspense.

Many people have sought to grasp the essence of Hitchcock's genius over the years. But almost all agree, his art is inseparable from his instincts and training as an electrical engineer.

It was Hitchcock's habit to draw out every scene on paper, exactly as he imagined it, like the design specifications of a complicated machine.

He did it to nut out the technical problems that stood between the image in his head, and the picture on the screen.

Think of the final scenes in *Vertigo*.

Hitchcock wants to get his audience so dizzy, they'll be retching in the aisles!

But he's already hit the cap of the production budget – no more spare change for motors and slings to physically tilt and wobble the set.

So what does he do?

He comes up with the technique of zooming in with the lens... while moving the camera backwards... giving a sense of dizziness to the shot.

Masterful.

Exhibit A, ladies and gentlemen: Some would call Alfred Hitchcock a Director Extraordinaire. I'd call him a qualified engineer adapting his skills.

Exhibit B: the story of an occupational health and safety officer.

She graduated from Curtin University ready to start a career in Occupational Therapy.

Then she worked for a few years in workplace health and safety organisations, before joining Rio Tinto in 2001.

Today she controls all of Rio Tinto's remote operations in the Pilbara, from the remote operations centre in Perth.

Let me give you some sense of the challenges she confronts every day.

- The Pilbara operation includes 15 iron ore mines, four port facilities and railways 1700 kilometres long.
- It has the world's largest fleet of self-driving trucks.
- It is building the world's first self-driving heavy haul trains.

All of this activity is coordinated day to day from the operations centre in Perth. An operations centre that makes the NASA control room in Houston look modest.

And the operations are expanding. The next generation technologies are coming online. The environmental footprint is shrinking.

All the while, the iron ore price ricochets around the global market, and the Operations Manager just carries on.

Her name is Kellie Parker, and I met her in Perth this month.

It turns out that occupational health and safety was the ideal training ground for the job.

The essence of the Pilbara operation is the integration of the human and the machine: to understand how the one can boost the other.

Exhibit B, ladies and gentlemen: the human resources path into high-tech industry.

So there are two examples – and if we thought about it, we could see that there are many thousands more.

The lesson I take for the university is simple.

We cannot know in detail what the jobs of tomorrow will require.

We can't even make graduates 'job-ready' for the wealth of opportunities they might want to pursue today!

Next time somebody throws the 'job ready' phrase at you, invariably in a negative context, retaliate that your role is to train graduates who are 'job capable'.

‘Job ready’ graduates might not be adaptable, and run the risk of being left behind in the ebb and flow of technology driven disruption. ‘Job capable’ graduates will ride the tides, as you would want them to do.

We certainly cannot expect to place every engineer into engineering, every lawyer into law and every scientist into research, with the neatness that economists always demand. (And would it be inappropriate to mention, as an aside, that only 5% of economics graduates work in economics?)

As long as a perfect match of discipline training to career is the social expectation, we will work very hard to fall forever short of a goal it is simply pointless to pursue.

What we offer instead is something worth having: the capacity to adapt to change – and the appetite to bring it about.

Our challenge is to *explain* that mission, and to *excel* at it: and we won’t achieve either unless we do both.

The momentum for change

Perhaps it might be easier with the encouragement of a nuclear winter and the collapse of civilisation to focus people’s minds. But let’s hope that won’t be required.

If any institution is equipped to help our society imagine the future, it is the university.

I am a great supporter of the sector as it has evolved in Australia.

So when the Prime Minister gave me the task of travelling round the country, inspecting our national research infrastructure, and drafting the Roadmap for its future...

... well, it’s a tough job... but someone’s got to do it.

And it's great! Everywhere I travel, I am reminded that we have:

- Entered the era of massification with our reputation intact!
- Built the nation's largest export service industry, in international education!
- And achieved genuine critical mass within constrained – and often contingent – resources.

This outstanding facility at Swinburne is a prime example.

All of the separate bits of equipment here could be found on a larger scale somewhere else.

Swinburne's genius is to bring them together: not just from drawing board to delivery, but from concept to clean-up.

In one location, we can visualise, design, prototype, fabricate and then recycle the materials.

It is a hothouse for new products and processes – as well as the people who make them.

And it reminds me that our Vice-Chancellors and senior academic leaders are some of the most enterprising people in the country.

- They are great optimists.
- They are relentless optimisers.
- And I mean this nicely: they are inveterate opportunists.

I'm in favour of all three.

Re-setting the incentives

To the extent that I have my gripes... they stem from the very rational responses of very capable leaders to very unhelpful incentives.

Let me offer two examples.

Classic example 1: lowering the bar for maths pre-requisites

As of August 2015:

In Science:

- Only 11% of Australian universities require at least intermediate level maths
- 12 of the 38 institutions offering the degree do not have any formal maths requirement at all!
- Swinburne splits the difference: any level mathematics is sufficient for entry to science.

In Engineering:

- Only 56% of universities require at least intermediate level mathematics (and I am pleased to report that Swinburne is one of them).
- 1 university (Murdoch University) does not include mathematics at any level for its course entry requirements.

And the second classic example: the stubbornness of gender imbalance

As we know, the underrepresentation of women in senior academic leadership roles is an enduring problem across the world.

But correct the incentive structures, and we put the opportunistic instincts to work – to typically impressive effect!

We see universities clamouring for admission to the Athena SWAN Australian pilot!

The Athena SWAN Charter is an evaluation and accreditation framework that has been operating in the UK for 10 years

Participants can seek accreditation at Bronze, Silver or Gold level, based on demonstrated improvements in gender equity.

The Athena SWAN charter was brought to Australia last year by the Academy of Science and the Academy of Technology and Engineering.

There are 32 founding Australian Charter members, including 25 universities (half the university sector), each of them paying significant amounts for the privilege of being in the pilot program.

And by tackling this problem at universities – the engines of social change – we'll set the pace for the rest of the nation.

So my job is not to present you with the game-plan for this University – but to help the Government to re-set the game.

How can a win for Swinburne be a win for the country, every time?

I won't say there has never been a better time, but I will say that the opportunities of: a new Minister, a newly re-elected government, and an upcoming Commonwealth Science Council meeting are too good to ignore.

So I am finalising my own plans for the next three years, with every expectation that much can be achieved.

My plans include:

- 1) This year's priority: the Research Infrastructure Roadmap.
- 2) Supporting the ARC in the development of impact measures.
- 3) Working with the sector to scale up the provision of work-integrated learning.

A model that I am keen to pursue is the French CIFRE program:

- 10% of French PhD student undertake their project as an employee of the company, whilst maintaining links to academic supervisor
- Students sign a 3 year full time work contract with a good salary (minimum 28,000 Euro in 2012)
- Established 1981, more than 20,000 participants to date
- Run by the French Ministry of Higher Education and Research

Conclusion and challenge

There is opportunity writ large here for a university like Swinburne. I welcome your contribution.

And I hope we'll tackle the task of re-invention with a bit more enthusiasm than the journalists have thus far.

After all, we survived the winter of 72,000 BC.

We've now got three times as many students enrolled at this university alone, than the entire human population post-apocalypse.

If it ever gets that bad again, I'll agree we have a right to complain.

But in justice to our ancestors, and in fairness to our descendants – I say no excuses for inertia in 2016.

There's a much better future on the factory floor today.

THANK YOU