Zooming Out

Trends and drivers impacting the health sector over the coming decades

Stefan Hajkowicz
What’s a Megatrend?
“the best way to anticipate change in your sector is to spend some time outside of it” – Michael Cameron

“... CSIRO identified the impact on office towers and shopping centres of: technology; ageing; and the need for more efficient energy sources ... and how e-commerce would boost demand for logistics property. Cameron has followed the advice with a big push into that sector”.

Photo of Michael Cameron, GPT CEO by Louie Douvis
Healthcare Megatrends

- Innovation Imperative
- Reality Bites
- Online burnout
- Forever Young
- Intelligent machines
- Data Driven
- Burning Platforms
Why a Venn Diagram?

Each area of overlap tells a unique story about the future

- Ice Cream
- Children
- Car Trip

Questions:

- Does the strategy perform in most/all areas of overlap?
- Take normal care
- Effective strategy not yet identified by humankind
- Use activity books and games
- Use serviettes
1. Demand Growth

The growth and continued growth in demand for healthcare services and innovations to improve the efficiency and effectiveness of services.
Queensland State Government Healthcare Spending

One scenario we generated (with sustained growth in health spend and low growth in revenue) sees the entire government budget spent on healthcare by 2080.

Obviously this can’t happen. But we need to innovate.

Data Source: Australian Institute of Health and Welfare
Individual Healthcare Spending, Queensland

Average year-on-year growth of 3.66% compared to average annual Queensland GDP growth over the same time period of 2.86%

Data Source: Australian Institute of Health and Welfare
Australian Government Health Spend, Percent of Tax Revenue

Data Source: Australian Institute of Health and Welfare
Innovation to Keep People Out of Hospital - Telehealth

The CSIRO National NBN Telehealth Trial

A selected test group of 150 patients suffering chronic conditions with frequent hospital admissions used stay-at-home tele-monitoring for 276 days. The test patients were found to have a:

- 46.3% reduction in medical expenditure
- 25.5% reduction in pharmaceutical expenditure
- 53.2% reduction in unscheduled admission to hospital
- 67.9% reduction in length of stay when admitted to hospital
- 41.3% and 44.5% reduction in mortality relative to control patients

The control group (300 patients) showed no significant change in these variables.

Branko Celler et al. 2018. Studies in Health Technology and Informatics
The haptic workbench

Image by North Sullivan Photography / CSIRO
An extra $10/person saves 9.1 lives per 100,000 equating to 27,000 avoided deaths per year yielding $213 billion in benefits and over $100 of benefit for $1 invested.

The pandemic of physical inactivity

“Physical inactivity is the fourth leading cause of death worldwide”
- Prof Dr Harold Kohl et al., 2012 The Lancet

In Australia Physical inactivity is main cause for 21–25% of breast & colon cancers, 27% of diabetes and 30% of heart disease.

Only one-third of children undertook the recommended 60 minutes of daily physical activity.

60% of Australian adults did less than the recommended 30 minutes of moderate intensity physical activity per day.

- Australian Government, Department of Health

Source: Australian Bureau of Statistics (ABS) 2013 - Australian Health Survey: Physical Activity, 2011-12. ABS Catalogue number 4364.0.55.004
Females are 1.43 times more likely to ride to work if there’s a bicycle path (Garrard et al, 2008, Preventative Medicine)

Comprehensive study of 90 large US cities found commuters more likely to ride (than drive) with bicycle infrastructure (Dill and Carr, 2014. Transportation)
Working Smarter (Not Just Harder)

A high tech digitally enabled economy rewards intelligence more than brute force

Experiments in Sweden, reducing the work week from 8 to 6 hours tested by:
- Svartedalens elderly care home
- Internet startup, Brath
- Filimundus App Developer
- Stockholm city council
- Toyota service centre in Gothenburg

Source: OECD Statistics
2. Forever Young
The Ageing Population – Australia

Today we’re some 14% over 65 yrs old

It will be 25% by 2050

Data Source: Australian Bureau of Statistics
36% of Japan’s Population Over 65yrs by 2050

Source: Japan National Institute of Population and Social Security Research, Population Forecasts
Average Retirement Age
Is on the Rise

As of June 2013
Australia’s entire workforce had a $727 billion shortfall for a comfortable retirement.

- Rice Warner Actuaries

Data source: OECD, Ageing and Employment Policies - Statistics on average effective age of retirement
Forecasts of the Dependency Ratio in Queensland

Portion of population aged 0-15 and >65 years old grows from 35% to 39%

Worldwide Obesity Prevalence Rates

“In 2010, overweight and obesity were estimated to cause 3.4 million deaths, 3.9% of years of life lost, and 3.8% of disability-adjusted life-years (DALYs) worldwide”

The Lancet 2014 384, 766-781. Ng et al.
3. Intelligent Machines
Artificial Intelligence

Mojave Desert, California
DARPA Grand Challenge, Race Day 2004
Image source: Wikimedia commons, DEXTER
Previously Unidentified Type of Dog
Reaching Further into Human Tasks
From recognising faces to recognising emotions – the Microsoft Azure Emotion API

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>0.0%</td>
</tr>
<tr>
<td>Contempt</td>
<td>0.0%</td>
</tr>
<tr>
<td>Disgust</td>
<td>0.0%</td>
</tr>
<tr>
<td>Fear</td>
<td>0.1%</td>
</tr>
<tr>
<td>Happiness</td>
<td>6.6%</td>
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<tr>
<td>Neutral</td>
<td>0.6%</td>
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<tr>
<td>Sadness</td>
<td>0.0%</td>
</tr>
<tr>
<td>Surprise</td>
<td>92.7%</td>
</tr>
</tbody>
</table>
We tried being happy – and nailed it
We tried being surprised – only Hien could do it. Me & Wen looked happy.
Impacts of Automation on the Workforce
Could it be 47% of all jobs are done by a robot?
But don’t Worry - Marovec’s Paradox is Here to Help

The Berkeley Robot for the Elimination of Tedious Task (Brett) by Prof Abbeel at UC Berkley. Image source: Youtube
Bifurcation of Labour Markets

Two Jobs in the Australian Photographic Industry

Employment ('000s)

- Photographers
- Developers/printers

Casualization of the Workforce

Share of total workforce in tenured* jobs: 51% (2012) vs. 50% (2017)
Share of workforce in part-time jobs: 30% (2012) vs. 32% (2017)
Share of <30 year olds without fulltime jobs: 43% (2012) vs. 40% (2017)
Share of workforce without paid leave entitlements: 24% (2012) vs. 25% (2017)

Source: Centre for Future Work, ABS
Not Everyone is Making the Transition

Working Age Males in Australia, Labour Force Participation Rate

4. Data Driven
Everything suggests this trends upwards. For example, by 2025 genomics is forecast to produce between 2-40 exabytes per year – dwarfing twitter, youtube and astronomy.
Demand for Improved Services

Complaints by Australians about broadband connections to the telecommunications ombudsman

Data source: Telecommunications Industry Ombudsman
Connectivity Versus Growth – OECD Countries

Unravelling the Relationship Between Digital Connectivity and Economic Growth

Source: OECD Statistics
According to a recent IDC Report worldwide revenues for big data and business analytics (BDA) reached $150.8 billion in 2017, an increase of 12.4% since 2016
Data Scientists are in Demand

Who ever thought of being a data scientist at school? By 2020 the number of jobs for all data professionals in the United States will increase by 364,000 openings to 2,720,000 (IBM Forecast)
Sources of Cognitive Bias that Robots Don’t Have

1. Bandwagon effect
2. Implicit favourite bias
3. Recency bias
4. Asymmetric risk preferences
5. Confirmation bias
6. FOMO, fear of missing out

... And the list goes on >100
5. Burning Platforms
Burning Platforms - Rethinking the Theory of the Firm?
Ronald Coase working in 2003.
Photo taken at and by University of Chicago Law School. Wikipedia.
New Business Models

Amazon Spent AUD$30.1 Billion on R&D Last Year

Australia spends AUD$34 billion/year
Distributed Ledger Technology
New Models for Finance

DLT and Money – Is there a change happening?

Withdrawals at Australian ATMs

Price of a Bitcoin (Australian Dollars)

Data source: Reserve Bank of Australia and Google Finance
Blockchain and Pharmaceutical Product Provenance

The trade in counterfeit pharmaceuticals is worth US$163 to US$217 billion/year. This trade harms and kills millions of people per year (PWC Strategy&).
6. Online Burnout
Approximately one in five young people in Australia under 18 (20%) reported experiencing online bullying.

Source: Australian Government, bullyingnoway.gov.au
Data breaches – Per capita costs, Australia

Source: IBM Security and the Ponemon Institute; 2017 Cost of Data Breach Study
New Vulnerabilities in Cyber Physical Systems

In a demonstration cyber attack on a popular commercial car researchers were:

“In a target vehicle, at low speeds (5-10 mph) [able to]:
  • Engine shutdown
  • Disable brakes
  • Steering

In a target vehicle, at any speed [able to]:
  • Door locks
  • Turn signal
  • Tachometer (motor rotation speed)
  • Radio, heating ventilation air conditioning, GPS”

Quote taken from Federal Bureau of Investigation (FBI)
Alert Number I-031716-PSA issued 17 March 2016
EU antitrust regulators fined Alphabet (Google) 2.42 billion euros for favoring its own shopping service in searches.

TechLash

European Competition Commissioner Margrethe Vestager on 27 June 2017 in Belgium.

Source: Reuters Business News
Heightened Privacy Awareness
The New World of Online Manipulation

James Comey testifies in front of the Senate Intelligence Committee during hearing in the Hart Senate Office building June 8 2017 in Washington DC
7. Reality Bites
And people still like the physical world...

Despite ever growing virtual options

Percentage of Australian Population Visiting a Cultural Venue (per year)

<table>
<thead>
<tr>
<th>Venue</th>
<th>2006</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Museums</td>
<td>23%</td>
<td>28%</td>
</tr>
<tr>
<td>Libraries</td>
<td>34%</td>
<td>34%</td>
</tr>
<tr>
<td>Cinemas</td>
<td>65%</td>
<td>66%</td>
</tr>
<tr>
<td>Total cultural places</td>
<td>85%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Australian Bureau of Statistics: 4114.0 - Attendance at Selected Cultural Venues and Events, Australia
The Experience Economy 2.0

Is it really just $C_8H_{10}N_4O_2$?
THE GREEK SPOT
GREEKGATEWAY.COM

we don't have WIFI!

eat, drink and talk to each other.
The Data61 Insight Team
Research excellence combined with business relevance

Please connect with us @stefanhajkowicz
Thank you

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