The future is here

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WE ARE LIVING in the future.

No, seriously … we are, it is true!

What was once mere ideas introduced to us through the minds of science-fiction writers has now materialised in the world around us.

Depending on your age and how strict your parents were when you were kids, you would have watched TV shows such as *Star Trek* and *Doctor Who*. While we may not yet have sonic screwdrivers or quantum transport, we have plenty of examples of technology that has materialised from the sci-fi genre. The concept of a door that opens automatically was revolutionary when it first appeared on our TV screens; now we commonly automate inanimate objects much more complex than a door. When my house still had a dial telephone and the TV remote control was either myself or my sisters (yes, we were the ones who changed the channels and the volume at our parents' behest), the film *Aliens* introduced me to the concept of a phone with an in-built TV screen allowing you to see in real time the person you were speaking with; now we link up with people all across the globe in a live video-chat without giving it a moment's reflection.

In a relatively small amount of time, we as individuals, as society, businesses and corporations have embraced technology. We almost take it for granted, and thanks to the consumerisation of technology, devices are now affordable and all pervasive.

It was a mere 28 years ago when my Dad surprised Mum with her 30th birthday present — a VCR! (Well, actually, Dad —bless him — really wanted the VCR and gave my Mum the choice of either a wall unit or a VCR. My Mum, in her infinite wisdom, chose the wall unit and after Dad realised he couldn't get her to change her mind, he was extra generous that year and bought her both gifts.) We were the first family in our town to have a VCR and it was very expensive — they were almost $1000 when the median wage was only $300/week, and now you can't give those devices away. When large screen, flat televisions came out in the late 1990s they were $30,000, and now you can pick them up for less than $1000.

I have loved technology from an early age. My fascination comes not from the 'gadgetry' but from the efficiency benefits technology affords me, and the fact that information technology is enabling the democratisation of knowledge. It is the great leveller.

I literally have the world in my back pocket. The world sits on a device that only a few years ago was only capable of making and receiving phone calls. Instead of that old dial telephone in my parents' house, I now have a phone that is my connection to the entire world. And what's more is that I expect it to be there, to always work and to do a bunch of different things for me. Our expectations of technology have vastly changed in the last five years — just ask a 15-year-old to adopt a piece of technology that is a single-function device and watch their facial contortions as they try and work out if you are serious and doubt your mental acuity.

Our ability to access the world's information, connect with people, build our communities, share ourselves, our minds and our ideas with the world is simply awesome, in the true sense of that word.

Healthcare — the only industry stuck in the technology dark ages?

I work in healthcare. Healthcare is, disappointingly, not living in the future yet. It is an industry that has embraced technological medical innovations, but has not embraced technology for capturing and sharing the information of healthcare.

Health technology is my obsession. I am the CEO of the Health Informatics Society of Australia, which means I get to advocate for the transformation of healthcare through technology and information, and to support the health ecosystem. (Yes, I do have the coolest job!) I am an occupational therapist by training and have a PhD in health informatics. The reason I do what I do is because as an undergraduate I was astounded at how inefficient and dangerous our healthcare system can be. Healthcare professionals are intelligent, caring people who go into the profession with altruistic motivations. They dedicate their lives to helping others. And yet, the system we expect them to work within doesn't equip them with the tools that ensure they have access to the right information, at the right time, at the right place. The result of not providing timely and accurate information can be catastrophic for individuals and for our economy — death, disability or injury from preventable errors are familiar,[1] and the costs of medical errors in Australia are enormous, estimated at more than $2.2 billion per year.[2]

Health informatics is that space at the intersection of technology and healthcare. It is a scientific discipline and a profession that is concerned with managing healthcare information to improve efficiency, productivity and, most importantly, deliver safer, better quality health outcomes. It is 2014 — we should be managing healthcare information using technology.

Healthcare is an information intensive industry. Each year billions of transactions occur in the healthcare system and by far the majority of these transactions are recorded on paper. We

record the information of healthcare on bits of paper: we have very little visibility of the integrity of that information; patients are required to fill out bits of paper, usually multiple times, capturing the same information; clinicians often don't have access to those bits of paper; and no one — not the patient nor the healthcare professional — has access to the complete healthcare record. Healthcare professionals don't share the information with each other because the healthcare information is kept in silos. Faxes — a technology that transfers a piece of paper and beams it (almost *Star Trek* style) to a fax machine in another location over a copper wire — are the most sophisticated technology we regularly use to manage healthcare information.

This is not good enough. It is crazily inefficient and alarmingly dangerous. Moving to a model where we collect, store, manage and share the information of healthcare in interoperable, secure, reliable, electronic formats represents the single closest thing we can do to increase the efficiency and safety of healthcare. Health reform is just not possible without e-health.

The good news is that the future of healthcare does look better than current realities. We are moving from a system that focuses on acute care and sickness to a system that focuses on wellness, where care is delivered in the community and in the home instead of large, expensive buildings. We are also progressively changing the power dynamic to one where the patient is a valuable and empowered member of the healthcare team. And technology innovation is enabling this to happen.

Healthcare technology trends

> (what) will emerge (is) a profound transformation of healthcare that will make the vision of Star Trek and Fantastic Voyage seem almost mundane.
>
> John Nosta, *Forbes*, 2013[3]

Let me give you a taste of some of the trends and emerging technologies which are reshaping healthcare and which you will hear more about in 2014 and beyond.

The consumer

It was not so long ago that conversations about the role of consumers/patients in healthcare were along the lines of 'baby-boomers wouldn't be prepared to settle for what our grandparents did and would change healthcare delivery through their sheer numbers and their raised expectations of healthcare delivery'. Now the conversation has radically shifted; thanks to technology, connectivity and information ubiquity, consumers of all ages and backgrounds are changing the nature of healthcare delivery. Consumer technologies such as the internet, social media, and self-tracking devices are empowering patients with information like never before. E-patients are leading the change and healthcare organisations and professionals need to adapt.

Crowdsourcing a cure for brain cancer: Consider the case of Salvatore Iaconesi.[4] Salvatore's response to his brain cancer diagnosis turns the 'medical establishment' on its head. He digitised his health record and put it online in various formats to seek advice and information from everyone and anyone. His website, 'the open source cure',[5] had hundreds of thousands of contributions, and his treatment plan is based on the synthesis of all that information. He has since started a worldwide movement on finding an open cure for cancer.

Data — big data and using small data better

Healthcare is an information intensive industry. Healthcare providers are increasingly finding themselves needing to analyse the data they capture in order to produce the intelligence that determines the effectiveness of their interventions. Governments' and funders' needs for data will intensify as they determine where to invest their healthcare budgets. We need to use the

small, localised data sets better, but the demand for data intelligence from increasingly larger data sets will continue to reshape healthcare.

The *raison d'être* of this field is the use of data to produce healthier outcomes — on both a personal and population scale. However, big data is also big business. Projections are that, come 2016, half of hospitals will be using advanced analytics software.[6] This is a far cry from where we are at now, so this field is set to grow exponentially.

Personalised medicine

Personalised medicine won't just transform healthcare, it will transform how we live.

Personalised medicine allows the medical care an individual receives to be tailored specifically for them. This includes the advance of genomics and pharmaceuticals so that the pill you take for condition X will work better for you than it will for others with a vastly different genetic makeup than you. An example of this is the discovery of blood biomarkers that could make personalised drug treatments for depression a possibility.

Whole genome sequencing — something we have heard very little about in Australia — is available to anyone. And it isn't government leading the charge or healthcare providers, but corporations. Companies are leading the charge, and the cost of having your genome sequenced is becoming an affordable service for many.

Consumer-tech meets health-tech and it's mobile

Wearable sensors in our clothes, sheets, shoes, and so on will increasingly become available. Microchips barely detectable by the human eye will ride through your body using an ingested pill as their vehicle of choice. Sensors that monitor our biological processes from within our bodies and on our skin will soon become a given. A US company that manufactures 'stretchable electronics' that can stick on your skin and measure heart rate,

brain activity, body temperature and hydration levels has raised $10 million in venture capital to bring these technologies to market.[7] A movement known as the 'quantified self' is based on using technology to collect information about your own health status and to use this information to manage your health and wellbeing. Remember the days when you had your blood pressure checked once a year during your annual check-up at the GP? Well, now your watch can detect your blood pressure constantly, learn your trends and alert you if there is anything you should be concerned about.

The Consumer Electronics Show (CES) is an electronics and technology tradeshow. The annual event, held in Las Vegas, attracts 140,000 people from all around the world. The VCR debuted there in 1970 and it took 13 years before that technology was in most people's homes. In a nod to health technology 'going mainstream', the past two years have seen CES focus on health-related technology innovations. In 2013, the US$10m Tricorder X Prize was announced. The prize challenges researchers and innovators to devise a *Star Trek*-like device that can measure key health metrics and diagnose a set of 15 diseases; the first Tricorder device is set for release in March 2014. The focus at CES 2014 was consumer health technology — the majority of which will be available for commercial purchase by the end of the year. I will certainly be lining up to get the headphones that will measure my heart rate while exercising!

A convergence of great minds, great thinkers, technological advancements and empowered healthcare consumers

As with all great revolutions, they are precipitated by convergence: a convergence of forces that serve to make a time in history remarkable through the change it heralds.

In healthcare this convergence comes in the form of the rapid advancement in technological innovation that captures

data produced by e-patients, by the healthcare system, and by our own genome. It will then enable that data to be transformed into information and knowledge that can be used and shared for the benefit of human health and wellness.

Delivering on the promise of technology innovation and healthcare informatics improving healthcare

> Ideas are worth nothing unless executed. They are just a multiplier. Execution is worth millions.
>
> Derek Sivers (entrepreneur), 2005[7]

The idea is a simple one. Let's give healthcare professionals access to information so they can have the best chance of saving our lives, and let's make sure patients can contribute to and have access to their own health information so they have the best chance of staying healthy and well.

So, what will it take to transform healthcare; to see and experience a real shift in how healthcare information is managed and how healthcare is practiced? Technology, you are probably not surprised to learn, is not the barrier — it is the enabler, the tool for information exchange.

Transforming these ideas into reality requires people to change. We need healthcare professionals to be trained in the science of health informatics during their undergraduate years and to continue that learning throughout their professional lives. We need to increase health literacy among the general public, empowering them with their own health information. We need to transform the business model of healthcare. We need governments and healthcare institutions to be brave and to see investment in technology as an economic reality, as necessary to deliver safe, high quality, efficient healthcare. We need to create a healthcare system that truly embraces the value of information, and that understands that saving someone's life starts with making sure healthcare professionals have access to

the information they need, when they need it. We need to be honest; that it is unethical to continue to let people die and suffer the 'adverse consequences' of a healthcare system that cannot effectively manage their healthcare information.

E-health was one of the eight pillars of health reform in the previous Labor government. They didn't get it all right, but a lot of great work has been done on establishing the technology infrastructure we need to deliver a personally controlled electronic health record. Our incoming Federal Government has not yet made their intentions known, and a review into e-health is ongoing. As an industry we are optimistic — the trends speak for themselves and the future looks promising.

Endnotes

1   RM Wilson et al., 'The Quality in Australian Health Care Study', Medical Journal of Australia, vol. 163, no. 9, pp. 458–471.

2   RA Smallwood, 'The safety and quality of health care: from Council to Commission', *Medical Journal of Australia*, vol. 184, 2006, pp. S30–S40.

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