11 Predictions

11.1 Introduction

In my book "The future of wireless communications", written in 2000, I said of 2020 that we would have delivered almost all the services and technologies that we could envision that we need. After that would come a period of slower change, partly because there was no need for new concepts, and partly because society would need time to digest all the new tools at its disposal. This appears prescient to me.

Overall, my prediction for the digital future is "not much change". That might strike many as ludicrous. We are told daily that the world is changing at an ever-faster pace. Some predictions for 30 years hence talk about transmitting emotional states and having buildings with living fabrics. Autonomous cars and AI are just around the corner it appears. 5G will appear shortly when we are promised a step-change in all we do. "Not much change" flies in the face of conventional wisdom, of recent experience, of what we hear daily.

I hope that in reading this book you have understood why I have come to these conclusions. I hope that my track record of forecasting in this area gives you some confidence that my views might have merit.

With that, here are my views on what the world will be like in 2027, 2037 and 2047.

11.2 The world in 2027

Before looking forward ten years, I look back ten, to remind us as to how much can change in a decade. 2007 was a pivotal year - it saw the introduction of the first iPhone. That has led to a huge revolution, making data connectivity on the phone valuable and leading to endless apps. It gave a huge boost to Twitter (created in 2006) and eventually to Facebook and YouTube as data networks

improved. It allowed many of the concepts foreseen by me and others such as using a phone as a boarding pass and finding a nearby Starbucks. Software in the phones improved massively including intelligent agents such as Siri, making many tasks much simpler. It has changed behaviours significantly, for example on trains most used to read newspapers, now most look at their phones. Indeed, many continue to look at their phones while walking down the street and when in the toilet! Of course, we had mobile data connectivity 20 years ago, but the last 10 has made it useful and accessible.

Home broadband connectivity also improved massively, from a stage where only the very lucky few had a Mbit/s to one where 50Mbits/s is quite normal, and some can go much higher. Home Wi-Fi is much better - faster, more reliable, able to connect more devices and with better range. But the home itself has not changed much, other than connected HVAC controllers for some. Nor has transport other than the ability to stay connected on trains and planes.

Computers, laptops and the Internet have remained very similar both in form-function and in capabilities. Most of our jobs have remained the same and are conducted in the same manner (still too many meetings).

So, to many, a decade of a lot of change, but primarily triggered by one event - the ability to use data effectively on a mobile device. Is there another such event coming in the next decade?

I believe there is a similar event - the ability to simply and cheaply connect IoT devices wherever they are. But this will be much less noticeable, leading to a slow improvement in reliability, functionality and productivity. Unlike the iPhone that was everywhere within a year, the IoT will take more than a decade to gain widespread penetration.

Looking at the bigger picture of enablers and developments, 2027 will see:

- IoT connectivity becoming more prevalent but primarily in business activities such as manufacturing and agriculture, resulting in improved productivity but little change in daily lives.

Predictions

- AI will become very good at specific tasks. Areas like language translation and speech recognition will be excellent, and the "virtual assistant" function that devices are starting to provide will be very effective. Adverts will become highly targeted online. But AI will not have transformed the world.
- Connectivity will appear to be perfect. Mobile and broadband networks will provide much greater speeds than we need, and the most prevalent not-spots such as on trains and in buildings will be mostly filled in, often with Wi-Fi. But, apart from coverage, networks are already often at the point of appearing perfect, so this is not a major change.

For the individual the virtual assistant will be much more powerful, suggesting entertainment, filtering and in some cases auto-responding to messages, planning travel based in calendar appointments, providing personalised news feeds and more. This will not enable anything new that was not previously possible, but will make some tasks much simpler, or indeed automatic, such as finding the best insurance deal when due for renewal. However, the handset, and indeed other communications devices, will remain much the same, basically consisting of a touch-screen in an outer case.

Homes have not changed much in the last 10 years, and are unlikely to do so in the next ten. My predictions are:

- Automated home HVAC systems will become ubiquitous during which time they will also gain the intelligence to adapt automatically to the diaries of the home occupants.
- Smart speakers such as Amazon's Echo, will be widely deployed within five years, but mostly used as a kitchen radio.
- Most innovation will occur at the device and the individual level rather than at the home appliance and household level.

The office potentially will see much more digital because it makes commercial sense. However, we might not notice since the aim is not to add new functionality but to reduce maintenance costs. Specifically:

- IoT will progressive be deployed in lights, plants, waste bins, coffee machines and more, starting within 5 years and throughout the coming decade.
- Biometrics will be progressively used to open doors and enable IT systems, starting almost immediately completing by 2027.
- Robotics will make some impact, with robotic vacuum cleaners and possibly other solutions to tasks that need to be performed daily. This will only just be starting to occur by the end of our time period.
- IT in the office will nearly all go away as BYOD predominates. This is already happening and will complete within 5 years. Even conference room IT systems will broadly disappear with simple TVs/projection units left for slideshows.
- Of the major employment sectors agriculture will see some steady productivity improvements continuing current trends, vehicle maintenance will grow, retail will continue to decline at approximately its current rate, construction and hospitality will be largely unaffected, and manufacturing will see ever-growing penetration of robots on the production floor.

Regarding transport my prediction is very little change. There will be better on-board connectivity – we are already well on the way to achieving this and it will broadly complete in the next 5-10 years. We will have simplified ticketing and payment – again this is already in place on some transport systems (eg buses and underground trains in the UK) so extending it to other areas is a relatively minor task.

For leisure I predicted that:

- Each form of leisure will get its own specialised digital enhancement from the equipment used through to the supporting websites and apps. This will burgeon over the next decade.
- Digital entertainment such as games will continue their steady growth towards ever-greater realism and complexity, adding voice control and other AI-related features.

- New forms of digital entertainment, enabled by AR/VR and similar will be trialled and adopted by a few, but will be struggling to find their first mass-market application.

So broadly, the largest changes will be in the virtual assistant, at work, in various work environments and in our leisure activity. Other areas might see little change.

The next decade will be a disappointment for many digital companies. 5G will be introduced but prove to be of little interest and end up as merely a minor enhancement to 4G. FTTH deployments will mostly be shelved as global experience shows no real interest in data rates beyond those available over fibre-to-the curb and other similar solutions.

Digital companies will find it a hard time, specifically:

- Apple with lose their sparkle as phone and laptop replacement cycles extend and there is ever-declining reason to upgrade to the latest iPhone.
- Handset manufacturers in China and Asia-Pacific will tend to dominate as they have in almost all other consumer products.
- Major telecommunication equipment vendors such as Nokia and Ericsson will suffer as infrastructure deployments stall.
- Mobile operators will gradually tend towards wholesale providers as mobile virtual network operators (MVNOs) blossom. These MVNOs will adopt many different tactics with some replicating Google's Project-Fi model where Wi-Fi plays a major role in connectivity.
- For fixed operators it will be business as usual.
- The dominant Internet companies - Google, Amazon, Facebook, will continue to dominate, but growth rates will gradually fall as it becomes harder to find new innovations that can be monetised.
- The companies with new business models - Uber, Airbnb and others, will remain but will struggle with employment laws, data privacy requirements, some societal discomfort and so on. Finding a way through all of this will take time and sap management attention.

- New companies will emerge, of course. But the rate of emergence will slow as new ideas are harder to come by and VCs perceive that the returns in digital are falling.

This will be unfolding against a background of volatile social and political issues. This book is not about what will happen in politics, but it seems likely we are set for a turbulent time, whatever the outcome. This might dampen economic growth and investment certainty, making it even less likely that large-scale new digital infrastructures or projects will be funded.

Some of this turbulence is caused by digital and we may need a period of less digital change to enable society and its structures to catch up. While politicians do not control digital change, societal push-back in various ways might make digital less welcome. Unfortunately, at the moment, the links between those evolving digital and those evolving societies are very weak so this may not happen in any coordinated manner.

11.3 The world in 2037

As before, I will start by looking back over the same time-period as I am forecasting, in this case 20 years to 1997. This was just about the time that the Internet became mainstream. Many will have gone on-line for the first time around then, using dial-up modems and trying to understand what the Internet was all about. The dot.com bubble was about to inflate as Amazon and many other new companies emerged. By 2001 the bubble had burst, leaving most to go out of business but allowing the strongest to solidify their leading position. Mobile phones were widespread but rarely used for data. Laptops were ubiquitous but tablets still to be invented.

Like our look at 2007 - 2017, the period 1997 - 2007 had one major new concept, in this case the Internet. Its impact was massive and was at the heart of almost all digital changes since. Can we expect another new concept, as powerful as the Internet, to emerge in the next 20 years? My view is probably not. The Internet was a one-off rather than a part of a larger trend of new concepts coming along every decade. In the same way that it is only possible to introduce electricity once, it is only possible to introduce computer connectivity once. However, AI may well become as mainstream as the Internet during this

time, and while not having quite as much impact as the Internet, it could still be very significant.

Looking at the bigger picture of enablers and developments, 2037 will see:

- IoT connectivity become very widespread, especially in all branches of business. We will be surprised when devices are not connected and annoyed when they cannot act intelligently and call for help when they need it.
- AI will have become extremely good at specific tasks. The challenges of more general AI will be well understood and research underway to address them. Big datasets will provide useful training material for machine learning systems.

For the individual their virtual assistant will now link to the IoT world, interacting with items around the user and changing their behaviour as needed. Much of this will happen without individuals even being aware of it.

Around 20 years from now AI will have evolved to deliver some useful in-home features that are not currently clear to us today, perhaps coupled with greater IoT connectivity in the home.

The office will continue its evolution. Specifically:

- IoT deployments in lights, plants, dustbins, coffee machines and more, which started to happen in the previous ten years, will become widespread in this period.
- Robotics will make an increasing impact, with robotic vacuum cleaners and possibly other solutions to tasks that need to be performed daily.
- Of the major employment sectors vehicle maintenance will decline rapidly as electric vehicles predominate, retail will be almost entirely on-line, but construction and hospitality will remain largely unaffected. Robotics in manufacturing will be widespread.

Digital will have gradually transformed public services, bringing them up towards the level of digital in the private sector. Healthcare will see major progress as AI becomes more widely accepted as a valid diagnostic tool.

Productivity might now be improving, using AI, robotics and IoT to deliver more crops, better products and reduced maintenance. This will lead to some job losses and society will be debating whether to push for continued full employment or to make shorter working weeks the norm. Debates on paying a basic income to all will be widespread.

We might hope that the political turbulence will settled down in the 10-20 year time horizon, replaced by debates about the balance of work and leisure and what to do with more leisure time. Digital will help by expanding the scope of leisure and enabling favourite pastimes to take more time - such as playing at being a virtual football manager when the football team is not in action.

11.4 The world in 2047

As before, I start by looking back over the same time period, now 30 years to 1987. This also saw an era with one big invention - in this case the mobile phone. While there had been car-phones for the rich, the late 1980s saw the first hand-portable phones. This led to phenomenal growth in subscriber numbers during the decade. Miniaturisation made it a decade of much change for electronics. Laptops became possible and portable. Pagers were widespread. Camcorders became widely available and digital cameras were just around the corner (all to eventually be subsumed into the smartphone).

It really does appear that we get one major digital breakthrough a decade – the mobile phone 30 years ago, the Internet 20 years ago and the iPhone 10 years ago. I suspect this is more coincidence than any "law" but it does suggest that predictions should allow for something happening every decade. My predictions are for IoT to be the breakthrough of the next ten years, AI for the decade after that and perhaps robotics (using AI to gain intelligence) for the third decade.

Not many of my predictions from earlier chapters were for the period 20-30 years out. As always that is partly because it is harder to imagine what we might want and what we might invent that far into the future. Inventions such as the

mobile phone in the 1980s led to the iPhone in 2007 and to virtual assistants and electronic payment by 2017. Predicting the iPhone would have been much harder if the mobile phone had not yet proven possible.

Thirty years out marks a point where many believe a "singularity" will occur. This is where AI becomes more intelligent than humans and then rapidly takes off; inventing its own ever-more superior machines in a spiral that quickly goes beyond our control. I am sceptical (after all, this had been forecast to happen in 2001) but nevertheless there is much uncertainty about AI and the role it might play by this point. In the period between 2037 and 2047 it is likely that this uncertainty will be resolved and either AI will remain a useful tool in specific cases (eg playing Go) or it will emerge as a powerful addition to humankind. In the latter case, predictions as to what might happen are nearly impossible from this far off.

For these reasons, I do not have any specific predictions 30 years out. If pushed I would tend towards the same predictions as 20 years out, but with high uncertainty that something important will have been missed.

11.5 National differences

Will the digital world of the future be different according to where you live? For example, it could be imagined that China will follow a different path to suit its political needs or that Japan will adopt robots for the care of the elderly to a far greater extent than other nations.

But differences to date have been very small. Most digital services are inherently global and are adopted everywhere. China does have its own versions of search engines and social media websites, but these are essentially the same as available from Google and Facebook. There is nothing in my predictions of the future to suggest that this will change.

Of course, the speed of adoption will differ. Richer countries will make use of IoT, AI and robotics before poorer countries. In some places cultural barriers will slow particular concepts. Robots may need to look different in some cultures. Overall, one of the roles of digital has been to make the world a smaller place. In doing so it has reduced the likelihood of national differences.

11.6 Why so pessimistic?

As I have noted before, many will see these predictions as hugely pessimistic. The Internet abounds with those who predict so much more. For example, Ian Pearson, "a futurist with an 85% accuracy record", came up with a list[1] in 2015 which I have summarised below. (Where the predictions cover areas I have discussed at length I have provided more detail).

1. We could start seeing delivery drones finally start making deliveries in the next two years.
2. A Hyperloop could take us in between cities in just six years.
3. Machines could start thinking like humans as early as 2025.
4. Space trips designed to send people to Mars could start taking place in 2030.
5. Prosthetics could get so advanced in the next 10 years they could give people new skills.
6. Clothing could give people superhuman skills in the next 10 years.
7. Virtual reality could replace textbooks during the next decade.
8. The smartphone will become obsolete by 2025 thanks to advancements in augmented reality. It will be possible to pull up screens in AR via a tiny bracelet or other piece of jewellery in the next 10 years, making it unnecessary to carry around a smartphone.
9. Self-driving vehicles could be ubiquitous in the next 10 years.
10. 3D-printing could be used to construct more houses in 20 years.
11. People could start using robots to do work around their house and provide companionship starting in 2030.
12. We could live in a Matrix-like virtual world by 2045.
13. People could also become Cyborgs by 2045.
14. People could control their home settings using artificial intelligence by 2040 as well. By 2040, AI will be built into buildings themselves, so you can talk to the building and ask for adjustments in temperature or lighting.
15. Super tall buildings could function like mini-cities in the next 25 years.

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[1] See http://uk.businessinsider.com/ian-pearson-predictions-about-the-world-in-2050-2016-7/?r=US&IR=T/

16. We could rely entirely on renewable energy by the year 2050.
17. Space tourism could be feasible in 2050, but likely only for the very wealthy.

It is hard to know where to start here. A few of these appear plausible such as being able to talk to a building and ask it to adjust its temperature. But most seem incredibly optimistic – such as AI being able to think like a human by 2025 (unless that human is a five-year-old). Take, for example, the second one - that a hyperloop will take us between cities by 2021. At the time of writing in 2017 small sections of hyperloop were being tested in the desert. To connect two cities would require (1) the technology to be proven (2) a tunnel to be dug, or a tube to be laid, between the major cities (3) trains to be mass produced and tested. Given that it takes more than 20 years for new train lines to be laid into major cities and similar lengths of time for major tunnelling projects, it is utterly impossible that this could happen by 2021. Even 2041 is a stretch. And that ignores the question of economics (recall that major projects like the Channel Tunnel went into bankruptcy). Even more obviously wrong is the first - that drone deliveries will start in 2017. It is now 2017 and they haven't.

All I can say is that if you prefer this set of predictions to mine then find a different book!

It all comes back to Peter Thiel and "we wanted flying cars and we got 140 characters". We want an exciting future where the world is a visibly better place and we like to be told that this will occur by visionaries. We often get something much less.

11.7 In summary

The world has seen one major "enabler" per decade in terms of a new concept becoming mainstream in the decade of the last thirty years. This started with mobile phones, then the Internet, then the iPhone/touch screen devices. There is no particular reason why this pattern should continue but I predict that it might. Over the next thirty years I anticipate IoT, then AI, then robotics as being key enablers. However, the big difference of these enablers is that they do not directly and immediately provide a change for the consumer, unlike the mobile phone. Instead they will enable better productivity, more reliable and responsive products

and faster innovation. While these are all good things, there may be downsides in reducing employment and risks of unintended consequences from AI.

Figure 11-1 provides a summary on one picture.
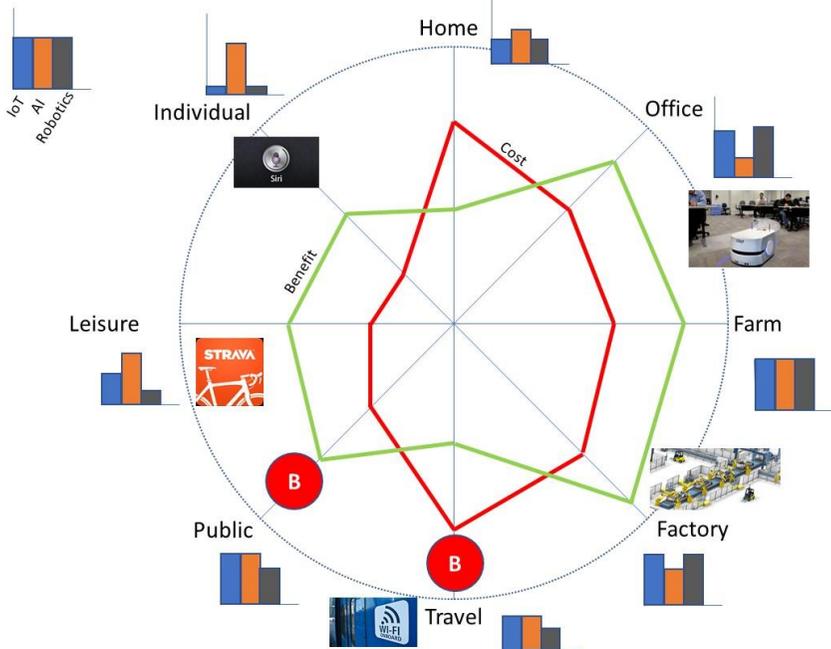
Figure 11-1 - A summary

In this figure, eight different environments are grouped around the circle. For each environment there is a cost and a benefit of new digital concepts. Where the benefits are greater than the costs then implementation should follow, but in some areas there are other blockers, indicated by the "B". For each area the relative importance of the three enablers is shown in bar charts, and where relevant a graphic represents the key development in that sector.

The next chapter looks at what these predictions would mean for companies in the digital space.

About the author