FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

IN THIS EDITION

THE FUTURE – IN ABOUT TEN MINUTES

by Richard Watson

Image credit: Richard Watson

HOW TO THINK ABOUT THE FUTURE

Here's a prediction. You are reading this because you believe that it's important to have a sense of what's coming next.

Or perhaps you believe that since disruptive events are becoming more frequent you need more warning about potential game-changers, although at the same time you're frustrated by the unstructured nature of futures thinking.

Foresight is usually defined as the act of seeing or looking forward - or to be in some way forewarned about future events. In the context of science, it can be interpreted as an awareness of the latest discoveries and where these may lead, while in business it's generally connected with an ability to think through longer-term opportunities and risks be these technological, geopolitical, economic, or environmental.

But how does one use foresight? What practical tools are available for individuals to stay one step ahead and to deal with potential pivots?

THE ANSWER TO THIS DEPENDS ON YOUR STATE OF MIND

In short, if alongside an ability to focus on the here and now you have – or can develop – a culture that's furiously curious, intellectually promiscuous, self-doubting, and meddlesome you are likely to be far more effective at foresight than if you doggedly stick to a single idea or worldview. This is because the future is rarely a logical extension of single ideas or conditions.

Furthermore, even when it looks as though this may be so, everything from totally unexpected events, feedback loops, behavioural change, pricing, taxation, and regulation have a habit of tripping up even the best-prepared plans.

LOOKING BOTH WAYS

In other words, when it comes to the future most people aren't really thinking, they are just being logical based on small sets of recent data or personal experience. The future is inherently unpredictable, but this gives us a clue as to how best to deal with it. If you accept – and how can you not - that the future is uncertain, then you must accept that there will always be numerous ways in which the future could play out. Developing a prudent, practical, pluralistic mind-set that's not narrow, self-assured, fixated, or over-invested in any singular outcome or future is therefore a wise move.

This is similar in some respects to the scientific method, which seeks new knowledge based upon the formulation, testing, and subsequent modification of a hypothesis.

Not blindly accepting conventional wisdom, being questioning and self-critical, looking for opposing forces, seeking out disagreement and above all being open to disagreements and anomalies are all ways of ensuring agility and most of all resilience in what is becoming an increasingly febrile and inconstant world.

This is all much easier said than done, of course. Homo sapiens are a pattern seeing species and two of the things we loathe are randomness and uncertainty. We are therefore drawn to forceful personalities with apparent expertise who build narrative arcs from a subjective selection of so-called facts. Critically, such narratives can force linkages between events that are unrelated or ignore important factors.

Seeking singular drivers of change or maintaining a simple positive or negative attitude toward any new scientific, technological, economic, or political development is therefore easier than constantly looking for complex interactions or erecting a barrier of scepticism about ideas that almost everyone else appears to agree upon or accept without question.

DANGER: HIDDEN ASSUMPTIONS

In this context a systems approach to thinking can pay dividends. In a globalised, hyper-connected world, few things exist in isolation and one of the main reasons that long-term planning can go so spectacularly wrong is the oversimplification of complex systems and relationships.

Another major factor is assumption, especially the hidden assumptions about how industries or technologies will evolve or how individuals will behave in relation to new ideas or events. The hysteria about Peak Oil might be a case in point. Putting to one side the natural assumption that we'll need oil in the future, the amount of oil that's available depends upon its price. If the price is high there's more incentive to discover and extract more oil especially, as it turned out, shale oil.

A high oil price also fuels the search for alternative energy sources, but also incentivises behavioural change at both an individual and governmental level. It's not an equal and opposite reaction, but the dynamic tensions inherent within powerful forces means that balancing forces do often appear over time.

Thus, we should always think in terms of technology *plus* psychology, or one factor *combined* with others. In this context, one should also consider wildcards. These are forces that appear out of nowhere or which blindside us because we've discounted their importance.

Similarly, it can often be useful to think in terms of future *and* past. History gives us clues about how people have behaved before and may behave again. Therefore, it's often worth travelling backwards to explore the history of industries, products, or technologies before travelling forwards.

If hidden assumptions, the extrapolation of recent experience, and the interplay of multiple factors are three traps, cognitive biases are a fourth. The human brain is a marvellous thing, but too often tricks us into believing that something that's personal or subjective is objective reality. For example, unless you are aware of confirmation bias it's difficult to unmake your mind once it's made up.

Once you have formed an idea about something - or someone - your conscious mind will seek out data to confirm your view, while your subconscious will block anything that contradicts it. This is why couples argue, why companies steadfastly refuse to evolve their strategy and why countries accidently go to war. Confirmation bias also explains why we persistently think that things we have experienced recently will continue. Similar biases mean that we stick to strategies long after they should have been abandoned (loss aversion) or fail to see things that are hidden in plain sight (inattentional blindness).

In 2013, a study in the US called the Good Judgement Project asked 20,000 people to forecast a series of geopolitical events. One of their key findings was that an understanding of these natural biases produced better predictions. An understanding of probabilities was also shown to be of benefit as was working as part of a team where a broad range of options and opinions were discussed.

You must be aware of another bias – Group Think – in this context, but if you are aware of the power of consensus you can at least work to offset its negative aspects.

Being aware of how people relate to one another also recalls the thought that being a good forecaster doesn't only mean being good at forecasts. Forecasts are no good unless someone is listening and is prepared to act.

Thinking about who is and who is not invested in certain outcomes - especially the status quo - can improve the odds when it comes to being heard. What you say is important, but so too is whom you speak to and how you illustrate your argument, especially in organisations that are more aligned to the world as it is than the world as it could become.

Steve Sasson, the Kodak engineer who invented the world's first digital camera in 1975 showed his invention to Kodak's management and their reaction allegedly was: '*That's cute, but don't tell anyone."* Eventually Kodak commissioned research, the conclusion of which was that digital photography could be disruptive

Steve Sasson with his first digital camera

However, it also said that Kodak would have a decade to prepare for any transition. This was all Kodak needed to hear to ignore it. It wasn't digital photography per se that killed Kodak, but the emergence of photo-sharing and of group think that equated photography with printing, but the result was much the same.

Good forecasters are good at getting other peoples' attention using narratives or visual representations. Just look at the power of science fiction, especially movies, versus that of white papers or power point presentations.

If the engineers at Kodak had persisted or had brought to life changing customer attitudes and behaviours using vivid storytelling - or perhaps photographs or film - things might have developed rather differently.

FIND OUT WHAT YOU DON'T KNOW.

Beyond thinking about your own thinking and thinking through whom you speak to and how you illustrate your argument, what else can you do to avoid being caught on the wrong side of history? According to Michael Laynor at Deloitte Research, strategy should begin with an assessment of what you don't know, not with what you do. This is reminiscent of Donald Rumsfeld's infamous 'unknown unknowns' speech.

"Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know…."

The language that's used here is tortured, but it does fit with the viewpoint of several leading futurists including Paul Saffo at the Institute for the Future. Saffo has argued that one of the key goals of forecasting is to map uncertainties.

What forecasting is about is uncovering hidden patterns and unexamined assumptions, which may signal significant revenue opportunities or threats in the future.

Hence the primary aim of forecasting is not to precisely predict, but to fully identify a range of possible outcomes, which includes elements and ideas that people haven't previously known about, taken seriously or fully considered.

The most useful starter question in this context is: 'What's next?' but forecasters must not stop there. They must also ask: 'So what?' and consider the full range of 'What if?'

CONSIDER THE IMPROBABLE

A key point here is to distinguish between what's probable, and what's possible.

Sherlock Holmes said that: *"Once you eliminate the impossible, whatever remains, no matter how improbable, must be the truth."*

This statement is applicable to forecasting because it is important to understand that improbability does not imply impossibility. Most scenarios about the future consider an expected or probable future and then move on to include other possible futures. But unless improbable futures are also considered significant opportunities or vulnerabilities will remain unseen.

This is all potentially moving us into the territory of risks rather than foresight, but both are connected. Foresight can be used to identify commercial opportunities, but it is equally applicable to due diligence or the hedging of risk. Unfortunately, this thought is lost on many corporations and governments who shy away from such long-term thinking or assume that new developments will follow a simple straight line. What invariably happens though is that change tends to follow an S Curve and developments tend to change direction when counterforces inevitably emerge.

Knowing precisely when a trend will bend is almost impossible but keeping in mind that many will is itself useful knowledge.

The Hype Cycle developed by Gartner Research is also helpful in this respect because it helps us to separate recent developments or fads (the noise) from deeper or longer-term forces (the signal). The Gartner model links to another important point too, which is that because we often fail to see broad context, we tend to simplify.

This means that we ignore market inertia and consequently overestimate or hype the importance of events in the shorter term, whilst simultaneously underestimating their importance over much longer timespans.

An example of this tendency is the home computer. In the 1980s, most industry observers were forecasting a Personal Computer in every home. They were right, but this took much longer than expected and, more importantly, we are not using our home computers for word processing or to view CDs as predicted. Instead, we are carrying mobile computers everywhere, which is driving universal connectivity, the Internet of Things, smart sensors, big data, predictive analytics, which are in turn changing our homes, our cities, our minds and much else besides.

DRILLING DOWN INTO THE BEDROCK TO REVEAL THE REAL WHY.

What else can you do to see the future early? One trick is to ask what's behind recent developments. What are the deep technological, regulatory of behavioural drivers of change? But don't stop there.

Dig down beyond the shifting sands of popular trends to uncover the hidden bedrock upon which new developments are being built. Then balance this out against the degree of associated uncertainty.

Other tips might include travelling to parts of the world that are in some way ahead technologically or socially. If you wish to study the trajectory of ageing, for instance, Japan is a good place to start. This is because Japan is the fastest ageing country on earth and consequently has been curious about robotics longer than most. Japan is already running out of humans and is looking to use robots to replace people in various roles ranging from kindergartens to aged care.

You can just read about such things, of course. New Scientist, Scientific American, MIT Technology Review, The Economist Technology Quarterly are all ways to reduce your travel budget, but seeing things with your own eyes tends to be more effective. Speaking with early adopters (often, but not exclusively younger people) is useful too as is spending time with heavy or highly enthusiastic users of products and services.

Academia is a useful laboratory for futures thinking too, as are the writings of some science fiction authors. And, of course, these two worlds can collide. It is perhaps no coincidence that the sci-fi author HG Wells studied science or that many of the most successful sci-fi writers, such as Isaac Asimov and Arthur C. Clarke, have scientific backgrounds.

So, find out what's going on within certain academic institutions, especially those focussed on science and technology, and familiarise yourself with the themes the best science-fiction writers are speculating about.

Will doing any or all these things allow you to see the future in any truly useful sense? The answer to this depends upon what it is that you are trying to achieve. If you aim is to get the future 100% correct, then you'll be 100% disappointed. However, if you aim is to highlight possible directions and discuss potential drivers of change there's a very good chance that you won't be 100% wrong. Thinking about the distant future is inherently problematic, but if you spend enough time doing so it will almost certainly beat not thinking about the future at all.

Creating the time to peer at the distant horizon can result in something far more valuable than prediction too. Our inclination to relate discussions about the future to the present means that the more time we spend thinking about future the more we will think about whether what we are doing *right now* is correct. Perhaps this is the true value of forecasting: It allows us to see the present with greater clarity and precision.

Richard Watson is Futurist-in-Residence at the Entrepreneurship Centre at the Judge School, Cambridge University.

Book Review

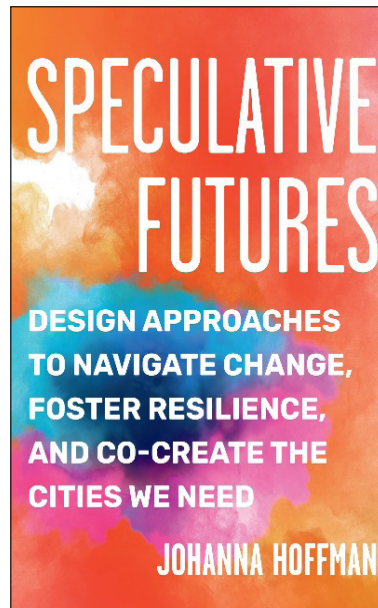by Charles Brass – Chair, Futures Foundation

Speculative Futures
by Johanna Hoffman

Richard Florida (author of *The Rise of the Creative Class*) suggests that: "In order to change our cities and the world, we need to first imagine a better future – a future that we might not have imagined at all". This book is a guidebook to getting there, describing a variety of projects across the globe that have used Johanna Hoffman's speculative futures approach to designing their future.

Speculative futures are design-based approaches that help visualise potential new worlds and move beyond what currently exist into what one day might be.

> *Taking the time to envision and refine alternative futures can foster a potent kind of openness.*
>
> p 29

> *To head toward different, potentially better future, we have to be able to imagine what those futures might be like.*
>
> p 146

The book begins with a journey through an immersive arts project installed by the author in San Francisco in 2016 designed to introduce residents to what the city could look like in 2200 if current climate trends continued. Patrons had to enter the exhibit by boat, and when they did enter sights, sounds and smells were all designed to highlight the very dystopian future climate change portended. As they left the exhibit, participants were invited to leave their comments both about the experience and on the portended future. These comments were fed back to municipal authorities as part of on-going planning efforts.

Not all of the examples outlined in the book have been created by Hoffman, but all provide examples of how a speculative futures approach can help those attempting to create more engaging futures to navigate their way there.

Other examples in the book include a (relatively short lived, unfortunately) attempt to reconceive a housing commission estate in Amsterdam, by imagining it as its own country, issuing passports, holding an olympic games and other community events (called Columbusplein for those wanting more detail).

Also described in some detail is a Kenyan initiative (called Agbobloshie) to re-envisage a rubbish dump as a recycling and upcycling centre, not just for the local population but as a model for the rest of the world. This example is a reminder that sustained success in these initiatives requires considerable care in the way the

external agents interact with the local population. Imposing models from elsewhere seldom works. Hoffman explains how, by encouraging the locals to adopt a design futures approach they came up with a solution they were committed to, and which has endured and grown since.

> " *...the future is not a destination, but a process and a path.*
>
> p 150

There are a number of similar examples in other chapters in this easy to read book. For example, and entire chapter is devoted to a project created by the European Climate Foundation in the early 200s who wanted to consider ways to decarbonise Europe's economy. Ultimately their preferred future was the creation of a borderless area called Eneropa that encompassed most of the major countries in the EU. Although this was recognised as unlikely from a political perspective, it lead to a number of cross-border initiatives that survive today.

Hoffman also explores how she helped design and create Future World Vision, an interactive educational video game exploring urban life in 2070. Based on in-depth research, the project is a detailed dive into how cities could change over the next half century, providing space to explore how engineering can become a strong foundation for thriving and achievable urban futures.
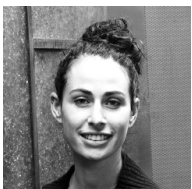
By giving us permission to imagine, speculative futures encourage a shift in attitude from *"What's the problem?"* to *"What's possible?"* In doing so, they question our assumptions about existing norms to see if they're really the paradigms we want to shape what lies ahead. Connecting current moves to long-term change helps ensure that the tactics used to solve short-term problems can address the fifty- or one-hundred-year issues as well. Speculative futures offer practices that create the forward-thinking, adaptive plans that modern uncertainty requires.

Most importantly, the approaches aren't exclusive or specialized. Using speculative futures doesn't depend on getting a degree or buying expensive software. Anyone can employ them, because everyone has the capacity to imagine. When more people feel empowered to envision their preferred futures, they're more equipped to advocate for their needs. More people promoting the futures they want encourages design and planning professionals to embrace the role of facilitators, to focus less on enacting their own ideas and more on coalescing diverse viewpoints into cohesive plans. In this way, speculative futures cultivates self-determination, creating cities more likely to work not just for the few, but for all.

Johanna Hoffman describes herself as an urbanist working in the space between design, planning, fiction and futures. She is a founder of the urban futures firm "Design for Adaptation." More information can be found on her website: https://johannahoffman.com/Speculative-Futures

Sohail Inayatullah sums up the book beautifully:

"In this remarkable book, Johanna Hoffman tells the story of city futures. This is not just the world of visioning the future city, but the gritty world of citizen meetings and foresight workshops…Hoffman's details provide both inspiration but also an illumination of the politics of futures design. In a journey of past, present, and future, speculative futures illuminates the way."

Sohail Inayatullah, UNESCO Chair in Futures Studies

FUTURISTS IN ACTION

HOW TO USE 'DESIGN FICTION' TO SPARK INNOVATION

A five-phase design fiction process that breaks boundaries and opens the doors to serendipity

by Roger Spitz and Lidia Zuin

[Source photos: Flavio Coelho/Getty Images; Ben Sweet/Unsplash; Shoeib Abolhassani/Unsplash; Christian Liebel/Unsplash]

The moon landing, the first satellite launch, the smart watch, and autonomous vehicles have one thing in common: They all appeared in works of science fiction before our reality. But these innovations don't always come from where you'd expect.

Rather than established industry participants, outside operators like Waymo (Alphabet), Tesla, NVIDIA, and Pony.ai pioneered autonomous driving. Likewise, Beyond Meat and Impossible Foods imagined meatless meat, breaking the molds of industry leaders like Tyson or JBS. SpaceX, not Airbus or Boeing, partnered with NASA to democratize commercial space. And startups like Mojo Vision offer a preview of augmented reality in the post-smartphone era, hinting at preventative eye care diagnosis with their futuristic smart contact lenses.

Incumbent businesses often operate like the world is linear, stable, and predictable. Truly innovative players cast these assumptions aside. They use lenses which widen the aperture and broaden time horizons, rewiring their mindsets to imagine the impossible.

Shareholders and C-suites rely on the presumed predictability of investment returns. Therefore, their strategies typically over-index assumptions while undervaluing imagination. Because science fiction is becoming science fact faster than ever,

outside actors who question assumptions beat incumbents in imagining, then creating, what might come next. As the cost of relying on assumptions is going through the roof, reframing assumptions could be the greatest driver of value creation.

Organizations can harness these powers using design fiction, which combines science fiction, design thinking, and foresight to create diegetic prototypes and inspire innovation. The design fiction process seeks questions (*why?, what if?, so what?*) rather than answers.

Our five-phase design fiction process breaks boundaries, opening the doors to serendipity.

IMAGINING

The first phase is "imagining," in which we ask *"What if?"* to suspend disbelief, then expand our horizons to put the impossible on the map. There is no future too far-fetched or unlikely.

The Mentimeter tool aids brainstorming by helping participants plant seeds for possible scenarios in their own minds. We envision different paths to explore by asking "What If?" questions about their organization's future.

VISIONING

In the second phase, "visioning," we map different futures. We build pictures of new worlds from a blank page. Visioning goes beyond planning or strategy, pushing the perceived limits of current realities. We can explore visions of the futures using foresight tools like the Futures Cone and the Futures Wheel.

The Futures Cone enables us to visualize a kaleidoscope of futures, illuminating the possible, plausible, probable, and preferable. This can generate visions which may be difficult to otherwise anticipate, such as Black Swans (rare, unforeseeable major events) or wild cards (low-probability, high-impact events without a strong signal preceding their arrivals). These events are not solely negative—you can use wild cards positively to spur creativity and explore beneficial ideas such as truly novel drug discoveries, or achieving cost-effective sustainable regenerative energy.
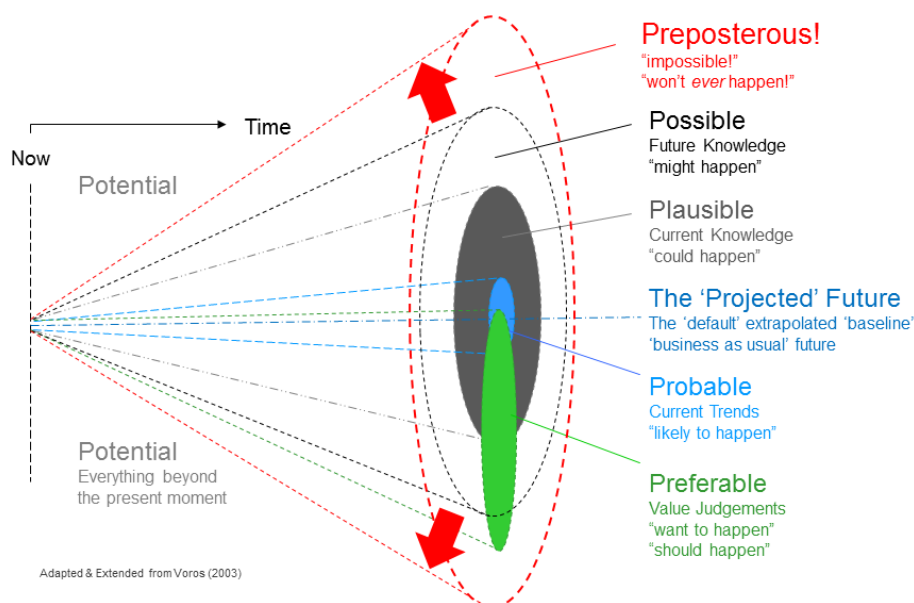
Devised by Jerome Glenn, the Futures Wheel can provoke practitioners to imagine next-order changes, suggesting that the futures will be vastly different from the present. This exercise stretches beyond the identification of the direct and indirect drivers of an initial selected change by investigating cascading higher-order impacts of that change or innovation.
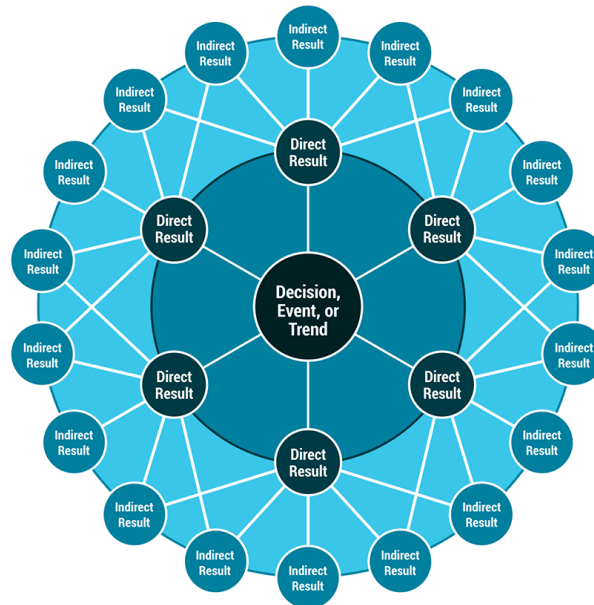
SCANNING THE FRINGE

"Scanning the fringe" is the third phase. Here, we scan the horizon to anticipate new innovations, technologies, and ideas. Real change invariably begins on the periphery, so we hunt the uninhibited, strange, and weird. We go wide to think outside of typical focus areas and diversify our sources, tapping experts, generalists, counterculture media, and global perspectives. We go deep to identify the drivers of change, analyzing undercurrents to see what may transform society in the long run.

We also leverage frameworks such as NASA's Technology Readiness Level (TRL) to measure the maturity of developing innovations, organize diverse signals, and imagine how they might connect. Signals should never be considered in isolation. Insights emerge from the connections between sectors. Magic happens when these intersections collide into new combinations.

One challenge of horizon scanning is that there are limitless weak, fake, and inflated signals. Unlike trends which explain the past, signals are mere fragments of the future embedded in the present. As there is no data on the future, the scanning process is intentionally broad, so using the right filters helps establish signal relevance.

For instance, qualifying a signal's source evaluates credibility and objectivity, integrating that fringe perspectives don't come from experts. We can also assess the likelihood, newness, frequency, interconnectedness, and even impact of signals in terms of what the signals could do and to whom. Finally, we look at whether the signals are compounding (is there a consensus that confirms similar observations? Are these signals strengthening by pushing in the same direction, or counterbalancing?).

PROTOYPING

The fourth phase, "prototyping," is where narratives come to life. Teams use their visioning and scanning outcomes to co-create diegetic prototypes, which can include objects, narratives, illustrations, performances, and more. Our goal is that the final audience considers these speculative scenarios as tangible possibilities.

The 2×2 matrix technique is a simple visual prototyping method which considers two high-impact, high-uncertainty drivers of a topic. By plotting these drivers on crossing axes, we can co-develop scenarios in the four resulting quadrants that emphasize or downplay the drivers in comparison.

Impact

Low effort,
High impact

High effort,
High impact

Low effort,
Low impact

High effort,
Low impact

Effort
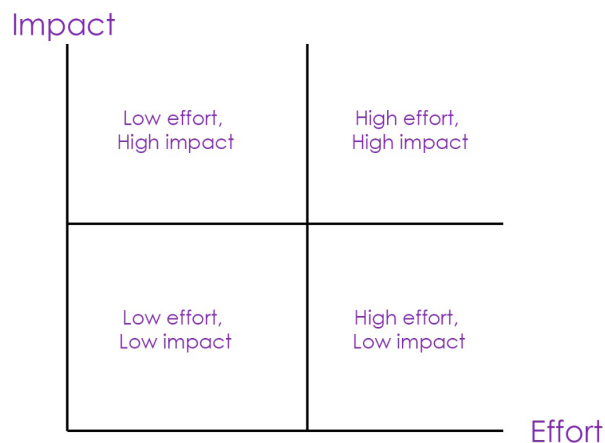
Prototyping is improvisational and emergent; it builds on itself to imagine knock-on implications of any visions. Designed by the Situation Lab, The Thing From The Future is an award-winning imagination game that prompts participants to draw cards and construct their prototypes. It uses four types of cards to help players imagine different aspects of their prototype: the timeframe and profile of potential futures ("Arc"), context ("Terrain"), form ("Object"), and emotions ("Mood").

BACKCASTING

In "backcasting," the final phase, we develop pathways to these prototypes by working from them back to the present. Organizations and leaders often take a present-forward approach, building on their current state and entrenched assumptions. Future-back challenges this philosophy. We ask "*So what?*" to reset assumptions for new paradigms, building narratives from vision to action, determining what steps will guide us towards these envisioned futures.

Backcasting allows us to project our vision back through time, tracing our steps through the years to determine what predicates the various aspects of our designed futures. We build our narratives backwards from vision to action, illuminating our next steps that can start today while also providing us with actionable milestones to track the implementation of strategies as we work towards our aspirations.
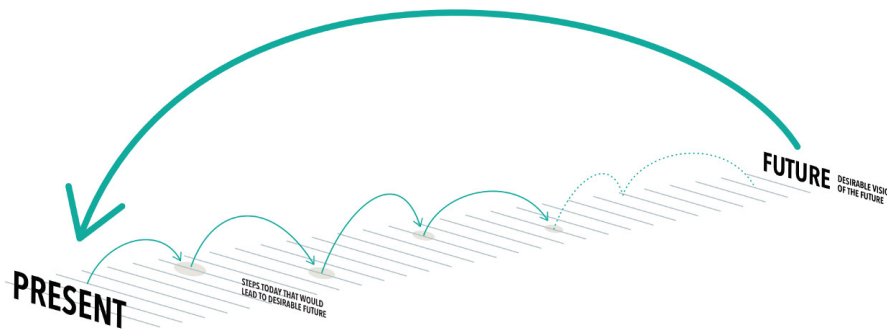

Figure 5 Backcasting to a Desirable Future. Adapted from The Natural Step (2011).

In our unpredictable world, science fiction is becoming mandatory to harness discontinuous innovation, even for fast-moving upstarts.

Palo Alto-based XP Health, named one of the most innovative companies in the vision market, offers a virtual-first benefits platform for eye care and eyewear, powered by AI. XP Health's DNA is user-centric design, rapid prototyping, and experimentation, which is how they reinvented the user experience in vision care. When the company sought inspiration to explore the *"What if?"* questions beyond their strategic plan, they worked with the Disruptive Futures Institute and explored design fiction narratives of their own.

XP Health used the design fiction process to think about the next levels of invention and reinvention. Their aspirational narrative for the decade ahead showed the company innovating beyond their current markets, creating new products that would transform the world and generate sustainable value creation. For Antonio Moraes, CEO of XP Health, imagining the evolution of tomorrow's eyewear markets inspired investors to finance their recent $17 million series A.

Maybe one day, a company like XP Health or Mojo Vision will deliver preventative healthcare as your smartphone, personal trainer, optometrist, *ex ante* insurance provider, and more as they create the future of vision where sectors intersect, converge, and emerge.

 Roger Spitz and Lidia Zuin are the authors of *The Definitive Guide to Thriving on Disruption* from which this article is adapted.

Signals in the Noise

10 FUTURIST PREDICTIONS IN THE WORLD OF TECHNOLOGY

by Gabrian Technology

Futurists can dish out some exciting and downright scary visions for the future of machines and science that either enhance or replace activities and products near and dear to us.

Being beamed from one location to another by teleportation was supposed to be right around the corner/in our lifetime/ just decades away, but it hasn't become possible yet. Inventions like the VCR that were once high tech — and now aren't — proved challenging for some: The VCR became obsolete before many of us learned how to program one. And who knew that working with atoms and molecules would become the future of technology? The futurists, of course.

Forecasting the future of technology is for dreamers who hope to innovate better tools — and for the mainstream people who hope to benefit from the new and improved. Many inventions are born in the lab and never make it into the consumer market, while others evolve beyond the pace of putting good regulations on their use. Next, we'll take a look at some sound-loving atoms, tiny tools for molecules, huge bunches of data and some disgruntled bands of people who may want to set all of this innovation back with the stroke of a keyboard.

ZERO-SIZE INTELLIGENCE

No one wants to be called a zero in terms of intelligence, but having zero-sized intelligence in computing means packing a whole lot of brains in a tiny, tiny package. Computer companies encourage forward-thinking creativity, and some, such as Intel, even have futurists on board to predict where technology is headed. Futurist Brian

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David Johnson sees the future advance of computing to so small a size that the housing for the computer itself is almost zero. We have the technology to put computers almost anywhere and in almost anything. Computers used to take up entire rooms, then whole desktops, laps and palms, to micro-chip-sized casings and atom-powered transistors invisible to the naked eye.

Many have predicted that the shrinking of computing size would also lead to the end of something called Moore's Law. Gordon E. Moore, a co-founder of Intel, famously predicted that every two years the number of transistors on a chip will roughly double every 24 months. As computer brains have diminished in size — with some models powered by just five atoms and one-atom developments about 10 to 20 years down the road — getting smaller may reach an end point as atomic transistors replace chips. Whether the low cost will trickle down despite the high cost of innovating such small transistors remains to be seen.
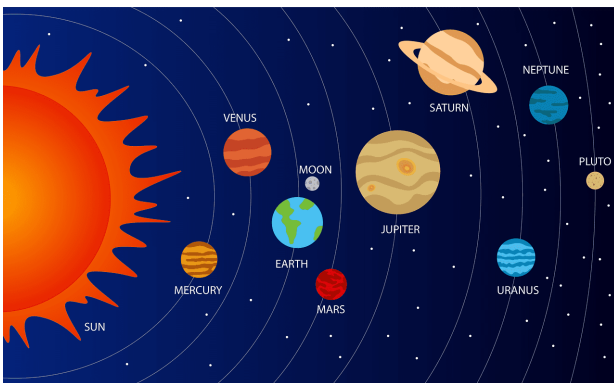
MOON, MARS, MORE?

Image source: Encyclopedia Britannica

Space exploration has taken some hits in the 21st century, with cuts to the U.S. and other international space program budgets. But with the Curiosity Rover on Mars as of August 2012 and plans to launch the "most powerful rocket in history," the Space Launch System (SLS) by 2017, NASA is still very much in the business of the future. After the planned, unmanned sendoff of the SLS in 2017, NASA intends to send a crew of up to four astronauts into space by 2021. This could be a return to the moon, with capabilities for missions on other planets.

Even with the world economic downturns of this century, individuals and corporations in the private sector also plan to keep aiming for the stars and enabling people to buy space exploration tickets of their own. Some futurists of decades past would be surprised to see that space travel for every man isn't commonplace, but for a few wealthy adventurers, it's no longer the stuff of science fiction. Maybe their trips will help drive down costs for the rest of us.
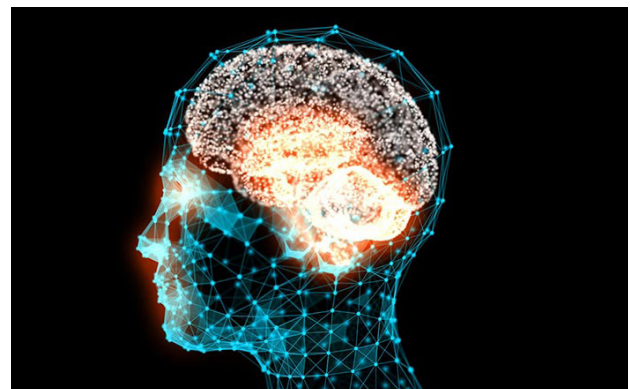
NEUROHACKING

Image source: Wikipedia

Will there be a day when you say "I can't read your mind, you know!" and the reply will be "Oh, stop it — of course you can!"? It could happen. Neuroscientists are finding ways to read people's minds with machines, and although this has been in the works for decades, real progress is being made by researchers at the University of California, Berkeley, and elsewhere. Translating electrical activity from the brain by means of decoding brainwaves is one way to help sufferers of dementia, for example, who have complications with neurotransmitters relaying thoughts into comprehensible speech or holding thoughts long enough to get them out verbally before they're forgotten.

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On the other hand, it is more than a little frightening to know that science and machines could soon have access to our innermost thoughts. Implications for neurohacking into people's thoughts have also been studied in relation to neuromarketing, which targets people's brains by manipulating their wants and desires through marketing and advertising. Our thoughts and actions could actually be hijacked by a form of media that makes us think we're getting what we want, when really, we're going for something our brains may only think is supposed to be good.

MASS DATA

Even if scientists and marketers can't get access to our brains for neurohacking or neuromarketing, can they get access to our data? With unprecedented amounts of images and data available online, filling clouds and other Web-based storage, media, government regulatory bodies and marketers work around the clock to mine user preferences, habits and even relationships.

What to do with all of this data, and more specifically and maybe more urgently, how can we keep all of our activities in the virtual space from shaping the real space of our world? As search preferences narrow results when using the Internet, and our reading and research have become "optimized" based on what key words people search for, our choices in buying products and accessing news and information narrows as the enormous stores of data accumulate.

Data and the machines and algorithms used to manage and make sense of it could largely replace independent decision-making — either large or small — and it is happening at such a speed that it's sometimes hard to remember the data isn't in control. People still control the data, but just who has this control and what they do with it will become an ongoing challenge.

QUANTUM CONTROL

Picture a tiny bit of a thing on an already miniscule computer chip. Something microscopic with the power to think like a computer without the need of complex circuitry and capable of being moved by light or sound: That is quantum technology simplified.

Put less simply, quantum control uses a technology derived from physics for computer applications. Quantum electrodynamics, or QED, describes the interaction of matter and light, and QED-circuits take this interaction to the computer chip by trying to harness the interaction for circuitry in machines. Phonons are sound-activated quantum vibrations that move circuitry and motor machines at the chip level.

All of these breakthroughs in quantum technology are advancing the zero-sized intelligence we touched on earlier, and they're very exciting to techies and scientists alike. They merge science and technology into something that isn't mere experimentation, but has enormous implications because they work and may someday power the computer and communication devices we use every day. Their enormity comes in their tiny, atomic-sized power.

YOUTH TECH MOVEMENTS

Young people have never before been so technologically savvy and interconnected, with so much time on their hands and so little money in their pockets, as they are now. There have always been disgruntled youth who fight the establishment and their parents for change and strike out against the old regimes in favor of new freedoms. But in the 21st century, a global recession, lack of opportunity and lack of hope for the youth are practically boiling over — or, at least, are simmering and ready to explode.

Signals in the Noise
10 FUTURIST PREDICTIONS IN THE WORLD OF TECHNOLOGY

People between the ages of 16 and 24, and ranging from the unschooled to those with doctorate-level educations, are coming up in a world where they may be stuck at home and without job prospects for years. All of this discontent may breed organized anarchy or rebellion in the form of technological or infrastructure sabotage, either physically or in cyberspace.

NANOTECHNOLOGY, NANOMED

Technology at the nano level, or nanotechnology, allows for unbelievable precision and a way to copy the work of nature at its most basic functioning, but just how small is a nano? According to the National Nanotechnology Initiative, a sheet of paper is 100,000 nanometers thick and there are 25.4 million nanos in 1 inch. A nanometer is one-billionth of a meter!

How is this impacting technology and the future? In just about every field, nanotechnology is being used for innovations in engineering, medical devices, imaging, computing and many more. Nanomedicine is one area experiencing rapid and dramatic growth. Because many illnesses and disorders in the body take place at the cellular level and grow as ruled by the formation of genetic makeup, nanotechnology has the capability to treat at the very root of the condition, rather than after it's fully spread throughout the body. It can be both preventative and curative because treatment reaches the narrowest and most minuscule centers of control. Neurosurgery and gene therapy are just two areas within nanomed that are particularly well-suited for nanotools and technology.

DARK NETWORKS

As the world gets smaller by sharing more and more of the same cyberspace and social tools, we are, like it or not, becoming a bigger collective target for the bad guys. While our data puts us all "out there" in many ways, that same data enables those involved in dark networks and activities to get lost and take on false, covert identities in order to plan bigger and bigger attacks.

Anonymous is one such dark group involved in "hactivism," having found its way into sensitive stores of information from the likes of the FBI, Visa and Mastercard, and government Web sites from the U.K. to China, causing large-scale, disabling computer terror. It functions as a collective of many individuals and spreads its login and computer activities thin enough to lead authorities in too many directions to track, and its acts target everything from politics to commerce.

As incidents of cyber-attacks — and even infrastructure attacks to water systems and electrical grids — grow, billions of dollars are stolen and billions of people are at risk each year. This may lead to increased cyber-insecurity, or widespread fear of the very technology people need to go about everyday commerce and communication.

UNIVERSAL TRANSLATORS

The Tower of Babel (source Wikipedia)

As the Old Testament Bible story goes, the people once spoke the same language and were proud of the accomplishments they

made in society, so they decided to build a tall monument to their accomplishments to spread their name to the heavens. God decided to humble their pride by confusing their language so they no longer spoke the same tongue. He created a babble and they abandoned their tower of Babel and scattered out to other nations, no longer proud and no longer one.

Maybe the creators of universal translators aren't out to reunite the nations and put an end to global language confusion, but amazingly enough, the day is near when two people speaking different languages can communicate with one another in their own voices but in languages they don't know or understand. An Arabic speaker can push a button and have his words translated into English as spoken, and vice-versa.

Anyone who uses Internet-based translators knows the difficulty of getting an accurate translation through a computer, but some of the biggest names in computer technology and military intelligence are hard at work in enabling easier communication across the nations.

AVATARS, SURROGATES, ROBOTICS

Maybe you aren't comfortable with all of the futurist predictions and even the current rate of technological advance, and that's OK. You can be yourself and interact in the world in a fairly low-tech way while allowing a surrogate, avatar or robot to live your online and tech life for you. Even the U.S. Defense Advanced Research Projects Agency (DARPA) has budgeted millions of dollars to create avatars that will act as surrogates for real, live soldiers.

While avatars and surrogates were once the stuff of games, virtual reality and computer interfacing, they are taking on more and more active roles as replacements for living breathing humans. Or, are they enhancements for humans?

Fully-realized robotic machines have become more and more widespread in medical technology and scientific development, both in the lab and in hospitals, enabling those with paralysis to move limbs, for instance. "Living" life with 'second life' surrogates is likely to become more and more common every day for those of us in less specialized fields, too.