

FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

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Shifting tides: Global economic scenarios for 2015–25

Scenarios developed by Luis Enriquez, Sven Smit, and Jonathan Ablett for McKinsey and Co

McKinsey & Company

At the National People's Congress in Beijing in March 2015, China's Premier Li Keqiang announced a growth target of 7 percent, acknowledging that "deep-seated problems in the country's economy are becoming more obvious." Three months later and thousands of miles away in Washington, the World Bank lowered its growth forecasts across the board and asked the US Federal Reserve Bank to delay any contemplated rate hikes. The World Bank's chief economist said that it had "just switched on the seat belt sign. We are advising nations, especially emerging economies, to fasten their seat belts."

So it's going to be a bumpy ride? How bumpy? And for how long?

Day-to-day developments in the world economy have become increasingly complex and global in their implications. Economic shocks, from Greece to China to Russia, are now of greater concern because around the world, traditional policy tools have already been used and financial resources depleted to help economies recover from the last downturn. Strategic decisions have become correspondingly more consequential. Shocks are inevitable, but strategists must find ways to extract the signals from the noise to understand what's over the horizon.

Three interlinked factors have the potential to shift the global economy from one long-term outcome to another: aggregate demand, structural challenges, and diverging growth patterns.

First, in the near term, the major economies continue to struggle to achieve self-sustaining growth in aggregate demand. This continues despite years of monetary and fiscal stimulus, as well as the recent drop in oil prices.

Second, the world's major economies face long-term structural challenges, including rising debt loads, aging populations, and inadequate or aging infrastructure. Success or failure in resolving these structural challenges will determine the speed of long-term growth in these economies.

Third, the world's major economies have increasingly diverged in the last few years. In the

past, global integration has driven convergence. The prospects for further integration have become less certain. The global financial shock was followed by years of weak growth and concerns over rising inequality. The path to renewed and stronger growth remains elusive.

Given the consequences of these interlinked factors, it is small wonder that near-term developments have taken on oversized importance. Our approach has been to work backward from a series of long-term outcomes, determined by the degree to which the structural challenges have been met and global growth has become more or less divergent. We are then able to move forward, articulating the scenarios likely to emerge in the path ahead from near-term developments.

Near-term signals and long-term forces

The world's major economies, emerging and mature alike, have been experiencing clearly divergent growth paths in the first half of 2015, in some cases due to unexpected challenges. The US economy contracted in the first quarter; growth returned to the eurozone, even as a crisis loomed in Greece. Chinese policy makers continued to steer cautiously between the risks of a slowdown and those of rising debt levels. In India, growth accelerated in anticipation of reforms, while lower oil prices and economic sanctions contributed to a contraction in the Russian economy.

These developments may signal the return of country-level business cycles, suppressed in the depths of the global economic downturn. Yet they may also be its lingering effects, suggesting that deeper forces are at work.

We believe that three sets of forces will shape the global economy over the coming decade. The first two are stimulus policies and shifting energy markets. These are near-term forces, whose effects are felt on a daily basis. The next two forces, urbanization and aging, are powerful, inexorable trends aggravating ongoing structural challenges. Finally, two forces are of uncertain and variable magnitude: technological innovation and global connectivity. All of these trends could intermittently disrupt and transform sectors.

Inexorable factors

Unlike the variegated impact of demand stimuli and energy-market shifts, the effects of urbanization and aging are predictable and are tilting the global economy in one general direction: toward emerging markets. Increasing urban congestion and an aging labor force impose burdens—among them, lower productivity, falling demand, and rising health and pension loads—on all economies. The challenges are clear. The uncertainty lies in how economies will adapt to them.

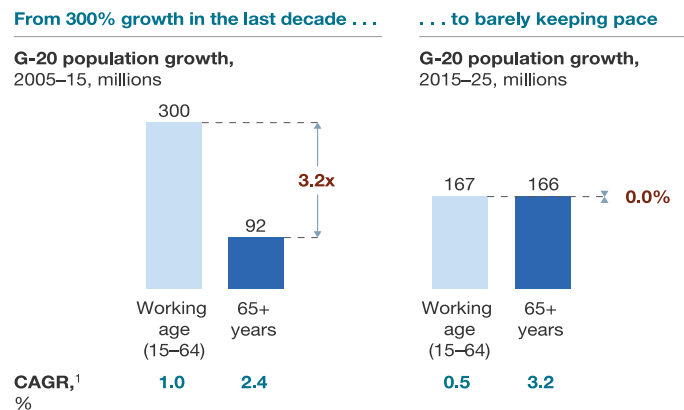
Rapid urbanization. From Brazil to China, emerging economies are urbanizing with unprecedented rapidity. Rural populations are responding to rising industrial opportunities and burgeoning growth, and the economic weight of cities in the world economy continues to rise. McKinsey research indicates that 46 of the world's 200 largest cities will be in China by 2025, a sign too of the eastward migration of the global economy's center of gravity. In recognition of the urbanization challenge China faces, the Chinese government is moving with astonishing speed to meet its climate goals, because the pollution produced by outmoded power generation and manufacturing is starting to interfere with the quality of life in urban areas. India is facing similar and intensifying urban challenges but has not yet moved with China's determination.

Demographic pressures. The labor force, on which economic activity depends, is both aging and shrinking. It is expected to contract by 11 percent in China by 2050, even as the country's economy expands. The shrinkage in continental Europe is expected to be even more dramatic. As life spans are growing and birthrates falling, furthermore, an aging working population in advanced and emerging economies will be supporting ever-higher numbers of retirees. Among the major economies, only the United States has a demographic profile favorable to long-term economic growth. For the rest of the leading economies, expected productivity improvements will not bridge the gap. Without a fundamental economic and cultural shift, favoring continued participation of older workers and the introduction of more women workers and immigrant labor, many economies would face serious growth constraints within ten years (see table).

Uncertain factors

The direction and potential impact of the final factors in our review are less certain than the effects of urbanization and aging. In one sense, technological innovation and global connectivity

In the past decade, the working-age population outgrew the retirement-age population; in the next decade, it will barely keep pace.



¹Compound annual growth rate.

McKinsey&Company | Source: McKinsey Global Growth Model, April 2015

are already familiar phenomena. As the science-fiction author William Gibson remarked 15 years ago, “The future is already here—it’s just not very evenly distributed yet.” Technological disruption has become a pervasive feature of the modern global economy, but its extent is uncertain. Especially important is the question of how much innovation will come from China, India, and other emerging economies. The opening of markets has accelerated the growth of global supply chains and productivity, but will this growth continue?

Technological innovation. Technological innovation has reached a level in the major economies where significant structural changes are in process or have already occurred. Digitization has transformed the telecommunications, media, financial-services, and retail sectors. Consumers are using mobile devices to connect to an ever-widening range of goods and services, while businesses embed such devices more deeply in functional processes and industrial activity. High-tech innovations in robotics and 3-D printing could enable mature and emerging economies alike to boost labor productivity and rapidly expand industrial horizons, while also shifting global trade patterns.

The deep innovation and structural shifts at the industry level have also given rise to concerns about market power and privacy. The theft of credit-card numbers, industrial espionage, and breaches in personal data all raise new questions about the security of information. Major technology companies face rising antitrust scrutiny. Assuredly, innovation will continue, but to what extent will it occur more globally, and how rapidly will it spread across borders?

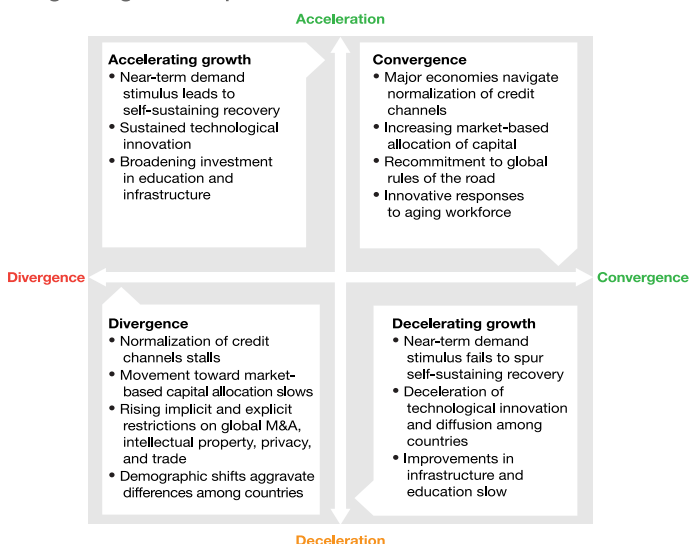
Global connectivity. The constituents of the global economy in 2015 are more deeply interconnected than ever before. Trading relationships are increasingly dense and complex, and they have rebounded rapidly since the global downturn. Today, China is a peerless world-trade hub and Latin American, Indian, and Middle Eastern trade has risen in world-economic weight. Among other factors, the recapitalization of banks, regulatory change, and monetary stimulus have exercised countervailing effects on financial flows, which remain well below pre-crisis levels. Concerns about the transmission and impact of financial shocks remain high on the global regulatory agenda.

The four scenarios

Our scenarios for 2015 to 2025 have been shaped by the three tightly linked sets of factors outlined above—near term, inexorable, and uncertain. The interaction of these factors will govern a number of crucial outcomes. Is weak growth in advanced economies going to undermine the will to open more politically sensitive markets and sectors?

To what extent will inadequate infrastructure or restrictive markets stall growth in emerging countries? How will falling commodity prices complicate efforts to diversify commodity-driven economies? The longer-term factors discussed above—urbanization, aging, technological innovation, and global connectivity—anchor our four scenarios. The near-term factors—monetary stimulus and energy prices—inform the path to the longer-term outcomes. These dynamics have been framed by the intersection of two axes (see table).

Intersecting variables reflect the speed and divergence of global growth expressed in the scenarios.

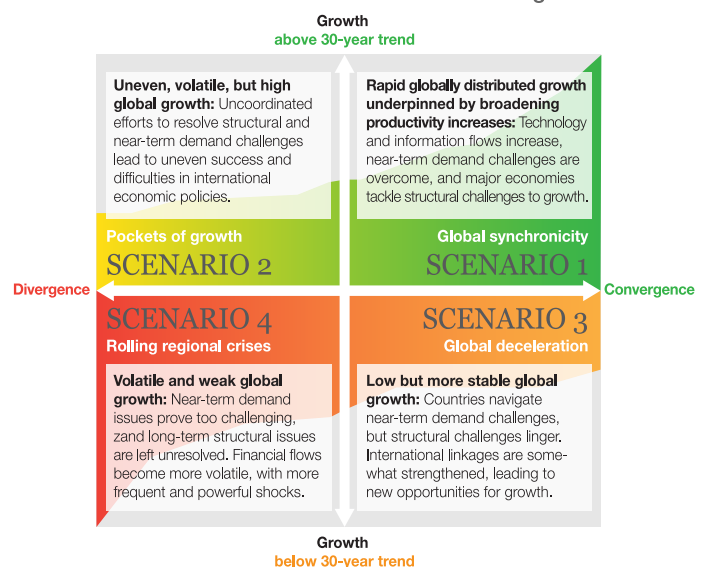


The vertical axis measures the acceleration or deceleration of growth and thus how well (or poorly) economies have tackled their long-term structural challenges. Successful economies drive up productivity and overall growth. The horizontal axis measures the extent to which global growth is convergent. This is determined by a combination of near- and longer-term factors. Countries can converge toward higher (or lower) growth rates, for example, according to how successful they have been in implementing and then unwinding their monetary and fiscal stimulus. In the long term, increasing convergence is also determined by the global evolution of economic rules of the road, covering the extent of economic activity, including goods and services, migration, investment, and intellectual-property rights.

A convergent world would not be impervious to shocks, but it would be better able to absorb them. Higher global systemic resilience means that individual economies can recover more quickly. Divergent outcomes, on the other hand, result when the policies of individual countries are at odds, creating internal systemic imbalances that can magnify the effects of a shock in a particular country. Divergence can also slow the movement of shocks across borders—a movement that, unfortunately, is common in an internationally linked world.

The four resulting scenarios are outlined below:

Global economic scenarios 2015–25 at a glance.



the entire article, together with background material and references can be found here:

http://www.mckinsey.com/insights/strategy/shifting_tides_global_economic_scenarios_for_2015_25

FUTURES FORUMS SERIES 2016

AUSTRALIA IN 2040: WHAT FUTURE ARE WE CREATING?

Do you worry that the best today's young Australians can look forward to is a degraded planet and a much diminished lifestyle? For the 2016 series of the Futures Forum we will imagine a better future, and the ways we may be able to actually create it.

The ten forums in this series will be held around Australia so very few people will be able to attend them all. However, each presentation will be recorded so anyone who listens to the complete series of podcasts, and connects to the parallel resource base on our website will find a comprehensive summary of the key issues facing Australia.

Thursday 25 February in Melbourne

HOW LONG WILL WE LIVE, AND HOW WILL WE DIE?

Health care is changing in a bewildering array of ways. Professional costs increase seemingly without end at the same time as individual and community health care and prevention programs flourish. How will future Australians manage to stay healthy?



Dr Sally Fawkes
Senior Lecturer, Health
Promotion and Leadership
Department of Public Health
La Trobe University

Thursday 31 March in Sydney

HOW WILL WE COMMUNICATE?

Most of the world's spoken languages are disappearing. People say that future kids won't need to read or write because of voice recognition software. Social media has taught us to communicate in 140 characters. Will all communication be mediated by technology?

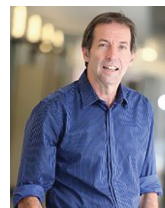


Philippa Barr,
PhD Candidate
Multimedia Producer
and Analyst
Sydney University

Thursday 28 April in Brisbane

HOW WILL THE ECONOMY FUNCTION?

While the market economy has created the wealth and abundance which surrounds us, it is under threat. How will future generations create and distribute wealth?



Professor John Quiggin,
Australian Laureate Fellow
in Economics
University of Queensland

Thursday 26 May in Melbourne

HOW WILL WE BE GOVERNED?

How will our three levels of government contribute to future Australian security and wellbeing? How will we decide who gets to act on our behalf in each of these three levels?



Professor Mark Considine
Dean of Arts
University of Melbourne

Thursday 30 June in Melbourne

HOW WILL WE LEARN?

The industrial revolution invented schooling systems that created industrial workers. Now all the information people could want is available to all, and employers want life-long learners. What will schools be accountable for in the future?



Professor Patrick Griffin
Chair of Education
(Assessment)
University of Melbourne

FUTURES FORUMS SERIES 2016

Thursday 28 July in Sydney

WHERE WILL WE LIVE?

Australia is one of the most urbanised countries in the world, and urban populations continue to increase. At the same time, regional cities and small towns are actively reinventing themselves as places to live and visit and mobile young people may make surprising choices about home ownership. How will the housing market respond?



Mary Casey
Chair,
Living Future Institute

Thursday 25 August in Melbourne

WHAT WILL OUR ENVIRONMENT BE LIKE?

Most people now accept that human beings are permanently changing the world's environment through their actions and inactions. How will future Australians adapt to a changing world?



Dr Jaci Brown
Senior Research Scientist,
CSIRO

Thursday 29 September in Sydney

WHAT WILL WE OWN?

In the middle of last century, owning stuff was the great ambition, but the sharing economy is increasing the range of things which people only use and might never own. In some countries manufacturers of products such as whitegoods and cars are responsible for the product once the consumer no longer wants it. How will industry respond to these new economic drivers?



Dr Chris Riedy
Associate Professor
Institute for Sustainable
Futures
University of Technology
Sydney

Thursday 29 October in Brisbane

WHERE WILL WE WORK?

250 years ago the industrial revolution put men, women and children into farms, mines and factories. The robotics revolution has only just begun, and we don't yet know if this technology will liberate humans from the drudgery of work, or threaten the way we live.



Dr David Tuffley
Lecturer in Applied Ethics
and Socio-Technical Studies
School of ICT
Griffith University

Thursday 24 November in Melbourne

WHAT WILL WE EAT?

The world's population is expanding faster than our capacity to provide good food. Will future Australians get their food from their own backyards, from the farm, from the factory, or from overseas?



Mark Lawrence
Associate Professor
Public Health Nutrition
Deakin University

FUTURES FORUMS SERIES 2016

**AUSTRALIA IN 2040:
WHAT FUTURE
ARE WE CREATING?**

All forums run from 5:30pm until 7:00pm.

Venue details will be confirmed closer to each event.

- Members can book to attend any forum through the website.
- Members pay \$20 including GST to attend.

More information – call the futures foundation on **03 9029 5787**

FUTURISTS IN ACTION

IMAGINING THE FUTURE: CHANGING THE WORLD ONE DAY AT A TIME

With the assistance of the futures foundation one of our members recently created a one day workshop for some of their brightest year 8-9 students designed to give them an opportunity to imagine the future they will one day inherit. These students joined others from half a dozen neighbouring schools in a day divided into two halves.



During the afternoon educators from the Swinburne Advanced Manufacturing and Design facility demonstrated some state-of-the-art robots and explained how these were manufactured and



programmed. More about this centre can be found here: www.swinburne.edu.au/research/strengths-achievements/specialist-facilities/advanced-manufacturing-and-design-centre/ During the morning a futurist explained how futurists think. Given that the future is unknowable, what does it mean to venture into the future, and how can exploring the future be useful when making decisions in the present?

He explained that futurists are much like crime scene investigators – both have a professional interest in a time and a place that they could not be at, and both bring a variety of tools and techniques to helping themselves and others better understand that time and place.

He outlined some of the steps that crime scene investigators

take when examining the time and place they are interested in:

- first they create a very clear boundary around the area in which they are interested
- then they take a careful inventory of what is inside their area of interest (including creating a time line of events)
- they take care to observe as objectively as they can, and not impose their values or prejudices on what they see

and explained that futurists take exactly the same steps before they visit the future.

After the presentation, the students were divided into three groups:

1. Each group was asked to agree on a particular part of the future that they wish to explore. The briefing they will have received prior to the event (see the appendix which follows) will help them begin to think about this before they arrive.
2. The students explored their chosen part of the future using the techniques which the futurist outlined.
3. Each group provided a maximum 7 minute report to the other students on where they chose to go and why, what they found there and what conclusions they drew.

Two of the groups explored different aspects of the future of healthcare, one group looked at rapid transport options, another the impact of modern technology on employment and one even explored the implications of time travel.

All the teachers present were very impressed with the depth of thinking that the students brought to their presentations. As they had been warned, the future is a complex place and their presentations reflected the contradictions and paradoxes they felt were inherent in the futures they visited.

The students said that they were surprised at how quickly the future became too big for them to handle. For example, the two groups that looked at health care both very quickly decided that they had to restrict their thinking only to a significant subset of health care (one ended up looking at antibiotic resistance and the other at the impact of technology on health care).

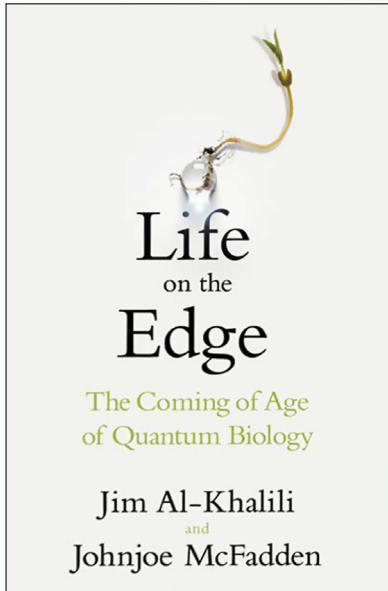
The futures foundation has conducted similar events in a number of schools, including some in which the project the students undertook lasted a fortnight or so giving them more time to gather data and think through the options. We are always keen to work with our members to help them explore the future.

Life on the Edge

The Coming of Age of Quantum Biology
by Jim Al-Khalili and Johnjoe McFadden
Published by Bantam Press 2014

Book Review

by Charles Brass – Chair, futures foundation



Perhaps the biggest question we can ask is: “How did we get here?” Actually, that is probably two questions: “Where did the universe come from?” and “How did life begin?” The way humans categorise things answering the first question is the province of physics and the second is answered by biologists.

Over the past hundred years both branches of science have learned a huge amount and have gone a long way towards answering both these questions.

Physicists are convinced that quantum mechanics played an absolutely crucial role in the early evolution of the universe, and are actively exploring the areas where quantum physics still plays a role. We even seem to be on the verge of being able to create quantum computers which will help us take further forward steps in answering our questions.

Biology, on the other hand, has amassed its many insights without having to consider quantum effects. This book is a speculative venture into some of the least understood areas of biology, exploring whether quantum effects might not also be involved there.

One of the authors (Al-Khalili) is a theoretical physicist and the other (Mc Fadden) is a Professor of Molecular Biology. Together they explore the migration of birds, photosynthesis, how biological enzymes work, how the sense of smell operates, what powers circadian rhythms, how genes mutate, what makes a mind (how do thoughts work?) and how life began; and conclude that none of these effects are yet completely understood, and these authors begin to wonder whether each might be better understood as quantum phenomena.

They acknowledge that their work is speculative (“when we hosted an international conference on quantum biology at the University of Surrey in September 2012 that was attended by most of those working in the field we managed to fit them all into a small lecture theatre (p23)”. but then devote 300 pages to painstakingly explaining just what quantum mechanics is and how it operates, and how it might be involved in many biological functions.

There is a lot to quantum mechanics and the way it might affect biological process varies. To give one example, a relatively

well known quantum concept is that particles are not ‘anywhere’ until they are measured. Before they are measured the best that can be said about them is the probability of their presence. These authors use the following analogy to explain how such an unusual quality might well work in the ‘real’ world:

‘Imagine a jewellery thief has just been given parole and is released from prison. Instead of mending his ways, he immediately reverts to his old habits and starts breaking into houses all over town. By studying a map, police are able to trace his likely whereabouts from the moment he is freed. While they cannot pinpoint his exact location at any particular time, they can assign probabilities to burglaries being committed by him in various districts.

To begin with, the houses close to the prison are at most risk, but in time the area under threat grows larger. And knowing the kind of properties he has targeted in the past, the police are also able to say with some confidence that the wealthier districts with their higher value jewellery are at more risk than the poorer ones. This one-man crime wave spreading through the city can be thought of as a wave of probability. It is not tangible and it is not real, just a set of abstract numbers that can be assigned to various parts of the city.

In a similar way, a wave function spreads out from the point where the electron was last

seen. Calculating the value of this wave function at different positions and times allows us to assign probabilities to where it might show up next (p48)".

This effect is used to explain a mystery concerning how photosynthesis actually works. Those who did school biology will remember that photosynthesis is the process used by plants to take light energy from the sun and convert it into biologically useful energy. The best known chemical that facilitates this process is called chlorophyll and it effectively uses the energy of photons to excite electrons that then move which creates an electrical current of the same kind that powers light globes.

The central mystery of this process is that it occurs inside a cell that contains thousand (if not millions) of chemicals all doing various things. How does the fragile energy created by exciting particularly

excitable electrons at one end of a chlorophyll molecule turn into coherent, usable electrical energy? (It is worth noting that photosynthesis is probably the most efficient energy conversion process in the known universe).

These authors suggest quantum effects. Classical physics would propose that each excited electron would bump randomly into other particles and dissipate its energy very quickly. Quantum physics, in which the electron doesn't exist anywhere until it is measured, would allow the electrons to cohere and hence combine their energies.

These, and all the other questions noted earlier, are all explored and explained without complex mathematics and using similar easy to understand analogies.

As a conclusion the authors posit that perhaps life:

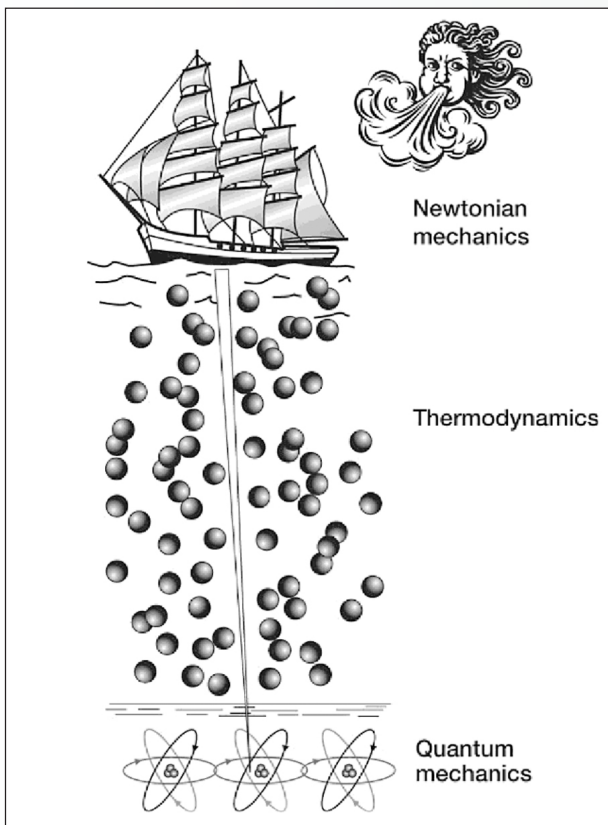
"navigates the edge of the quantum and classical worlds.

The living cell is like a shop whose narrow keel penetrates right down to the quantum layer of reality and can thereby capture phenomena such as tunnelling or entanglement to keep itself alive. This connection to the quantum realm has to be actively maintained by living cells harnessing the thermodynamic storms – molecular noise – to maintain, rather than disrupt quantum coherence (p314)".

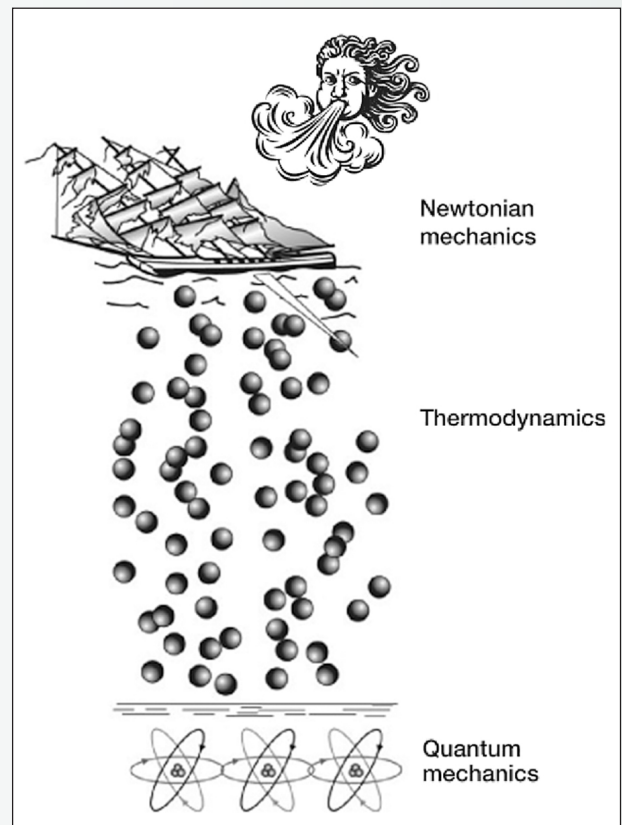
and perhaps death:

"represents the severing of the living organism's connection with the orderly quantum realm, leaving it powerless to resist the randomising forces of thermodynamics (p316)".

Fascinating conclusions helping answer some really big questions.



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Signals in the Noise

TOP 10 STRATEGIC TECHNOLOGY TRENDS FOR 2016



David Cearley, Vice President and Gartner Fellow, recently released the company's "Top Ten Strategic Technology Trends for 2016." They emphasize the Internet of Things, and smart devices talking to each other, getting smarter and more useful as they do. Through it all, the evolution of digital business is clearly at the heart of what is covered. Here is a summary of the trends:

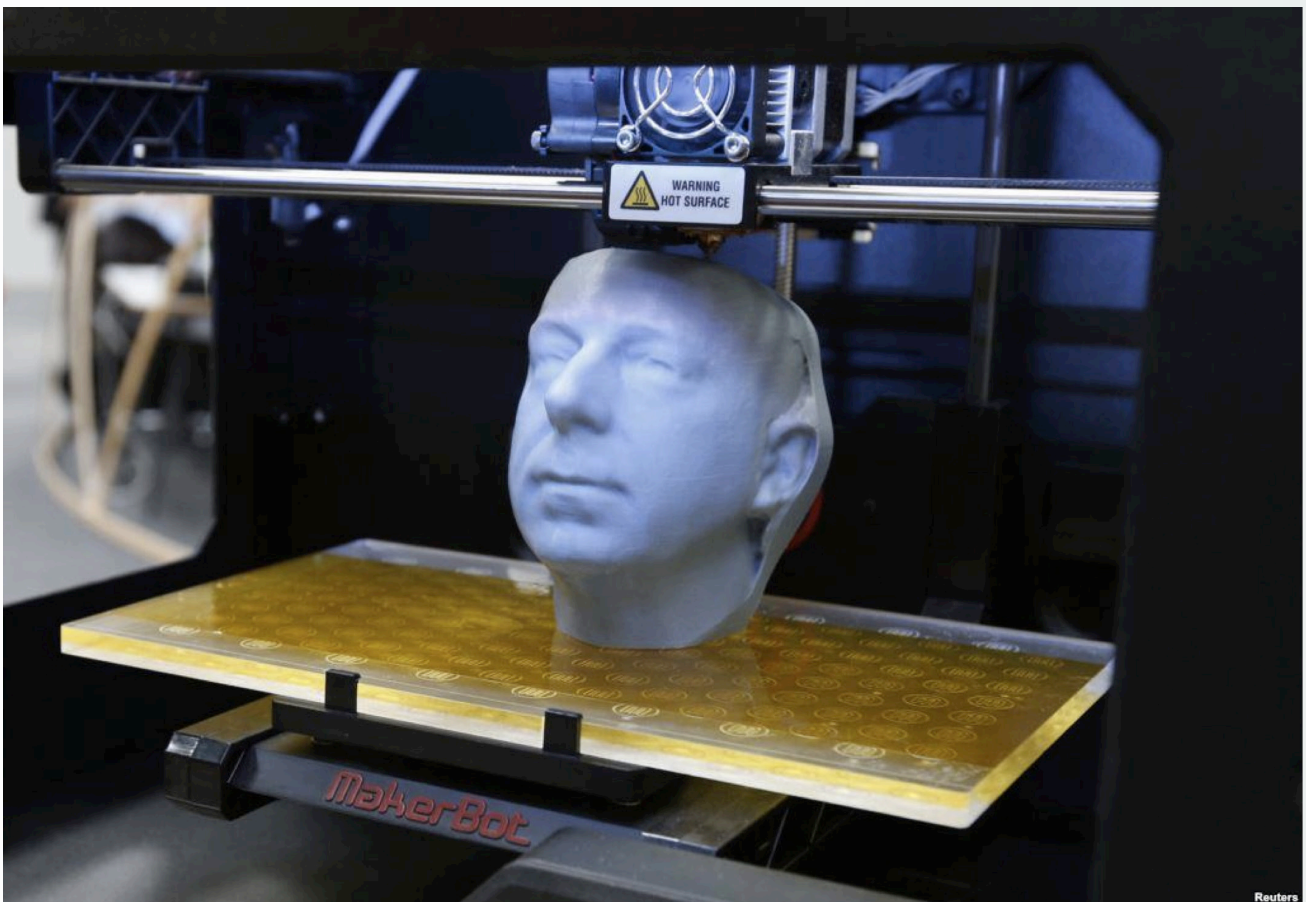
1. The Device Mesh

A variety of other trends have led to an increased number of sensors embedded in many technologies and devices that we use personally and professionally. They become smarter as they gather more data on our daily patterns. Gartner predicts that these sensors, which tend to work in silos today will increasingly work in concert, leading to even greater insights about our daily patterns.

2. Ambient User Experience

Gartner refers to these devices and sensors' ability to gather more contextual data as described above as Ambient UX. The challenge will be with application design, anticipating this level of device synchronicity and collaboration, for lack of better framing. Gartner posits that the devices and sensors will become so smart that they will be able to organize our lives without our even noticing that they are doing so.

3. 3D-printing Materials



Though not a new trend, 3D-printing has caught its stride now that companies like Tesla are using it to build engine parts, and SpaceX is using it to create rocket parts. Better applications of the technology to biological material and food will follow, according to Gartner.

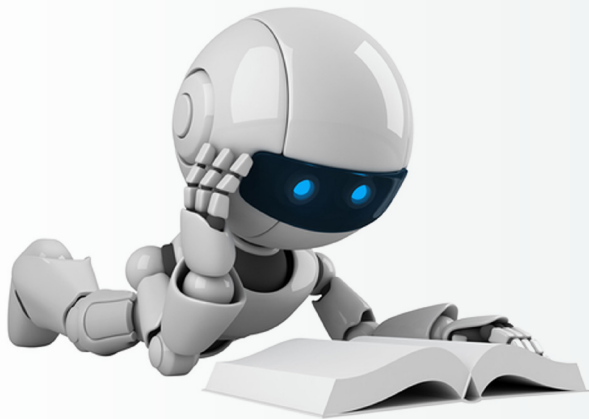
Signals in the Noise

TOP 10 STRATEGIC TECHNOLOGY TRENDS FOR 2016

4. Information of Everything

According to Gartner, by 2020, 25 billion devices will be generating data about almost every topic imaginable. This is equal parts opportunity and challenge. There will be a plethora of data, but making sense of it will be the trick. Those companies that harness the power of this tidal wave of information will leapfrog competitors in the process.

5. Advanced Machine Learning



To an increasing extent, technologies will be able to not only collect information, but learn based upon it. In the process, much of the initial analysis that has typically required a human can be done by machines, elevating the analysis in the process. People will need to engage at a higher level as a result. An engineer checks a robot used by neurosurgeons.

6. Autonomous Agents and Things

The potential for robots to continue to master and surpass humans in their ability to undertake human tasks will increase rapidly. Perhaps the most prominent example is the autonomous driving car, which leverage learnings from autonomous vehicles that have been used within controlled environments for years. Masdar City in the United Arab Emirates is one such prominent controlled environments. Moving beyond controlled environments into non-controlled environments, including the airspace that drones occupy will require further advances – advances that Gartner foresees coming soon.

7. Adaptive Security Architecture

A majority of CIOs list security as their top priority, especially with an increased number of companies that have experienced breaches. Historical norms have been to play defense, but Gartner predicts that more tools will be available to go on the offensive, leveraging predictive modeling, for example, allowing apps to protect themselves. Gartner emphasizes that companies must build security into all business processes, end-to-end. Having it as an afterthought is tantamount to inviting issues.

8. Advanced Customer Architecture

Gartner notes that companies are pushing the envelope on making technology mimic human brains. Prominent examples of this in action include Facebook's Deepface facial recognition technology.

9. Mesh App and Service Architecture

More apps are being built to be plugged together, and the value of the combination is much greater than the sum of the parts. As Lyft has integrated with comparable offerings in other countries, its ability to expand its offering for traditional customers traveling abroad and the reverse has meant faster growth with minimal cost implications.

10. Internet of Things Architecture and Platforms

Gartner indicates that the providers of Internet of Things platforms are fragmented today, and would benefit greatly from cobbling together a better ecosystem where data is shared more broadly. This issue will persist through 2018, and IT departments will likely procure more one-off solutions as opposed to integrated webs of solutions that would serve them better. As IT leaders clamor for a better way, the change will come, says Gartner.