

Driving Forces - 100 Trends and Developments Shaping the Path to 2025

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Identifying the 100 Forces

In this article, we have drawn on our ongoing foresight research programme to highlight a list of 100 key trends and developments that organisations need to be aware of when developing strategies for the next decade and beyond. These encompass a variety of 'future factors' - driving forces, trends, developments and emerging ideas that are already clearly visible in our world today and that could shape the path to 2025.

There are easily at least a hundred more relevant future factors that could have been included in this list and we have deliberately been quite selective in order not to overwhelm the reader. We have to a large extent focused on those developments which we feel will have the broadest impact across society. We'd be delighted to hear your views on additional ideas you'd like to see included.

The future factors are presented under six category headings:

1. Science and Technology
2. The Business of Business
3. Economics
4. Socio-Demographic
5. Politics
6. Environment, Energy and Sustainability

Science and Technology

1. **Disruptive Innovation** – Progress in science and technology is driving a range of disruptive developments that are leading to profound societal and business change. Examples include new web based enterprises with offerings and business models that are disintermediating, commoditising and reinventing existing sectors. In the 'physical world' disruption comes from new manufacturing paradigms such as 3D printing, advanced robotics, synthetic biology, genetic manufacturing, and grown materials. In some cases these developments are already transforming manufacturing processes, businesses and industries.
2. **Continuation of the Moore's Law** – Moore's law suggests that the number of transistors that can be deposited on an integrated circuit doubles approximately every eighteen months to two years. Many experts believe that this exponential trend will continue for some time to come due to continued nanoscale innovation.
3. **Hyperconnectivity** – The increased velocity, complexity, transparency and interdependency of today's society is creating a transformation of unprecedented scale. Hyperconnectivity is redefining how individuals, enterprises and governments interconnect and relate. It provides new models for innovation, new opportunities for growth and new risks that will have to be managed and mitigated.

4. **Big Data** - Big data refers to the large and growing databases of customer and transactional information being generated through everyday activities and increasingly from web-connected devices and sensors. The scale of data collection is projected to rise exponentially due to this emerging 'internet of things'. HP has predicted that by 2020 four billion people could be online globally and 30 billion mobile phones in circulation. As a result, the global volume of data being generated and collected could rise from around 0.8 zettabytes of data in 2009 to 50 zettabytes of data per year generated by 2020 (1 zettabyte = 10^{21} bytes).¹
5. **Predictive Analytics** - The rise of big data has also spurred interest in tools and techniques to analyse and predict future outcomes such as buying behaviours based on recent trends. Predictive analytics draw on a variety of techniques from statistics, modeling, data mining, pattern recognition and artificial intelligence to predict relatively near-term future behaviors of people, markets or systems through the analysis of current and historical data.
6. **The internet - increasing global penetration and ease of access** – The internet is rapidly becoming a critical part of the 'operational infrastructure' for individuals, business and government. It is transforming access to services and encouraging entrepreneurship - enabling people with very limited resources to start businesses with a truly global reach. By 2016, the number of broadband households is projected to potentially double in Latin America and grow by 50-100% in the Asia-Pacific region.
7. **Intelligent web** - The Intelligent web refers to the next stage of the evolution of the internet. The expectation is that the internet could evolve into an intelligent system that understands spoken inquiries, gathers relevant information, and forms meaningful, focused answers. Advances in artificial intelligence could revolutionize the way in which humans interact via the web, and the ways in which we can access its content.
8. **Cloud computing** – Cloud computing provides computing as a service, where data content and applications are stored and provided remotely over a network, typically the internet, rather than housed on a user's own servers. This provides the potentially to reduce an organisation's fixed investment in physical computing infrastructure, space requirements and energy consumption. A recent study by Verdantix forecasts that cloud computing could help large U.S. companies realize \$12.3 billion in energy savings annually by 2020².
9. **The 'Internet of Things'** – The 'Internet of Things' is the idea that any physical object can connect to the internet and communicate with other objects or relay information to people and systems. Forecasts suggest that in the future most everyday objects will be connected to the internet, which means that many tasks / information exchanges will be automated. Different forecasts suggest that between 50 and 100 billion objects could be connected to the web by 2020.
10. **Virtual currencies, e.g. Bitcoin** – Virtual or digital currency is money in electronic form that allows instant transfer between accounts. There are currently no controls on who issues these currencies and they sit outside government regulatory frameworks. A wide range already exist such as Bitcoin and Litecoin - in each case they are decentralised, controlled by users rather than the government and transactions are anonymous. Unlike

credit cards which block payments from some countries, currencies like Bitcoin enable instant payment to anyone from anywhere in the world.

11. **Virtual Worlds** - These are a genre of online community that often takes the form of a computer-based 3D simulated environment, through which users can interact with one another. Virtual worlds can either be a representation of the real world, such as in Second Life, or a fantasy world, such as World of Warcraft. Virtual worlds can be used for gaming, e-learning and business applications such as online conferences, promotional sites and meeting spaces.
12. **Wireless intelligence** – Forecasts suggest that the communications backbone for our IT infrastructure and other key services could be 80% wireless on a single integrated platform by 2020. This will be enabled by advancements in cellular networks, satellite networks, RFID and Wi-Fi. This intelligent network would be managed by a central server which commands different emergency services to detect, react, prepare, respond and even predict events.
13. **Artificial Intelligence (AI)** – AI usually refers to computer-based analytical processes that exhibit human-like intelligent reasoning and behavior. AI systems are being improved continuously and can take the form of smart algorithms or intelligent robots. Recent developments in deep learning have increased researcher optimism that 'strong AI' - or Artificial General Intelligence (AGI) could at some stage reach human levels of intelligence. In business, products deploying expert systems neural network software are already being used for applications like bankruptcy and cost prediction, revenue forecasts and risk evaluation. AI has the potential to change enterprises radically in the future - taking over an increasing amount of the work performed by a number of high-end human roles and professions such as doctors and lawyers.
14. **Explosion of smart devices** – Globally, the number of smart devices is growing exponentially. Today, there are roughly two Internet-connected devices for every man, woman and child on the planet. Analysts forecast that by 2015 the number of embedded devices could reach 25 billion and increase to 50-100 billion by 2020.
15. **Evolving personal technology ecosystems** – Our technology is evolving quickly from desktop to luggable to portable to embedded. A growing range of computing and communications functions are being implanted in clothing and objects. The next stage of evolution is to embed technologies in the body - it is already happening with pacemakers, cochlear implants, tracking devices.
16. **Augmented Reality** - Augmented reality (AR) devices enhance physical world experiences by overlaying physical objects with digitally generated content such as text, maps, sounds and video. This is currently done via devices such as smartphones and tablets but will extend to a range of wearable and portable devices such as special purpose AR headsets, contact lenses and glasses.
17. **Virtual reality** – Virtual reality (VR) enables people to interact with an artificial, 3D visual or other sensory environment through computer modelling and simulation. VR is expected to impact and reshape many fields in the future, including business, education and healthcare and personal life.

18. **Future consumer electronics** – New technologies such as video calling, mind-control video gaming and 3D HDTV are expected to hit the mainstream market by 2020, changing the way people think, interact and work. High adoption rates for such technologies could lead to greener, smarter and technology-savvy lives in the future, but will also change the way we interact and relate.
19. **3D printing / Additive manufacturing** – This is the technique that turns computer designs into reality by depositing material layer by layer in a manner similar to that of an inkjet printer. The disruptive potential of 3D printing is huge not only for manufacturing but also for many other industries e.g. healthcare (3D printed organs) and construction (3D printed houses and buildings).
20. **Robotics / Automation** – Rapid progress in robotic science has led to the development of sophisticated machines that perform a wide range of industrial and domestic tasks. Robots that think, behave and look like human beings are likely to share the workplace in the future or even take on some human roles.
21. **Biotechnology and the emerging bio age** – There has been great progress in biotechnology in recent years including the mapping of the human genome, cloning and genetic modification of plants and animals. The next decade offers the prospect of unlocking the true potential of biotechnology, genomics, genetic engineering, synthetic biology and bio-informatics for individuals and the wider economy. Emerging biosciences have the potential to deliver cures for major diseases, increased human lifespans, genetic enhancement, agricultural innovation and new energy sources.
22. **Nanotechnology** – The term refers to the engineering of functional systems at the molecular scale. Industries working on nanoscale applications include energy, biotechnology, chemistry, environment, food, electronics, healthcare and space. Nano-materials have unusual characteristics such as extreme strength, special electric properties and very low friction. Nanotechnology is increasingly creating opportunities for product and process innovation.
23. **Nano Bio Info Cogno (NBIC)-convergence** – This is the ongoing unification of nanotechnology, biotechnology, information technologies and cognitive science which are gradually converging into a single theoretical and applied discipline. NBIC-convergence offers the potential to deliver a range of new products such as smart materials with memory.
24. **Human enhancement** – Human enhancement refers to the augmentation of human abilities beyond natural levels through chemical, genetic or technological means. The purpose of human enhancement is to improve faculties such as mental performance, physical strength, speed, and stamina. The range of human enhancement applications currently being explored includes exoskeletons to enhance strength and speed, chemical enhancement of brain functions and genetic intervention to eliminate conditions such as rage and obesity. Future possibilities could include machine-augmented minds, AI-paired minds and the use of 3D printed body parts.
25. **Brain-computer interfaces (BCI)** – A BCI system records the brain's electrical activity using EEG signals, which are detected with electrodes attached to the scalp. Machine-learning software is then used to recognize the patterns generated by each user as they

think of a certain concept. A variety of BCIs are already available with applications that enable people to communicate wirelessly with gaming consoles, computers and more distant objects.

26. **Human brain mapping** – Human brain mapping aims to understand the relationship between structure and function in the brain and the physical processes that underlie the storage of information and memories, human sensation, awareness, and cognition. The European Commission has awarded approximately \$1.35Bn to the Human Brain Project. One of the project goals is to develop supercomputing techniques modelled on the brain. A number of commercial firms are interested in the opportunity this might open up for uploading of the human brain to an external storage device or the internet.

The Business of Business

27. **Continued Globalization** – Global flows of people, capitals, goods and services are becoming increasingly interconnected - a trend that is expected to continue for the next decade. Globalization typically leads to increased market liberalization and expanded trade in most countries. However, it also introduces a new level of complexity to business decision making and concerns about cultural dilution.
28. **Shorter and faster business cycles** – A growing sense that the speed of business cycles is increasing whilst their duration is reducing is forcing organisations to adapt their structures, processes and systems on an almost continuous basis.
29. **Level of complexity in business** – Complexity is being driven by the rapid pace of social and market change, innovation and regulatory requirements. Firms that operate in multiple legal jurisdictions are increasingly faced with a multitude of processes, regulatory requirements, governance procedures, differing staff expectations, organisational structures and operating culture. The notion of the 'Chaordic enterprise' is becoming increasingly popular as firms seek to establish how to survive at the boundary between chaos and control.
30. **Commoditisation** – Across a range of sectors, previously premium-priced services are being commoditised. Economic pressures, global competition and automation are combining to drive down prices for goods and services alike from clothing and airline tickets to audit fees. Many fear that such 'lowest cost' strategies are unsustainable and mitigate against investment in workforce development and innovation. The belief is that only the most innovative and deep pocketed businesses are likely to survive this 'race to the bottom' in a world of rampant commoditisation.
31. **New business models** – These are emerging at three levels i) assets funding is shifting from 'ownership to usership; ii) innovation is increasingly being funded through crowdsourcing; iii) revenue models are changing with aggregated buying, auctions, freemium and pay per usage becoming more widespread.
32. **Freemium business models** – Freemium business models provide products or services for free while charging premiums for advanced features or functionality. Freemium models, originally deployed by software companies, are now disrupting an increasing number of industries - driven by customer demands for free products and services. The

model is being applied in diverse contexts ranging from airline landing charges to online subscriptions for information services and social network membership.

33. **Crowdsourced funding** – The internet has facilitated the emergence of new finance models that allow companies, typically start-ups and early stage ventures, to fund products and services in advance via crowdsourcing, using online platforms with consumers committing to become early customers or investors.
34. **Scale of reverse innovation** – Reverse innovation is the strategy of innovating products and services in emerging economies and then distributing these innovations in mature markets. Examples such as the \$10 insurance policy, the \$25 laptop and \$2500 car are already crossing into developed economies. An increasing level of reverse innovation is beginning to challenge established companies, business models and research centres in mature economies.
35. **Commercialisation of public services** – Increasingly governments around the world are looking to commercial providers to deliver public services from healthcare and education to policing and prisons.
36. **Organisational reframing** – Organisational designs and working practices are being influenced by a number of converging factors. Some of these include new operating structures and cultures (e.g. flat organisations), business becoming more social (e.g. companies leveraging social networks to amplify business reach), and increasing cultural complexity - creating the need to accommodate multiple worldviews, religions and customs in day-to-day work.
37. **Networked organisations** – Networked organisations are becoming increasingly widespread as firms seek to partner to deliver solutions rather than do everything in-house. While larger organisations are increasingly embracing some form of networked behaviour, the model is more popular with startups, small firm cooperatives, freelance communities and independent workers - adopting new management approaches and business models.
38. **The rise of co-creation** – As businesses increasingly partner on the design of new products and services with customers, the boundaries between businesses and society are blurring. Customers play a larger role in the firm's ecosystem than simply consumers buying products and services.
39. **The rise of independent workers** – Independent workers are projected to increase dramatically and potentially be in the majority by 2020. This has a major impact on the skills and support required for individuals to manage an independent existence and is forcing companies to rework traditional staffing / resourcing models.
40. **Rate of obsolescence of professional knowledge** - An individual's professional knowledge is becoming outdated at a much faster rate than ever before. Rapid changes in the job market and work-related technologies are necessitating continuous education. In some sectors, the potential exists for AI and other forms of automation to eliminate 50-80% of the work currently undertaken by professionals and skilled workers.

41. **Alternative reward systems and models** – Workers are increasingly requesting a more diverse and continuously evolving mix of benefits over time. Such demands already include holiday discounts when staff are young and elder care services as they continue working into their 70's. Enterprises are coming under increasing pressure to support such an 'a la carte' reward model while ensuring equitable treatment of employees performing similar roles.
42. **Digital assets** – A digital asset is any form of digitally stored content and / or media, including the right to use it. Such assets might include music, literature, computer games or other intellectual property. The scale and pace of replication and the difficulty of securing patents on digital assets is driving firms to accelerate the pace of innovation and usage of digital assets. The development of virtual immersive worlds implies that virtual spending on digital assets could increase, with value creation becoming de-linked from physical objects.
43. **Technological Unemployment** – Automation, robotics and AI have the potential to transform a number of sectors and eliminate roles in industries as diverse as accounting, healthcare, power, automotive, manufacturing and manual labour industries. Some estimates suggest that up to 2 billion jobs could disappear from the workforce by 2030. The hope is that new industries will emerge to create new opportunities - the concern is that the current educational system is still educating young people for careers that won't exist by the time they enter the job market.
44. **Increase in distance working** – The boundaries of organisations and the use of home working are expected to continue growing as firms seek to cut premises costs and workers look to save travel time and increase the flexibility of their working day. The trend is enabled by developments such as cloud computing, the proliferation of mobile devices and greater connectivity.
45. **Disintermediation / redefinition of key sectors** – In many sectors the role of the long supply chain will continue to decline as the internet provides a mechanism for connecting buyers and sellers directly. The advent of 3D printing offers the potential for local manufacture on demand of many goods and services with the distribution company taking on the role of local manufacture and shipping to the end customer.
46. **The rise of micro businesses** – Micro-businesses (companies employing fewer than ten people and with a turnover of less than 2m Euros / US\$2.4m) are becoming an increasingly important part of the economy because they diversify national employment risk, can be started relatively quickly, and are often active in key knowledge-based industry sectors.
47. **Gamification** – Gamification is the process of using game techniques to engage users to solve problems. In business, gamification is increasingly being used for motivating shoppers to buy goods and services, for co-creating products/services with consumers and for employee training.
48. **Future outsourcing hotspots** – Outsourcing markets are increasingly being defined by specialization in niche areas like specialist manufacture, business analytics, software application development, product development and software testing. Many of the next

wave of hotspots are expected to be located in Eastern and Central Asia and Latin America.

49. **Future Fortune Global 500** – An increasing number of emerging market and in particular Asian companies are entering the Global 500 and could dominate it by 2020. This is trend which mirrors the overall shift of economic power from Europe and the United States to developing economies such as India and China and number of emerging economies following in their wake.
50. **The sharing economy & collaborative consumption** – The sharing economy is capitalising on their idea that people no longer want to own an asset and are more interested in its use. Hence from bedrooms and cars to clothing and household tools we are seeing ventures emerge that enable people to share ownership and rent to each other. Examples of startups capitalizing on the sharing economy include Etsy, Airbnb, Skillshare, Uber and Zipcar - all of which are beginning to evolve into viable ventures.

Economics

51. **Systemic fragility** – Today's operating environment is being shaped by an increasing sense of fragility and interconnectedness between key global systems that govern every aspect of finance, commerce and governance. These concerns are compounded by growing economic volatility, wealth divides, and declining government expenditures, as well as demands for true sustainability in national choices around infrastructure investment, resource allocation and the industrial mix.
52. **Public debt** – Public debt is the total amount of money owed by the government to creditors. The global financial crisis and the Eurozone sovereign debt crisis have left advanced economies with high levels of indebtedness. Global Finance suggests that the total debt for OECD has risen from 74.2% of total OECD GDP in 2007 and to 112.5% in 2014 (estimated figure).³
53. **Global Derivatives Market** - The last global financial crisis was triggered in part by the level of default on sub-prime mortgages. These are a form of financial derivative instrument - most of which are not traded on any exchange and so total exposure is hard to determine. Estimates for the current scale of derivatives contracts in circulation range from US\$700 trillion to US\$1.2 trillion - against a total global GDP of approximately US\$72 trillion in nominal terms.
54. **Global flows** – The global flows of goods, services, finance, and people are rising rapidly - representing over 35% of global GDP and creating new degrees of connectedness among economies. The degree of interconnection for a city or nation is seen as an important indicator of current and potential prosperity - with Germany considered the most interconnected country in the world.
55. **Economic growth** – Despite the global financial crisis, economic growth / global GDP is projected to grow in the coming decades. According to OECD forecasts, global GDP will

almost triple between 2010 - 2050. China and India are expected to account for 46 % of global economic output by 2050.⁴

56. **Economic power shifts / The Next 11 (N-11)** – Emerging economies are experiencing economic growth, lifting millions out of poverty while also exerting more influence in the global economy. The rebalancing of global power might lead to the rise of new international system, increasingly shaped by the grouping of Brazil, Russia, India and China (the BRICs) and a number of nations that follow in their wake. The so called 'next 11' emerging markets are expected to be among the largest future economic engines of growth – signalling a potential shift in economic power by 2020 from BRIC countries. The N-11 comprises Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey and Vietnam.
57. **New trading zones** – Governments around the world are entering into new trade agreements which should spur the development of new trading hubs, creating new growth markets and increasing trade volumes by 2020.
58. **Global inequality** – The scale of global inequality has increased dramatically over the past 20 years. An Oxfam report states that globally, the income of the top 1% increased 60% in twenty years with the growth in income for the 0.01% being even greater.⁵ A growing body of research indicates that higher income inequality within countries correlates with higher unemployment, higher crime rates, lower average health, limited access to public services and lower social mobility.
59. **Urbanization** – An ever increasing number of people are expected to live in urban areas in the next decade. The United Nations reports that the global urban population has overtaken the rural one and could reach 55-60% by 2030. Urbanization poses significant challenges around the creation of economic opportunity, the effective management and provision of infrastructure, services, sanitation, clean water, food healthcare and safe environments.
60. **Mega cities** – Mega cities have populations of at least five million. In 1950, New York and Tokyo were the world's only megacities. Now estimates suggest there are 23, the UN predicts this number could rise to 37 by 2025. The developing is expected to be home to 29 mega cities by 2025.
61. **Smart /intelligent cities** – The aim of smart city projects around the world is to connect objects into an internet of everything - including electricity grids, roads, sewer systems, buildings and cars - enabling object-to-object and people-to-object interaction. Buildings will turn the light on when you are approaching and roads will interact with your smart car. The belief is that this will open up vast new possibilities for economic growth and development. Boston, Copenhagen, Dublin, Barcelona, Masdar Abu Dhabi, Rio and Singapore are the locations pioneering smart city initiatives.

Socio-Demographic

62. **Population growth** – The global population is expected to continue growing at least until 2050, when it is expected to reach 9.3 billion.⁶ Population growth will bring about both advantages (younger workforce, greater consumer market) and disadvantages (competition for resources).
63. **Female shift** – Traditional gender role models are gradually being overcome at different rates around the world. Girls now outperform boys at every level of the education system in every OECD country. More people are employed in the US by women owned businesses than in Fortune 500 companies. As women gain more power and influence on the economy, society and politics, habits in professional and private lives are undergoing profound changes. The female shift will require changes at different levels, including work-life balance, family roles and structures as well as organisational leadership.
64. **Emerging middle class** – The size of the “global middle class” is projected to increase from 1.8 billion in 2009 to 3.2 billion by 2020 and 4.9 billion by 2030 with the bulk of the growth coming from Asia. The emerging middle class in developing economies is expected to act as a major engine of growth.
65. **Ageing / Super-centenarian Societies** – The world’s population is ageing. Over the period from 2010-2050, the proportion of over-60’s in the developed economies is projected to rise from 22% to 33%, with a more dramatic rise in developing world from 9% to 20%. In most developed economies, the over-80’s represent the fastest growing age group. By 2050 the expectation is that healthcare advances and lifestyle changes will enable people to live longer and healthier lives. Average life expectancy at birth is expected to reach 90 years, and most of the population will live longer than one century. Political choices will increasingly be shaped by the over-60’s who already make up the majority of the voting population in many nations.
66. **Eldercare** – Demographic trends toward having fewer children later in life suggest that eldercare might become a huge burden for the average worker in the future. Workers might increasingly need to deal with aging parents which in turn could put a drag on geographic mobility.
67. **New notions of retirement** – Retirement as we know it might not exist in the future. Instead, people might step in and out of work for regular periods in the final 20-30 years of working life and take more long breaks early in their careers.
68. **Demographic diversity** – Baby Boomers, gen X (1966-1976), gen Y (1977-1994) and gen Z (1995-present) will increasingly have to work together in the future. Potential conflicts might arise in the workplace as these generations have diverse values, communication styles, working method and lifestyle preferences. Many companies are already experiencing an evolving clash of the ‘print’ (generation X, Baby Boomers) and subsequent ‘born digital’ generations.
69. **Multiple careers** – As people are likely to live longer in the future, they are also likely to have multiple careers - enabled by opportunities for continuous re-education. A university graduate in 2014 might reasonably expect to pursue 5-10 careers or more in a

working life that could extend to the year 2090 and beyond - if the notion of work as we know still existed at that time.

70. **New Skillsets** - The Institute for the Future identifies 10 critical skillsets for individuals to thrive and survive in the 21st century. These can be categorised into four groups. Soft skills: Cross Cultural Competency and Social Intelligence. Thinking and mental management capabilities: Sense Making, Cognitive Load Management and Novel and Adaptive Thinking. Professional skills: Trans Disciplinarity and Design Mindset. Technical competencies: New Media Literacy, Computational Thinking and Virtual Collaboration.
71. **Greater cultural diversity in the workplace** – The UN forecasts that Europe may need 1.6 million immigrants per year up until 2050 just to maintain 2011 population levels. A significant proportion of these are likely to be drawn from emerging economies, leading to a need for accommodation of greater cultural diversity in European societies.
72. **Health divide** – In many developed and developing economies alike, the gap is increasing between those with good and poor health. Health inequalities may threaten the prospects for social development, growth and stability.
73. **Imbalances between high skill and low skill labour** – McKinsey (2012) predicts that by 2020 there could be a shortfall against global workforce requirements of 30-40 million workers with tertiary education and 90-95 million low-skilled workers. A critical challenge here is the reskilling of the existing workforce to take on new roles in the jobs, professions, industries of tomorrow.
74. **Reverse brain-drain** – As economic and social conditions improve around the world, increasing numbers of highly educated and skilled workers are predicted to return to their homelands by 2020. The vast majority of these are expected to be from developing countries such as India, China, and Brazil.
75. **Individualization** – Global advances in education, health and technology access are increasingly empowering individuals to shape their lifestyles and careers and to influence governments and policy decision-making. This shift from a more collective approach to individualization and segments of one is challenging governments and businesses alike to rethink their delivery proposition.
76. **Proliferating digital and online tools for learning** – Recent years have seen the development and evolution of a variety of digital and internet-based tools with significant potential to transform the practice of education and the position of learning in daily life. Based on the general technologies of computing, the internet, and cellular communications and strongly shaped by recent advances in social media applications and mobile devices, these emerging tools allow learning to be decoupled from the traditional classroom and to make learning personalized, interactive, and social. These are driving change in the classroom and lecture theatre and democratizing access.
77. **Massive open online courses** –Massively open online courses (MOOCs) are now being offered for free by thousands of educational bodies ranging from established

institutions such as MIT and Harvard to relative newcomers such as the Khan Academy and Apple iTunes. The internet has now eliminated barriers to access - with the offerings proving particularly popular to developing economy students who would not otherwise be able to fund higher education.

78. **Multiple identities** – The co-existence of digital and physical worlds has given rise to the notion of individuals having multiple – potentially more complex - and multi-faceted identities. Virtual worlds have demonstrated people's desire to establish online personas that are even completely different from their physical identity.
79. **Data junkies** – The term refers to people who are preoccupied with the collection and analysis of their personal data derived from a variety of devices and sources such as health monitoring aids, mobile phones and specialist devices. Big Think (2012) suggests these individuals are collecting and recording data from the web - tracking, broadcasting and comparing it with others using mobile devices.
80. **Geo-socialization** – Geo-socialization is the next generation of socializing - based on geographic services and capabilities, such as geocoding and geotagging. It matches people's profiles, interests and other user data with location-based services, so that people can connect and coordinate with surrounding people or events. Geo-socialization opens up new opportunities to reach and interact with each other and with consumers.

Politics

81. **Political Experimentation** - Around the globe, there is growing understanding that political governance models evolved in over the last five centuries may not be appropriate for a world in transition. Existing models of democracy, single party states, monarchic rule, benign and oppressive dictatorship are all coming under scrutiny as governments look for models that can best deliver national goals in the digital age.
82. **Democracy 2.0** - New models of democracy are emerging for the digital era. Enabled by mobile technology and internet in particular, these approaches enable policy makers to account of the views of the population at street, village, community, region or country level in an increasingly flexible, adaptable and real time manner. Citizens can now be consulted on a wide range of matters and now have mechanisms to bring issues to government attention.
83. **The Rate of Democratic Transition** – Following the 'Arab Spring' uprisings in the Middle East, expectations rose about the potential for more nations to move to a democratic governance model either through conflict or peaceful means. However, the resulting difficulties of many of those nations to bed in the democratic model has highlighted the challenges inherent in such fundamental change and the timescales required to bed in new political systems.
84. **Reframing of Global Governance Institutions** - Shifts in economic wealth, power and influence, coupled with demographic change are driving demand for the reformation of

global institutions such as the United Nations, World Bank and International Monetary Fund. Gradually these entities are ceding more power and greater influence to the populous evolving economies such as China and India

85. **Governance / delivery of public services** – Public sector provision is being moved increasingly to the private sector, particularly in the West and rapidly evolving economies. Globally, questions around governance and risk are emerging, e.g. how to define and enforce public governance when an increasing number of public services are delivered by the private sector.
86. **Empowered Populations** – Technology advances and changing governance models are gradually enabling populations to be more empowered to share knowledge, be aware of their environment and take informed and responsible decisions. The emergence of such communities of empowered individuals could increasingly challenge the roles of the representative decision makers currently running politics, health, education and welfare systems.
87. **Rise in e-government** – Across the globe countries are pursuing e-government projects in order to provide better services to citizens, improve internal communications and cut costs. Such initiatives could change the way individuals and businesses interact with government and access services.
88. **Networking of the world's legal systems** – Although there may not be world law in the foreseeable future, it is likely that the world's legal systems will be increasingly networked in the future.
89. **Governance of The Shadow Economy** – The shadow / informal economy refers to "...those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation." The size of the shadow economy has been estimated at \$10 trillion – second only in size to the USA at \$14 trillion. While many countries have sought to control the Shadow Economy, many are moving to a model of accommodation. They are acknowledging that - in some cases - the Shadow Economy is the largest segment of the economy and delivers many of the services expected of governments - such as policing, education and healthcare.

Environment, Energy and Sustainability

90. **Climate Change** – Most scientific analyses suggest that the planet is experiencing dangerous climate change. Increases in severe weather, sea-level rise, greater flooding, drought, and other environmental impacts arising from climate change could affect all aspects of our lives in the future. Ensuring the resilience of natural and built systems and developing relevant climate change mitigation and adaptation policies are becoming an increasing challenge for governments globally.
91. **Resource Scarcity** – The combined pressures of population growth, economic growth, resource scarcity and climate change are having an increasing impact on business

decision making - from location to securing raw material supplies. Sustainable resource management is rising higher on government agendas.

92. **Rising Energy Demand** – The International Energy Agency predicts that energy demand could rise 40% by 2035. All sources of energy are expected to experience growth, but renewable energy is still expected to make a relatively small contribution to total world energy use by 2035. ⁷
93. **Growth of Fracking** - Hydraulic fracturing (fracking) involves drilling down vertically into the earth to release gas and oil from shale rock. A high-pressure water mixture of water, sand and chemicals is injected into the rock enabling gas and oil to flow up to the well head. Globally, estimates suggest that trillions of cubic feet of shale oil and gas could be extracted. Environmental concerns are rising about the cost of shipping in water, the risk of chemical escape and the potential for fracking to cause earthquakes and tremors.
94. **Peak Everything** – ‘Peak everything’ proponents believe that we have reached or are rapidly approaching the planet’s maximum capacity on everything from oil to water - resulting in the prospect severe raw materials resource constraints. For example, global oil production is expected to peak in the period between 2015 and 2020. The FAO (2012) warns that a projected 5% increase in total arable land worldwide by 2050 will not suffice to meet global food demands. Forecasts suggest that agricultural productivity will need to rise by 60% to feed the rising global population.
95. **Age of Abundance** – Countering the concerns of the peak proponents, the Singularity movement argues that advances in science and technology could lead to a world of post-scarcity, or abundance, between 2020 and 2050. The expected exponential rate of development in fields such nanotechnology, genetic science, bio / molecular manufacturing, robotics, ICT and AI could yield greater efficiencies in resource usage and deliver abundant sources of new materials.
96. **Environmental Market Mechanisms** – Continued global growth is expected in the adoption of carbon taxes and ‘cap and trade’ policies. These are already among the most widely adopted environmental market mechanisms - aiming to encourage more sound behaviour around carbon usage and provide the funds to finance ecological protection.
97. **Developing Materiality of Biodiversity Impacts on Business** – Growing resource scarcity, biodiversity loss and the degradation of ecosystem services present financially material risks and opportunities to investors, shareholders and insurers, given corporate reliance upon these natural assets.
98. **Scale of take-up in alternative energy** – Alternative forms of green energy such as solar, wind and biogas are becoming increasingly popular at the corporate level as they are giving firms a wider range of options for fulfilling their energy needs and decoupling themselves from the price volatility of public energy supply.
99. **Green manufacturing** – Sustainable standards for green manufacturing are emerging and are increasingly being embraced by multinationals and consumers around the world.

100. **Community Sustainable Resource Management Schemes** - A growing number of local initiatives are encouraging communities to reuse, recycle, repurpose and share resources. For example, Curitiba in Brazil provides local with 1 kilogram of local produced food for each 4 kilograms of waste they recycle.

About Fast Future

Fast Future is a global research and consulting firm. We undertake in-depth research into the forces and factors shaping the future. We then use this in four ways:

- Live delivery - Futurist presentations, conference chairmanship and designing highly participative executive level futures experiences
- Reinventing the present - Helping clients determine how to transform their strategy, products and services and create the future design for their organisation
- Envisioning the future - Helping clients create transformative future visions and organisational models - recently these have included envisioning an airline, airport and city of the future for industry leaders in each sector
- Investing in disruption - Helping clients spot, invest in and nurture disruptive new ventures and developments that could transform their business.

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¹<http://www.v3.co.uk/v3-uk/the-frontline-blog/2129028/hp-predicts-zettabytes-created-2020>

²http://www.verdantix.com/index.cfm/papers/Press.Details/press_id/58/verdantix-cloud-computing-report-for-carbon-disclosure-project-forecasts-12-3-billion-financial-savings-for-us-firms/

³<http://www.gfmag.com/component/content/article/119-economic-data/12370-public-debt-percentage-gdp.html#axzz318RWednZ>

⁴<file:///C:/Users/lva/Downloads/Assessment%20of%20global%20megatrends%20update%20Chp%205.pdf>

⁵<http://www.oxfam.org/sites/www.oxfam.org/files/cost-of-inequality-oxfam-mb180113.pdf>

⁶http://esa.un.org/wpp/Other-Information/Press_Release_WPP2010.pdf

⁷file:///C:/Users/lva/Downloads/OurFutureWorld_CSIRO_2012.pdf