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Through the megacrisis: the passage to global maturity

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Abstract

Purpose – *The paper aims to give an evolutionary perspective and ''collective intelligence'' methods to help understand how the world could make the passage through today's ''global megacrisis'' – the intersection of climate change, peak oil, financial instability, and other threats – reaching a critical point as industrialization doubles over the next decade.*

Design/methodology/approach – *An online survey is used to assess attitudes toward four scenarios defining the range of possible outcomes of the global megacrisis, and an improved Delphi method estimates when emerging technologies are likely to enter mainstream use.*

Findings – *The survey shows that people think there is a strong likelihood these trends will cause major global disasters or a collapse of civilization in large parts of the globe. Macro-forecasts of the Technology Revolution suggest that the rise of e-commerce, green business, climate control, alternative energy, artificial intelligence, and other technological advances are likely to move the world to a more sophisticated level of development about 2020.*

Research limitations/implications – *Trend analysis and ''collective intelligence'' methods, such as attitude surveys and Delphi studies, involve some degree of uncertainty*

Practical implications – *Results clarify how that today's global threats are part of a broader evolutionary passage to an advanced global order.*

Originality/value – *The evolutionary perspective is an original approach to global affairs, and the forecasts are from what may possibly be the best forecasting system available.*

Keywords *Governance, Forecasting, Globalization, Consciousness, Knowledge economy, Technology-led strategy*

Paper type *Research paper*

Introduction: today's role in the journey of evolution

Life unfolds in cycles of birth, growth, and death. The life cycles of humans run a few decades, while civilizations rise and fall over centuries. Even planets and stars are born and die, although their life cycles run billions of years. Biologist James Lovelock observed that our planet evolves as a living organism in its own right (Lovelock, 1982), with life on Earth evolving through its own life cycle. This article outlines how global civilization is passing through a particularly critical stage in this evolutionary journey.

The Great Recession that began in 2008 soon escalated into a ''global megacrisis'' of interlocking fears over climate change, energy shortages, financial instability, and other yet unforeseen threats. As we will read shortly, a TechCast survey finds there is a 60 percent probability that major parts of the globe will suffer the loss of civilization or enter a high-tech dark age. People the world over have deep anxiety over entrenched failures in governance, and they do not see a way through this impasse. Futurist John Petersen calls it ''the greatest challenge in our history'' (Peterson, 2008).

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From an evolutionary perspective, this is not simply an unusually great crisis but a difficult passage to a rather different world. We are being pulled by historic trends into a massive

transition we do not understand very well as yet. Powerful forces are behind the global megacrisis, like currents beneath the surface, and they are likely to provoke and resolve today's predicaments. Drawing on authoritative forecasts and social analyses, we show that a ''technology revolution'' is driving an evolutionary shift to a high-tech, advanced stage of civilization with its own logic, much as the Industrial Age replaced the feudal system of the Medieval Ages. The evidence presented here shows exploding capabilities in all fields, mounting knowledge everywhere, widespread artificial intelligence, and a growing sense of global consciousness. The global megacrisis actually represents a passage to a ''mature'' world, much like the maturity crisis young people pass through to reach adulthood.

This is a transition that will transform global systems, social institutions, and our personal lives, so it is urgent to consider how we can best meet the events to come. Because, rest assured, within five or ten years from now, our lifestyles, careers, communities, and the world as we know it are likely to change quickly and dramatically. I believe these changes will be for the better generally, but they are likely to be difficult for those who are unprepared. Events of this magnitude can sweep away outmoded systems, as seen in the enormous economic, personal and social damage caused by the financial crisis of 2008 that continues to unravel.

The research underpinning this evolutionary perspective is conducted by the TechCast Project at George Washington University (www.TechCast.org). For more than a decade, TechCast has pooled available knowledge and the judgement of 100 plus experts worldwide to forecast technology breakthroughs and their social impact. The Project was cited by the US National Academies of Science and Engineering as among the three best systems available, and Internet searches rank it No. 2 or 3 out of 106 million hits. It could be thought of as the Hubble Telescope of technology forecasting, able to see more clearly into the future.

Events could prove us wrong, of course, and this transition appears to be especially difficult, like all evolutionary processes. After all, every birth is inherently a messy, painful process, and every teen must struggle through an identity crisis to reach adulthood. The most brilliant new technologies and robust economic systems alone will not succeed unless we accept responsibility for these challenges, set bold new goals, marshal our capabilities, learn to collaborate across differences, and find some measure of wisdom. These are the elements of maturity in any system - human, national, or global. To survive, much less thrive, as disruptive events unfold over the next five to ten years, the world as a whole will have to make difficult choices on climate control, transitioning to renewable energy, reforming business and government, and resolving conflict. This article can be thought of as a guide to the terrain ahead.

From this perspective, the megacrisis presents itself as more than merely a great problem. It could prove a boon for those able to envision the coming economic expansion on the other side of this transition, and it offers a rare opportunity for badly needed structural change. We are being forced to become responsible and act wisely. If we fail to meet this challenge, our lifestyles, the prospects for our children and grandchildren, for nations, and for the planet will decline severely.

Analyzing the global megacrisis

The threats making up the global megacrisis form a complex interplay of destructive forces that are straining old systems to the breaking point. These are interrelated elements of a failing global order that looks like a train wreck in slow motion. If it had not been bad mortgages in 2008, some other flaw in these complex global systems could have caused roughly the same type of financial failure, and more failures are likely to cascade one upon the other as pressures increase. Box 1 is a summary of our trend analysis that defines the megacrisis (Halal and Marien, 2011).

The problems cut across all sectors of society to announce the end of the Reagan/Thatcher Revolution that began in 1980. The Iraq war demonstrated the limits of military power, and the 2008 financial crisis showed the limits of poorly regulated markets focused on profit. Overleveraged, badly managed American banks brought down the world's financial system – and then profited handsomely. Politicians were complicit by allowing the corrupting money of corporate lobbyists to grease palms and avert eyes. The economic culture glorifying

Box 1. Trend analysis of the megacrisis

Because the megacrisis is complex, this analysis uses prominent data to define it more clearly. The ''Driving Trends'' and ''Resolving Trends'' below are interwoven into a Gordian Knot of entangled relationships, of course. But this analysis helps identify and gauge the extent of forces working in ''optimist'' versus ''pessimistic'' directions. This is a tentative outline that is continually improved, so please email proposed additions, needed changes, and other thoughts to *Halal@GWU.edu* and *mmarien@twcny.rr.com* For details, see (Halal and Marien, 2011).

Trends driving the megacrisis

- *Scientific forecasts for climate change are grim.* Global temperatures have risen 1^{o} C thus far, but 97 percent of climatologists support the IPCC's estimate of an added 4-6^{o} F even if all proposed actions are taken. If carbon emissions keep growing, temperature could increase by 6-10^{o} F and sea levels could rise 3-6 feet by 2100. Researchers estimate that global warming is largely caused by humans, and greenhouse gases would have to be reduced by 80 percent from current levels to avoid severe climate change. This would cost roughly $20 trillion, or about 1-3 percent of global GDP, if done soon – but far more costly later.
- *Dangerous environmental impacts likely.* Climate change is producing more extreme weather (heat waves, hurricanes, drought, etc.), environmental pollution, and energy shortages. It could destroy a quarter of all animal species, the greatest extinction since the dinosaurs. A hotter climate is likely to spread dengue, malaria, asthma, allergies, and other disease more easily. A team of scientists cautioned ''Climate change is the biggest health threat of the twenty-first century.''
- *Methane a growing threat.* Greatly increased methane released from thawing tundra and melting clathrates on the ocean floor are thought to be three times earlier estimates. Methane has 23 times the global warming impact of CO2, so it could pose another possibly even greater threat that could appear quickly.
- *Industrialization growing rapidly.* The megacrisis is increasing as most developing nations industrialize. The number of people living at industrial age levels will spurt from 1-2 billion in 2011 to 4-7 billion by 2050 or so, increasing all these threats by a factor of 3-4 over the long-term.
- *Energy in transition.* Oil production has plateaued since 2005, earlier than estimates by the IEA, suggesting that ''peak oil'' has passed. The energy from tar sands in Canada, fracking shale in the USA, and similar plans around the world offer hope for the looming energy crisis. But the costs of more complex extraction, water use, and ecological damage are high and mounting. NASA's James Hansen says the tar sands contain twice the CO2 emitted by oil throughout history. ''If Canada proceeds, he said, ''It will be game over for the climate.''
- *Little political will.* There is as yet no global agreement on taxing carbon or other policies that would decrease carbon emissions significantly. The USA, with the largest economy is the world, has no serious plan because the nation is in political gridlock and likely to remain so for years. China, India, and the USA are planning to build a total of 850 coal-fired plants, adding five times as much CO_2 as present treaties intend to reduce, although clean coal may help.
- *Water scarcity.* Nearly 1 billion people lack clean water and 2.6 billion lack good sanitation. Water tables are falling on all continents, and by 2025 the World Bank estimates half of the world could face water scarcity due to climate change, population growth, and increasing demand. Absent major changes, water shortages are likely to cause mass migrations, higher food costs, malnutrition and conflicts.
- *Financial instability.* The imminent implosion of the EU is being held at bay, but an eventual collapse is possible and potential crises are appearing in China and elsewhere. Knowledgable observers claim the default of Greece would have the same effect that the fall of Lehman Brothers had on the 2008 US financial crisis. George Soros thinks riots are ''inevitable.''
- *Recession likely for years.* The Great Recession of 2008 is often compared to the Great Depression of 1929 which lasted until 1940. The International Monetary Fund (IMF) forecasts growth for the next two years at about 2 percent in developed nations, although higher in the developing world. The Recession is exacerbated by rising costs of health care, food and energy, retirement of aging populations, and other negative trends. Some economists think unemployment rates of 8-9 percent are not unlikely for several years, much like Japan's ''lost decade.''

- *Institutional failures could grow severe.* The 2008 financial crisis highlighted structural failures in business, government, and other institutions. An IBM study of 1500 CEOs noted: ''the world's leaders think their enterprises are not equipped to cope with complexity.''
- *Cyber-insecurity.* Computer hacking is growing with the boom in global e-commerce. Military networks, nuclear facilities, banks, air traffic systems, and electrical grids are under constant attack. The cost globally is estimated at $1 trillion/year. The threat is so great that one expert suggested installing ''cyberwar hot lines'' – like the red phones the USA and USSR used to avoid nuclear Armageddon.
- *Weapons of mass destruction.* The old status quo of ''mutually assured destruction'' may have worked for two superpowers, but it is no longer viable with some nine contending nuclear powers, and more are likely, possibly including terrorist groups. Bioweapons are also probable. Between 1993 and the end of 2009, the Illicit Trafficking Database recorded 1,784 nuclear trafficking incidents.
- *Organized crime growing worldwide.* The total annual income of organized crime is estimated at $3 trillion, twice the military budgets of the entire world combined. The World Bank also estimates $1 trillion is paid in bribes each year.
- *Increasing consumption.* Demand for food, energy, and goods is increasing with globalization, and obesity is becoming a serious problem. Raising cattle for meat produces 30-50 percent of global warming. Average body mass is 80 kg in the USA, 58 in Asia, and 62 globally, and the world may be shifting to the lifestyle of the USA
- *Post-collapse scenarios.* Futurist Jim Dator, Dennis Meadows, and others think a global collapse is coming, but a rebound could follow to create a better world. This seems unlikely if the decline to disaster scenario were to occur because civilization would no longer exist in major parts of the globe, but it is plausible under the muddling down scenario.

Trends resolving the megacrisis

- *Accelerating use of alternative energy.* By 2020, the EU expects renewables to reach 22 percent, Britain expects to reach 35 percent, Sweden 50 percent, and China 16 percent. Alt. energy is growing 30-50 percent/year and is likely to provide 30 percent of all energy by 2030. Some contend it would prove a boon for both developing and developed nations.
- *Energy conservation reducing CO2.* Higher auto fuel economy, regulating coal emissions, and replacing oil with cleaner gas are reducing CO2. The Fed. Govt. predicts CO2 will flat-line through 2035.
- *Curbing warming.* An international team studied 400 ways to reduce global warming and found 14 that provide 90 percent of all benefits. Cleaning emissions of methane and soot could have a big impact in months.
- *The technology revolution.* Information technology (IT), artificial intelligence (AI), robotics, and other revolutionary fields offer more powerful communication, amass knowledge, form intelligent systems, and generally improve awareness. The Collapse of Communism, the Arab Spring, the Tea Party, and Occupy Wall Street show how IT is challenging power. People are now connected by almost 6 B cellphones (80 percent of world pop'n.) – all becoming smart little computers using the web for almost anything. TechCast studies show a burst of innovation starting about 2015, coinciding with the beginning of the next projected 35 year upcycle.
- *Forces of social change.* The rise of women into power, citizen revolts in the Middle East, the Millennial generation modeling the first ''global citizens,'' and other movements are introducing fresh perspectives and energy.
- *Urban areas ''going green''.* Many regions are following the Green Growth Strategy urged by the Organization for Economic Cooperation and Development (OECD) to develop ''a stronger, cleaner, and fairer world economy.'' Cities acting on their own are important, especially where national policy is lacking.
- *Saturation likely.* Acquisition and consumption may reach a saturation point, which would lessen forces driving the megacrisis. Developing people are increasing consumption, but trends toward Voluntary Simplicity have been rising in the developed world and could lead to more realistic living standards globally..
- *Long-term evolutionary trend.* Humanity has always struggled through crises, and they are always surmounted: The Fall of Rome, Dark Ages, World Wars I and II, Nuclear Arms Race, etc.

consumerism is now threatened, and world leaders from the Pope to Bill Gates are critical of these moral failings of an economic system based on self-interest that is largely responsible for the financial meltdown.

Just as the collapse of communism resulted from an over-controlled, planned state economy, this ''collapse of capitalism'' can be viewed as the result of an under-controlled market economy. Nobel economist Joseph Stiglitz wrote ''Markets are not efficient and self-correcting . . . .the financial collapse of 2008 may be to market fundamentalism what the Berlin Wall was to Communism'' (Stiglitz, 2010).

Markets are essential, of course, and this hard reality poses a huge challenge. How can we invent some new form of enterprise that offers a more productive, equitable, and secure basis for economic vitality in a world that has changed so fundamentally? Borrowing a phrase the English have used on such occasions, one might proclaim ''Capitalism is dead. Long live Free Enterprise.''

Warnings of massive transformation have been issued for decades by the Club of Rome and many others. Suddenly, all of the concerns we were forewarned about are at hand. The future has arrived finally – and with a vengeance. The analysis below will show there is a palpable fear that our present world is unsustainable, that we cannot get our act together, and that events could spin out of control. Scientists think a 60-80 percent reduction in CO2 from 1980 levels is needed to stave off climate change, but that looks so unrealistic that many are girding to withstand a 2 to 3 meter rise in sea levels, scorching heat, and freak weather patterns (Lyall, 2013). The Dutch, who for centuries have managed their water lands, are redesigning dikes to handle higher seas.

Following is a summary of our survey that estimated the probability of alternative passages through the megacrisis (Halal and Marien, 2011).

Survey on the global megacrisis

Four Scenarios on a Pessimism vs Optimism Axis (Results as of November, 2012 Sample = 60)

1. *Decline to disaster – 25 percent probability.* World fails to react. Global warming, sea level rise, energy shortages, economic depression, nuclear exchange, etc. Loss of civilization in major nations.
2. *Muddling down – 35 percent probability.* Weak response. High-tech dark age, ecological damage, increased poverty and conflict.
3. *Muddling up – 28 percent probability.* World reacts out of need and the help of IT/AI. Disaster avoided but some increased disorder
4. *Rise to maturity – 12 percent probability.* Ideal transition to a responsible global order.

The heavy distribution of probabilities at the pessimistic end of this range is sobering. Respondents think there is a 60 percent chance we will enter a high-tech dark age or suffer the loss of civilization in major regions of the globe. Here are the dangers that experts expressed:

- A great study. Well posed and valid. The crisis is real. Outcome is uncertain.
- I think muddling down has already begun.
- Challenging. Complex. Sleep-robbing.

Many identify the problem as chronic failures in culture, governance, and leadership:

- Present trends, cultures, structures and leadership all point down.
- Immature governance systems and political lag seem drivers of crisis.
- Humanity is long on skill (IT/AI) but short on wisdom.

The most striking conclusion is that institutional gridlock, failures of leadership, inability to cooperate, and other higher-order problems pose enormous obstacles. Trillions of dollars are being poured into reviving economic life. Yet we have slighted the need for a guiding

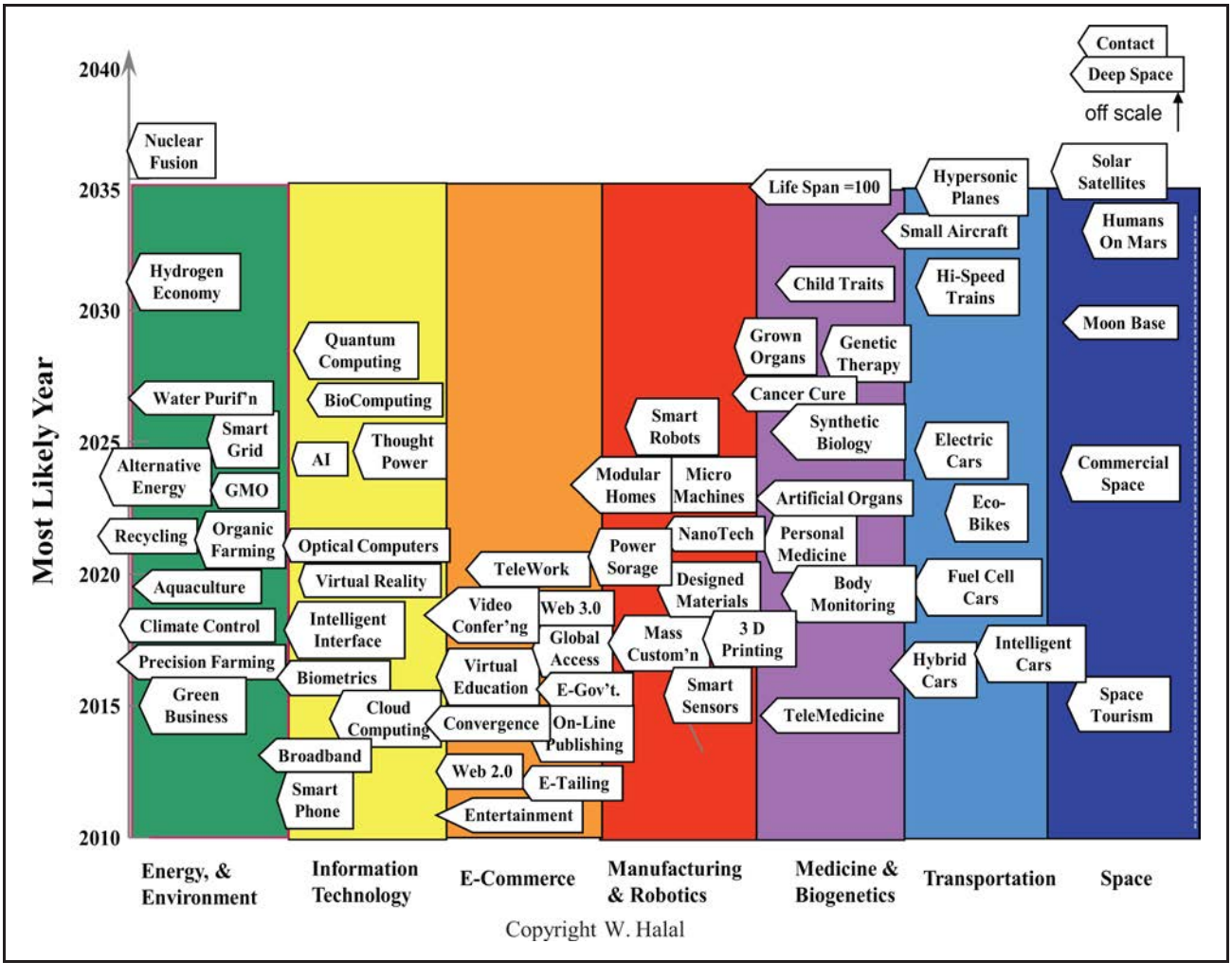
vision and for powerful new strategies able to meet the challenges. We have no clear understanding of what is taking place and what it all means. We lack a sense of what would constitute a good society in these different circumstances.

Forecasting the technology revolution

Our technology forecasts offer an understanding of how the global megacrisis is likely to be resolved. TechCast's work over many years demonstrates that technological advances and their social impacts follow well-defined cycles of invention, take-off, and mainstream use that can be forecast rather accurately. For the research method and other details of the TechCast project, see www.TechCast.org Figure 1 highlights the data produced by this research that shows the dates when leading technologies in seven fields are likely to enter the mainstream. Some of these technologies are available commercially but they have not yet reached the 30 percent adoption level where new breakthroughs enter widespread use. Dramatic advances will transform life in the years ahead.

The relentless power of this tsunami of technology change can be seen in the rushing change of everyday products. When digital photography became feasible a few years ago, the entire film industry was overturned by simply moving around digital bits instead. Nikon, Kodak, and other famous names that once dominated photography are still struggling to adjust, laying off thousands of employees and replacing product lines. In place of film, new

Figure 1 The technology revolution



industries soon sprang up as digital cameras unleashed floods of photos and videos to populate Web 2.0 – Facebook, YouTube, blogs, wikis, and more sure to come. In turn, digital cameras are being replaced by smart phones.

The same revolutionary forces are at work in most industrial sectors as endless streams of innovation reach the take-off point. We can realistically envision computer power becoming cheap and infinite, mobile communications at lightning speeds, renewable energy alleviating the threat of climate change, biogenetics improving health and extending life, robots serving as helpers and caregivers, and much more to come.

The technology revolution is at an early stage, and it presents dangers as well as benefits. Some innovations will fail or prove disappointing, and unforeseen developments always occur. And there is an average margin of error of about three years surrounding these forecasts. It is also true that technology can be misused and often produces disastrous consequences. When we first used PCs in the 1980s, who knew we would soon be swamped with viruses, hacking, spam, and other daily threats? So too the coming upheaval will present massive challenges we are not equipped for.

The great recession may slow things down, but technology is largely immune to economic cycles because research institutions and entrepreneurs discount the short-term to favor pent-up demand. The potential for using knowledge to solve problems is so great that it is limited only by imagination and will. Some scientists, like Ray Kurzweil, envision a ''singularity'' in which the pace of change leaps dramatically during the next decades (Kurzweil, 2005).

Macroforecasts of the next economic upcycle

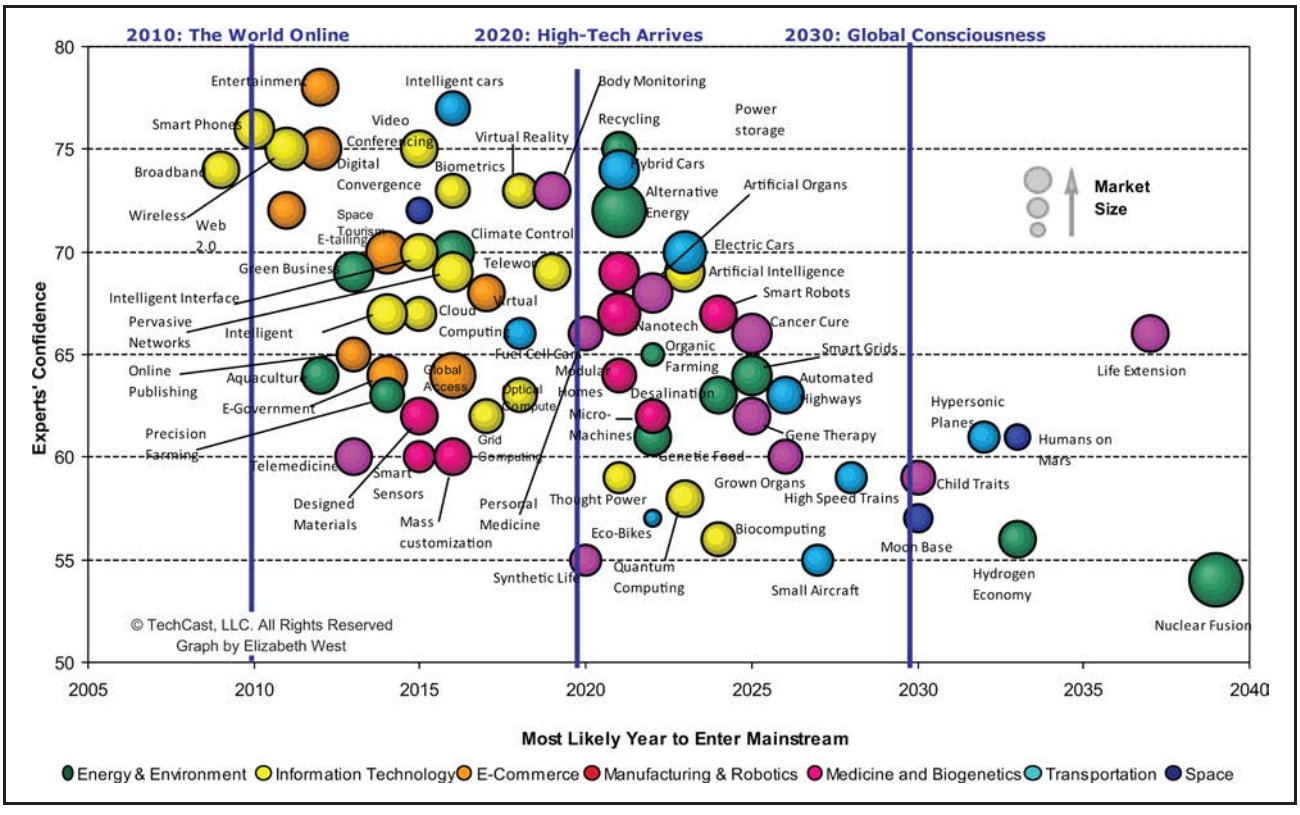
Our collective forecasts are aggregated to ''macro-forecast'' the larger economy over the next decade or two. The bubble chart in Figure 2 presents all three dimensions of all forecast data: ''Most likely year'', ''Experts' confidence'' and the potential ''Market size''. This analysis suggests that the Great Recession may linger for a few years, but a new wave of economic growth is likely to take off about 2015.

The period around 2015 is significant because the cluster of green technologies, information systems, e-commerce, and advanced auto designs in Figure 2 suggests a resurgence of economic growth is likely about that time. This also coincides with the pattern of 35 year cycles that roughly govern US stock markets. Observe a 100 year graph of the Dow Jones Industrial Average on a log scale and you will find three 35 year cycles. The Roaring Twenties was the peak of a 35 year cycle that ended with the Great Crash of 1929. The Eisenhower boom of the sixties started about 1945 and was followed by the Reagan boom that began with his election in 1980. The 2008 economic crisis marked the end of the Reagan 35 year cycle, and it is likely be followed by a new worldwide boom starting about 2015 based on the technologies noted above.

One of our most striking conclusions is that a green revolution is imminent. It promises to help pull the global economy out of récession, leading to a new wave of sustainable economic growth. Today's surge of green business should reach mainstream use about 2015 and governments are likely to take serious steps to curb global warming and climate change at about the same time. Alternative energy sources – largely wind, biofuels, solar cells, nuclear plants – are growing 30 to 50 percent per year globally and are likely to provide 30 percent of all energy use about 2025. This growth rate is comparable to the famous Moore's Law that forecast skyrocketing IT systems, so we should expect a similar rapid build up of sustainable technology.

Led by the EU, Japan, China, and other nations, this green sector is expected to reach a volume of global business on the order of $10-20 trillion, larger than autos, health care, and defense combined. In short, the present mess in energy and environment policy actually offers a great opportunity to convert a potential crisis into sustainable, unifying growth. It may even be that this green boom could serve to defuse the race toward weapons of mass destruction, terrorism, and conflict as diverse cultures become more closely integrated into

Figure 2 Longitudinal summary of forecasts



the fabric of a global community. Tom Friedman, the NY Times columnist and Pulitzer-prize winning author, sees it as a great opportunity to lead in the creation of an ecologically sustainable economy (Friedman, 2008).

As the Technology Revolution picks up speed in about 2020, we forecast a wide-spread use of genetic therapy, personal medicine, cancer cures, nanotechnology and the other advanced technologies shown in Figure 1. This period is also likely to enjoy near-infinite computing power due to second-generation machines using optical, bio, nano, and quantum architectures. Smart robots are likely to enter homes and offices, and AI should also become sufficiently sophisticated to automate routine knowledge. As endless intelligent devices take over routine tasks, we will shift attention beyond knowledge to focus on values, beliefs, ideology, vision, and other higher levels of thought. This pivotal shift is occurring not out of noble motives alone but simply out of the sheer necessity of dealing with the megacrisis.

Information technology may be the most powerful force shaping the world today, igniting endless innovations in online publishing, virtual education, and other forms of e-commerce that will soon reach the critical point where new industries take off. And the huge populations of China, India, Brazil, and other developing countries are moving in droves to PCs, the internet, and smart phones. Our forecasts suggest that between five and six billion people will soon inhabit a digital world that is far larger and more intelligent than imagined, creating online markets of several trillion dollars and producing massive social impacts, for better or worse.

The central role of AI will shift the relationship between humans and machines in profound ways. Contrary to the assertion that AI will surpass people and make us obsolete, AI liberates us from mental drudgery and releases the unique human capability for higher consciousness – at the same time that the world is heading toward unprecedented challenges. This is hardly a coincidence but rather the outcome of natural forces in the life cycle of the planet from one stage of development to the next.

This growth is being integrated into a rudimentary form of the Global Brain that futurists have long anticipated (Wells, 1938; Russell, 2000). As a global equivalent of a brain, each person represents a neuron connected by PCs, smart phones, television, and endless other sensors to other ''neurons,'' forming trillions of synapses. Scientists call this a Type I civilization in which the planet is unified. Kevin Kelly, founder of *Wired* magazine and an Internet sage, said of this emerging global central nervous system: ''There is only one time in the history of each planet when its inhabitants first wire up its innumerable parts to make one large machine'' (Kelly, 2005).

This is the next logical phase in social evolution from agriculture, to manufacturing, to services, to knowledge, and soon to consciousness itself. The rise of consciousness can be seen even now in the way the economic crisis has provoked a widespread awareness of the need to alter world systems governing finance, energy, and climate. Yes, it's hard to grasp a world based on consciousness. But who would have imagined 20 years ago that the Information Age would have us spending half the day staring into PCs, laptops, smart phones, and various other devices?

The great Jesuit anthropologist, Teilhard de Chardin, anticipated this eventual growth of a fine overlay of conscious thought and spirit enveloping the Earth (De Chardin, 1959). He called it the ''Noosphere.'' The planetary brain is spreading rapidly now, and billions of educated people in developing nations will soon join online to make the new global intelligence operational.

We tend to place such prospects in the distant future, if we are able to see them at all. But this emerging global intelligence is hastening advances as never before, accelerating this historic transition in our lifetimes. A 60-year-old today should witness the 2020 passage to a high-tech world at about the age of 70, and the emergence of a coherent global order at 80 or 90. As we will see, life extension should raise the average life span to 100 years by about 2030, so these are realistic scenarios. Even an 80-year old could live to see the passage to maturity. These forecasts are not merely an intellectual exercise as most people will see this historic step in civilization's progress.

At the cusp of transformation

With such bold prospects for innovation likely over the next five to ten year planning horizon, it is essential to prepare for the Technology Revolution now. Whatever the method and whatever the purpose, organizations need to develop some type of well-thought out system to forecast and adapt to this wave of technological change. There may be uncertainty about specific breakthroughs, but there is very little uncertainty that we are going to see plenty of technological change (Halal, 2012a).

As the transition unfolds, a host of difficult social changes are poised to enter mainstream, along with critical shifts in thought, beliefs, values, ideologies, and choices needed to survive the megacrisis. The success of the Women's Movement offers a great example of structural change that developed over decades and altered the fabric of society and people's outlook forever. This historic change culminated about 2010, when the number of women with college degrees and good jobs in modern nations first matched that of men. In the USA, for instance, women students now outnumber men in college, and women are reaching parity in the workplace. The leadership of feminists was crucial, but why didn't this happen earlier?

Contraceptives (''the pill'') freed women from bearing what seemed an endless line of children, and household appliances and packaged foods reduced housework. Would you believe that my mother made her own soap? Meanwhile, automation eliminated hard labor and opened up a flood of white collar and professional jobs at which women excel. Global competition drove employers to outsource work abroad, keeping a tight lid on worker pay and forcing wives to supplement their husband's incomes. Ultimately, it was the pill, modern appliances, automation, and globalization that caused this historic shift by moving women from the home to the office.

In a similar way, the internet is now transforming newspapers, education, publishing, and entertainment as people increasingly opt to live digitally instead of buying records, movies, newspapers, magazines, DVDs, and books. If the pill, automation, and digital devices can

do all this, imagine what is likely as the Technology Revolution unleashes thousands, and possibly millions, of breakthroughs. Intelligent green cars that drive themselves on automated highways. Medical advances that extend healthy life spans beyond 100 years. Ecologically designed factories, homes, and offices. A global brain composed of billions of educated people serving as high-tech communication hubs. This is not a distant vision because today's tsunami of technology is likely to crest about 2020, in a mere decade.

One imminent change is the replacement of today's computers with intelligent, talking machines. Good speech recognition, artificial intelligence, and virtual robots are all likely to be widely adopted by 2015-2020, producing a conversational form of human-machine interaction. Rather than hunch over a keyboard, the PC will disappear into a corner while we talk to virtual persons on large wall monitors in high-fidelity 3-D video, enhanced by language translation and various forms of intelligence. Sophisticated virtual presence may prove more practical in day-to-day virtual transactions than ordinary human interaction.

I call this *teleliving* – a conversational interface that allows a more convenient way to shop, work, educate, entertain, and conduct most other social relationships (Halal, 2003). Teleworking with colleagues, buying and selling online, taking an educational course, consulting with your physician, or just talking with a friend virtually via images on smart phones. Social life moves from the tele*phone*, to tele***vision***, to tele*living.*

Suppose you want to buy a book. Today you could go to Amazon.com, find your way through a homepage containing 20 to 30 items, and then work through more pages to find the book, pay, and arrange shipment. How would you like to be greeted instead by a ''virtual salesperson'' who knows you by name? After asking what you want, he/she would find the book, display it with price and shipping, ask for your credit card, and inquire if there were anything else you needed – just like a real salesperson, but one who knows all the merchandise and has infinite patience. You could probably alter his/her character about as easily as changing wallpaper on your PC. Would you like to be served by Sarah Palin, Bill Clinton, or Lady Gaga? Just ask.

Nobody doubts the enormity of the problems that are certain to emerge along the way. Despite vows that the 2008 financial crisis marked an end to profligate behavior, it is hard to imagine how the passage to maturity can be achieved in a world that still celebrates power politics, money, consumerism, and self-interest. As products, industries, markets, organizational forms, consumption patterns, and even the rules of competition shift, executives in all fields face constant challenges to redefine their mission and purpose, cultivate new clients with cutting edge products and services, and withstand external threats. We are being forced to readjust careers, downshift to sustainable lifestyles, and rethink priorities. The uncertain nature of this transition also makes it hard to know which nations and corporations will lead and which will fail, while war, economic failures, and political stalling are not about to disappear.

But there are strong reasons to think the world will make this transition reasonably well. History is replete with social transformations, and they are usually the result of deep shifts in technology, followed by corresponding changes in economics, and social behavior – the very foundations of society. After the miseries of the medieval period, Gutenberg's invention of the printing press released knowledge from the clerical and aristocratic elites to everyone able to read. This spread of knowledge led to historic changes, such as the Protestant Reformation, the Age of Reason, and the Renaissance.

The collapse of communism may have been led by Ronald Reagan and Mikael Gorbachov, but it was only possible because the Soviet Union was entering a post-industrial era of such complexity that its planned, state-controlled economy began to fail. Today, all nations but Cuba and North Korea have yielded to free markets.

Success becomes even more compelling when viewed within the larger context of the Life Cycle of Evolution – that long progression from a lifeless planet at the dawn of creation, to the birth of primitive organisms (the ''technology of life''), to our cave-dwelling ancestors living close to nature, to the first agrarian civilizations, to the efficiency of modern industrial society, and now to a coming world of knowledge and intelligence (Halal, 2004). How did

humans bridge this leap from mere apes to biogenetic engineering, quantum computers, and space exploration? Arthur C. Clarke explained that pivotal moment three million years ago when the development of primitive tools initiated that long struggle to harness the power of technology – ''Tools invented man'' (Clarke, 1973).

Yes, this has been a very long and difficult journey, fraught with war and conflict, poverty and pain, setbacks and crises. But it has also produced escalating numbers of educated people sharing a growing body of knowledge. Within the last decade – scarcely a nanosecond on the scale of evolution – a more advanced barrier has been breached. Where once humans struggled to tame fire, stone, iron, and electricity, now it is knowledge – the very heart of scientific progress – that is being harnessed systematically on a massive scale (Halal, 1998). The decoding of the human genome, for instance, was possible because supercomputers were able to decipher the 3 billion bits of information in DNA.

The long ascent of civilization has always rolled over what appeared to be insurmountable obstacles – the Ice Ages, the Fall of Rome, the Dark Ages, First and Second World Wars, the Nuclear Age – and it is likely to form a global consciousness to survive the megacrisis (Harman, 1988). This process is larger and more powerful than mere individuals, and it is likely to alter rock-hard convictions in ways that may shock us. With increasing problems pressing in, the excesses of the industrial age could be sloughed off like an animal shedding its outworn hide. In short, it is time to start planning how we intend to cope with the megacrisis. The alternative is to face prospects of disaster.

Our forecasts suggest the Muddling Up scenario is entirely plausible, and the passage is most likely to culminate about 2020 when human powers should increase dramatically and threats should reach intolerable levels. A coherent global order could easily develop about 2030-50, and possibly sooner. There is no assurance, of course, but this alternative offers a reasonable basis for the type of vision needed to meet the challenge. Without such aspirations, we would remain captives of an aging world.

I have tried to distill good foresight knowledge on how to can best realize this enormous challenge into a few salient principles (Halal, 2012b). Below are five bits of advice from the future:

1. *Stop fighting and start cooperating.* Cooperation is crucial to meet the challenges of exploding complexity. Since knowledge increases when shared, a knowledge economy is ripe for collaboration. That's why business managers have long practiced ''coopetition'' – cooperating even with competitors to produce better results for all. Today's battles in the US Congress, between labor and management, the US and Iran, Israel and Arabs, etc. are outmoded relics of a brutal past. Conflict is unfit for a complex world facing enormous challenges. That is why progressive companies like Whole Foods, Google, IKEA, Tata, and many others around the globe are moving toward a more productive form of business based on collaboration (Mackey, 2013).

2. *Reform institutions.* Big business and big government badly need to be transformed for a new world. Collaboration is now productive, the rise of corporate ethics, social responsibility, the triple bottom line, strategic alliances, women entering management, Internet transparency, and other trends are coalescing into a broader model of business - ''democratic enterprise.'' At the World Economic Forum in Davos, Henry Blodget of the *Business Insider* proposed a ''shift to a more balanced focus on profit, employees, and customers.'' Among the Millennial youth, 92 percent think business should help serve social needs as well as profit. And for big government bloat, ironically, the solution is to instill a healthy dose of free enterprise into the public sector, as many have argued.

3. *Green everything.* Stop delaying the inevitable and embrace the greening of the world as the great opportunity it really is. Blocking carbon taxes, pushing oil exploration, fighting the EPA, and denying the science behind climate change are fruitless. The world is in a historic shift away from carbon fuels, and an industrializing world is drowning in pollutants. China, Germany, and much of Europe illustrate how renewable energy, conservation, green taxes, ecological design, better cars and buildings, and smart grids offer huge opportunities for sustainable growth.

4. *Plan ahead.* The belief that an invisible hand will magically find market solutions to complex problems is dying with the continuing crisis of capitalism. In contrast, Korea, Singapore, and China are thriving precisely because the state plans for a difficult future. We should yield our fear of government control to invite federal and state agencies to engage business, labor, academia, and other stakeholders in constructive planning to reach their collective goals. This type of bottom-up strategy could realize the promise of democracy by bringing it into everyday life.

5. *Celebrate life.* That sense of solidarity one feels during the Olympic Games is essential for a functioning society, and it would help if the world could unite occasionally in celebrating the gifts we share. If nothing else, the search for extraterrestrial life has shown how alone the Earth is in the great scheme of things, so we bear responsibility to make the most of our special place in the universe.

Beneath the surface, deep rivers of fresh thought are bubbling up. Pollster John Zogby's data over the past 20 years shows ''We are in the midst of a fundamental reorientation of character. . . Away from wanton consumption and toward a new global citizenry in an age of limited resources'' (Zogby, 2008). Young people lead around the globe are embracing this view. Despite our common image of disheveled youngsters oblivious to all but their cell-phones, Zogby finds that young adults 18 to 29 years old constitute the ''first globals.'' This ''digital generation'' accepts all races, sexual orientations, national cultures, and other differences, and they are intent on living sustainably in a unified world. And the UN Millennium Project notes:

> Ours is the first generation with the means to know the world as a whole . . . and to improve global systems. . . This does not mean world government; it means world governance (Glenn *et al.*, 2008).

The world seems poised at the cusp of a great passage. Common sense and experience are not very useful because this has never happened before. Things look bleak because that is the normal situation facing any system struggling through crisis. Nobody plans these passages; they are natural events unfolding with a life all their own in the cycle of evolution, and the imperative is always the same – adapt or perish.

It is precisely because so many people are so deeply concerned that a series of mental shifts is underway. The world has accepted women in power, transformed planned economies into free markets, begun to protect the environment, and the Middle East is becoming democratic. Now we face the tough challenge of creating a world that works. We can hardly expect a perfect world, of course, but it could become a reasonably functioning global order.

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About the author

William Halal is Professor Emeritus of Management, Technology, and Innovation at George Washington University, Washington, DC. He is visiting professor at Bangkok University, Thailand, and an authority on emerging technology, strategic planning, knowledge, innovation, and institutional change; he has worked with General Motors, AT&T, SAIC, Blue Cross/Blue Shield, IDC, the DoD, the Asian Development Bank, foreign companies, and various government agencies. He substituted for Peter Drucker in giving a talk to 2000 managers at the Los Angeles Coliseum. Halal's work has appeared in journals such as *Nature/BioTechnology*, *California Management Review*, *Strategy & Business*, *Knowledge Management Review*, *Academy of Management Executive*, *Journal of Corporate Citizenship*, *Human Relations*, *Systems & Cybernetics*, and *Technological Forecasting & Social Change*. He has also published in *The New York Times*, *The Washington Post*, *Christian Science Monitor*, *Toronto Globe & Mail*, *Advertising Age*, *Executive Excellence*, and *The Futurist*. He has produced six books: *The New Capitalism* (Wiley, 1986), *Internal Markets* (Wiley, 1993), *The New Management* (Berrett-Koehler, 1996), *The Infinite Resource* (Jossey-Bass, 1998), *21st Century Economics* (St Martin's Press, 1999), and *Technology's Promise* (Palgrave Macmillan, 2008). Professor Halal is the founder of TechCast, a web-based system that pools the knowledge of experts to forecast breakthroughs in all technical fields – ''A virtual think tank tracking the technology revolution.'' TechCast was cited by the National Academies as possibly the best forecasting system in the world. He also co-founded the Institute for Knowledge and Innovation as a collaborative effort between the GW School of Business and the School of Engineering. Halal studied engineering, economics, and the social sciences at Purdue and Berkeley. Previously, he was a major in the US Air Force, an aerospace engineer on the Apollo Program, and a Silicon Valley business manager. He serves on advisory boards of AMD Corporation, the World Future Society, and other organizations. His work has received prominent recognition. One paper, ''Beyond the profit-motive,'' won the 1977 Mitchell Prize and an award of $10,000, and he received a medal from the Freedom Foundation for Excellence in the Study of Enterprise. Macmillan's Encyclopedia of the Future ranked him among ''The World's 100 Most Influential Futurists,'' including H.G. Wells, Arthur C. Clarke, Alvin Toffler, and Daniel Bell. William Halal can be contacted at: Halal@GWU.edu