



**Keynote by DK Matai Chairman, mi2g, ATCA and The Philanthropia**



## **Opportunities and Challenges of 21st Century Emerging Technologies**

**Center for Policy on Emerging Technologies (C-PET)  
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Chairman, Ladies and Gentlemen

It is a great privilege, pleasure, and honour for me to be with you today. What I would like to do is first and foremost say that I am humbled to be here. I feel humbled because all of you are so much more illustrious, and have so much more experience and knowledge of emerging technologies and all these words that don't mean much to poor me. In a sense I am humbled by the experience, the collective knowledge, and wisdom that is accumulated in this room. So thank you very much for taking time out of your busy lives to listen to what I might have to say.

I would like to talk to you about global opportunities and risk from the point of view of emerging technologies. To begin with, I would like to talk about global risk from a personal perspective; not something coming out of textbooks but something that happened in my life step-by-step. I will share with you the journey of my life as a mechanism to prompt questions and Socratic dialogue. I believe that dialogue between human beings, the capability to come up with new ideas and thoughts, is absolutely central to being able to reinvent human civilisation and to define our common future as a shared humanity on the world stage. I will be talking about the top ten global risks that we foresee in the 21<sup>st</sup> century. Of course you may agree or disagree with them, but I hope it will be a starting point for dialogue.

My story begins in the year 1979. The reason why I have chosen 1979 is that my father at that time was a chief engineer to the Shah of Iran, on some aviation projects. He was very convinced that Iran was growing with great momentum and it would remain a very massive, formidable power in the Middle East. All of that changed in late January 1979 with the start of the Iranian revolution. The consequences of the Iranian revolution on my life were that my family photographs were displaced during the revolution, our collections of art and antiques were also destroyed or displaced. I took a moral message out of this revolution and said that for the rest of my life I am not going to be an avid collector of art and antiques; I am going to become an avid collector of interesting people. Because when the Iranian Revolutionary Guards came to burn and to damage houses, people could walk out but the Monets, the Manets and the Picassos remained there ready to get burnt. So in a funny sort of way it had an impact on my life, it was a sort of defining moment.

Let's speed forward. As a young boy, as a teenager, I sought to build a computer and fell in love with computing. I ended-up studying electronics engineering in England and whilst graduating I worked for a 'little company' called IBM. This little company taught me many things about how global business runs around the world while I worked on the design of super computers. One thing led to another and I founded my own company called mi2g. It was founded in England in 1995 and we began with the area of global risk and using super computers to simulate global risk

I am sure you would have your own definitions of global risk but I believe that insurance and reinsurance are the DNA of modern capitalism. In order to understand how modern capitalism works and how risk is syndicated, one has to be able to understand the mechanisms of risk transfer that are inherent within insurance and reinsurance. Working with the blessing of the Chairman of Lloyd's of London at the time, a charming man who went to the same university as I – I went to Southampton University as did Max Taylor the Chairman of Lloyds, so we had a good bridge –, he started saying to me let's look at the top ten global risks. What about them? We wanted to know about these from the point of view of insurance and reinsurance. We went into dialogue with organisations like General Reinsurance Corporation owned by Warren Buffett, we went into dialogue with the other large players like Swiss Re and Munich Re, and basically the five or six major reinsurers in the world. We had deep discussions with them about how they look at global risk.

What was I struck by? I was struck by the fact that reinsurance companies can look at the world from a 250 year horizon; in some cases they were looking 250 years into the past. It fascinated me because I thought, well here we are thinking about the coming 90 days for a listed company, and our horizons had now blinkered to the point that we were thinking 90 days for everything. The quarter by quarter reportage has completely destroyed our capability to think in decades and some of these reinsurance companies look at actuarial risk over the past 250 years and try to map risk over the coming 100, 200 years. Therefore I thought, well this is an industry I must get to know more deeply as a student of history because of the fact that they are also trying to look at the future from a historical perspective.

The other thing that struck me about reinsurance was to look at risk, which was asymmetric. Asymmetric risk is defined as that kind of risk which is not normative or normal risk. When people will talk about global risks they will talk about general demographics, they will talk about seasonal water shortages or well-known fault lines within the global geopolitical landscape. All of these risks are real risks but it is not as if humankind has not learnt to understand demographic growth and has not really understood how to cope with another billion people on the planet. The point is it is a risk, but it is not necessarily asymmetric because it evolves slowly and allows humankind to adapt albeit with huge pain.

In such a context, the asymmetric opportunities and threats associated with emerging technologies are perhaps the most important subject area that we shall address in this century. These technologies are likely to play a crucial role in the context of global integration and synchronicity that are shaping the future.

One vital starting-point has been laid out by Professor Hans-Peter Durr and his collaborators. How is the human race to face the challenges which lie ahead? A nuclear physicist and philosopher, Durr was the vice executive director at the Max Planck Institute for Physics. He developed the "Potsdam

Denkschrift, " building on the famous "Russell-Einstein Manifesto" of 1955, one of the most thought-provoking and significant think-pieces of our time. The great global challenges of the 21<sup>st</sup> century depend on the approach that humankind adopts in its thinking and actions in order to address seemingly intractable yet interlinked confrontations. Because of the interrelationship and interdependence of these issues, and as the speed of progress increases, the global dynamic equilibrium will be seriously challenged. With this in mind, the Potsdam Denkschrift proclaims: "We have to learn to think in a new way."

Within this context, C-PET should focus on the way in which emerging technologies raise fundamental questions about the nature of humanity. Developments in robotics pose special concerns, given the significant advances being made in the realm of artificial intelligence – though it is unclear whether robots could ever have the capacity to love, a quality which would appear to be intrinsically linked to being human. This question demonstrates new kinds of philosophical questions which are emerging and which consequently need to be addressed by policymakers in anticipation of rapid developments in the technologies. By the same token, forgiveness and tolerance are two characteristic themes in human experience, which would seem to be hard to replicate with machine intelligence. Yet there are experts in artificial intelligence who tell us that we cannot exclude any such possibility, so philosophers and policy-makers alike need to be aware and prepared.

Let me ask you to engage in a thought experiment. What if Einstein and Heisenberg are present with us here in this room, engaging in the style of conversations they had in the 1930s. What would they be discussing when confronted with the challenges of the 21<sup>st</sup> century? Just as they reflected on the profound implications of the technologies emerging in their day, so they would be now. What we define as "emerging technologies" changes over time, as fresh technologies emerge with their own vast implications for human well-being. In 2008, we pose the same questions – and ask what are the implications of the latest technology for today and tomorrow. What I am seeking to do today in this presentation is to provoke you into taking forward that conversation.

Let's be more specific, and move onwards towards robotics, genetics, nanotechnology, artificial technology and informatics. Most of us are living off these devices, mobile phones and PDAs, I carry two of them. The reality is that these devices which we carry, we live off them or should I say, that they live off us? And if they stop working for even three hours it completely alters the dynamic of our thinking and our action/reaction capability. This is a clear vulnerability in the society that we are building up fast, so the informatics vulnerability is very clearly there.

As we approach the questions raised by these technologies and their applications, we need to develop a collective judgment that will add an ethical dimension to the creative process of invention. A common pool of knowledge needs to be established, from which collective understanding can arise. One

valuable way in which collective judgement can be informed is through scenario planning. Peter Schwartz popularised the method of scenario planning, but it began with the French thinker, Pierre Wack. Wack was a planner at Shell and helped prepare for possible spikes in oil prices using crisis planning and various modelling approaches. As a result, Shell was prepared for the 1970s oil embargos, and the company's growth into an energy giant was aided.

The key need today -- one which C-PET could aspire to meet -- is to offer solutions to such emerging global challenges by creating a centre of excellence to which both companies and governments could turn for solutions and answers. Solutions offered by scenario planning offer a welcome alternative to knee-jerk responses after the event -- when an emerging technology has already caused economic or other damage.

The narrative of humankind is that we are here to build for ourselves a better life. But it has to change to become: we want to build a better world for each other. This is where we share our humanity, and we have to be thinking outside the box of nation states. I would say that the sovereignty of the nation-state itself is being superseded by the sovereignty of the individual in the 21<sup>st</sup> century. If you think about the 9/11 hijackers; the 9/11 hijackers were nineteen, sixteen of them were from Saudi Arabia, but the government of Saudi Arabia was not per se involved in the 9/11 incident. Those sixteen hijackers chose to carry out their dastardly actions based on an individualised sovereignty that they had accepted in their within. And I think we are facing those types of risks where the sovereignty of the nation-state is very difficult to enforce and to maintain.

Nation-states are no longer the most important agents responsible for posing risks to the global order. In their place, sovereign individuals have become the source of the most high-risk activity. For example, individuals housed in a nation such as Saudi Arabia or Iran are no longer constrained by the policies of their governments, and should not be considered as acting on their behalf. At the same time, all nations can now be considered as platforms for investment in emerging technologies. Given that there are so many more agents now posing risk, the cost of addressing risks -- especially on the part of western governments -- has become much higher.

The fast process of global integration which offers both great opportunities and great risks sets the context for our assessment of Low Probability/High Impact and Black Swan events. These events could change the present trajectory of nation states and those large economic entities with turnovers in excess of the GDP of many nations. It is this situation that has given rise to what is referred to as Asymmetric Globalisation, where friends and adversaries no longer look similar as they react to off-the-radar forces giving rise to Low Probability High Impact and Black Swan events. The terrorist attacks of 9/11 offer a good example of this process, which heralds a shift of risk from the sovereignty of the nation to the sovereignty of the individual.

We are all being hurled closer to each other as the world integrates faster than ever before. The propensity for fast global integration creates both huge opportunities and its inevitable flip-side, huge risks. In the future, we should be concerned about Low Probability High Impact and Black Swan events which can change the present trajectory of nation states and large economic entities, many with turnovers in excess of the GDP of most nations. Welcome to Asymmetric Globalisation in which friends and adversaries are no longer similar looking as they react to off-the-radar forces giving rise to Low Probability High Impact and Black Swan Events. This also means that more risk is transferred into the markets away from Sovereign states.

The risk of missing some High Impact events altogether increases with the complexity of our world. This statistical phenomenon has been dubbed Black Swan by statistician N N Taleb, who describes them as 'outliers', i.e. events which lie "outside the realm of our expectations, because nothing in the past can convincingly point to [their] possibility." This retrospective but not prospective predictability is the critical distinction between a Black Swan and a 'normal' Low Probability High Impact Event. Its impact is further exacerbated by our tendency "to act as if they do not exist."

All the forces of global integration -- technological, economic, political and social alongside lowered trade barriers and increased capital flows -- support improved opportunities for growth. At the same time, those same paradoxical forces of integration are accompanied by a growing number of asymmetric Low Probability High Impact and Black Swan events outlined by distinguished colleagues at ATCA over the last seven years. It is plain that at several points the role and task of C-PET lie in developing responses to these emerging risks and challenges on a global scale and in a manner that integrates with insurance and finance.

These top risks faced by the human race in the 21<sup>st</sup> century may be summarized as follows.

1. **Climate chaos and environmental degradation.** This chaos has arisen as a consequence of a disposable, consumer society, and has been exacerbated by a tendency to view production-consumption-waste as linear and not circular with a recycling loop.
2. **Radical poverty.** This risk is even greater now that persons can compare their economic welfare with others on a global scale as a result of the new reach of mass media.
3. **Geo-politics and energy.** The deep imbalance between western and developing-world usages of energy, and its global environmental and resource implications, will have growing political salience.
4. **Organised crime and terrorism.** There is a clear relationship between failed states and both organised crime and terrorism. The global profitability of crime syndicates has been estimated at USD1 trillion. A

terrorist armed with nanotechnology is much more worrying than a terrorist armed with traditional weapons.

5. **Advanced technologies proliferation** – bio, info, nano, robo and AI.
6. **Demographic skews**, particularly with regard to sex and age.
7. **Resource shortages** We are now not only worried about shortages in energy production, but in resources such as water and clean air.
8. **Pandemics**. The threat of pandemic influenza has underlined the increased fragility of the 21<sup>st</sup> century world to traditional disease threats as a result of such factors as global transportation, economic integration, and the growth of cities.
9. **Financial systems and systemic risk** – both caused by global freedom of capital movement, derivatives, and the increasing impotence of nation states and their regulatory authorities.
10. **Transhumanism and ethics**. Progress in certain emerging technologies could give a competitive advantage to certain groups of humans or machines.

The special focus of C-PET lies in the prospect of the proliferation of advanced technologies and their global impact, as well as their potential application in ways that have been called “transhumanist.” So we turn to these emerging technologies - robotics, genetics, nanotechnology, artificial technology and informatics. We have noted our vulnerability to failures in informatics, the emerging technology that connects most obviously with our daily experience. But the questions raised by emerging technologies are far-reaching. In Japan there is a show called the Aichi Robot Show. What you can see in this show is robots greeting you: you go to the reception, a bit like this venue’s reception, and the lady who is greeting you in English, in German, in French, in Japanese, or in Mandarin, happens to be doing it impeccably and she’s a robot. And she’s even got a face that looks human. This kind of robot-lady can be mass produced; they can make a million of them.

Today we are outsourcing to India and China because they are cheaper labour points. Tomorrow the robots are going to be replacing those cheaper labour points in mass manufacturing and some services because that is where the world is headed: towards mass robotics. We may be 10 years away from it, we may be fifteen years away from it, or we may be 5 years away from it. But today if we go inside the Japanese Tokyo sub-city systems and we look at the way sewage is being cleaned, we look at the way other types of cleaning operations are undertaken in Japan, it is all robot driven. And who is there to say that these robots cannot be used for warfare? Look at the number of spy-plane drones that are being used in the Middle-East conflicts in the Levant, Iraq and Afghanistan. Robot-driven drones are being used to carry-out asymmetric attacks.

So I think that we are basically facing different kinds of asymmetric threats at present and in the years to come. Then there is the artificial intelligence collage. The chief executive of Google was talking recently about the way that

politicians are not going to be able to lie in the future to their electorate because Google's artificial intelligence algorithm will work out what a politician said five years ago, and four years ago. You can put in a statement by Gordon Brown and it can work out what is the probability he may not be telling the truth on this occasion based on historical data. I think that politicians have figured out how television works, they know how to manipulate television, they know how to come across with a smile on television, they know how to disobey on television, and they know how to manipulate our emotions on television. What they haven't figured out is the Internet. Look at the blogging phenomenon. This is a revolution, which is taking place, the grassroots activism is bubbling away and changing the way that the political landscape is defined for political parties and leaders in the future.

I have talked a bit about robotics and artificial intelligence, now nanotechnology. If I hold in my hand a small capsule full of water, in it I show you something like pepper, maybe a hundred pieces of little pepper-like items inside, and then I tell you these are a hundred microchips. Some of these microchips can be injected into our bloodstream. And once they are injected they can measure our temperature, they can figure out that as a diabetic we may be running low on sugar, and all of this work is underway. Nanotechnology is here with us. You may not be able to see the microchips but they are here. And tomorrow you think about nanotechnology driven robots in the hands of a terrorist. You've got nanobots that extremists are able to utilise, commandeer, for their purposes. Where does our civilisation, our sophisticated civilisation, stand with that kind of blended threat?

We haven't talked about genetics. Genetics is often touted as a saviour, because, when you plant a crop of wheat in a temperate environment, the type of weed killer, or the killer which is needed to deal with a particular pest, is inside the wheat. This has been genetically engineered into the wheat. But nobody knows what the human consequences are of eating that wheat. And the notion that the Federal Drugs Agency trial over five years to prove that that wheat is safe and is good enough to eat is not good enough. We may need to be able to spend a hundred years to be able to figure out what our next generation, and the generation after that is going to suffer as a result of the genetically modified food that is resistant to pests or has some other special resistance characteristics and may damage us in ways that we do not yet fully understand.

It is in this context that we see the relevance and importance of Hans-Peter Durr's work, building on the Russell-Einstein manifesto and its relevance to today in the face of 21<sup>st</sup> century global risks, and also that we note the opportunity created by the inception of C-PET. Just as they sought to highlight the dangers posed by nuclear weapons and called for world leaders to seek peaceful resolutions to international conflict, C-PET's role is to focus the global conversation to assess the risks of today's emerging technologies.

In conclusion, we should note some specific approaches that will aid C-PET and the global community in this task. Underlying them must lie a belief that the world is one family.

- a) **Scenario planning.** There needs to be careful consideration given to thinking through the associated fall-out of all decisions taken. This includes consideration of both ethical and policy implications. White papers should be produced aimed at sustainability and the longevity of humanity.
- b) **Venture capital.** Recognition needs to be given to the role of entrepreneurs who will be “jumping on the back” of emerging technology projects funded by venture capitalists. Venture capital is the “oxygen” required for emerging technologies to succeed, and the VC houses need the best information about associated risk. C-PET should aim to work closely with them.
- c) **Expert wealth management.** C-PET should seek to establish a reputation as the definitive source of advice on how to manage and direct wealth with regard to emerging technologies, given that this is a crucial and continuing global need. To this end, C-PET should establish a database of experts in both emerging technologies and expert wealth management to offer solutions to emerging technologies risk.
- d) **Insurance and re-insurance business.** Nanotechnology is widely seen to be the technology of the future. Consequently, business and government alike are investing large sums. There is therefore a concomitant need for awareness of the risks and opportunities associated with the technology, and its effects on the insurance industry. C-PET should pay close attention to risk research conducted by insurers and re-insurers, such as the recent report by SwissRe on nanotechnology.
- e) **Weapons uses of Emerging Technologies.** There needs to be particular attention paid to the implications of military applications of emerging technologies.

I have talked about the ten global risks and the five potential areas of core focus for C-PET. Now I want to talk to you about optimism, love, doing things in a positive way and how all of this is going to come together. I do not genuinely believe that humanity is done. I do believe that humanity is resourceful, I believe in the power of collective wisdom, and I believe that the global economy will have to go towards a wisdom denominated economy. When we move towards a wisdom denominated economy we'll be able to think in terms of longevity and sustainability. When we think about longevity and sustainability and how our decisions are going to affect other nations, not just ourselves, then we are beginning to think in a holistic way. And holism is the mantra for the 21<sup>st</sup> century; being able to look beyond the individualised, compartmentalised notions of this world, which we share and inhabit together.

And I think that the reductionist view of science and the way that reductionism has been at the centre of minimising everything has got to be replaced with much more meaningful things like love, and much more meaningful things like passion, and much more meaningful things like the exchange of new ideas, doing things in different ways and innovation. And when we think in those ways, and when we act in those ways, then I believe that human kind is not only going to survive, it is going to thrive and it is going to have an even greater future than the civilisations that we have come to esteem over the last thousands of years.

The task facing C-PET is therefore to focus its energies on generating Socratic dialogue via information, reports and policy proposals that encompass the benefits and risks of emerging technologies -- with sustainability and longevity as a core focus.

Such efforts to influence the shape of global policy approaches on the part of investors, governments and civil society alike should be inter-disciplinary and couched in terms of our humanist and fiduciary and responsibility to future generations.

## **C-PET**

The Center for Policy on Emerging Technologies (c-pet.org) is a nonpartisan think tank based in Washington, DC, with a primary focus on the implications of the key emerging technologies of the 21st century. C-PET's mission is to stimulate broad nonpartisan dialogue, involving civil society, business and finance, and policymakers, on emerging technologies and their social, ethical, and legal implications.

C-PET is developing a global dialogue on the societal dimensions of emerging technologies. The January, 2008 meeting marked the initiation of the Transatlantic Dialogue, with co-sponsorship from the University of Ulster and the Illinois Institute of Technology Center on Nanotechnology and Society, and support from the Wellcome Trust.

## **DK Matai**

DK Matai is an engineer turned entrepreneur and philanthropist with a keen interest in the well being of global society. DK founded mi2g in 1995, the global risk specialists, in London, UK, whilst developing simulations for his PhD at Imperial College. DK helped found ATCA – The Asymmetric Threats Contingency Alliance – in 2001, a philanthropic expert initiative to address complex global challenges through Socratic dialogue and joint executive action to build a wisdom based global economy. ATCA addresses opportunities and threats arising from climate chaos, radical poverty, organised crime, extremism, informatics, nanotechnology, robotics, genetics, artificial intelligence and financial systems. ATCA has 5,000+ distinguished members from over 100 countries: including several from the House of Lords, House of Commons, EU Parliament, US Congress & Senate, G10's Senior Government officials and over 1,500 CEOs from financial institutions, scientific corporates, NGOs and 750+ Profs from academic centres of excellence.

**Philanthropy** – DK co-founded The Philanthropia in 2005 – to include the Trinity Club, Syndicates and Ethical Investment Funds – with 1,000 leading philanthropists, family offices, foundations, private banks, NGOs and specialist advisors to resolve complex global challenges through collaborative & sustained efforts. DK's other voluntary interests are Sant Bani (Voice of Saints), a culturally diverse fellowship dedicated to the unity of humankind; World Future Council's Board of Advisors and Donors; The Shirley Foundation; Oxford Internet Institute at University of Oxford; Tomorrow's Company and The Trinity Forum, where he advises on a pro bono basis.

**Honours** – DK was selected to present knowledge management to The Queen in 1998 and mi2g won The Queen's Award for Enterprise in the category of Innovation for Bespoke Security Architecture in 2003. This led to a visit to Buckingham Palace, a celebration hosted at Lloyd's of London, and by The Lord Mayor at Mansion House, followed by a joint visit to Zurich, Switzerland.

**Innovation** – DK spends about half of his time innovating with mi2g teams focused on digital banking, digital risk management and bespoke security architecture for major financial institutions, government agencies and multi-nationals in Europe, America and Asia. DK believes passionately that the next generation of private and corporate banking involves the global safe custody of valuable data and intellectual property alongside financial deposits with "guaranteed security". D2-Banking is holistic and includes the online vaulting of genomic maps and medical records; art, photo, music and video collections; digital messages and personal files including wills, deeds and memoirs; and other intellectual property alongside traditional financial services.

**Authority** – DK is an authority on countering complex global threats; strategic risk management & visualisation; contingency planning; Information Operations (IO); electronic defence; biometric authentication; secure payment systems and Open Source hardened kernel solutions. He is an invited contributor to defence and global security analysis in the UK, USA, EU, Canada, Switzerland, Japan and India. mi2g intelligence has been cited by several government agencies including NISCC in the UK, FBI in the US and United Nations agencies in New York and Geneva.

**Background** – DK is a British subject, a Freeman of the City of London, a Liveryman of the Worshipful Company of Information Technologists, and a member of the Institute of Directors and The Institution of Engineering and Technology. He has worked formerly in the R&D labs of IBM, Inmos, ST Microelectronics and Helvar Electrosonic on Massive Parallel Processing and supercomputing applications. He enjoys meeting people, sharing thoughts, reading history and learning languages. He is vegetarian, teetotal and an optimist. He has lived in Asia, the Middle East, Europe and North America and he now lives with his family in Europe, with London as hub.