

**Globalization of technology – Imagine the possibilities
Socio-economic, political and cultural implications and thought leadership**

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Abstract

Today, technology breaks frontiers in all corners of the globe. Be it in North America, Asia Pacific, Europe and Russia or India and China investment in technology research and development is paying dividends. In the developed economies, an inertia associated with legacy investments in assets is acting as a brake, whilst in rapidly growing emerging markets leap frogging technology is enabling a faster pace of new technology adoption.

Globalization of technology means that 20th century economic advantages and powerbase structures are being rapidly removed. The internet and the world-wide-web is a great knowledge leveler. Businesses large or small, long established or just born are all equal in the cyber world of RSS feeds, electronic mail, e-commerce, web portals and Google hits.

But what are the new horizons with globalization of technology? Today we cannot isolate engineering and technology from the world of business and commerce, law and contracts, culture and religion, language and literacy, well being and wealth.

We are all under pressure to seek competitive advantage at a local, regional, national and international level to maintain status, earn income, live life and sustain future generations. Thus it is imperative that engineers and technologists understand human factors, economics, culture and societies to become creative and innovative in the 21st century.

Globalization of technology has been instrumental in wealth creation activity in emerging markets. Equally, union activity in mature economies highlights the concerns of the migration of skilled jobs to emerging markets. Protectionism is a growing concern, not just for preserving employment and safeguarding GDP but also the post 9/11 era introduces the new dimension of personal and national security.

This paper will address the pertinent issues that surround globalization of technology. Addressing the positives and dealing with the negatives of future possibilities will be important to human survival. This paper will set the benchmark with non judgmental foresight.

Introduction

The world we live in thrives on change. Change usually reflects progress, perceived or otherwise. Technological advances underpin change today, regardless of the purpose of endeavor. Today globalization of technology is a fact of life. When did it start? Actually, as early as, or late as, you can make it in time or care to remember. Stone flint tools, bow and arrows, clothing, utensils, paper and print, telephones, television, computers and the internet – globalization has been with us since time immemorial.

Are there historical patterns that we observe that can be linked to globalization of technology? What does the past tell us about the future? What new facets are involved today that may change the course of future directions? Who will be best able and equipped to survive the next 100 years? Imagine the possibilities.

Read on to look deeper.

Vantage points

What we know for certain is that change involves winners and losers. Ideas, innovation and inventions that have popularity are natural winners, whilst those that introduce no value add lose out over time or instantly. What is interesting is that the measure of usefulness (i.e. utility value in being a time saver) and value add (i.e. a kind of financial advantage, at present or in future) is linked to a defined shelf life. And, therefore one vantage point is 'Time'.

However, what we do see is that time is itself not a primary determinant of success or failure. The reason that good products or services last forever, or, disappear rapidly is in effect competition – what I mean by that is the effect that competition has to add value to, or to replace, a product, process or an experience. Think about the electric kettle or domestic iron. They survived for a long time – and there is no real competition to them now, or, in the immediate future. Compare that to the ubiquitous telephone. It survived for a long time with no competition – until the rapid adoption of the mobile cell phone. With competition comes the notion of 'depreciation' e.g. what does each new model of car, television or computer do to the future value of the earlier generation? Yes, competition will create depreciation. If you look deeper competition is just one component of the depreciation formula. Other components can include wear and tear, inflation and taxation.

So the second vantage point is 'Competition'. Today competition is global. Competition has existed in free markets, whether truly free or not, and can be controlled loosely or tightly in other economic regimes. Stifling competition means stifling change. We can see the real effects of such policies within some countries that resist change.

The third vantage point is 'Culture and politics'. One of the more important vantage points in terms of future possibilities, this holds the key to unlocking new value structures in the

future. Globalization, in a period of intense global economic activity, generally introduces multiple macro effects such as inter continental mass migration and capital flows. Globalization of technology aids and abets this process, acting as a catalyst for change. The effect of culture and politics is that uniformity in, or, predictability of outcomes in various regional markets becomes skewed by the nuances of particular market theatres; the most common theatres being North America, Europe, Middle East and Africa (EMEA) and Asia Pacific. Micro theatres do exist at a sub regional level and introduces even more nuances – often ignored by corporate marketing and business development teams – simply because the returns on the investment in customization are unjustified compared to the proportion of initial capital outlay involved in product or service customization.

The fourth vantage point is economics. As stated earlier, inflation and taxation can affect or shape the viability of future possibilities and so could subsidies and red tape. Equally financial markets, free trade agreements, world-bank and IMF policies, OECD influence, G8 policies and OPEC decisions all impact on the viability of the future possibilities arising from the globalization of technology. As a result, research and development directions in technology and engineering need to focus on the future impact of current economic policies and global directions being set for the future. In the past such liaison was uncommon in the field of engineering research and development and in the future such liaison will be a must to ensure success.

Understanding the vantage points, that are all somehow mutually dependent, will be essential to unlocking the visions of the technological horizon and our ability to create wealth along the way. Yes engineers need to think more like economists, venture capitalists and politicians if future products and services are to compete with each other and older generations of products or services.

Current issues

The outcome of globalization of technology is influenced by multiple factors that we all have to live with in our everyday endeavors.

What are they, and will they be relevant in the future?

If we look deeper they are:

- ◆ Technical standards & regulations (Global, Inter continental, National, Local)
- ◆ Effectiveness of free markets, and the effect of taxation and subsidies
- ◆ Language
- ◆ Culture and politics

Increasingly there is evidence that the issues that we face with, in the globalization of technology, is to do with protectionism – for maintaining or safeguarding profits, jobs and technological supremacy. The philanthropical aspect of globalization of technology has

become sidelined and so has the need to seek sustainable consumption – i.e. to reduce, reuse and recycle.

There are multiple pulling forces at work today. Uneven macro economic structures between North America, Europe and Asia seem to be the root cause driving innovation and invention. Why do we have to live with ‘region coded’ hardware, whether they are DVD & Bluray players, digitized movies, electronic games or as I learn to my dismay, ink cartridges for the same make and model of printer.

When digital content, hardware or consumables are priced to reflect local costs, and when price unevenness becomes known to a consumer savvy in global pricing structures thanks to cross border ecommerce, tensions arise. Why should goods, apparently the same in technological make up and function, be priced so differently? And why do governments still protect legacy outdated ‘customs and excise’ duties and levies on electronics – when the threat no longer exists to local jobs or capital flows? An ink cartridge produced in Asia for the North American market or the European market should in theory have the same economic impact in both regions – surely? If not what are the skewing factors? I would suggest they are profits (derived from cost plus accounting) and protectionist economic policies. What we do see is that North America has benefited from volume driven efficiencies in an expanded market whilst the Euro zone still suffers from historical micro borders - divisions based on language, culture and nationality and intra zone uneven economic structures – despite the Euro being the single currency in the majority of European regions.

In future, the sustainability agenda and green economics will need to pull stronger than protectionist policies. The Euro-zone and NAFTA economic zones have to a large extent been successful in enlarging market size with common standards for their respective theatres. The effect on the consumer is varied though. Even though market sizes in North America and Europe are in the same order of magnitude, in Europe, oil and energy costs are an order of magnitude higher, than North America, and higher land, rental and red tape costs leads to higher prices for goods and services. Thus the response to the sustainability agenda has been quite different in Europe – being shaped by legacy and entrenched policies of conservatism, liberalism or socialism in various countries. Thus globalization of technology yields uneven results in various theatres.

One of the barriers to the creation of successful sustainability policies from the globalization of technology has been evolution of regional standards and regulations. When will we have global standards in technology that work for all? Why should mobile cell phones be multi-standard, i.e. triple or quad band GSM? Why should we have television tuners that are multi standard, i.e. NTSC or PAL/SECAM? Why do consumer electronics cater for dual standard voltages, being 110v ac or 230v ac? What is the incremental positive or negative effect of these standards savvy products on sustainability to afford maximum opportunities to reduce, reuse and recycle? The negatives seem to outweigh the positives – in terms of materials, the costs, the value add and shelf life. Why - because the majority of products hit their end of life before they find use for ‘multi-standard’ ability.

A key aspect of the globalization of technology will mean that we need to address the future possibilities opening up to all of us - that we do need to seek efficiency in consumption and that means impacting directly on global standards; standards that work for all nations. What does that mean – do we need more leadership from politicians, economists and financiers and less from technologists and engineers? If so, will that mean that standards organizations and institutions like ISO, IEEE, EIA, TIA, CENELEC need to be influenced greater by the UN, WTO, IMF or World Bank policies? For sure yes. But do I hear a loud No?

Well, if not, why not? For a start we see failings in standards organizations that capitulate to lobbyists from powerful multinationals and special interests groups equally we see IMF and World Bank policies being shaped by share of capital contribution from wealthy nations. Of the two camps though we do see more global public acceptance (and therefore more trust, be it blind, resigned or convinced) from the techno savvy consumer for the technologists and engineers. After all we are all able to have telephone conversations across the globe with a universal touch tone handset, watch television channels across national boundaries via cable and satellite, access web sites hosted anywhere in the world using globalized xDSL technology and transact goods and services world wide electronically.

On the other hand what we do fail to see are progressive trends in reaching the global evenness needed in wealth creation, poverty reduction, general well being and therefore a greater evenness of standards of living across the world. In the techno context, this leads us naturally to the digital divide that exists, between the rich and poor, and to the causes for such divide – regardless of whether at international, national or local level. Are those shaping economic policies, the politicians, civil servants and diplomats in power, to blame? I would say yes. But should it be so?

The world revolves around basic presumptions of unevenness in wealth whether material, monetary or intellectual. Economic activity is stimulated by unevenness. Capital flows need an inherent wealth imbalance. After all, an advantage of some form leads to trade. Early bartering of goods came about because of an imbalance – perhaps one produced too much grain, and the other produced too much milk or meat. So we are never going to reach a perfect state of evenness in the free market economies. There will be those who are rich and those who are poor materially, monetarily or intellectually. How does globalization of technology fit in to this paradigm? I would say that in the 21st century it will be by lifting standards of well being for all – without necessarily finding, or promising, evenness in wealth.

Socio economic issues

Macro economics has always been about seeking structural advantage for national benefit and therefore social advancement. Most macro economic policies has therefore tended to favor innovation and creativity using new technology, and as a consequence progressive macro economic policies tends to support investment in research and development.

However, globalization of technology has created new tools for leveling previously uneven playfields. Macroeconomists for a decade or so seem to have missed this obvious point. The internet and the services it sustains is one such leveler - from simple window dressing to e-commerce, news feeds and IPTV or the Wiki concept, social networking and citizen journalism have all become active instruments in leveling out technological advantage. As an analogy, now it is no longer about whether you are a champion racing driver because you own the best performing engine and the most aerodynamic model of car – but now it is about skills, human skills to compete at a human level when mechanical or technical advantage is marginalized between competitive equipment. What I say is that we are, now in the 21st century, in search of supremacy in human capital – where are the most creative brains and are they equipped to perform and deliver? We can see the early effects of this paradigm in how India and China now respond to become the focus of wealth creation in the global economy.

The primary issue that skews and distorts the natural trend towards a reliance on human capital for wealth creation is the imbalance, globally, in natural wealth and resources. Large oil & gas reserves, deposits of iron or uranium, gold or diamonds will distort any advantage or disadvantage in human capital. Equally drought, heat and inhospitable terrain, inclement weather or climate and fresh water scarcity will distort the effects of advantage in human capital. Man made situations arising from conflict and war equally distort our ability to harvest rewards from effectively deployed human capital.

It is therefore natural to anticipate that, with depleting natural resources, that the globalization of technology will mean that macro economic policies will shift towards a position of protecting and enhancing human capital; we see this already taking shape in new investment planning projects in regions that are acutely aware of diminishing non renewable natural resources. These countries are creating environments conducive for attracting, rewarding and retaining human capital. Equally there have been structural changes in the way global migration flows are managed with ‘skilled’ migrants in advantageous positions. To safeguard and mitigate these effects, emerging markets are investing in new technology, primarily in telecommunications, engineering and technology and enabling infrastructure (e.g. transport, education and healthcare) to retain talent and to create foundations for improved standards of living. They are beginning to realize success cannot be short term and needs longer term sustainability; thus these markets are now seeking alternatives to fossil fuel reliance. Globalization of technology now demonstrates how fiber to the home (FTTH) and wireless telecommunications becomes ubiquitous in progressive developing and emerging economies, just as how interest in nuclear power plants, wind turbines and solar arrays are proliferating – leap frogging generations of technologies that we relied on for the 19th and 20th century industrial revolution.

What does that mean to the sustainability cause to reuse, recycle and reduce our consumption? Arguably the developed economies of the world viewed the developing economies as a means to off load (therefore re-use) legacy technology. This is no longer a viable mantra from the rich to the poor. The emerging trends, from a simple emerging

markets point of view, suggest that legacy technology will need to be dumped in favor of new.

However a natural consequence, whether liked or disliked, will be the emergence and dominance of the emerging markets differentiating themselves from poorer developing economies. The old 1970's distinction between developed and developing economies has disappeared to create new tiers. Tiers that suggest that certain countries will become consumers of legacy technologies and other emerging markets that will become early adopters - markets where new technology adoption will occur at a faster rate than economically developed or newly industrialized economies. For example, in the 1990's we already observed the widening gaps between Asian Tigers and Sub Saharan Africa. If this were to be the future status quo in wealth creation and consumption, globally, then backwards compatibility of newly emerging technological standards does need to be maintained in the future. It should support at least about a quarter of the world's population locked in the 'poor' camp regardless of citizenship. By that I mean the next generation telephone, television, computer or internet needs to be able to interact with previous generations of products. Yes, even in North America or Europe, the steep rising cost of living will create larger pools of marginalized poor. If so, technological leap frogging can no longer mean fork lift upgrades and a rush to landfill.

Thus the socio economic impact of globalization of technology will need to sustain a future digital divide, where the divisions are no longer just the 'haves' and 'have-nots'. In the future they are likely to be the 'legacy' and 'emerging' divides as well. Yes, ten years from now there will be those with obsolete 2nd generation GSM phones, some with 3G and others in the fast lane with 4G and the most advanced techno gadgets for the time.

Sustaining legacy and giving it a second life will be big business – in the future.

The positives and negatives

There are indeed many positive outcomes of globalization of technology. These can be the obvious such as:

- Commoditization in mass markets yielding lower costs with higher volumes
- Uniformity in product standards, often yielding higher quality products to the poor
- Extending product life times with opportunities to re-use in less developed economies
- Greater mobility for products globally, avoiding waste, when consumers travel
- Greater personal security and easier international travel with standardized security and personal identity verification
- Globally available support systems for technology sourced from the lowest cost base when the competency levels are marginalized between higher and lower cost bases.

There are also many negatives that impact our every day lives. They can be

- Protectionist technologies that lock in products and therefore profits to regions of culture or wealth

- Regional and sub regional customization of technical standards to influence the use of products or consumption of services
- Erosion of privacy as standardization affords greater opportunities for intrusion
- Shortened shelf life and faster depreciation of newly emerging products as competition becomes global, increasing opportunities to waste and reduced attractiveness to invest in R&D
- Forced acceptance of unwanted product features or functions in regional theatres that are culture agnostic when standardization prevails over customization

Future possibilities

Globalization of technology creates new opportunities – as a reaction to emerging demands arising from new possibilities. This is where thought leadership makes a difference. What I mean by that is the ability to predict demand that never existed and prepare for it and then the ability to service those gaps in the market will, in the future, command a premium. Thought leadership that brings foresight to product development, from a mix of engineering and economics knowledge will be a new potent skill in the future.

Globalization of technology already has demonstrated that cross border and inter-continental outsourcing, crossing several time zones, is a viable business. It is made possible by the leveling nature of common language skills, literacy and intellectual abilities regardless of citizenship. The British Commonwealth has benefited from language advantage, and so too have countries with a historical focus and affinity for high quality in education and healthcare and associated standards of achievement and excellence.

Equally, reliability in telecommunications services, IT hardware and support services enables higher acceptable standards in support infrastructure to be universally achievable – in developing and emerging economies and in the developed or newly industrialized economies.

There are many future possibilities with globalization of technology and they give rise to new scenarios.

New cyber concierge services that replace sweat shop style call centers could originate from remote centers of excellence. These centers will be where knowledge is acquired, vetted, stored and context aware linked in database structures that permit fast response times to standardized queries and hybrid what-if queries. Such knowledge repositories will in the future be biased towards reporting using video content for quick absorption and comprehension than present day text and two dimensional graphics based outputs that exist in standardized spreadsheet, word processor or database formats.

Computer generated video reporting will become the norm in the future, with video objects being hyper-linked with capability for drill down queries. Computer graphics animations merging with real time video for illustrative and explanatory purposes will give rise to new many new applications.

In the future cultural unawareness or language difficulties accentuated by local dialects and accents will be overcome by innovative use of technology. Another future possibility will be avatars that replace humans with market theatre specific local nuances. The key question is who will be controlling the avatars? Will it be the best of brains in the east or the best of brains in the west? There will be a natural and predictable wave of an initial expansion in the east – for about the next twenty years being followed by a reactive wave in the subsequent two decades where the west will seek to regain competitive advantage from the east – a natural consequence of monetary capital flows following any marginal advantage in human capital.

As IP networks and communications services expand it is possible that across the global IP network a corporate could have building access control, building automation, reception and concierge, help desks and other forms of soft support from, dare I say it, a central command centre. Will those centers be in the west or the east? First reactions suggest that the west will seek to entrench such centers locally since technical reliability of infrastructure and political and economic stability will be magnified as inherent strengths that protect investment and local jobs.

An equally likely scenario is that education and healthcare services in the future could be effectively delivered from a remote location. Distance teaching has taken off as a viable business but has so far has been confined to cultural boundaries. Automating the production and delivery of learning content and the automation of performance assessments of learning objectives could easily be achieved with globalization of technology. Likewise surgeons that utilise robotic arms for remote controlled surgery could become a reality, easily. What do these scenarios really mean? It suggests that globalization of technology will become an important leveling tool for imbalances in wealth across the globe. Will that be nurtured? I think so, especially if that creates a barrier to population migration by offering new lines of compensating capital flows leading ultimately to higher standards of living for all.

Whatever the scenarios, the entire set of future possibilities banks on the fact that there is a sustainable means towards continuity in economic growth brought about with an advancement with technology alternatives for the scarcity in energy sources whilst assuming somehow the effects of climate change can be stabilized in the long term. If not, globalization of technology will not be of much use in the future.

We all need to evangelize that the direction of the future possibilities from globalization of technology needs to have an urgent need to focus on the sustainability issues, and the need to enhance our security and safety arising from structural imbalances in wealth creation and distribution, resulting in social injustice and the erosion in values of citizenship and social responsibilities.

Globalization of technology is already making advancements in enabling personal and national security to be enhanced. Today we see biometrics affording greater security for national borders, as human beings become more mobile and when cultural barriers are

overcome when ‘aliens’ are no longer identifiable by the language spoken, the accent used or the dress code. The only unique identity for each and every human will be the biometric imprints in finger print, facial features, DNA or the iris. In the future globalization of security standards will enable personal history to become mobile. This will cause erosion in civil liberties. How will humans respond? I think positively, if the overall advantages outweigh the disadvantages.

Another future possibility is the emergence of biometric dependent cryptography and secure communications. Will the next version of the IP protocol have a built in intelligence layer to afford privacy in communications? It is possible, surely.

Globalization of technology will also result in the future possibilities of:

- automation in information broker and future knowledge broker services,
- automated arbitration in disputes,
- automation in contextual translation services (as opposed to current forms of context unaware machine translation)

Summary

Globalization of technology has been with us for generations. It will continue to be with us into the future. It is a natural consequence of basic human endeavor for food, clothing and shelter and differentiation. In the immediate future, globalization of technology will focus on the need to stabilize the planet from the effects of greenhouse gases, plastic mountains and depleting oil and gas reserves.

The human desire to be better than the other will drive future possibilities. The next generation technologies will focus on applications in the fields of education, medicine, information and personal security, concierge services, knowledge management and creative digital media. With depleting natural resources and raw materials, wealth creation in future will be dependent on innovation in services and cross border trade brought possible by the globalization of computing and communications technology.

Standardization work needs to be more holistic and sympathetic towards current issues. Economic policies should seek to support and encourage globalization of technology. Research & development needs to focus on sustainability. Opportunities to reuse and recycle technology products have commercial potential. New political thinking is needed to replace old die hard policies of the 19th and 21st centuries centered on protectionism.

What is a certainty is that there is plenty to be done. Many opportunities for innovation and invention exist. A lot of change for the good will result in the future. An exciting and challenging horizon awaits all of us.

Glossary

CELENEC European Committee for Electrotechnical Standardization

EIA Electrical Industries Association

GDP Gross Domestic Product
G8 Group of Eight countries
GSM Global system for mobile communications
IMF International Monetary Fund
OECD Organisation for Economic Co-operation and Development
OPEC Organisation of Petroleum Exporting Countries
ISO International Standards Organisation
IEEE Institute of Electrical and Electronic Engineers
IPTV Internet Protocol Television
TIA Telecommunications Industries Association
xDSL Digital subscriber loop Broadband communications

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Biography

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