RTT TECHNOLOGY TOPIC
November 2009

New thinking in a newly connected economy- a new age of enlightenment?

Last month we argued that providing narrow band access to survival economies should take precedence over broadband investment in developed economies.

This would not be naïve altruism but a pragmatic way to maximise the social and economic dividend from global connectivity investment.

Present broadband investment proposals in developed economies are justified on the basis of delivering nationalistic competitive advantage.

This will create additional distance between the rich and poor on the planet, an unsustainable model for future global growth.

In this month's technology topic, we explore how access technologies, fibre, cable, copper and wireless, can potentially deliver social and economic progress based on social and economic equality, the pre condition for achieving at least a measure of political stability.

We also argue that connectivity should be more broadly defined and delivered as a super utility in order to realise a step function reduction in connectivity cost and energy efficiency, a topic which we develop in more detail next month.

Our reference resource this month is **'The Making the Modern World Gallery'** in the Science Museum – a UK centric view of the world but with useful lessons attached. Each of the links will take you to one of the **'icons of invention'** or a related exhibit on display in the gallery or other relevant sources.

Opened ten years ago with two show cases modelled on the **Great Exhibition of 1851** and the **Festival of Britain in 1951**, the gallery traces the impact of technology and engineering on Britain and the British Empire between 1750 and the year 2000.

Puffin Billy, the world's oldest surviving locomotive (1814) shares gallery floor space with **Stephenson's Rocket (1829)**, side by side with icons of the telecom world, **Cooke and Wheatstone's telegraph of 1837**, **Thomson's Galvanometer** used at both ends of the world's first transatlantic telegraph system in 1858, **Bell's Osborne Telegraph of 1878**, disliked by Queen Victoria, **Fleming's 1904 diode valve**, **Lee de Forrest's 1907 triode valve**, **a 1943 radio with the first printed circuit board** and **early British transistors from 1950 to 1953**.

The Museum has hundreds of telecom artefacts including original **telephones designed by Alexander Graham Bell** and a small display of cellular phones which will be remedied when the new Making of Modern Communications gallery is opened. Only a fraction of the Museum's telecom collection is presently on show due to budget limitations.

The Making the Modern World Gallery and the Flight Gallery were made available to us for **Cellular 25**, an event designed to change the way we think about the global role of cellular communication. It is intended that the event will help provide some funding for the proposed new gallery.

The presentations made at the event are available **here**

Photographs taken at the event are available **here**

Connected Economies – a definition
Connected economies can be interpreted on several levels.

There is a close inter connectivity between developed, emerging and survival economies and a growing recognition that South America, Africa and Greater Asia will be or will continue to be the engines of future global prosperity providing fast growth markets for the developed world to serve. The 2016 Olympics in Brazil will be a reflection of this global transition.

Additionally these emerging economies are becoming increasingly able to undertake local technology and engineering development.

Over six million young people graduated from Chinese universities this year of which about half a million are engineering graduates- an awesome but **presently under exploited** engine of innovation. India similarly is producing **400,000 new engineers per year.**

The availability and cost and effectiveness of engineering resource is closely coupled with the world's ability to deliver connectivity.

Additionally, telecoms connectivity is dependent on the availability of civil engineering skills and an ability to source and use energy as efficiently as possible.

The telecom companies that trace their heritage back to the Victorian era, **Cable and Wireless**, **BT** and **Siemens** being three examples, have built their business on the back of multi discipline skills that include mechanical, civil and energy engineering.

Most telecoms companies today regard a capability to source and use energy efficiently as a core part of the connectivity proposition for both rural and urban deployment, Ericsson/Telecom Italia being **a topical example.**

Connectivity is however not a term that is exclusive to telecoms but includes transport, water and power.

To put this in an historical context, steam and coal, steel and oil, the motor car, the aeroplane, the valve and the transistor have created and shaped the world that we live in today – the discoveries and developments, inventions and innovations that have provided the foundation for today's modern **connected economy.**

However technologies always come with a social and environmental price tag attached. As a general rule the costs and the benefits are not equally distributed geographically of demographically – technology does not have a good track record for delivering social or economic equality.

So should technology and the engineering needed to exploit technology have an explicit social purpose and if so how should that purpose be measured and managed?

An answer rather than **the** answer to the question can be found by analysing technology history in the developed world.

The Science Museum helps with the analysis process by dividing 'recent' (1750 to 2000) technology history into eight overlapping periods

Enlightenment and Measurement 1750 to 1820

Henry Eighth, a very modern politician, though with a marital record that would have not stood up well to modern media attention, laid the foundation for the age of Enlightenment by spending a disproportionate amount of money on the British navy. This allowed Britain to build its colonial empire generating the wealth which went partly into an expanded University system.

Two hundred years later, that same University system delivered Isaac Newton to the world and a generation of thinkers with the time and money to consider how the world could be understood and therefore managed through experiment, measurement and reason.

Most things that moved and many things that didn't were measured including rainfall, deaths and electric charge, an age of scientific curiosity and instrumentation.

However this was enlightenment for the few not the many – an important shift in intellectual thinking but with limited impact on the poor and disadvantaged.

Manufacture by Machine 1800 to 1860

The era in which 'Machines to Make Machines' produced the looms and spinning machines that powered the industrial revolution destroying the Indian cotton spinning industry in the process.

The industrial revolution resulted in a process of intense urbanisation and rural social deprivation. The net wealth of the nation increased but so did social and economic inequality.

In parallel, the traditional education system failed to respond to the need for engineers. This was to sow the seeds of Britain's industrial decline in the 20th century.

Age of the Engineer 1820 to 1880

This underlying problem was hidden by a small group of Victorian engineering super stars, James Watt, Robert Stephenson and Brunel.

Industrial Town 1830 to 1900

Between 1800 and 1900 Britain's population more than quadrupled and became predominantly urban. Production machinery made it possible for factories to employ hundreds of people. Towns with high density working populations created new problems of housing, health and transport.

Second Industrial Revolution 1870 to 1914

The first Industrial Revolution had been based on steam power, factories and railways. The second was based on new kinds of power - electricity, new chemicals, new plastics and new drugs - particularly from recently industrialized nations like Germany and the USA. The USA introduced mass production techniques into the weapons industry – a change which was to have a profound influence on the world's twentieth century political order.

The Age of Mass Production

By 1914 Henry Ford's car lines in Detroit showed the world that production and machine repetition could transform the economics of personal transportation. Mass production generated mass employment, mass consumption and a World War in which technologically advanced mass-produced weapons enabled killing and wounding on an unprecedented scale, the age of mass destruction.

Wireless telecommunications started to have a substantial social, political and economic impact (See **100 Years in Telecoms**, **75 Years in Telecoms, Fifty Years in Telecoms and 25 Years in Telecoms** for more detail on this).

Defiant Modernism 1930 to 1968

The atomic age had resulted in the age of **mass destruction** being taken to a new level of deadly efficiency but as a small compensation, the Second World War provided the basis for inventions and innovations that could be potentially repurposed to realise social and economic progress.

The **V2 rocket** provided the basis for the space programmes of the fifties and sixties, the atom bomb was supposed to result in nuclear power stations that would produce **electricity 'too cheap to meter'** and emissions 'too small to measure', aspirations that significantly failed to materialize.

Design Diversity 1950 to 1965

The availability of new materials and the dawn of the age of plastic provided opportunities to differentiate the design of every day products in order to meet consumer expectations of choice, cost, quality and functionality.

Age of Ambivalence 1960 to 2000

Organized environmental movements and **environmental campaigns** reflected a growing unease and failing confidence in the ability of technology to deliver social and economic progress at an acceptable **environmental** and social cost.

This included concerns about genetic modification techniques.

In parallel there was a growing recognition that the gap between rich and poor countries and the gap between rich and poor within those countries was getting wider over time both in terms of wealth and health – a recipe for economic, political and social instability.

Inferences and Implications
A number of **general** inferences can be drawn from this particular slice of technology history.

The social and economic benefits of technology and engineering innovation are generally not evenly distributed geographically or demographically nor are the direct and indirect costs. The direct costs are those associated with initial deployment and maintenance costs thereafter. The indirect costs are the social and economic costs which can be both short term, the loss of cotton spinning jobs in India being one example, or long term. Only now, 150 years later are we becoming aware of the full environmental cost of the industrial revolution.

By the end of the 19th century, Britain had become **the world's most advanced connected economy** based on a **postal system**, **the telegraph**, **the railway** including the **London Underground** , **a canal system**, **a steam driven water system**, **the world's largest network of sewers**, **an underground hydraulic system**, **gas, electricity** and **a large merchant navy**, a form of mobile connectivity.

This was infrastructure investment on a scale never seen before or since, built on the profits of the British Empire. Today we still post letters in Victorian post boxes, travel on Victorian railways and the underground network, navigate and ship goods on Victorian canals, drink water delivered through Victorian pipes and flush effluent away through now leaky Victorian sewers. The water based hydraulic system was retired in 1977 and **the curtains at the London Palladium** are now opened and closed using electric rather than water power.

A number of **specific** inferences can be drawn from this.

The infrastructure of a connected economy is expensive and has to be financed from somewhere else by someone else. The return on investment has a long tail extending to hundreds of years.

Telecommunications is only one of several bidirectional connectivity systems including **the postal service** with which it was successfully integrated for over fifty years.

Water and sewage is of course bidirectional but **modern electricity grids** are also now being designed as two way systems.

This suggests that there may be merit in reconsidering the concept **of the**

repurposed super utility.

Super utilities were invented by the Victorians as a mechanism for delivering multiple services more efficiently.

The **Gas Light and Coke Company** is one example; the **General Post Office** (Post and Telecommunications) is another.

Utilities are delivered in the developed world with bizarre inefficiency, the only possible justification being the employment provided to the trench digging, hole digging and meter reading community.

It is inherently inefficient to have multiple organisations separately supplying electricity, gas, water, sewage, and fibre, cable, copper and wireless connectivity.

If Britain was a dictatorship there would be a strong argument in favour of setting up two organisations, the **British Broadband Corporation** and the **National Connectivity Corporation.**

The **British Broadband Corporation** would take over responsibility for public service broadcasting from the BBC but would also provide broadband connectivity using fibre, copper, cable and wireless and would be responsible for developing new broadband and narrowband delivery technologies that could be applied into emerging and survival economies. The logo could stay the same as well.

It would have a **social remit** – 'entertain, inform and educate' would do nicely, a term apparently coined not by the BBC's Lord Reith but by the American broadcasting pioneer **David Sarnoff in 1922.**

The **National Connectivity Corporation** would provide all other forms of connectivity with a similar remit to develop connectivity technologies, particularly water and electricity, that could be applied cost efficiently and energy efficiently into emerging and survival economies.

Both corporations would be publicly owned but profit making with dividends only payable to pensioners. The two organisations would be mandated to develop mutually supporting collaborative delivery models.

This of course will not happen but does suggest that there may be merit in considering new more closely integrated ways of delivering water, electricity and telecommunications to remote communities in bottom end economies.

The newly connected economy
As in the Victorian age, connectivity efficiency is very much determined by how the energy needed is created and how efficiently that energy is used.

In the 19th century water and sewage systems were powered by coal and steam.

In the 20th century telecommunications were powered and are still predominantly powered today from the electricity grid

In the 21st century, connectivity is much more likely to be powered from locally generated energy including wind and solar powered base stations, and wind and solar powered water pump and recycling systems all of which could potentially be community owned and managed.

But let's just consider the particular contribution that cellular phones can make to connectivity.

Connecting the unconnected
The Mobile World has forecast that by 2015 the number of cellular phones in the world will equal the number of people (not counting the number of machine to machine devices that will be interconnected by then).

This does not mean that everyone will have a cellular phone but is a reflection of the growth of multiple device ownership in developed economies. Cellular phones also need cellular networks or more specifically access to information networks in order to be useful, a topic we return to next month.

However achieving 100% penetration demonstrates that we have the **industrial ability** to provide a cellular phone to every human being on the planet and the **ICT ability** to deliver socially and economically useful personal and individual services to those phones

This industrial and ICT capability is not concentrated in a single country or continent but spread across Europe, Greater Asia, the US and South America, a globally distributed deployment resource.

The cost and energy efficiency of deployment will be dependent on how well these services are integrated with copper, cable, fibre and other wireless delivery systems and the best social and economic returns may be from narrow band rather than broadband investment but without a doubt the modern world has sufficient technology and engineering and financial resource to connect the unconnected provided we have the political will to do it.

The dawn of a new age of enlightenment?
Developed nations have visibility to a plausible model for providing affordable and sustainable informational, educational and economic connectivity to the survival economies of the emerging world, delivered physically side by side with water and power connectivity – a light at the end of a dark tunnel of technology driven social and economic inequality, the potential dawn of a new age of engineering based personalized mass enlightenment, enlightenment for the many not the few.

About RTT Technology Topics

RTT Technology Topics reflect areas of research that we are presently working on.

We aim to introduce new terminology and new ideas to clarify present and future technology and business issues.

Do pass these Technology Topics on to your colleagues, encourage them to join our **Push List** and respond with comments.

Contact RTT

RTT, the **Shosteck Group** and **The Mobile World** are presently working on a number of research and forecasting projects in the cellular, two way radio, satellite and broadcasting industry.

If you would like more information on this work then please contact

geoff@rttonline.com

00 44 208 744 3163