In last month's RTT Technology Topic we looked back over twenty five years of cellular radio history and reflected on the way in which the regulatory environment of the industry has changed.

We highlighted some of the contradictions that occur when a policy of 'let the market decide' is imposed on an industry which has to respond to short term irrational market sentiment.

The unintended consequence of 'light touch' regulation is that band plans become disconnected from engineering reality, the US 700 band plan being a recent example. This in turn compromises the ability of operators to realise a long term return on their spectral investment.

This would be less of a problem if spectral allocation policy could more accurately reflect future technology and engineering trends.

This implies a need to develop accurate forecasting methods.

The forecasting of technology and engineering trends can be inferred from past precedent. In particular the rate of change in enabling technologies can be established over time and extrapolated forward.

These forward forecasts are almost always wrong but can be made less inaccurate by taking into account political, social and economic factors.

Forecasting political, social and economic change is a less than precise science but again the basis is past precedent.

It might be argued that as we go further back in time, the relevance of past history reduces.

This is an all too common misconception.

Fortuitously we work in an industry which has over 100 years of well documented history of radio technology including the impact that radio technology has had on political social and economic history and the impact that politics and 'social economics' has had on radio technology.

This is a resource that we generally under use particularly when analysing technology and engineering trends.

Over the next couple of months we are going to try and show how a study of the

history of wireless when studied in the context of contemporaneous political, social and economic events helps us forecast our wireless future.

Why 25 years is not a long enough historical perspective - why we should go back to 50 years ago
There are several reasons why we need to go back more than 25 years and why 50 years provides a good second reference point.

In many countries, documents, particularly political documents that are considered sensitive or embarrassing are hidden from public scrutiny and only become available for study after 50 years has passed.

The origin of the 50 year rule is the assumption that by the time 50 years have elapsed most of the politicians involved will no longer be with us.

As an example, the cabinet discussions about the ill fated Suez invasion in 1958 have only just become available.

In technology history, fifty years is useful because many of the young engineers involved in what at the time was pioneering wireless development are still very much alive and with us today. This is 'living memory' history. Please see the note at the end of this Technology Topic about our 'Living Memory' Wireless Heritage Project.

The political context of 1958 was a perceived crisis relating to the security of oil supply which prompted an ill fated poorly researched poorly planned and poorly executed invasion of a sovereign country in defence of perceived national interest. History has a habit of repeating itself.

The technology context of fifty years ago was dominated by the impact of the transistor on radio devices and systems.

These radio devices and systems in turn changed the world that we lived in.

Here are three examples

1958 - The beginning of the Space Race
1958 was the year in which NASA was formed.

This was in response to the launch by Russia of the Sputnik satellites and marks the official start of the space race.

The Sputnik was not just about launching objects into space (including Laika the unfortunate dog in Sputnik 2) but talking to the object while it was there.

Sputnik 3 launched in April 1958 had an S band ranging radar working between 2.5 and 3 GHz, a VHF telemetry system and a two way command and control system working at 48 MHz.

It was the world's first automatic scientific spacecraft, measuring the pressure and composition of the upper atmosphere, the concentration of charged particles, photons

and heavy nuclei in cosmic rays, magnetic and electrostatic fields and meteoric particles.

Sputnik could not have flown and would have been pointless without radio communication. These radio systems would not have worked without the transistor.

Just over ten years and twenty five billion dollars later, Neil Armstrong and Edwin Buzz Aldrin stepped on to the moon.

Within ten years space based radio communications had developed to the point where TV pictures of astonishing clarity could be received (via the Parkes Observatory in Australia) providing the basis for probably the most memorable 'almost live' TV footage ever taken.

The parallel development of the navigation and guidance computing needed for the Apollo programme laid the foundation for the computing and software revolution that dominated the later decades of the century.

So what relevance does this have today?

In September this year two taikonauts (Chinese astronauts) stepped out for a space walk from their space capsule 'Shenzhou' ('Divine Vessel' in Chinese). A manned mission to the moon is planned by 2017.

On October 22nd this year the 1157 lb Chandrayan-1 (First Journey to the moon in Ancient Sanskrit) was launched on an Indian rocket from the Sriharikota Space Centre in India.

Russia similarly has renascent space ambitions. This web site reveals all (and seems inexplicably to be linked to a Russian dating site).

Two simple inferences can be made.

China and India or rather the Chinese and Indian and probably Russian tax paying public will be investing disproportionate sums of money in these 'Apollo Plus' adventures.

Deep space exploration requires substantial investment in radio communications technology and infrastructure and parallel investment in computing and software systems.

If Apollo provided the basis for the US dominance of the computing and software industry in the last two decades of the last century what will be the impact over the next fifty years of the China and Indian and rejuvenated Russian space programmes?

US companies are still dominant in the satellite industry and space industry (both industries being intimately cross connected) in terms of R and D, manufacturing expertise and operational experience.

In the mobile satellite sector there are ambitious plans to refresh existing low orbit

satellite constellations and to broaden their role beyond voice communications to include environmental monitoring. The Iridium Next constellation is one example.

There are compelling social, political, economic and more recently environmental reasons why closer cooperation between all of the space race contenders would be mutually beneficial. The partial success of the International Space Station as an example of international co operation provides at least some grounds for optimism here.

1958 - The portable device based consumer wireless revolution.
In November 1958, four years after the first transistor radios were introduced (TI based devices introduced in 1954), Sony introduced the TR 610.

The TR 610 was a technical triumph- a light weight power efficient pocket sized transistor radio working off a nine volt battery.

The TR 610 became a design classic with a marketing campaign that still deserves study today.

The TR 610 provides an example of early mass market production with over half a million units manufactured and sold.

The product marked the start of **the content driven portable consumer electronics revolution,** which in many respects is the cornerstone of our industry today. There are an estimated seven billion transistor radios on the planet. The cellular industry still has some catching up to do.

The product marked the start of an era of Japanese dominance of the consumer electronics industry including an absolute dominance of the compact camera sector.

1958 - The two way radio revolution
The R 610 was the world's first mass produced pocket transistor radio capable of receiving VHF FM broadcasts.

However the use of FM VHF technology in mobile devices was not confined to consumer applications.

In 1958 Motorola the Motrac VHF FM two way radio was introduced. This was the world's first two way radio for in car use with a fully transistorised power supply - the first radio to be able to be used without the engine running.

In parallel Motorola were developing a first generation of VHF FM personal radios for the police force.

Some of these radios crossed the Atlantic in 1959 and were introduced into the Lancashire Police Force working at 150 MHz.

Over the next 40 years personal radios transformed the efficiency of policemen on the beat in the UK, the US and internationally.

What relevance do these three examples have to the next fifty years?

Why bother to forecast 50 years ahead?

To answer both questions, 50 years is not a long time particularly in an industry where spectral assets have traditionally been leased on a twenty or twenty five year tenure and where semiconductor fabrication investments need to be planned at least 15 to 20 years ahead.

Fifty years ago the transistor ushered in a new 'era of smallness' and power efficiency which took us to the moon, gave us transistor radios and more efficient policemen.

Fifty years on nanotechnology is ushering in a new era of smallness and power efficiency.

This will help to take China and India to the moon, bring us a new generation of consumer devices including healthcare and wellness products and more efficient policing.

Finally just over 50 years ago (in 1956) in response to the great London smog of 1952 the UK government introduced its first Clean Air Act introducing smokeless zones, mandating the use of cleaner coal (eliminating the burning of nutty slack) and encouraging the re location of power stations to rural areas.

In the same year Calder Hall, the world's first industrial scale nuclear power station started delivering electricity to the National Grid and was cause for national celebration, the start of a 'new atomic age'.

Fifty years on a 'second atomic age' is being promoted as a solution to future energy and environmental issues.

Energy and environmental concerns are not new. Humans have been trashing the environment for at least 2000 years. Elephants have a pretty poor environmental record too.

Summary
It might be argued that producing a fifty year technology and engineering forecast is an exercise in futility.

On the contrary it is perfectly reasonable to produce long term technology and engineering plans based on past precedent particularly when detailed historical information is available for study and analysis.

This applies to a broad cross section of industries including nuclear power, where it can take 15 years just to get planning consent, and wireless telecoms, where on the basis of present spectral cost, returns on investment may only be realised 20 years or more in to the future.

As a consequence, long term cellular business plans must factor in the changes taking place in other parts of the industry including the satellite sector, consumer

electronics and public safety and emergency response radio. (Next month we analyse the importance of broadcasting in this mix).

We can state with some certainty that the space sector will remain an area where present competition could be translated into future internationally co operative ventures that could deliver substantial global political, social and economic gains. This will create opportunity for the cellular operator community.

We can state with some certainty that a new 'era of smallness' will create new consumer products which will change the dynamics of the consumer electronics industry. This will create opportunity for the cellular operator community.

We can state with some certainty that if used wisely, wireless technology could make the world a safer place to live in. This will create opportunity for the cellular operator community.

Wisdom is of course a product of past experience.

We rest our historical case.

A note about the 'Living Memory' Wireless Heritage Project

As part of a UK based Wireless Heritage Project which we are undertaking in association with the custodians of the Pye Telecom Historic wireless collection, we are putting together a series of articles written by engineers who have been actively involved in radio system design and implementation over the past fifty years.

The first of these articles has been written by John Davies. John joined the Lancashire Wireless Workshops in 1948 as a radio engineer. He retired in 1984 and lectured for a number of years on private mobile radio system design and implementation.

He remains exceedingly active and has maintained a very close interest in radio engineering including recent involvement in a local radio planning enquiry.

In this article he describes the pioneering work undertaken by Lancashire Constabulary on wide area coverage systems and the parallel evolution of mobile and portable transceivers.

The innovations introduced by Lancashire had very tangible benefits in terms of operational efficiency.

John's story, a mix of personal and professional observation, provides a fascinating insight into forty years of radio design experience.

This article (with some wonderful archive photographs) is available as a download.

If you are interested in contributing similar articles to this collection do please contact us

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

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About RTT Technology Topics

RTT Technology Topics generally 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.

This is a hazardous process and we welcome comments from our readership who often have definite and better developed views on these subjects.

So do pass these Technology Topics on to your colleagues (using the many sharing algorithmic tools at your disposal), encourage them to join our Push List and encourage them to respond with comments.

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