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Space for the connected car?

In this month's technology topic we look at the past, present and future of the connected car, how scale determines commercial viability, how the combined scale of the automotive and telecoms industry could impact telecom and automotive stock value and the evolving role of satellites in car connectivity and control.

As a starting point it is useful to differentiate technology scale from market scale.

Radio connectivity technologies, in common with most other technologies, scale by virtue of the engineering applied to them. Technology scale economy is generally horizontal and is a composite of a number of discrete vertical markets.

Vertical markets develop when a technology is introduced that delivers demonstrable added value and the scaling process is generally a function of the realisable added value and the marketing investment that the added value can sustain.

As an example, military radio and radar, emergency response radio, business radio and consumer radio products all use similar RF components and assembly techniques and thus allow horizontal scale to be realised across a number of discrete vertical markets or put another way, many vertical markets only become realisable based on cost recovery from and across other verticals.

An underlying assumption is that as a market gets larger, scale efficiency will increase however It can also be generally stated that as a market gets larger, the opportunity cost of servicing other markets increases.

By definition, new technologies start with zero scale however initial scale benefits can be translatable from other industries. Henry Ford achieved his early mover advantage in an emerging automotive market by using light weight high tensile vanadium steel developed for the construction and military industry, by repurposing closely toleranced machine tools from the armaments industry, a side benefit of the volume production of firearms during the American Civil War, and by using overhead meat hooks from abattoirs to realise high throughput low cost assembly. The cars cost less and went further and faster than other cars.

The money made from mass production of the Model T was ploughed into Detroit. When the new Ford manufacturing plant opened in 1928 it was the largest factory in the world with its own docks, electricity plant and steel mill,100 miles of railroad track, a fire station, police force and hospital. The factory employed 100,000 people even in the depths of the depression.

This now seems modest. Foxconn today employ 1.3 million people with almost half a million employed in their largest factory in Shenzhen, an empire based on manufacturing iPhones.

Foxconn now intend to build cars in a joint venture with Fiat Chrysler, servicing the EV (electric vehicle)/IOV (internet of vehicles) market.

Cars and connectivity are on ongoing story with scale as a necessary precondition for commercial success.

In 1929, the Galvin Manufacturing Company developed the world's first commercially viable car radio laying the foundations for the Motorola Corporation. The early success with car radios

translated into Motorola's move into home audio products in the 1930's which provided the basis for the military two way radio business in the Second World War including the use of FM (1942).

This technology experience translated into Motorola's TV business (the 1947 table top TV), semiconductor manufacturing (1952), and then paging (1956), a technology which transformed a swathe of vertical industries including hospitals, health care, emergency service provision and hospitality.

In 1974 the TV business was sold to Panasonic, a prescient decision given that through the 1960's Motorola had been the world's largest TV manufacturer. The car radio business lived on for a few years with a UK based factory and then closed in 1987.

In 1977 Motorola spacecraft radios were installed in to the two Voyager spacecraft and the FCC granted a developmental license for the Motorola Dynatac cellular system in Washington, D.C and Baltimore. In 1984 Motorola produced one of the first 32 bit microprocessors and started to build ever smaller phones culminating in the introduction of the Star Tac in 1996 and ever larger cellular networks.

However by 1998, Nokia had overtaken Motorola as the market leader in handsets. In parallel Nokia and Ericsson won a steadily increasing share of the global infrastructure market.

It is easy to be wise after the event but it is useful to consider why it was hard for Motorola to translate US national and regional market scale to sustainable global scale.

Motorola's dominance of TV manufacturing had been achieved when the US was the largest global market. Similarly Motorola dominated the cellular market due to the dominance of the US by volume and value (the US represented over 80% of the global market in the late 1980's compared to less than 5% thirty years later).

In television, the US NTSC standard competed with the more broadly adopted PAL standard and with new factories in Japan that were more efficient and more cost effective. This was not a specific US problem. In the 1970's, Toshiba were producing the same number of televisions from one factory as Philips were producing from 21. For all its legacy size and radio competence it was going to be hard for Motorola to match Japanese costs and the cellular business began to look like a good alternative.

Motorola's growth and profitability proved the rightness of that decision from the mid 80's to the late 1990's but a similar fate awaited the cellular business as GSM consolidated its hold on European and Asian markets leaving Motorola over committed to US standards (IS136 TDMA and IS95 CDMA) and a US cellular market growing more slowly than the rest of the world.

Other US vendors, notably Qualcomm, managed this shift to a global market more successfully with a deft use of the standards process to establish barriers to market entry. The end result is a truly remarkable presence in 4G and 5G standards and the 4G and 5G baseband modem market.

And it remains observable that a dominant presence in a national market can be translated into a formidable global market position. Samsung and Huawei are two contemporary examples.

However the brand value of these market majors looks modest compared to web scale competitors. In broad terms Huawei has a market value somewhere in the region of $100 billion dollars, similar to Qualcomm. Samsung has a valuation in the region of $200 billion dollars but this compares to the trillion dollar valuations of Microsoft, Amazon and Apple with Alphabet close behind and Facebook, Ali Baba and Ten Cent all heading in the same direction.

Ericsson and Nokia each have a market capitalisation closer to $20 billion. To put this in context, on a single day last November, Ali Baba recorded sales of $31 billion dollars. Motorola stock has had a roller coaster ride from $65 billion in 2006 to $6.5 billion to $30 billion today.

Apart from this terrifying volatility, similar startling comparisons can be made for the relative cash positions of the web scale majors and the industrial scale majors – the web scale companies have hundreds of millions of dollars of cash, the industrial scale majors have hundreds of millions of dollars of debt.

This is curious given that radio infrastructure companies such as Nokia, Ericsson, Huawei and mobile broadband device vendors such as Samsung are critical to the realisation of web scale value. Only Apple has managed to successfully bridge both worlds.

This brings us back to Foxconn (and Huawei).

Foxconn was founded in 1974, the year in which Motorola exited the TV business to concentrate on mobile phones and cellular networks. Huawei was founded in 1987.

Foxconn has a market valuation of about $100 billion. Foxconn and Huawei together have a combined market valuation of around $300 billion, rather less than a quarter of Apple's stock value, presently $1.3 trillion.

Tesla is now valued at $100 billion having overtaken VW as the world's second most valuable car company (Toyota comes first with a market capitalisation of $200 billion).

However more cars are manufactured in China than anywhere else in the world.

https://www.toptengama.com/topten/car-manufacturers-china/

So it would be plausible to expect China to dominate the connected car market

But this all depends on how next generation cars are connected.

Space X have just delivered a fourth batch of sixty satellites into space as part of their mission to build a mega constellation of potentially 42,000 satellites.

These numbers seem stratospherically high when compared to existing constellation counts but are modest when compared to terrestrial base station numbers. Huawei will be shipping two million 5G base stations this year.

But the mega constellation will be a single network with inter satellite switching. It will be competing with upwards of six hundred cellular operators, five hundred and ninety of which are sub scale.

Space X could therefore have an operational cost base several orders lower than their terrestrial competition coupled to a global network with absolute control of end to end performance.

The low earth orbit satellites additionally have a high Doppler signature and higher flux density then MEO based GPS satellites and are therefore well placed to provide precise positioning and everywhere and anywhere connectivity for autonomous vehicles. This must at least partially explain Mr Musk's enthusiasm for space based communication.

Tesla is still a minnow in terms of automotive volume with 400,000 cars shipped last year compared to six million by Ford but their market capitalisation is based on the perception that they have a truly disruptive business model.

Like Mr Ford, Mr Musk appears to have reinvented the car. HIs Space X ambitions could potentially reinvent connectivity. Putting the two together seems like an eminently sensible plan.

China of course has substantial space capabilities – the lunar rover presently lumbering round the dark side of the Moon is a technology triumph significantly under reported in the Western Press.

It would be perfectly possible for China to combine their telecoms, space and automotive capabilities but so far Mr Musk seems to have achieved a first mover advantage and like Mr Ford a hundred years ago seems well positioned to be a dominant industrial force for the foreseeable future.

Ends

Next month - a more detailed look at industrial and web scale dynamics in the satellite industry.

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