

*Technology and the Need  
to Develop New Economics*

by Martin O'Dea

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## Technology and the Need to Develop New Economics

### What is Technology

When the word technology appears before our eyes there is a reasonable chance that we imagine circuits and plugs, computers and mobiles. It is important to begin by trying to get the fuller meaning of technology.

When our distant ancestors used flint to shape spears or ignite fires we parted company with all of our earthly co-inhabitants. We had begun to use materials outside of our bodies to achieve goals. Technology is the means by which our species improves its lot. Hunting, transport, agriculture and industrialisation are not good for their innate aesthetic – but because they have made our lives more secure and satisfied. We can see that they enable the major transitions of our species. Spears led to our dominance as hunter gatherers (from our first homo sapiens ancestors to just 10,000 years ago), ploughs and other technologies led to our becoming non-nomadic farmers, and the industrial revolution moved us in significant numbers to being urban dwellers, mass producers; and ultimately mass consumers.

### What is A.I.?

Within the technology of the industrial revolution we saw clear examples of artificial intelligence (which again, can be erroneously seen as some intangible computer based notion). If I design a machine in terms of levers and gears, cutting instruments and pressures then by placing the component parts in this particular arrangement each time I send a material through the machine an altered usable item appears at the other side. How is this artificial intelligence? Well by design. Anything that we design to exhibit this type of behaviour is intelligent – it does something useful, creates order, and we call it artificial because it is designed by man and not resulting from evolution, like, say, a tree!

### A Computer and an Oven

Now, a real game changer in all of this was, through greater scientific understanding, being able to harness not just the steam and coal power of the industrial machines but also like Benjamin’s Franklin’s kite the awesome speed of electricity. It is worth noting that computers are physical entities as much as you or I, indeed, the first computers were humans; or this is where the name was derived; from people who added and subtracted lists of numbers, or computed. We just designed the ‘computers’ to do these additions and subtractions for us at greatly enhanced speeds. And we progressed to combine sound waves and our developing media to give us a modern computer which at the hit of a button can play me a movie. Remember though, all of this is designed, artificial intelligence just as is an oven where energy is channelled specifically to

heat bread. In a further attempt to demystify and regain control for those of us who are not computer programmers let’s consider the movie on my computer screen with. How does it play? From a vast set of 1’s and 0’s that inform a predesigned array of colours to hit the very large number of pixels on my screen to illuminate a particular picture, the pictures are discrete and are followed by the next preset arrangement of illumination, of course, it happens so quickly that the illusion of movement prevails (as a curiosity this is how your eyes function also); this all stems from the rather laborious binary code, where we can see 1 as simply replacing turn the light switch on and 0 meaning turn it off. Simultaneously a certain set of sound waves hit the speakers on your computer and you sit and enjoy your movie. To prove it someday perhaps someone will design a set of levers attached by cable to tiny light switches and speakers and someone will by pulling one lever after another after another and in a particular order play the movie. It might take a while, in fact many any years; and would certainly need to be sped up significantly before it would make sense to a viewer.

### Technology Speeds Up

Technology advances exponentially. This is quite counterintuitive and discomfiting; however, during our evolutionary history beasts on the plains did not approach us in leaps of accelerating distance and speed (thankfully) they ran in largely continuous speeds and lines and so our brains could evolve linearly and not exponentially and we could take evasive action. Technology has been shown by a range of very big minds over the last half a century to be an exponential grower. While this can be hard to digest it is, still undeniable. We can look at a couple of very well known examples.

- *Moore’s Law:*

George Moore is a co-founder of Intel. In 1965 he observed that the processing power on a transistor had been doubling every two years or so for a number of preceding years. He made a bold prediction that this trend might continue for another decade. It’s still going! Now, if this is new to you, then you might be trying to do a little bit of calculating now, by giving yourself a base of 100 or 1000 processes at the starting point in 1965; and you are having a difficult time digesting the results. Both to quote a number of Irish government officials during its ongoing financial crisis; we are where we are!

- *Sequencing the Genome:*

As an oft cited example of the real implications of this we can look at scientists who were half way through a 15 year project to compute the entire informational pattern from the DNA of a human. The technologists supporting this work were receiving a bit of a slating because although 7 years had passed they had completed a mere 1% of the task. A number of them claimed it was not a problem and pointed to exponential growth patterns of technical capacities. Turns out that 1% is just about 7 doublings from 100%! They duly finished with a year to spare.

Where we can find massive optimism is when we consider that, although, these doublings continue and continue to scare us a little, in areas like genetics, Nano-technology, bio-tech and so much more; in truth the impossible keeps receding. The previously almost unimaginable seems just a question of application, and what seems breakthrough now seems old hat in a few years. How you apply the computational potential is up to us, but the above should hopefully help appreciate that as a financial crisis hurts the actual human ability to better itself has never had it so good.

### Technology and Wealth

We can certainly see the links between the more recent technological trends and global economic history, if we look at, for example, the concept of the Malthusian Trap shows just how much the industrial revolution changed the world. In essence what this suggests is that prior to 1800 any increase in population or productivity, or reduction in disease, war etc was a bad thing, as it meant greater division of the very limited wealth which was viewed to grow at about 0.05% per annum, and while there were some few wealthy individuals who held tightly to these resources (mostly by political and violent power) generally speaking the average person’s lot had not improved significantly prior to 1800 throughout mankind’s history. The evidence seems to suggest then that the rapid growth of technology allowed the Industrial Revolution to break the mould when it came to strong growth. However, as has been argued often, with this, our ability to predict growth, or economics, has weakened.

### Supply

There is much to be considered within this recognition of the electronic age of computation and the potential applications, including the *lessening of the fundamental tenet of much of traditional economics that is limited supply* (it is worth imagining in a test case where there is enough of most everything that is consumed for survival/entertainment/enhancement etc for the total population – and what impact this has on supply/demand and price). In truth a lot of products and services of the here and now and into the future will have no problem in being used by 7 billion people. There is also the fact that entrepreneurship and innovation can thrive in an environment where it is less essential to have vast sums of initial set-up finances. The case of the 600 million facebook users and its couple of thousand dollar starting point has recently been a Hollywood blockbuster and would surely have seemed like egalitarian science fiction fifteen years earlier. People can purchase just on a computer or mobile phone a domain and using their own endeavour be financially successful. This is a gold rush in many ways – remembering the above potential future concept that there is no limit to the gold but even with that the gold remains desirable and useful!

### More Disconcerting Yet

Of course, pick a figure for what could be computed all those ‘eons’ ago when Facebook was launched (2004) and you must double that whole massive figure and then double it again, and again, and pretty soon you will have to double it again. Other areas of science grow rapidly also, in most cases progress is greatly aided by information technology which does much of the computation and ‘heavy –lifting’ of the research and exploration. The computation itself will increase in complexity, with many people looking to use the constructs of the physiology of the human brain, but, of course, capable of operating at much greater speeds than its mammalian blueprint as an avenue to increase the efficiency and complexity or ‘intelligence’ of the design.

People have been reminded recently that perhaps the only clear reason for our assumption that ‘things always stay the same’ is that we find a degree of comfort in this and are intuitively slow to accept change. Again, this is how we are wired, returning to our ancestral friend on the plains if he/she saw for the first time a snake, he/she would not pick it up first and accept it as safe – they would rule out danger first – we are hardwired for caution. A problem with this, though, is that we can see with our logical brains that research in laboratories around the world and breakthroughs in terms of production and with resultant life enhancing possibilities; are not going to be sensitive to our reticence, they too will grow and our growing incredibly rapidly.

It is important to retain, centrally, the notion that the breakthroughs that are coming now almost daily are things that even our parent’s parents could hardly have dreamed of. We can also see the application and potential stretching out pushing back the limits of impossibility in a whole range of arenas. Genetics is taking tentative steps towards a biological revolution that is inevitable if with a debatable timeline. Robotics has stuttered and stammered for forty years but, of course, as it begins to reach certain impressive levels, we begin to appreciate how literally overnight so much might change. For instance the first robot marathon is just being held in Japan, a country where you can also be greeted in a restaurant and directed to your table by a robot; we know already of robotics within the arena of manufacturing and are all aware of how little manual work actually still occurs. Nano-technology, or the ability to engineer at the one billionth of a meter scale, also seems due to change the world fundamentally with materials being redesigned at their most basic level and our imaginations again seeming the limit to possible uses. A visit to CRANN in Trinity College (virtually or otherwise) shows some of the best work in this field. Finally, as an example of another potential revolution we can review developments in 3D printing. Using base materials and laser printing layer upon unimaginably thin layer people literally print from their computers - objects!

### The Economic Motivation to Innovation and Post-Scarcity Wealth Distribution

In truth, when we look at a world where we spend time on YouTube and Facebook or Wikipedia or listening to mostly free music and reading free newspapers and books and where we buy computers at a tenth of their predecessors cost but which are capable of performing 100s of

times as many operations we begin to see perhaps that there is a freedom and individual empowerment inherent in the informational revolution that may not fit easily with the history of wealth. Bear in mind that aside from some advertising none of the above charge money – and yet numbers never heard of before avail. On what grounds is facebook going to repay its €50 billion valuation?

This is one area where the future and the past must, somewhat, part company. One of the driving forces of much that is the neo-liberal or laissez faire or feudal approaches of power and economic management is something we all easily recognise and that is the drive of the presently wealthy to remain wealthy. When the wealth was limited and growing slowly this may not have been pleasant but it was a little more easily understand than at a time where we can see increasing wealth potentially flow through a wealth that grows most by being shared.

How though do we escape the necessity for money to initially invest in production and look for return, and so escape the whims and vagaries of investors and financial markets? There seems a battle well underway between those whose actions speak very loud through developing practices such as open source software where everyone can use software for free and can make improvements as they go – and so falling outside traditional business models and being good for everyone or society at large; and those who see these endeavours as aberrations or perhaps even missed opportunities resulting from idiocy, naivety etc. There are those who make a strong argument that there can never really be a post-scarcity as we will only revalue continuously and so while things that are expensive now will be free in the future there will be other ‘sought after’ more recent or higher ‘quality’ goods always that will fetch a price. What is the solution between using the marketplace to help launch these rapidly improving technologies, and what is to stop erring with over-enthusiasm and boom-bust or not achieving the growth levels that are possible from non-competitive stagnation? Indeed, in a world of plenty what role should financing play at all? Perhaps there is a gradual evolution from our supply based to an open source economics or some kind of hybrid? These are issues that may tax the progressive and the economist in equal measure.

### About the author

Martin O’Dea lectures in Management at the Dublin Business School.