

“A paradigm shift in the paradigm shift”
The means to create industrial revolutions
Tahir Iqbal © 2009



sponsored by pink pavilion bijou
b&b

*“brighton’s best kept secret.. elusive..exclusive
Ravishingly romantic”*

12 Madeira Place
Brighton
BN2 1TN
www.brightonpavilion.co.uk
contact@brightonpavilion.co.uk

call 01273 385959 for a booking

The Techno-economic paradigm algorithm

A techno-economic paradigm is a structural shift in an economy-technology complex. We restrict our study to this to avoid discussing socially based variants of this such as Marx's transition of society to communism or indeed the very creation of industrial capitalism.

Thomas Kuhn created the idea of a paradigm shift. Each area of knowledge has a core set of beliefs or world-views which shape both individual theories and research as well as the course of debate. Newtonian physics held to certain assumptions about space-time which Einstein overturned, his own theories in some sense overturned by Quantum mechanics, in the sense that Einstein viewed the idea of a random universe as somehow abhorrent.

Economists developed the idea of a techno-economic paradigm, perhaps originating with Schumpeter's ideas of innovation creating economic growth. This is interpreted by us as being the network of effects of technology, social organisation and economic structure, processes and results. The idea of the accumulation structure was defined in our earlier book "What is the Sound of an Invisible Hand Clapping".

Essentially a structure is a basis for the tendency of development of an economy created by a myriad factors from rules and norms to forms of contracts, beliefs and social structures. Thus the presence of railroads allows for

distributed manufacturing, leading to greater size of such firms and thus, for example, economies of scale and development of productivity and economic growth.

Previous techno-economic paradigms include road networks and the automobile, the telephone, the internet, air travel, the mobile phone, the concept of mass production and the factory. We clearly in any historical narrative group any amount of innovations together to form ever more complex techno-economic paradigms, however we choose for the purpose of analysis to look at individual innovations. What can be seen from this difference in approach is that techno-economic paradigms have common features, common results and importantly, we can discuss these features to create the means to develop new techno-economic paradigms which can stimulate growth.

The spill-over effect of a techno-economic paradigm

Consider the creation of the steam engine. This is actually rather useless for travelling around until pioneering firms invest large capital sums to create a network infrastructure of rail roads to allow steam trains to move about. Notably without the invention of the wheel the steam engine is also quite useless for this purpose. From this we see that whilst we can discuss the steam train in itself, it can be divided

into many cohabiting inventions that bring great new things to life.

Consider now the road network perhaps we can see enlarged to a significant degree in the post Depression fiscal stimulus of America. This allows for the automobile to come into fruition. Thus creating one product creates another. From the automobile we may leap forward in time to the satellite navigation system which is something that really has little demand without the two preceding inventions, large road networks and cars.

This spill-over effect is a crucially important aspect of techno-economic paradigms and why they are a very exciting area of research, since to set off a chain reaction of growth and development one needs the seeds of a few great innovations.

A note of caution though, the time between the wheel being invented and the car becoming a realistic commercial venture is very great. Thus economists often talk of clusters of innovations leading to a techno-economic paradigm.

The nexus between technology and economy is bound by the social effect and social environment of the nation-states involved in the paradigm. Within this is the idea-maps, lifeworlds and time-geography of the society which is both the cause of the initial techno-economic paradigm shift and is the object of it.

When we move from one cluster of innovations to another our whole way of life changes. Consider the difference in one's life before mobile phones and after. Consider the life of the horse drawn carriage and the car. Government changes with paradigm shifts as new regulation, risks and political interests and groups are created. The internet lead to many more grass roots organisations forming and developing as people debated ever more sophisticated ideas using a greater knowledge base itself disseminated by the internet (consider wikipedia an online encyclopaedia created by the viewers of it that has fewer errors than the Encyclopaedia Britannica and is of considerable size in many languages).

What is interesting is that many paradigm shifts involve a great deal of hype and bursting forth of the animal spirits of the entrepreneur. Thus we see that as a new platform for many new technologies the shift can in fact be used for macroeconomic 'jumpstarting' of the economy. Such activity can be carried out by government, the private sector, political groups or a combination of these. MITI in Japan was very successful at developing Japanese technological capability through such involvement, whilst private sector groups built many new technologies sometimes competing firms collaborating on standards and interoperability of products, whilst political groups built the foundation and 'free' ideology of the internet.

The point here is that the activity of creating a new techno-economic paradigm can occur from any quarter but for it to occur someone must be consciously trying to create it. In the absence of action there is no result. This essay seeks to analyse the concept of the techno-economic paradigm such that new and better ones can be created thus propelling humanity further down the road of progress.

The core features of a techno-economic paradigm

1) inspiring to masses

-gives greater freedom and unleashes a new part of the experience of being human

-looks in some way complicated

-relates to the modernist idea of progress, teleology

-brings people together with a new vision

Consider the effect of putting a man on the moon.

All the world was brought together for a moment

as a man's foot touched that faint glowing

satellite. Poetry comes into being and new

catchphrases enter our culture ('one small step

for man, one giant leap for mankind'). What is

important to note is that inspiration and driving

of energy is concomitant with grand eloquence

and poesy.

2) provides the base for many new kinds of

industries and inventions e.g. roads lead to

automobile. PCs lead to many software

companies. Philosophy leads to many subjects including physics, psychology and political science.

3) uses a patentable technology (so that the industry involved in the investment in the invention is able to recoup this and develop further, the internet was a classic example of a techno-economic paradigm that was deflated by the lack of patentability). This creates a rent in economic terms which allows for a restriction of the market for some period.

4) change the makeup of the economy (i.e. its structure). Factories changed the very nature of our economy, leading to industrial concentration as opposed to dispersed craft. As people migrate to cities to work in cutting edge factories, much as Indians move to Silicon Valley to work at cutting edge software firms, there is a change in the nature of the economy. Cities grow, housing and service needs become more important. The concentration of the working week finds its release in the pub, nightclub and concert. Whilst these effects were not planned, it is not without possibility that one could plan certain effects from such changes to allow for a variety of policy objectives.

5) often changes the time-geography of humans: consider the daily path of a human moving around different paths, both intellectual as well as

physical to different areas engaging in different life-worlds and social structures. A new invention completely changes this path, as a tourist may previously have gone to a tourist information office to explore a new country, now they have more information than ever because of the internet.

The above features lead to a change in the meaning of being human by affecting our society and thus lead to a great deal of drive to invest in unproven technologies whilst the demand for these products is created by the very momentous effects these inventions have on our lives.

In order to develop a new techno-economic paradigm we need to understand what human needs are and then look at the technologies available and those that could be created in a short space of time to create such a new platform for many new products. We have carried out a brief survey of the UK economy by taking down the different consumer product areas from major retailers. We then outline numerous needs which they are based on. It is an interesting exercise for the reader to put the needs together with the goods categories as this can help you understand the nature and also the ease with which revolutionising the techno-economic paradigm can be.

The UK economy	The human condition (what does thou will?):
Kitchen Home and furniture Garden DIY, crafts and creative goods Sport Leisure Health/Personal care Jewellery Watches Hobbies Home entertainment Photography Office PC Phones Toys Food and groceries Cosmetics and Beauty Baby goods Books Cars Transport Novelty goods Clothing and shoes Entertainment: Film, Music and computer games Finance	Need to stop Boredom Need for unpredictability of experience Need to socialise and having talking points Need to create Need to have meaning and understand Needs of a geographically dispersed society Need to eat Need for social reproduction Need for biological reproduction Need for a family/love Need to nurture and develop/grow something Need to communicate Need to feel self-worth, achievement and pride Need for warmth Need for social acceptance and social climbing Need to laugh Need for intellectual stimulation Need for healing Need for psychological resolution of complexes Need for cultural reproduction

<p>Insurance Education Housing and homes</p>	<p>Need for new things Need for immortality Need for money Need for power and control of one's environment Need for order and continuity, to represent things as symbols Need for change Need for comfort Need for glamour Need for magic/the unexplained Need for something greater Need for fame and popularity Need for respect Need for having something quickly (not having to wait for things) Need for portability of items that supply a need anywhere Need to help others Need to relieve stress Need to compress information Need for help in making decisions Need for romance Need for sexual stimulation Need to have a link to others Need to feel safe Need to retain memories and experiences</p>
--	---

The next steps to building a new invention.

Having identified the core needs of a human being one now needs to look at available technologies from which to build a credible product or service. One can research patents from the world patent organisation (look up on Google). Clearly this is highly technical however looking up key issues on wikipedia can give even the laywoman a handle on the rough use and design of the product.

What one then does is to construct using existing technologies, new patented products and also what we call 'black boxes' (that is a small gap in the design of the product which can be easily overcome with research and development) a product that satisfies a need given by our earlier analysis. We then look at the social effect this product would have and thus we can determine new ways to sell it and also new means to engage government and other investing bodies to help fund the research and development of the product.

Thus rather than the stepwise innovation that occurs, great leaps and new platforms for a host of new industries can be created. On discussing this method I was rebuked that such a task would be impossible and difficult.

I thus set out to see if this method could work. I looked at the new scientist and having only basic science education found a patent at the world patent organisation for making

microscopic objects using DNA. This was a working invention and clearly I considered the idea of making a computer (hardware and software) that could direct the creation of the microscopic objects. The key advance here is not just the original nano-technology patent but rather the ability for making a product from a computer, akin to the replicator in Star Trek, thus allowing for an entirely new means to manufacture many user defined products with consumer applications (from people making their own customised goods) to industrial impacts (having small and intricate devices created without labour involvement beyond the design stage). We leave the reader to consider the social effects of such a device, consider for example the lack of need to actually manufacture anything as one could have a replicator for all one's needs in the home.

We have not tested whether this innovation could work but the overall scheme, the algorithm to alter the techno-economic paradigm is evident. What is clear though is that previous booms have often been fuelled by a mania for such inspiring inventions. Thus we argue that this essay is a paradigm shift in the concept of the paradigm shift.

The algorithm for technological development

To develop new technologies as given above we can follow a simple series of steps.

1. identify the available technologies
2. identify the technologies that could easily be made by combining these technologies
3. now list all available technologies from the above
4. now consider hypothetical technologies which we call 'black boxes' that can be made from the list in (3) with small jumps and innovations. These small jumps are themselves found by creating more hypothetical technologies from the available list.
5. By reducing the leap in technology to smaller and smaller black boxes research can be directed to dealing with these black boxes.
6. To increase technological development further we can look at basic science and see what kinds of hypothetical technologies can be made from this knowledge and follow the previous steps (1) to (5) to create more technologies. The full description of this method is given below as 'The algorithm for basic science development'.
7. By attacking the technological problem with a pincer base of basic science and existing technologies we are able then to make more technologies.

The algorithm for basic science development

To develop new basic science we can follow a series of simple steps.

1. Identify what technologies basic science can create.
2. Identify what technologies basic science could create using available technologies in combination.
3. now consider hypothetical technologies that basic science can create with black boxes in the basic science which are non-existing small jumps in basic science.
4. these black boxes are themselves subdivided into other hypothetical basic science technologies that are made of smaller jumps.
5. by reducing the leap in basic science one can focus research on critical components that allow for quicker development of technology from basic science.