The Oil Drum: Campfire
Discussions about Energy and Our Future

The Abandonment of Technology

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Campfire
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This is a guest post by Cameron Leckie, known on The Oil Drum as leckos. Cameron is an officer in the Australian army. He is a member of ASPO Australia and lives in Brisbane with his wife and two young children.

The other day, whilst visiting the in-laws, I was involved in a conversation that in my view opened a window to the future of technology. My mother in law, who works in a small retail outlet was packing her lunch. My wife asked why she was putting an ice block in with her lunch box. The answer was that the owner of the shop had removed the staff refrigerator (and turned off the hot water system) to save a couple of hundred dollars a year. As someone who strongly believes that the most likely outcome for a debt based economic system approaching a world of declining net energy supplies is economic contraction and lower standards of living (at least materially), this started me thinking about the process by which industrial civilisation may abandon some of the technologies that we currently take for granted.

There are many reasons why we humans adopt new technologies, but in my view the root cause is that the benefit provided by a new technology outweighs its cost. Importantly costs and benefits can be measured both in financial terms and by other less tangible factors, something that will be important when considering which technologies are abandoned. One reason that we may abandon a technology is the flip side of the reason for its adoption - that the costs outweigh the benefits obtained. Thus the fridge has been abandoned because the cost of maintaining it outweighs the benefit of keeping lunch cold. Other reasons might be that the technology is no longer supportable (for example, If you cannot access fuel, your car is not going anywhere) or another technology appears/reappears to replace it.

In this post, I would like to propose a theory by which some, or potentially many, modern technologies could be abandoned. This is an important issue because of its implications for government policy, business investment and of course society as a whole. I will briefly examine the relationship between technology and complexity, detail a theory to explain how technologies might be abandoned and finally propose some questions for discussion.

Technology and complexity

Virtually all technologies increase the complexity of the organisation/society that adopts the technology. Whilst to the end user a new technology might appear simpler, from a systems perspective, complexity has increased. Consider a hunter gatherer versus a modern consumer's procuring of food. The hunter gather had to work much harder to obtain and prepare food than the modern consumer reliant upon supermarkets and pre-prepared food. The system required to

support our food system however is orders of magnitude more complex than that of a hunter gatherer. This increased level of complexity comes at a cost in terms of the capital, resources and energy required to maintain a level of complexity.

For example, to maintain our road networks requires significant financial and human capital, a vast array of equipment, and resources such as sand, gravel, bitumen, steel, aluminium and concrete. This is all supported by the expenditure of energy, such as diesel and electricity. Whilst the global economy has grown meeting these maintenance costs has been in the most part achievable. It is highly unlikely however that society will be able to meet these maintenance costs in a contracting economy. Indeed this is already occurring in some parts of the world, such as the US, where in some instances financially pressured local governments have been turning bitumen roads into gravel roads to reduce costs.

The theory

So how could a technology be abandoned? Figure 1 summarises the theory that I am proposing. Figure 1 represents a single technology, such as a car. Rather than using a specific number of units (e.g. cars) or other measures (e.g. Vehicle Kilometres Travelled), I have used percentages to represent the level of abandonment, with 100% representing the maximum uptake of a particular technology and 0% being its complete abandonment. Obviously how individual technologies are abandoned will vary considerably both in time and level of abandonment, thus the general case represented in Figure 1 is generic only to assist with explaining the theory.
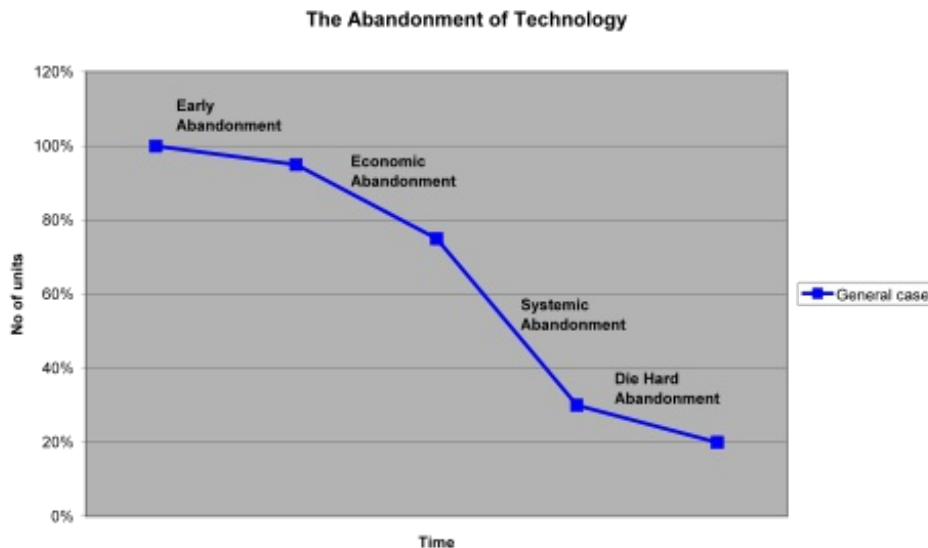

Figure 1. The abandonment of technology.

General case. In the general case, technology is abandoned in four stages:

>   **Early abandonment**. During this phase a small number of people abandon a technology for a number of reasons. These could be altruistic (selling the second refrigerator because of concerns over climate change), frugality (trying to save a little extra money) or economic (long term unemployment). Whilst some of these reasons will recur in later stages, the early abandoners will be small in numbers, the actual abandonment won't cause major inconveniences to the people who decide to do so, the technologies are likely to be discretionary use items and the effects of this abandonment are likely to only have minor

impacts upon the industries associated with that technology.

An example might be provided by the home telephone. With the proliferation of mobile telephone services and attractive contracts, some people might decide to close their home telephone service and instead rely upon mobile phones. I know a number of people who have done this already and have even considered it myself as a means of reducing living expenses.

- **Economic abandonment**. The transition from the relatively painless stage of early abandonment to this stage is likely to coincide with a financial crisis or economic recession. Unemployment, increased costs of living and reduced incomes will force tough decisions to be made resulting in abandoning or significantly reducing the use of technologies. Discretionary items are likely to be the first to go, but over time, items more and more fundamental to our current lifestyles will be abandoned. This stage will be characterised by major falls in sales. It is likely to be widespread, at least regionally or nationally and the items that are abandoned will have increasingly greater impacts.

  During this stage the item of technology will still be supported, that is the industries supporting the technology will still function. An example might be provided by cars. Sustained high oil prices combined with other economic factors are likely to result in significantly less travel by car; however there will still be an automotive industry. This stage is likely to last for some time, potentially decades depending upon the technology.

- **Systemic abandonment**. This stage is defined by a technology being abandoned because it can no longer be supported or maintained, at least on a wide scale. The reasons that this could occur are many such as the unavailability of parts due to business failures/supply chain disruptions, a credit freeze, oil supply disruptions or an unreliable electrical supply. This stage is characterised by the physical inability to support a technology on a reliable basis. This stage could have global impacts and occur quite quickly due to synchronous failure. For example if Boeing, or Airbus, were to fail, this would have significant implications for airlines globally.

- **Die hard abandonment**. The final stage of abandonment is likely to be the longest. Some technologies might disappear completely whilst others may last for decades or centuries. The use of a technology during this phase is likely to be isolated and dependent upon local circumstances. For example, you would expect that Saudi Arabia will have cars on the road far longer than an oil importing nation. Smaller numbers of a technology may also be maintained through the cannibalisation of parts or local manufacture. This stage is likely to be highly uneven between regions and different types of technologies. For example, maintaining mechanical items is likely to be more achievable than sophisticated electronic items.

Some general comments on the theory. Although this is explained in a linear fashion, the transition between stages is likely to overlap and could even occur concurrently between different regions or nations. Indeed some nations might be increasing the uptake of a technology at the same time another nation is abandoning it.

Also, it is not necessarily a one way process; it is likely to be dynamic. All that it will take to reverse the process is for the cost benefit analysis to alter direction, assuming that a technology is still supportable. In many industries we are likely to have major over capacity problems in the

years ahead as the global economy contracts. Economic and systemic abandonment, whilst likely to be highly disruptive, may result in some technologies being able to remain viable for much longer as excess capacity is removed.

Finally synchronous failure, to use Thomas Homer-Dixon's phrase, could rapidly accelerate this process due to the interdependencies between many technologies. As an example, if the US Air Forces Global Positioning System constellation were to fail, this could render a whole host of technologies that rely upon it immediately useless.

Questions

The key assumption that underpins this theory is that the future path of the global economy will be one of contraction. Taken in this context, detailed below are some questions for discussion on the theory of technological abandonment:

- Is this theory valid? If not, are there other ways of describing how we might abandon technology?
- Is there any evidence, anecdotal or otherwise, available to support this theory?
- What technologies are most at risk?
- What technologies should we attempt to maintain? What are the priorities?
- What role should Governments take?
- Where should we be focusing investment and R&D budgets?
- What characteristics should future technologies embody?
- What are the implications for manufacturers and business?
- What opportunities does the realisation of this theory present?
- Should/could we abandon at risk technologies prematurely?
- What do we do with the remnants of the technologies that we abandon?

Author's Note

This campfire post is an extension of my thoughts on the future of technology explained in a paper that has recently been published in the Australian Defence Force Journal titled 'Lasers or Longbows: A paradox of military technology' (from page 44). The paradox I define in the paper as being 'The advantage provided by the increased complexity of a military capability increases the vulnerability of that same capability to systemic collapse due to its reliance on complex supply chains.' Whilst this paper was describing the impact on the military, I believe that it is equally relevant to all technologies. This post expands upon the argument presented in the paper to examine how individual technologies may be abandoned.