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# Blade Runner economics: Will innovation lead the economic recovery?

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ABSTRACT

According to Schumpeterian theories, economic expansions are associated with the introduction of successful new products, processes and services while depressions are linked to stagnant periods with few innovations. Can the economic crisis set in motion in 2008 be explained by the inability to innovate and upgrade production? And, conversely, will an economic recovery require a new stream of innovations? Drawing on the debate which emerged after the 1970s economic crisis, this discussion paper tries to assess whether it is likely that the next long-term expansion will be linked to a new stream of innovations. While most evidence suggests that ICTs continue to provide the back-bone of economic activities, there is the prospect that biotechnology will eventually start to fulfil the promise envisaged over 30 years ago in the film *Blade Runner*.



## 1. Artificial life in Venice

I was just a boy when, in 1982, fate led me to watch *Blade Runner* at the Venice Film Festival. Ridley Scott and Harrison Ford were there, but I was much more impressed and fascinated by the fantasy of new technologies than by the celebrities in the cinema. I was not the only one: the film and its seven different versions have since become a "cult movie" and have been analysed not only for their artistic meaning but also for their social, political and economic implications (see, for example, the variety of perspectives presented in Kerman, 1997).

I would like to explore here the film as an experiment in technological forecasting. Many prospective technologies presented in the film, such as flying vehicles, were already predicted by previous science fictions novels, films and cartoons. However, some devices struck my imagination:

**Electronics:** Battery-operated electronic tills present everywhere, even in street kiosks. Voice-operated televisions. Gigantic electronic screens. Scanners (I do not think that the word even existed in 1982) that could in an instant enlarge photographs several times over.

**Biological artefacts:** Artificial animals (e.g. snakes, owls, ostriches). Artificial body parts (human eyes). Living toys (dolls, puppets and tin soldiers). And, of course, the very hero of the film, the Replicant, an artificial human who could be distinguished from real humans only after undergoing a rather complex psychological/oculist test.

Experts in science fiction will no doubt argue that any one of these innovations was already predicted in previous science fiction works.[1] Nevertheless, the narrative of *Blade Runner* makes these manufactured biological artefacts realistic and impressive for their pervasive social diffusion, perhaps because it portrays a vision of an entire industry based on what we might label today as a 'general purpose technology' (for a discussion of the concept, see David, 1990; Bresnahan and Trajtenberg, 1995), namely artificial life.

One distinctive aspect of *Blade Runner* should be underlined. It did not present a totally new society: many things were almost identical to the civilization of the 1980s. The structure of social classes depicted in *Blade Runner* is rather similar to what existed at the time of the film's release, and this is in itself an accomplished prediction since income inequality has become even greater in the last thirty years. Already Fritz Lange's *Metropolis* (1927) had

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[1] Thanks to a very knowledgeable reviewer, I have learnt that "bio-engineered" animals could be found in Olaf Stapledon's *Sirius* (1944), and that a mixture of humans and animals are also to be found in Cordwainer Smith's *The Dead Lady of Clown Town* (1964).

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**Table 1**
Phases of Capitalist Development and Pavitt's Categories of Firms.

| Period | Successive Techno-Economic Paradigms | Industrial organisation | Typical industries | Rise of Pavitt's category of firms |
|---|---|---|---|---|
| 1770–1830 | Early Mechanisation | Growing importance of small manufacturing firms | Textiles, Potteries, Machinery | Supplier dominated |
| 1840–1880 | Steam power and railway | Separation been producers of capital and consumption goods | Mechanical engineering, Steel and Coal | Specialized suppliers |
| 1890–1930 | Opportunities associated to scientific discoveries | Emergence of large firms | Chemicals, Electrical machinery, Engineering | Science based |
| 1940–1980 | Fordist and Taylorist revolutions | Oligopolistic competition for mass consumption | Automobiles, Synthetic products, Consumer durables | Scale intensive |
| 1980–2010 | Information and communication | Networks of firms, strong user-producer interactions | Microelectronics, Telecoms, Software | Information intensive |

Source: Author's elaborations on Freeman (1987), Table 15. Last column derived from Pavitt (1984, 1990).

depicted a social stratification in which lower classes re-entered a state of slavery, and *Blade Runner* shows that the new lumpen-proletariat of Marxist remembrance has a new competitor: the non-human class of the androids. Like *Metropolis*, the film represents a peculiar urban stratification of social classes: it is not *horizontal*, as when you have different neighbourhoods, but rather *vertical*: lower classes are low also because they live on the ground floor, while the upper classes reveal their highflying nature almost literally, occupying the top floors of skyscrapers.

The dominant technologies are not identified by single innovations only, but by clusters of interrelated innovations. Surprisingly, however, the film fails to connect systematically the two clusters in Electronics and Biological artefacts. With the benefit of hindsight, we can today identify these technologies as belonging to two main clusters: "Information and Communication Technologies" (ICTs) and "Biotechnologies". Seen from the perspective of the early 1980s, both ICTs and Biotech had a potential that was still unexplored and that appeared equally revolutionary and promising.

After thirty years, I watched the film again in very exclusive company, namely that of my children. Like me, they found the film imaginative and exciting, but with some basic differences. On the one hand, all the innovations in the field of ICTs have become trivial for them: the mobiles in their pockets contain scanners, audio-visuals, photo enlargers and GPS navigators more powerful and much smaller than in the film. In the middle of the adventure, one of my kids wondered: "why does he not send an email with an attachment?", and the question was not that silly. If we accept the intriguing idea that science fiction can influence innovation as much as innovation influences science fiction (Bassett et al., 2013), we can now say that this influence has been much stronger for ICTs than for Biotechnologies. *Blade Runner* underestimated the pace of change in ICTs, to the point that it does not forecast what has become the most significant innovation of the last decade or so, namely the web. The TV screens, GPS navigators and video-telephones pictured in the film are, by contemporary standards, big and chunky.

On the other hand, none of the innovations in Biotechnology has to the same extent changed our lives. ICTs have created new companies and millions of jobs, and they have transformed the operation of traditional industries such as retailing. Biotechnologies, in spite of the massive investment in R&D, have not (yet) produced anything like the same effect. Biotechnology still has to produce the general purpose technology equivalent to the microprocessor and it remains confined to a very narrow niche.

## 2. Schumpeterian insights

The idea that clusters of innovations generate phases of economic development is older than *Blade Runner*. Marxist and Schumpeterian economists have for a century or more tried to relate stages of development to the emergence and decline of different technologies. According to this view, each historical period is dominated by the intensive and extensive use of specific production technologies. These technologies may be fostered or hampered by institutions and social beliefs, which often explain why they develop and are disseminated in some parts of the world rather than others.

Crucial to the Schumpeterian insight is that innovations do not have an economic impact in isolation: they become dominant because they are applied in different contexts, shaping and transforming original ideas. Innovations could occur in different economic arenas (e.g. steam engines and textile machinery), but they are mixed and recombined in the economic and social fabric (e.g. the steam engine provided power for textile mills). When the new knowledge associated with a few emerging technologies starts to become widely diffused in economic life, then it will generate a phase of economic expansion. New technological opportunities stimulate and open up new industries that did not exist before, leading to job creation and structural change. When the opportunities start to dry up, it is likely that there will be a lower rate of economic growth or even an economic crisis.

Regular patterns are always difficult to recognize, but Schumpeterian economists have attempted to identify five phases of capitalist development, each associated with a cluster of dominant technologies (Schumpeter, 1939; Freeman, 1984b; Mandel, 1995; Freeman and Louçã, 2001). Chris Freeman (1992) and Carlota Perez (2002) have termed these major phases "techno-economic paradigms", identifying their key characteristics in terms of: i) core industries, ii) industrial organization, and iii) the modality to introduce innovations. Table 1 summarizes the key characteristic of each techno-economic paradigm.

Why do we need such a categorization? The main purpose is to understand the distinctive technological areas of a specific epoch and to trace their evolution. Archaeologists have found it useful to classify ancient societies into the Stone, Bronze and Iron Ages, since the techniques associated with each of these periods can explain quite a lot about their economic, social and even cultural and political life.[2] These ages do not necessarily occur simultaneously: for

[2] This periodization was originally suggested by the Danish archaeologist, Christian Jürgensen Thomsen, in the 1840s and it has since been widely applied.

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