

BOOK REVIEW

RACE AGAINST THE MACHINE

How the digital revolution is accelerating innovation, driving productivity and irreversibly transforming employment and the economy.

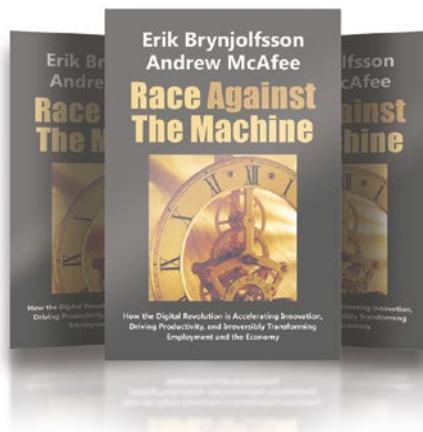
Erik Brynjolfsson and Andrew McAfee

RACE AGAINST THE MACHINE

Based at the MIT Sloan School of Management, the authors are respectively Director and Associate Director at the MIT Centre for Digital Business. Both are experts on the rise of the digital economy with Brynjolfsson's previous book titled 'Wired for Innovation: How IT is Reshaping the Economy'. Interestingly, their original intention was to write a book about all the worldwide benefits that digital technologies have created. One of their first findings as they researched the field was that the more technology any industry had, the bigger the performance gaps as the leaders rapidly adopted new technology and raced ahead. In other words technology spawned losers as well as winners. As they researched further they discovered that as technology races ahead it widens the gaps between swift and slow individuals even more than between companies and that technology's impact on employment was a neglected field in research and writing. Consequently they re-focused the book away from the benefits of the digital economy to its implications for employment and incomes now and in the future.

IMPACT OF TECHNOLOGY-DRIVEN CHANGE

When did the population of working horses peak in the UK? 1791, 1831,



SIGNIFICANT AS HARDWARE IMPROVEMENTS ARE, THEY ARE ACTUALLY DWARFED BY THE IMPACT OF SOFTWARE ADVANCES.

1861, 1881 or 1901? The answer is 1901, with a peak of 3.25 million. This seems rather late, but it's because the impact of all technology-driven change accelerates exponentially. It makes a big difference only on the "second half of the chess board".

ANYONE FOR CHESS?

The analogy refers to a traditional story told about the inventor of the game of chess, who showed his creation to his country's ruler. The emperor was so impressed by the game that he allowed the inventor to name his own reward. The inventor said he would like some rice with the quantity to be determined as follows. One grain of rice for the first square, two grains for the second square, four grains for the third and continuing to double for each of the subsequent squares. The emperor readily agreed to this seemingly modest request. However, when it comes to measure out the amount of rice it's a different story. At first, the quantity builds up slowly, resulting in about one field's worth after 32 squares. But once the amount is this large, continued doubling on the second half of the chessboard makes a dramatic impact, generating a pile of rice that would have been bigger than Mount Everest.

MOORE'S LAW

Moore's Law is just the same. In the first three or four decades after the publication of Moore's 1965 article, computing power did keep doubling but not beyond all recognition. However, it's now moving onto the second half of the chessboard. Significant as hardware improvements are, they are

actually dwarfed by the impact of software advances. The authors quote a study by Martin Grottschel, who quantified advances in computers' problem solving performance from 1988 to 2003. He calculated a 43 million fold improvement, but broke this down into processor speeds improving by a factor of 1,000 compared with a 43,000 fold improvement for algorithms / software.

IMPLICATIONS FOR THE FUTURE

People now are like horses in the first part of the 20th century. Technology-driven changes to the world of work are now entering the second half of the chess board. There are three main implications:

- **High versus low skilled workers**

As automation of tasks gathers pace routine tasks are increasingly being undertaken by hardware and software whilst opportunities for more complex tasks such as programming, management and marketing are increasing. Downward wage pressure for unskilled jobs will slow but not stop this trend. In 2011 Terry Gou, founder of Foxconn, announced his intention to introduce a million robots by 2014 to replace thousands of low skilled workers.

- **Superstars versus the rest**

Economists Frank and Cook have explained how technology has transformed music, software, sports and many other products that can be transmitted as digital bits, turning them into 'winner take all' markets'. Since 2002, the top 1% of US households have grabbed 65% of the financial benefits of growth in GDP.

- **Capital versus labour**

What makes most sense? Investing in capital or labour? When it was cheap and had no bargaining power the answer was labour, even during periods of strong technological advance such as the Industrial Revolution. Since World War II, big increases in the cost of labour, driven by stronger bargaining power, coupled with the effects of Moore's Law, have completely reversed that equation. Since the onset of the recession

investment has increasingly been focused on technology not labour. In the US, corporate profit as a share of GDP is at a 50 year high but spending on people as a share of GDP is at a 50 year low.

As these trends gather pace it isn't only the least skilled who are affected. Computers are rapidly advancing into areas such as complex communication and advanced pattern recognition, displacing human labour from such highly skilled tasks as medical diagnoses, legal research and foreign language translation. And tests have conclusively shown the Google driverless car to be far safer than the human piloted alternative.

COMPUTERS ARE RAPIDLY ADVANCING INTO AREAS SUCH AS COMPLEX COMMUNICATION AND ADVANCED PATTERN RECOGNITION, DISPLACING HUMAN LABOUR FROM SUCH HIGHLY SKILLED TASKS AS MEDICAL DIAGNOSIS, LEGAL RESEARCH AND FOREIGN LANGUAGE TRANSLATION

So what's left for people? Anything involving 'human' characteristics such as empathy or emotions, e.g. counselling or social work. Jobs involving complex and especially unpredictable communication and decision making such as nursing, management and most professional services are still growing. And computers remain poor at creativity whether it's cultural (writing or composing), aesthetic (architecture, fashion), or innovation (a new product or a new business). But if you really want to have a job for the future why not learn programming so you can help the machines to eliminate the last few areas where humans still retain the upper hand?

Brynjolfsson and McAfee's recommendations for winning the Race Against The Machine are five-fold.

ONE

Invest in education including paying teachers more, holding them more accountable and extending tuition hours.

TWO

Stimulate entrepreneurship through higher education, vocational training and drastically reduced regulatory barriers for new businesses.

THREE

Encourage selective immigration through green cards for selected post graduate students, visas for highly skilled workers and founders' visas for entrepreneurs.

FOUR

Invest in much improved transport and communications infrastructure.

FIVE

Increase research funding for technology-related R&D institutions.



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