

Insight

MAKE, THINK, IMAGINE: ENGINEERING THE FUTURE OF CIVILISATION

Throughout my life and career, I have always been connected to the arts and to cultural organisations. When I applied for a scholarship to study physics at the University of Cambridge, I had to submit an essay about something completely different to my core area of study. So, I submitted a piece about the Safavid architecture of Isfahan.

With my first bonus cheque from BP, I bought a David Hockney print.

And since then I have been a passionate and consistent supporter of the arts, serving on the boards of the Folger Shakespeare Library, the British Museum, the Tate and the Courtauld Institute, amongst many others.

I relish the time I spend with these organisations, but there has always been something about the arts and cultural sector which has troubled me. I have heard people assert again and again that arts and culture are the foundation of civilisation, and that to understand the history of civilisation, one has to study the history of art.

But while great art is essential for understanding the human condition, it is preceded by great engineering, which is the true foundation on which civilisation is built.

This is why I wrote my new book *Make, Think, Imagine*: to make the argument that engineering is the lifeblood of all progress, and the beating heart of society.

What do I mean by ‘engineering’? I think of it as a head with two sets of eyes: one set looks to the fruits of scientific discovery, while the other looks to the needs of commerce and customers. The brain in the middle integrates all that it sees and comes up with solutions: the tools and systems that we all use to understand and shape our worlds.

From the hand axe which changed the way our distant ancestors got food, through to the James Webb Space Telescope, which is going to be launched a million miles away from Earth so we can look further back in time than ever before: engineering is the platform upon which everything else is built.

Engineering is also our source of hope for a better future.

My mother was an Auschwitz survivor, and so it is hardly surprising that she believed more in the future than in the past. She always told me that the best was yet to come. She had no time for pessimism and no space for those who did not believe in progress. That view rubbed off on her son.



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When I look around, what I see is a world where every day more people are surviving, getting an education and living without disease, with a diminishing threat of violence, and with a growing freedom to choose how they want to live. This is progress. And it is all being driven by engineering.

But despite abundant evidence of an improving world, I often find myself in a minority in believing that progress is real and engineering will make sure the world continues to grow and prosper.

Look to the media and you will draw a far more negative conclusion. Time and time again commentators paint a bleak picture of our world. In doing so they seem often to attack the engineering mind-set itself.

Facial recognition technology will be used to infringe our human rights and make privacy a distant memory.

Terrorists will soon use gene-editing to make deadly viruses that will kill people tens of millions of people. Many millions more will be killed by the fast approaching catastrophe of antimicrobial resistance.

Then there is climate change, resulting from the use of fossil fuels, which could soon spiral out of control, with devastating consequences for us all.

These are all truly hellish visions. What makes them most disturbing is the fact that any or all of them could actually become true.

How do we react to all this? As engineers, scientists, business people, policy makers or members of an engaged society, how can we make sure progress is not subverted by malign actors and undermined by the unintended consequences of engineering and technology?

This is the issue at the crux of my new book and, I believe, the central issue of our times.

It is important to remember that, dire as they may sound, today's dystopian visions of our technological future differ from the doomsday prophecies of the past in one critically important way. This time, we know how to solve them.

Earlier this summer I became embroiled in a debate with an anthropologist whose basic message seemed to be that economic growth is a bad thing and innovation has progressed far enough. But that would mean welcoming back forgotten diseases, accepting that millions will die as babies and billions more will have to endure lives of grinding poverty. It could mean a return to the hardship of a 65-hour working week, from today's more comfortable average of 38 hours.

We would be stepping backwards into a cold, cruel world. Trying to stop the forward march of engineering is not only pointless, it is wrong.

Instead, I believe passionately that the solution to the problems created by engineering is not less engineering. It is *more* engineering. And I have four ideas for how we can use engineering to chart a better course into the future.

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First, we must never forget the dark side of progress. If engineers and innovators try to gloss over the abuses and unintended consequences of engineered products, fear will take over and progress will go into reverse.

It is now technically possible to build autonomous drones, equipped with facial recognition algorithms and an explosive charge. Terrorists could wreak unimaginable havoc with swarms of these things, which you may have seen depicted online in the fictional film *Slaughterbots*.

The risk is a real one, notwithstanding the fact that engineers from the defence sector are already developing counter-measures. But if stories like these are the only ones we hear about drones and facial recognition, fear could derail development of these technologies. The same will happen if the makers of self-driving cars fail to address society's concerns about the accidents and deaths caused by the presence of their test vehicles on public roads. Or indeed if gene-editing is used to alter the human genome in ways that are not demonstrably safe or desirable.

If fear prevails and these technologies are banned or rejected outright, we will all miss out on the many advantages each will bring, which range from greater convenience and safety, to improved healthcare, and much more.

Rather than ignoring the problems, it is vital we reflect deeply and learn from yesterday's mistakes in order to forestall those of tomorrow. The answer is not, as some would have it, to adopt an extremely precautionary approach. That way leads to doubt and stagnation.

This leads me to my second point: we must be bold and ambitious about all that we can achieve.

Time and again, engineers have overcome seemingly impossible challenges. In the past 40 years, engineers have driven a 250-fold reduction in the cost of solar electricity. Lithium batteries are on a similar learning curve and, perhaps even more significantly, mass deployment is the only way to turn today's expensive carbon capture technology into a cornerstone of society's response to climate change.

This is what engineering does: tools that were once unattainably expensive and impractical become available for everyone. This applies to everything from printed books and lightbulbs to antibiotics, automobiles and artificial intelligence algorithms. All were written off in their time, before going on to change the world.

My third point is about trust. The role of leaders in innovation and in business, is about more – much more – than administering the advent of the inevitable.

It is about exercising judgement. And it is about putting people and society at the heart of every decision you make. This is what Tim Cook, CEO of Apple, made clear in his address to graduating students at Stanford University earlier this summer. In his view, 'big tech' went wrong when it started to take credit for the benefits of new technologies, without accepting responsibility for their harmful outcomes.

To earn our trust, innovators, and companies should never shirk from the memory of what can go wrong. That is why Canadian professional engineers wear a ring made from a badly designed bridge that collapsed in a storm. For the same reason, I will never forget the day in 2005 when, as CEO of BP, I learned of the tragic explosion at our Texas City refinery. Fifteen

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people died and many were injured. It takes constant vigilance to ensure that products and processes are safe and that we learn from failures.

Engineers and innovators the world over need to show that they “get this.” Only then will they regain trust and earn the freedom to exercise the full scope of their vision.

My final point is about imagination. In a world where we are all becoming more dependent on increasingly intelligent engineered systems, the creativity of the human brain is our exceptional characteristic.

This is amplified when we pool our minds and work together; when we ignore traditional boundaries between professional sectors. Most transformative innovations, including the printing press, the transistor and the DNA sequencer, emerge from the fertile gaps between existing disciplines.

When we achieve this more inclusive and optimistic mindset, we unshackle our imaginations, and threats such as antibiotic resistance and climate change cease to be existential. They are just another set of problems to be solved.

We already have the engineered products and processes we need to stop the worst effects of climate change, for example. Almost a quarter century ago, I was the first leader of a big oil company to acknowledge the risk posed by climate change, and to pledge to do something about it. Too little has happened since.

In tackling a truly global challenge like climate change, we must maintain our belief in the power of engineering to make a better world. Because, with history as my guide, our future will depend on engineers who are equipped to push back the frontiers of the possible.

We have the tools we need to steer engineering and progress down the right path. I have no time for those who would turn back the clock, and neither should you.

*Lord Browne
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John Browne trained as an engineer, was CEO of BP from 1995 to 2007 and is now Chairman of L1 Energy. He is Chairman of the Crick Institute, a Fellow of the Royal Society, past President of the Royal Academy of Engineering and former Chairman of the Tate. He is a collector of antique books and art and the author of four books.

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