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BOOK REVIEWS

Innovation and its enemies: why people resist new technologies, by Calestous Juma, New York, Oxford University Press, 2016, 416 pp., $US29.95, ISBN: 9780190467036

In each era, there are controversies about new technologies. Controversies that have already been settled often sound pointless to us, but we do understand the importance of current controversies. Or in other words, we do not feel any more why we would be worried about whether coffee or electric equipment should be legalized, but we do understand why we are in favour of or against self-driving cars. However, the book 'Innovation and its enemies' argues that precisely by trying to understand former controversies over technologies, we get historical reference points that will help us to solve new controversies (p. 43). To that aim, the author discusses nine case studies of controversies over technologies in nine different chapters, of which the oldest starts in the 15th century, and the last two are still unsettled.

In order to help the reader understand the various case studies, the first chapter offers a framework to explain the relationship between technological innovation and social change. Central to this framework is Joseph Schumpeter's concept of 'creative destruction'. Creative destruction means that new technologies disrupt societal structures (organisations, institutions, and how people relate to each other). Since institutions and people are trying to maintain continuity in society, this disruption causes tensions in society. These tensions are visible in controversies over new technologies. However, since there is a coevolution between technology and institutions, new institutions are created when a new technology is implemented. Over the years, such institutions will become incumbent institutions, which try to maintain continuity in society when, again, new technologies are introduced.

The process of creative destruction is portrayed as an inevitable transition to a new situation, which means that controversies over new technologies are inevitable, although in some cases the controversy is stronger than in others. In Chapters 2 to 10, the process of creative destruction is clearly visible in the separate case studies. These case studies are: coffee, the printing press, margarine, tractors, electricity, refrigerators, recorded sound, genetic modification of crops, and genetic modification of salmon. However, even though the same process can be found in each case, the case studies are not interchangeable. In each case, people oppose the new technology for different reasons. Their arguments can be economic, political, religious, technological, concern about health and safety, etc. In this way, the various chapters show that the overall process in each case is similar, but the details are different.

For example, in the case of margarine, the dairy industry did not like the competition and tried to convince the public and politicians that consuming margarine was a danger to health. It even fabricated a scientific study to show that margarine is unhealthy. None of the industry's health claims were true. On the other hand, in the case of the transition from gas to electricity in the 19th century, people had legitimate fears about electricity. The first electric wires were installed unsafely, and there were several accidents in which people died or were badly injured. Since these people did not know how important electricity would become in the 20th century, it is understandable that they doubted whether electricity really was better than gas.

The similarities and differences of these case studies make it interesting that this book elaborates on so many case studies so extensively. It shows that we do not need to downplay controversies over technologies, but that in such controversies legitimate concerns can be

raised that need to be solved before the technology is fully implemented in society. Moreover, it also shows that fake news is not new. In the case of coffee, there was fake news in the 15th century: both critics and proponents of coffee made up stories about why this drink would be either good or bad for health. So fake news is not just something of this era; we will always need to be wary of false arguments in the discussion of a new technology.

The book does reach its aim of providing historical reference points that can aid understanding of current and future controversies over technologies. However, it would have been easier to follow if the first and last chapters (Chapters 1 and 11) had been merged into one chapter before the case studies. In Chapter 11, the author is explicit about not regarding the general public as ignorant and about the fact that the main audience for his book consists of political leaders and entrepreneurs. The case studies would have been easier to understand, had this been made clear in Chapter 1. Moreover, at the end of each case study, lessons are drawn; the lessons would have made more sense had the focus on political leaders and entrepreneurs been made clear from the start.

The reason the author does not regard the general public as ignorant is that he regularly suggests that in the end, people will have to accept a new technology because it is just better than what went before. He is clearly a strong proponent of technological progress. However, precisely because some proponents of technological progress do regard the general public as ignorant (p. 307), a clear statement in Chapter 1 would have shed a different light on the case studies. If one is against a technology, it does not mean that one does not understand the technology. I recommend that readers first read Chapters 1 and 11, and only then read the case studies.

In Chapter 11, the author calls on political leaders and entrepreneurs to be courageous enough to take the initiative when new technologies are ready to be implemented into society; in other words, to lead the process of creative destruction. These leaders and entrepreneurs are being called courageous because politicians risk losing the support of their voters, and entrepreneurs risk reinforcing technologies that turn out to be failures. But they are not expected to do this alone. This last chapter argues for an 'inclusive innovation' approach in which there are clear roles not only for political leaders and entrepreneurs, but also for scientists and the general public.

Inclusive innovation is an approach in which the scientific risk assessment and the decision-making process of a new technology are sufficiently transparent for the general public to be informed about the benefits and the risks of the new technology. In addition, the general public should be involved in discussions on how to implement the new technology into society. Involving the general public is regarded as important because it would enable people to understand fully the implications of a technology (p. 299), and also help politicians and entrepreneurs to win the trust of the public.

The book focuses on technologies that in the end became successful. In this way, it can seem as if, despite all the controversy over new technologies, people will become used to them in the end anyway. This is not always the case. Take asbestos, for example. Evidence had been amassing from the 1930s that asbestos damaged health. In 1964 and 1965, papers were published in which scientists agreed that asbestos is related to lung cancer. Nevertheless, it took politicians decades to regulate and ban the use of asbestos (Bartrip, 2004, pp. 74–75).

More examples could be given in which it takes governments a long time before they respond to scientific evidence that some technology around which an industry has already formed is unsafe. Because of this, there are also important lessons to be learned from failed technology. Why was it legalized in the first place? Why did it take governments so long to ban it? The book emphasises the importance of politicians and entrepreneurs winning the trust of the people, but I think that an important way to win the trust of the people is by quickly banning a new technology if it turns out to be unsafe – even if a new industry has formed around it. So, the message of this book would be stronger if a case study had been included of a failed technology around which new institutions had already been formed.

It is surprising that philosophers of technology are not mentioned at all in this book. The concept of creative destruction is focused on the relationship between new technologies and society, but political leaders, entrepreneurs, and even scientists are not trained to analyse such relationships. Philosophers of technology are. The importance of analysing new controversies over technologies should not be underestimated. The author has analysed all nine case studies and clearly knows a lot about society and technology, but still I do not agree with his view on self-driving cars. The author uses the self-driving car as an example of his claim that perceptions are formed based on what people fear, not on actual risks. He argues that self-driving cars are safer than human-driven cars, and so, he claims, laws that require a licensed driver in a self-driving car able to intervene when necessary are laws created for economic and not safety concerns (p. 295). However, even though self-driving cars may be safer than human-driven cars, self-driving cars still need to be developed further if they are to function properly. Because their software can become 'confused', it is still safer to have a human watching over what the car is doing and able to intervene if the car behaves strangely (Bundy, 2017, p. 41).

Philosophers of technology are equipped to analyse the relationship between new technologies and society. They can increase the benefits of this approach, and they can also learn from it. There is one group of philosophers of technology whose way of analysing technologies is compatible with that in this book. These are the philosophers of the 'empirical turn'. At the turn of the century, a shift in focus took place among several philosophers of technology – the empirical turn. The aim of this turn is to understand technologies by describing them. Many of these philosophers are also focused on trying to understand technologies in their social context (Achterhuis, 2001, pp. 6–8).

So, in both the approach of this book and that of the philosophers of the empirical turn, descriptions of technologies are used in order to understand them. However, the way that technologies are described in this book is much more comprehensive than the descriptions in the philosophy of technology. Philosophers of the empirical turn are often focused on the interaction between technologies and various social groups. But Juma makes clear how important it is to distinguish the various arguments of the various groups and their underlying motives in order to understand what is really happening when people are worried about a new technology. Taking this additional step will help these philosophers to improve their comprehension of the controversies.

Next to political leaders and entrepreneurs, who are addressed directly, I recommend this book to anyone interested in controversies over technologies and in the relationship between society and technology in general. The first chapter might be a bit difficult for a non-academic public, but Chapter 11 is much easier to follow. Read Chapter 11 before reading the case studies.

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Mariska Thalitha Bosschaert
4TU.Centre for Ethics and Technology, Maarssenbroek, The Netherlands
mariska_th@hotmail.com

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