



The Fourth Industrial Revolution and the Importance of Disagreement

By Alex Broadbent

Introduction: When Everyone Agrees, Something Is Wrong

In healthy dialogue, there are always people who disagree, even if they are eccentric flat-Earthers. Something about human psychology seems to require that some people always take up a contrary position to the majority on any substantive idea, and empirical evidence always permits this, because it always underdetermines the conclusions we

draw from it. When there is no disagreement on a certain idea, therefore, we have to consider that we're either not assessing the idea properly, or not entertaining all opinions. If we were, some of us would come to different conclusions.

My concern is that there is too much agreement about the Fourth Industrial Revolution (4IR), which is far less well understood and confirmed than the idea that the world is round. We've

heard so much about what's going to happen, and why. How carefully have the bases of these claims been tested? How seriously have we asked ourselves about the most likely scenarios in which the 4IR does *not* happen— because it is derailed, or because we have “topped out” already in our latest phase of industrialisation, or for some other reason? In short, have we asked: what could possibly go wrong (Broadbent, 2011)?

The 4IR Story

“The Fourth Industrial Revolution” is a tag-line for a hypothesised major change in how society is organised, driven by the availability of new technologies. These are fundamentally driven by the growth of computing power, enabling smaller and faster devices, and the implementation of artificially intelligent systems. Combining small and intelligent systems allows a much tighter cyber-physical interface. Growing biological knowledge, especially of the human body, enables the cyber-physical interface to include the cyber-human. As a result of all these new technological possibilities, the story goes, we're going to see huge changes in the way people work, interact, govern, travel, think, play, and quite generally live. Moreover, these changes are already occurring. Finally, it's characteristic of the 4IR story to emphasise that the exact changes we will see in society are not easy to predict and are under our collective control. Emphasis is therefore placed on the importance of awareness, embrace, preparation, and a focus on protecting values such as equality and privacy.

This article argues that most of this story is false, insofar as it says anything at all. I will outline several reasons for this statement. I could frame my argument as “probably” false, but I'm more confident than that, and would like to instead propose that it is mostly false, from start to finish.

Fitting Your Data to the Theory

The 4IR story is constructed with little or no reference to the accumulated work of people who have thought about the nature of society and the reasons for its changing shapes. The historical literature does not make place for three prior industrial revolutions, but for one. Moreover, that one Industrial Revolution was not a global phenomenon, nor even a template, model or trope

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of some repeatable event-type that may occur anywhere and anytime with the right conditions. Rather, it is a particular and very complex historical episode taking place in particular countries at particular times.

It's easy to see why most historians think in particulars when one considers the tangles that the 4IR story gets itself into in the context of countries that are still in the process of industrialisation. In many countries, smart phones, the internet and social media exist alongside agrarian societies that continue to use rudimentary technologies. The question of needing a dependable energy source for the 4IR is important to consider, and many countries have uneven societies where, arguably, only some people are participating in the 4IR.

It's easy to retro-fit your hypothesis to new evidence. However, if that were the way scientists did their work, we would not have smartphones. It doesn't work in the empirical sciences, and it doesn't work in the social sciences either. When you retro-fit a hypothesis to fit new data, your predictions don't come true. You can alter your hypothesis some more to explain this failure away, but explaining away your errors today doesn't help you to be right tomorrow.

Foxes and Hedgehogs

There's clear empirical evidence for this assertion. The psychologist Philip Tetlock, who worked on understanding what makes the difference between predictive failure and success, argues that the key differentiator is cognitive style (Tetlock, 2005; Tetlock and Gardner, 2015). Tetlock conducted multi-decade studies in which he interviewed a wide range of people about socio-political events, such as election outcomes, wars, the collapse of the USSR, and many similar, more fine-grained events. These studies are ongoing. Based on his research, Tetlock identified two

types of people. So-called “foxes” are tentative, entertain complex and qualified hypotheses, and change their minds—or at least consider doing so—in the face of new evidence. “Hedgehogs”, on the other hand, have a view that makes sense of the world, and sees all evidence either as confirming this view, or else as invalid and irrelevant.

This gives us what philosophers would call a second-order argument that predictions around the 4IR are false. The argument doesn’t engage with any of the first-order details of the 4IR hypothesis. It simply points out that most of what we hear about it sounds very hedgehog-ish.

In his book *The Fourth Industrial Revolution*, Klaus Schwab mentions that fox-like thinking will be needed in the 4IR, but in my opinion it is a hedgehog’s book, through and through. The apparently round-the-corner creation of “smart-dust”, very small computers that can “arrange themselves” into networks for particular purposes, is extrapolated to the prospect of a medical panacea, in which the dust is injected into us and computers arrange themselves to attack viruses or release “healing medicines”, without any consideration of the various possibilities that might prevent this result (Schwab, 2016). I read something similar in my early teens, in a science-fiction book from the 1960s. In that book, details forgotten, there was a machine on a spaceship that was able to overhaul or service a person. Afterwards, the protagonist “felt like he had been oiled”. Admittedly, this was a machine and not smart dust, but the idea is basically the same, and the differences in detail reflect the science of the day, rather than differentiated predictive exercises. In my opinion, neither case is a decent prediction; both are mere projections.

That’s exactly what foxes don’t do: project. They look around for other ways that things might go, that are not more of the same. There’s precious

little of this in Schwab’s book, and many excited talks, videos, op eds, and so forth that I’ve failed in my efforts to avoid. Room is made for the possibility that the 4IR could turn out in more than one way, but this is always within a framework of predictive certainties: the continuing growth of computing power and data, increasing connectivity, and, most importantly, continued technological advances, on an exponential trajectory. The world’s response to this trajectory is allowed to be uncertain, but the trajectory is treated as a certainty. Technology marches on, and society must respond, like it or not.

Getting Causality Wrong

So much for second-order arguments. Let us now turn to first-order considerations: the evidence and arguments for the 4IR hypothesis.

The overarching problem with the considerations advanced for the 4IR hypothesis is that they get causality all wrong. They see technology as marching along more or less under its own steam, thus driving change. They don’t see the reverse causal direction, which is also important: society driving technological change. In truth, both technological development and societal change are caused in very complex ways, including by each other, and the causal model set up by 4IR proponents is nowhere near complex enough to be credible.

For example, a 4IR enthusiast might wonder why the “first” Industrial Revolution occurred in England and not India, which is more populous, and thus more likely to stochastically throw up great ideas. There’s nothing in Schwab’s book, for example, to explain this. The question presupposes that invention is more or less a random occurrence, perhaps a confluence of genius with adequate social traction, which is therefore more likely to occur in a larger society. There’s a further assumption that societies which are broadly similar in complexity and some basic structures, such as class-like stratification (a feature of all the complex societies I can think of), will respond to such sparks of innovation in much the same way. Then it’s natural to ask: why did the spark of the “first” Revolution occur and catch in the small, soggy island of Britain, and not in much more populous India?

Of course, the assumptions are false. There are

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complex reasons for the initiation of the Industrial Revolution in Britain. It may be that good ideas are more common than we realise (I certainly suspect they are more obvious), but even if a spark of genius is part of the story, conditions need to be such as to educate the genius enough to have a relevant idea—and then the spark has to catch.

Despite being damp, Britain's and especially England's eighteenth-century development was such as to make it flammable for good ideas. Although a class-stratified society, English classes rubbed shoulders with each other to an extent that French visitors found quite strange, as Roy Porter remarks (1990). The squire would joke with the stable boy. In Russia, by comparison, the stable boy might be a serf, a virtual slave, and the nobleman might well choose to address his peers in a language the stable boy would not understand, such as French. In England, for further historical reasons, a large body of English-language literature was available, and English readership of all kinds of material—books, pamphlets, posters—was far higher than in continental Europe. A political culture of debate was evolving, and while riots were common, the general development of politics was towards an inclusion of more voices and away from the violent assertion of power. None of these things could be said of European neighbours, nor indeed of eighteenth-century India. Eighteenth-century England was no paradise: it was violent, cruel, unfair, scourged by gin, debt and gout; it was miserable for many. And I fully concede that merely mentioning the factors I've mentioned hardly amounts to a case for England as a tinderbox for innovation. Nonetheless, it was clearly a socio-political context that cannot be ignored when asking why the Industrial Revolution happened in England rather than, say, India.

Such considerations do not feature at all in the reasoning of Schwab's book, either as regards

the unfolding of the supposed previous three industrial revolutions, nor as regards projections for the fourth. It's not so much that socio-political factors are ignored; I'm sure he would admit that they matter. It's rather that their complexity is underestimated. Entire academic disciplines (history, sociology, anthropology, psychology, philosophy) devote huge energy to understanding the shape and development of human existence. Even if one doesn't think much of these efforts, one can't ignore the fact that the shape and progress of humanity has proved remarkably tough against the intellectual blade.

The Beginning of Exponential Growth, or the Edge of a New Plateau?

There is another, perhaps deeper, reason for why many researchers get the wrong answer: an underlying lack of appreciation of the nature of change in the world of ideas—including technological ideas.

Progress across many fields of human inquiry seems to display two related properties. It occurs in step changes, and its direction is unanticipated. Together, these features explain the embarrassing history of big-picture predictive narratives, which is that they are nearly always wrong. The direction of development is usually unanticipated, and usually the point at which wild projections are made represents not the start of a dizzying climb, but the cusp of a new plateau.

Travel is a great example. Space travel to the moon was a highpoint; Concorde was eventually decommissioned in favour of massive lumbering disappointments. There were other remarkable technological developments in the following decades, but they had little to do with high-speed or long-distance travel; instead, they concerned communication and computation. And even there, developments have not produced the conscious computers with which the science fiction writers of the 1960s equipped their interstellar spaceships. Sadly, we still do not have robots that can gain consciousness and take over the world.

Thomas Kuhn argued compellingly that science does not proceed in a smooth accumulation of knowledge, but in a series of step changes, or “paradigm shifts” (Bird, 2000; Kuhn, 1962, 1977). There is a lot more to this much-abused notion, but what matters here is that the model of continued

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and accelerating development is not one that we generally see in knowledge acquisition. Even before science, the Scholastics famously developed Aristotelian and Christian thought for centuries; and, while they certainly made intellectual innovations, the basic framework was not challenged until the Renaissance and the Enlightenment. Newton upset the apple cart of Aristotelian physics, and Einstein did the same for Newtonian physics, but there was not a steady growth of innovation between the two. Medicine, after years of frustrating curative impotence, went through a step-change in effectiveness in the twentieth-century, which saw it come to grips with infectious diseases – then mount a new plateau, returning to a shallow trajectory of incremental improvements. Of the top ten causes of death in 1900, six remained in 1998, and the number of deaths per 100 000 had risen in several of these (Rockett, 1999, p.8).

It is therefore a mistake to see physics, medicine, or any of our other great human achievements as an accelerating, cumulative curve. The projection of sharp recent upward trends has always been a tempting method of predicting the socio-political future, but has never yet proved successful, because of the stepped nature of progress.

The Real Value of the 4IR

I want to finish by talking about what I find valuable about the 4IR story. As Executive Dean of Humanities at UJ, I’ve been extremely active at “readying” the Faculty for the 4IR. In particular, I’ve pushed a complete overhaul of the undergraduate offering. Where we offered 13 degree programmes with a further four specialisations, we now have an interdisciplinary BA, to be rolled out in 2020. We’ve reduced lecture time, increased small group contact, and trained our entire Faculty in blended delivery and contemporary pedagogy.

We’re moving away from traditional assessment practices in many cases. It’s the biggest change the Faculty’s teaching offering has ever gone through, and it’s all related to the “4IR”.

I mention this to prove that I’m not a Luddite. I welcome the conversation about the 4IR when it’s done well, as a call for thinking carefully and openly about the future. Especially for Africa, there’s huge value in the call to look outwards and forwards, to reorganise workplaces and bureaucracies, and to train different skills. These are valuable messages for an isolated region, mired in its past.

I don’t see the 4IR story as an entirely benign fiction, because many commentators go beyond contingency planning and make fantastical assertions about what *will* happen, which I then worry may become the basis of terrible decisions. My worry about the 4IR is that it may influence the making of specific decisions on an inadequate basis: in policy, investment, curriculum design, and many other areas of collective decision-making. There is no doubt that change is occurring (indeed, occurring is change’s favourite pastime), and there’s a need for Africa in particular to wake up and respond. Africa tends to be isolated, forgotten, ignored, inward-looking; it tends to be mired in its past and to lack clear, realistic hopes for its future and plans for how to get there.

The 4IR discussion is a wonderful wake-up call for this region. My worry is related to the specifics. We must not start building a future based on fiction, even science fiction. We cannot design curricula to teach inaccurate soundbites. Most importantly, if we’re to teach critical thinking, we must imbue the entire 4IR ethos with that approach. My hope is that this article will encourage a dose of healthy scepticism, giving rise to reflective pause before basing decisions on bold predictions. ■

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