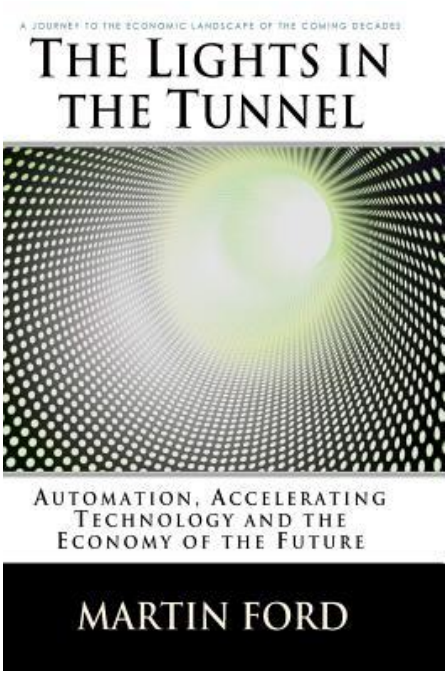

The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future

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What will the economy of the future look like? Where will advancing technology, job automation, outsourcing and globalization lead? This groundbreaking book by a Silicon Valley computer engineer explores these questions and shows how accelerating technology is likely to have a highly disruptive influence on our economy in the near future--and may well already be a significant factor in the current global crisis. THE LIGHTS IN THE TUNNEL employs a powerful thought experiment to explore the economy of the future. An imaginary "tunnel of lights" is used to visualize the economic implications of the new technologies that are likely to appear in the coming years and decades. The book directly challenges conventional views of the future and illuminates the danger that lies ahead if we do not plan for the impact of rapidly advancing technology. It also shows how the economic realities of the future might offer solutions to issues such as poverty and climate change.

The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future Details

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From Reader Review The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future for online ebook

Gordon says

Martin Ford is a Silicon Valley software engineer who worries about what Mr. and Ms. Jetson of the future will do for a job. As I recall, Mr. Jetson spent two hours a day pushing buttons at the factory, and in exchange earned enough to support a nice middle-class living for four. Martin Ford thinks the work for the middle class may go away, and the Jetsons won't be living their middle-class dream after all. Hence, his book.

Daniel Lemire says

Pretty good book about what the future might hold. In short: automation and unemployment. It is a convincing scenario.

Kevin Vejrup says

The book is written by a computer engineer, who is convinced that technology will take over jobs currently performed by humans. His arguments are unconvincing. He refutes the idea of past technological job removal, with few and poor arguments of present accomplishments and exponential progress. He makes no attempt to predict the jobs that could be created in the future. Surprisingly, he believes that it is mainly the high paid knowledge workers, whose jobs will be automated. He is seemingly unable to comprehend econometrics and he lacks imagination for technological progress, focusing on job automation and for instance not progress in human capabilities. It is an interesting thought experiment of how to organize a society where nobody/few works. The book contains several spelling errors and unimpressive analogies.

Domen Bider says

Envision a tunnel. The tunnel is dark, but streaming through the tunnel are countless points of white light. As we watch the lights float past, we notice that the majority shine with a medium range of brightness. At the extreme, we can very occasionally see an intensely bright light, shining like a miniature sun. Still, as we watch the scene inside the tunnel, it is the overwhelming number of the average lights that truly captivates us. The tunnel walls are tiled with thousands upon thousands of flat panel displays. As we continue to watch the lights, we can now see that they are attracted to the various panels. As the lights touch the panel and bounce back towards the centre of the tunnel, we notice that they dim slightly while the panel itself pulses with new energy. We know that a natural cycle exists within the tunnel. Almost instantly, we can see that many thousands of lights scattered randomly shine a little more brightly. If we could watch the action in the tunnel over a long period of time, we would find that the tunnel is not at all a static place. Some of the panels

on the walls gradually grow dimmer and attract fewer lights. In some cases, they may reverse their decline and become strong again. But in many other cases, they weaken and grow dark. Even as this happens, however, elsewhere on the tunnel walls, we see that new panels are appearing and growing stronger. Let's now move a few couple of decades further. Many of the average lights grow dimmer and in many cases disappear completely. Some of the brightest lights, however, are beginning to shine whit even more intensity. Now, finally, we begin to see a real difference in the tunnel. It becomes obvious that there are fewer lights. Just as this realization strikes us, we immediately feel that there is now a new sense of urgency pervading the panels that line the walls of the tunnel - they are growing dark. Now we see that many of the very brightest lights in the tunnel finally feel the impact and also begin to lose their light. The tunnel has become a far darker and more stagnant place. We sense clearly that the hope of even the remaining brighter lights are gradually evaporating into the emptiness of the tunnel. Now however, we notice something new in the tunnel. A green light has appeared. As we watch closely, we see that many more lights gradually begin to shift in hue. The intensity of the lights remains unchanged, but the color rotates between white and green. The green lights initially represent a small minority of the lights within the tunnel. Over time, however, we see that their number is increasing. The green light gradually comes to predominate. While the color rotation among the lights captures our interest for a time, the most striking realization is that nothing else has changed in the tunnel. Overall, we sense that stability has returned to the tunnel.

Douglas Summers-Stay says

I thought the "lights in the tunnel" metaphor was not very illustrative, but I agreed with everything this book was saying about the upcoming problem. Increasing automation is reducing the ability of the average worker to find any job, and this situation will only get worse as computational power grows exponentially. At some point, many workers will be unable to find any kind of employment at all. I don't know about his solutions, though.
You can download this book for free at http://www.thelightsinthetunnel.com/

Robert says

Certainly a very interesting and probably presentient book. The only negative is the faith the author seems to have in the political process. It is basically our only hope and to me that is reason for concern.

Alex Timberman says

His analysis was rigorous but all based on the fundamental assumption that automation will kill jobs off – leading to a global crisis. Either he believes in what he writes or he is writing up to the audience that most resonates with the end-of-the-world narrative. The reason why I disagree with him is two-fold: first, political processes (especially democratic ones) will erode the momentum of technology to replace workers, at least to the extent the author alludes to. And second, most of the world is still living in poverty by U.S. standards, giving rise to a huge surplus of cheap labor that is much more cost effective than the type of automation that the author writes of. Entertaining and well-written, the book either ignores or does not address some of these counter-points that I believe seriously damages its arguments.

David Uriell says

The Lights in the Tunnel convincingly describes the inevitability of automation and the effects it will have on the economy, i.e. massive unemployment which depresses demand to the point of systemic collapse. Ford's proposed solution is to redistribute wealth using a new taxation system that taxes capital rather than labor, and to create 'virtual jobs' where people get paid for doing activities that have positive externalities e.g. learning, civic participation, or living an environmentally friendly life. His proposal could work but I doubt it's politically possible to implement under capitalism. I don't understand how Ford can propose massive state interventionism while simultaneously harping on the wonders of the 'free market.' He wrote a chapter entitled 'Outsmarting Marx' where he not only misreads the man, but attempts to refute him with less than two pages of text. Ford's entire book illustrates a fundamental flaw of capitalism, i.e. capital accumulation, and proves that Marxism is as pertinent as ever. Despite that he thinks Marx deserves to be 'swept into the dustbin of history' because of the historic failures of communism (read: USSR). You can tell it was written by a Silicon Valley software developer, so I suggest you take his technological predictions seriously but throw out anything he says concerning politics/economics.

Bakari says

The author does a great job in describing and arguing how automation and technology is reducing the workforce in many sectors of the economy. He argues well that the question is not how can we create more jobs, but how do we live in an economy that does not require millions of people to actually work the way we have done for centuries? It is not only automation that is replacing the workforce, we simply do not need people to perform manual tasks that technology replaces (e.g. bank tellers, store clerks, assembly plant workers, computer technicians, fast food workers.) This means however that we live in an economy that depends upon people buying stuff to “grow the economy”, but yet more than half of the population has less purchasing power than they did 20 years ago.

While I disagree with the author that the free market system is the only type of economy that will work, it is very difficult and hard to argue that unemployment levels will ever again get below 8%. In fact, we will see higher levels of unemployment, going towards 10 and 12% over the next two decades. In some towns and cities, unemployment is already at 30 to 50%.

Even if you don't totally agree with the arguments made in Lights In the Tunnel, the author still shines light on the direction this economy is going.

Keith Swenson says

It is hard to describe how wrong this sorry excuse for a book is. In fact, so hard I just spent over 12 hours writing down a list of things I felt was wrong or misleading. Here I will give you just a brief synopsis.

First some positives: it is entertaining. I read until the end. It poses some important questions about how the economy will change with the advent of "strong" automation which is likely to displace most of the jobs today. Ford presents reasonable intellectual honesty when he points out that certain idea are or are not

supported by evidence. At least when he makes stuff up, he admits it, and that is honorable. This book is an excellent motivation for vociferous debates.

The entire book is based on the assumption that there are fixed number of jobs, and as those jobs are automated, people will be put out of work. With no work, the economy, which depends upon consumers, will collapse.

This is exactly the argument made by the Luddites in 1812 when looms were being automated. Most people call this the "Luddite Fallacy" because those worried that there were a fixed number of jobs, and that automation would eliminate job opportunities, did not realize that automation of one job brings in a whole host of other jobs. It is not always obvious what those new jobs would be. We talk about car manufacturer eliminating the need for "buggy whip" manufacturers, but nobody a century ago ever imagined that there would be a new market for after-market turbo chargers. You simply can't know what the new jobs will be, when the existing jobs are being eliminated.

Ford argues that "this time is different". He spends chapter 2 (80 pages) trying to prove that this time the Luddite Fallacy is not a fallacy. All the reasoning is based on assumptions that are not supported by evidence. He makes up a "human skills curve" which is shown to be leveling off. Apparently he believes there will be no new skills needed as technology advances. This is crazy especially for someone who started a software company -- software development is a profession unimaginable 100 years ago. He puts this on a chart showing Moore's law, and claims this is evidence that there is a big disruption when these curves cross.

He spends a reasonable time exploring the nature of exponential growth, but then page 31 claims that exponential growth explains why the rich keep getting richer. Actually, it is exactly the opposite: if the rich and the poor are both on exponential growth of the market, the ratio of their positions will remain EXACTLY the same. He never really explains why exponential growth of processor speed is related to wealth of entrepreneurs. Even though my computer today is a million times faster than the one in 1980, it still takes 5 minutes to boot up, and I am not a million times more productive. There are other effects at work.

He considers two jobs: one fairly skilled and one fairly unskilled. He claims that the skilled one (radiologist) will eventually be automated, while the relatively unskilled on (housecleaning) will not. The entire analysis is deeply flawed.

He is correct in pointing out that what a radiologist does today will be automated, but does not seem to understand that there is so much MORE for a radiologist to do. Radiology is far from being "solved" and providing complete information about the scanned body. As the routine tasks today are automated, it will free the radiologist to look at higher level functions. Until all disease and cancer is cured, there will always be the need to do more with these tools. Automation will allow the radiologist to do much more much faster, and we are in no danger of that everything possible will automated. Ford simply misses the idea that new jobs created by automation are hard to see or understand today.

As for housecleaning, he feels that this not automatable, and uses this as the basis of the argument that humans will tend to do less and less skilled jobs in the future. However, there is lots of evidence that such tasks are more automatiable than he thinks. For example, driving a car was considered not automatable, and Google has them today. Face recognition was considered a unique human skill, and today it is impossible to buy a camera without that built in.

All this reasoning leads Ford to the conclusion that humans will occupy less skilled work, college will be

useless and avoided, machines will take over all the skilled work, there are no new skills to learn, there are a fixed number of jobs, so .... there is going to be widespread unemployment. Ford then continues into some wildly entertaining ideas of how to solve this problem, like government subsidies to support consumer behavior in order to keep the existing companies alive.

The "Lights in the Tunnel" is a reference to a visualization of the economy where consumers are points of light, and businesses form a kind of tunnel wall around 1 billion people, while 5 billion poor are left out of the tunnel. The brightness of a point of light is the spending power, and economic activity is signified by waxing and waning of the light strength. All of this supposed to give an "instinctual" feel for the workings of the market economy but certainly for me it does not. Nor is there any real insight that can be gotten from this visualization (which he calls a "simulation"). He make an intuitive conclusion based in this imaginary visualization that middle income people form the most dominant light. However, statistics and actual market data do not support this position.

To me, Ford's flaw rests primarily in his professed belief that "the economy creates jobs". It is a simplistic view of economics that recognizes the exchange of money for consumables, but ignores the long term value of work being done, as well as the driving source. The economy is just a place where people can exchange money for work, but it does not provide the primal impetus for that work in any way.

Jobs are "created" by need to have problems solved, and by people specializing to solve those problems. The cure for every disease is not known, and until every cure is known, there will be jobs for people trying to cure disease. Today, the need for food, clothing and shelter may be the primary drivers of the economy -- occupying many more people than those trying to cure cancer. It is not that cancer research is not important, it is just that we have too many things to do just to live.

As automation steps in to take over these jobs of providing basic food production, basic manufacturing, basic lower skilled job, it will FREE UP people to work on jobs that still need to be done. The fact is that there are many jobs we would like to be doing today, but can't. Automation will allow us to do the mundane things faster with fewer people, but that will NOT cause everyone else to sit on the street. With basic needs met by automation, we will work on research, understanding the universe, understanding psychology and why some people have such a hard time coping, and medicine. These needs will still be there, and there will remain an economy of people wanting to pay others to do this work. Ford seem oblivious of this effect. He argues that since the world is a closed system, there are no new jobs to be done, ever in the future. Rather short-sighted in my opinion.

He also ignores the effect that the price of a product drops dramatically when its manufacture is automated. He argues that automation will allow companies to let go of workers, and keep all the income to the elite, but he does not see that the total income will drop as well. Similarly, since these things are cheaper, there is less need for consumers to have as much money. There are many shifts that the market makes as automation is introduced and he does not consider the effect of this change in price at all in his analysis.

It is hard for anyone to predict what this future will bring, but if his claim was true that the singularity brings (nearly) complete automation of all basic needs production -- food, clothing, shelter -- then the result of this extreme automation would be to make everything free; there would be no need for jobs. Neither Ford nor I are saying that automation will be complete and that everything will be free, but there is a correlation: to the extent that automation eliminates people from the production of basic goods, the price of those goods will drop by an exactly equivalent amount. This would still not eliminate all jobs: instead it frees up people to work on jobs that we simply can not get to today because we are too busy with basic goods.

In conclusion, my vision of the future is somewhat rosier than Ford's. I completely reject his notion that automation will eliminate jobs and put people on welfare, and similarly reject his ideas that the government should give money to people so they can consume products. I don't claim to be an economist or expert on the future, however I can point out the flaws in the logic that leads to Ford's conclusions. It is surprising that Ford does not see that automating jobs today, will require new skills, and produce new jobs tomorrow. His fixation on there being a fixed set of skills, a fixed set of jobs, and a fixed overall economy, undermines all of the conclusions he makes in this book.

Alexander Fowler says

Martin Ford is one of the few people out there who has realized that relentless technological development, especially in AI and robotics, and the free market economy as we know it are inherently incompatible because it will essentially lead to the creation of an almost purely autonomous but jobless economy.

Since the free market economic engine is the mass market, who will be the future consumers of goods and services when intelligent machines take over their jobs? If nothing is done about this often overlooked problem, we could be in for a shock in the future as the very technology that was supposed to bring us economic growth and prosperity will ultimately lead us on a downward economic spiral. Thankfully the author does propose a somewhat workable solution which modifies the free market economy such that we can retain its benefits while accelerating technological development even further.

One might be tempted to scorn the author as a neo-Luddite but the author is the owner of a silicon valley software development firm and has 25 years experience in computer technology. If anything, we should all take his thoughts on the matter more seriously. Download the ebook for free online from the author's website and be prepared for a mind blowing read!

Caren says

I thought this was a very interesting book and am perplexed by the only other reader giving it one star. As with any book attempting to peer into the future, much of it is speculation. The author does however work with technology, so it is perhaps well-informed speculation. The title of the book is based on a little thought experiment in which a tunnel represents our free market economy. The many points of light are participants in this economy, each with an income that is spent and replenished by interactions with other points of light. Should many of these lights begin to lose their incomes, they would lose their ability to participate in the tunnel's activity. The author believes there is a real possibility this will happen within this century as technology replaces humans with machines in many occupations. He believes the way in which outsourcing has been made possible by the advance in technology is just the beginning of the trend, although many currently outsourced jobs will, in short order, be replaced by computers. Most vulnerable are "knowledge" jobs for which advanced educaiton is required. (He gives the example of looking for legal precedents in past cases, or radiologists reading scans---both jobs that could soon be done by computers.)Many of our social programs are funded by payroll taxes. What happens when fewer and fewer people have jobs? What happens to our society when fewer people see the value of advanced education? The question of machines replacing people has been addressed at the dawn of the Industrial Revolution by the Luddites (in 1811). Economists

countered that "as automation increases the productivity of workers, it leads to lower prices for products and services,and in turn, those lower prices result in increased consumer demand. As businesses stive to meet that increased demand, they ramp up production---and that means new jobs." (p.95-6).This is called the "Luddite fallacy". The author poses the logical question: "Where will this increase in demand come from? Who is going to step forward and purchase all this increased output?.....When a substantial fraction of these people are no longer employed, where will market demand come from?...Nearly every consumer--every light in our tunnel--derives income from a job. If we automate the bulk of those jobs away, demand must fall...What happens when machines become workers---when capital beomes labor?" (p. 96-7)
Mr. Ford touches on a lot of interesting ideas, offers possible solutions, and, in an appendix, addresses possible criticisms of his theories. You don't have to agree with everything he presents to find the book interesting. I consider a book like this part of the "great conversation".

Steven Grimm says

Are there going to be more people than economically productive jobs in the future? Ford thinks so and he lays out the reasons why. His proposed solution may or may not be the best possible one and will likely ruffle the feathers of both economic conservatives and economic progressives (it borrows from both lines of thinking), but it's likely a lot better than what'll happen if we keep blinders on about the situation. Even though the book was written in 2009 and is thus slightly out of date regarding the latest economic and technological developments, it's still very relevant and I'd love to put copies in the hands of the world's policymakers.

I'm a little conflicted about how to review this book. I've written a little bit on this subject in the past myself, and I've come to more or less the same set of conclusions Ford has, albeit in far less detail. So for me this book pretty much preaches to the choir. And yet, I found some of its arguments unconvincing, which was strange -- I already agreed with both the premise and the conclusion but didn't think Ford always connected the two well enough to convince a skeptical reader. For example, he uses Moore's Law as the main argument that computers will become increasingly capable of performing white-collar work over time, while totally failing to mention the common, valid, objection to that line of reasoning: doubling the speed of a computer doesn't always make hard software problems such as those in AI any easier to solve, and it's as much the software as the hardware that determines what work a computer can do.

I also didn't find the "tunnel" visualization very useful. If this were a multimedia presentation where the tunnel could actually be animated visually, it might work a bit better, but as it is, Ford spends more time describing the visualization than it would likely have taken to clearly describe the underlying model. Maybe it will be of more use to more visually-oriented readers.

If I had to critique the actual content, I'd say there are a couple potential developments that may be worth incorporating into any analysis of exponential improvements in automation. The first is that people may not remain as limited a resource as the book supposes. While I agree with its assertion that we've already picked a lot of the low-hanging fruit in terms of improving traditional education of ordinary humans and that education will go down in economic value over time, technologically augmented humans may be a lot more resourceful. This doesn't even have to mean fancy brain implants (though we're making progress in that area) -- imagine Google Glass with a live contextual Wikipedia feed and smart display of how-to videos from YouTube. Cyborgs may well be competitive against pure machines even when plain humans aren't.

The second possible development is that the autonomous machines may themselves become consumers in

the market. This doesn't even require full-on Turing-test-passing, singularity-triggering AI; if an autonomous system is implemented with an incentive system and enough smarts to try out new ways to meet the incentives, it'll start asking for new things and will have to pay to get them, thus becoming an independent economic actor to some degree.

Neither of these things really negate the thrust of the book, though; they're just nuances whose absence makes the analysis seem a little less thorough.

One thing Ford is spot-on about is the almost willful ignorance of economists (or at least ones to whose work I'm exposed) about the nature of exponential growth of technology. Ford's critique of traditional economic analysis of automation and offshoring exactly matches what I've read. This conventional wisdom -- which more or less dismisses the possibility that machines will ever significantly catch up to humans in the labor force, and thus fails to analyze at all what the results would be -- is going to be a huge barrier to doing anything useful about the situation before it starts to cause major problems.

Agree with it or not, this book is thought-provoking and well worth reading.

Michael Bievenouer says

Loved it!

My guess is that most of us who are paying attention will find this book to be telling it like it is. As a population we need to recognize that computers and robotics will and are fundamentally changing the future of jobs. We can take the road of doing what is best for all or try to take the road of cut throat capitalism. Our choice, but we will be forced to chose.

Greg Linster says

The fear of technological unemployment dates back to the eighteenth century when Ned Ludd famously smashed two stocking frames. The word "Luddite" was thus created for anyone who opposed technology. Of course, if you mention technological unemployment to most modern day economists they'll kindly remind you that machines don't actually take jobs from people, but rather, they create more jobs. And, until now, most modern economists have been right. Hence, a belief that machines takes jobs from humans is often called the Luddite fallacy. Ned Ludd may, however, be vindicated at some point in the near future.

In this book, Ford asserts that technological unemployment is happening now and will only get worse in the future. His critics, however, dismiss his claims and accuse him of being a neo-Luddite. Given the developments in robotics, nanotechnologies, and artificial intelligence, I think Ford's concern is entirely warranted. Just because technology has created more human jobs in the past does not mean that it will forever, especially if we don't have the right economic structure in place.

I think many economists fail to realize that as the machines move towards increasing autonomy, the need for human labor will continue to decrease. This, however, is not necessarily a bad thing if we have the right economic architecture in place to support a world in which this is a reality. Right now, however, we don't. In the book, Ford reminds us that we need to challenge a few of basic economic assumptions that our modern

free market is predicated on. There are also cultural assumptions that need to be challenged too.

Ultimately, I think Ford diagnoses the problem of technological unemployment quite well; however, I don't entirely agree with is proposed solutions.
