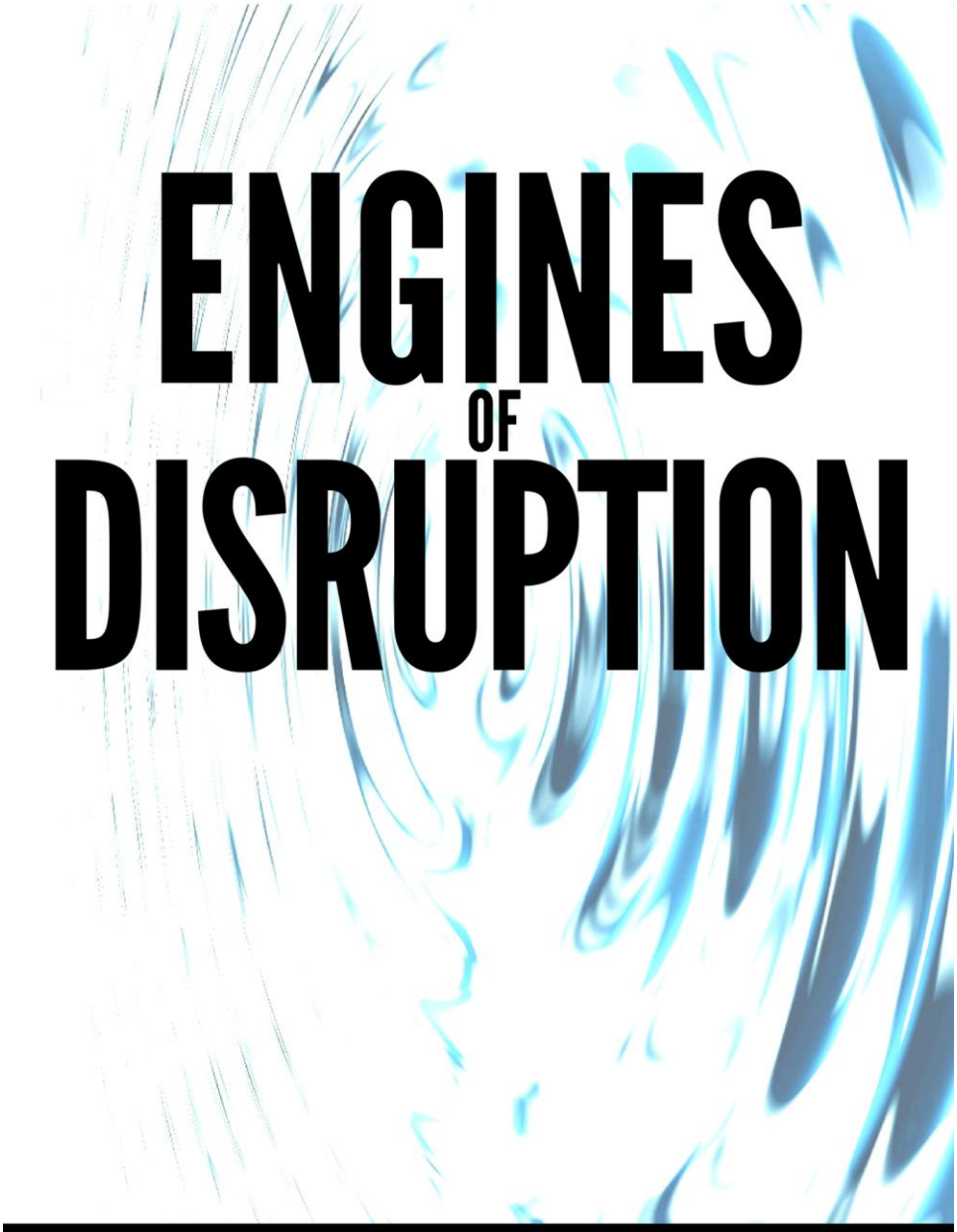
Philip Bowermaster



ENGINES OF DISRUPTION

How data is changing everything.

Engines of Disruption

How data is changing everything.

by

Philip Bowermaster

Ninety-nine percent of who you are
is invisible and untouchable.

– R. Buckminster Fuller

Contents

Before We Begin 6
Big Data and Hype 7
How Much Data? 11
Where the Possibilities Are 13
Driving Towards the Data Future 15
You Are What You Eat 19
Datafication 21
The Evolutionary Approach 23
Parting Thoughts 26

For Ron Powell.

Introduction

Before We Begin

This is a short book that attempts to contend with some big ideas. If you're looking for the big answers, you probably won't find them here. If we're lucky, we may get as far as articulating one or two of the big questions.

Today we are witnesses to, and participants in, one of the most disruptive transformations in history. This is not just the era of Big Data, or of Real-Time Data, or of Digital Transformation, or of Deep Learning. What is going on around us transcends the buzzwords. Data is becoming more central to everything we do and, as explored in the pages that follow, to everything we *are.*

Are we ready for such fundamental changes occurring so rapidly? And if not, how can we make ourselves ready? Let's begin by exploring some of the possibilities.

Big Data and Hype

I think maybe big data is being under-hyped.

That's right. *Under*.

And, yes, I know how ridiculous that sounds. Surely, the voice of reason will insist: isn't big data being hyped enough already? It's not like a few years ago, when so many were uncertain as to what the term *meant*. People get it now. They know what big data is. In fact, at least one major survey shows that big data has pretty much become mainstream. Everybody is doing it. And, interestingly, even as people have come to know what it is, to accept that it exists, and to engage in big data projects...they still don't much care for the term.[1]

If everybody is doing it now, what need could there be for further hype? If anything, maybe we can and should be talking about it a bit less now that it has gone mainstream. Besides, if people don't care for the term now, more hype cycles aren't going to do much to help, are they?

Probably not. But I'm not suggesting that big data needs more hype because I want more people to use it or to like it. I just want them to be more aware of it. Maybe I'm using the wrong word, here. What exactly does "hype" mean?

Dictionary.com gives us some choices[2]:

verb (used with object), **hyped, hyping.**

1. to stimulate, excite, or agitate (usually followed by *up*):
   She was hyped up at the thought of owning her own car.

2. to create interest in by flamboyant or dramatic methods; promote or publicize showily:

---

[1] "Big Data Now Mainstream in Large Companies, Term Still Widely Disliked, A New Survey Finds" *Forbes* https://goo.gl/phMaHp
[2] Dictionary.com, https://goo.gl/Hso9iR

a promoter who knows how to hype a prizefight.

3. to intensify (advertising, promotion, or publicity) by ingenious or questionable claims, methods, etc. (usually followed by *up*).

4. to trick; gull.

Going by these definitions, I'm probably using the second definition of the word hype. I think we need to create greater interest even if we have to use "flamboyant or dramatic methods."

Why?

Because big data is only getting bigger. And it is only becoming more deeply embedded in our everyday experiences. Moreover, it is changing the world itself. Does that sound like an overstatement? Consider this:

> General Electric (GE) has recently announced substantial changes to the design of the CFM Leap aircraft engine, which powers the Airbus A320neo, Boeing 737 Max and COMAC C919 aircraft. The new generation Leap is "designed to provide significant reductions in fuel burn, noise, and NOx emissions compared to the current… engine." It is designed to generate 32K pounds of thrust, achieve a 99.87% reliability rate, and introduce a $3 million operating saving annually.
>
> Where will these savings come from? New sensors intricately track how the engine is operating. The use of data fundamentally transforms how the engine operates and makes it more efficient. But that efficiency requires a lot of data. The new version of the Leap aircraft engine generates 1 TB per day from those sensors alone. Add in avionics, traffic data, weather data… a massive amount of information is generated just from taking a flight. In previous versions, the Leap engine has completed more than 18 million commercial hours of operation, with some 22,000 of the engines manufactured. So we're talking about a lot of data.
>
> In every way but one, this engine now operates with a smaller footprint: it requires less fuel, it makes less noise, it generates fewer noxious

> emissions, it costs less to operate. *Only in one area, data, is its footprint expanding.* [Emphasis added.][3]

An aircraft engine becomes smaller, cleaner, and more efficient. These changes in *the physical properties of the engine* have been achieved by generating, manipulating, and responding to data. Of course, if this one jet engine were the only example of such a shift, it wouldn't be all that persuasive. But the examples are everywhere.

A few years ago, there was a lot of discussion about how the new smartphones were replacing so many other devices. You no longer needed a digital camera, a music player, a GPS system. The phone did it all. Where did all those separate devices go? Their physical footprints were dramatically reduced; their data footprints took up the slack.

Meanwhile, consider how many of your interactions with others, how much of what you do and think and communicate, how much of your *self* is now closely associated with that same device. What is a human life made of? Lots of things, obviously. But increasingly, one of the core component parts of our lives is the data component. Like that jet engine, we're growing bigger and bigger data footprints.

We seem to be transitioning from a world made out of stuff to a world made out of data...and stuff.

A while back I wrote a piece about de-industrialization, describing how capability that once belonged to large institutions is passing into the hands of everyday people.[4] Some of the most prominent examples of this phenomenon have taken place in the film and recording industries. Those same smartphones that swallowed all the other devices are now being used to make movies—the kind it used to take a whole studio to make (including one that got an Oscar nomination.[5])

The shift from a world made primarily of stuff to one made primarily of data is evident in many trends; it's why fewer and fewer people have a landline phone at

---

[3] Irfan Khan, "Your Big Data Footprint Will Only Get Bigger," SAP.com, https://goo.gl/Mh5Aqb
[4] Phil Bowermaster "De-Industrialization," *The Speculist*, https://goo.gl/jzmLx0
[5] Kurt Orzel, "Olive: the Oscar Contender Made with a Smart Phone," *The Wrap*, https://goo.gl/uF5VVv

home; it’s why so many business people telecommute; it’s why so much business these days is transacted at the local Starbucks. R. Buckminster Fuller described a process that he called ephemeralization, whereby you “do more and more with less and less until eventually you do everything with nothing."[6] We are clearly doing more with less these days, although doing *everything with nothing* remains some distance ahead.

But as we use less stuff—less energy, matter, time and space—to do the things we do, we are using more and more data. Big data really is changing the world around us. We need to be aware of this process, and try to understand it. So let's have some more big data hype.

---

[6] R. Buckminster Fuller, *Nine Chains to the Moon*, Anchor Books, 1938

How Much Data?

Recent IDC research shows that we—with "we," here meaning humanity, all of civilization—produced 2.8 zettabytes in 2012.[7] (That's 2.8 trillion gigabytes, for those who couldn't remember where "zetta" falls on the scale of hugeness.) In what may be a corollary to Moore's Law, IDC also says that the total amount of data in the world doubles every 18 months and that we will therefore be at 40 zettabytes by 2020. That's 4 trillion gigabytes: a billion bytes, 4 trillion times.

A fun way to look at data growth is to consider all the infrastructure required to support it. Steve Ballmer says that Microsoft—not exactly the first name you think of when you think of big data—is currently using a million or so servers.

A million. Seven figures. The oldest stats I can find offhand show that about 40 years ago, the total number of computers sold each year was 50,000.[8] I doubt there were even a million computers in the world at that time. Now that's how many computers one company owns. Moreover, web cartoonist XKCD has put together an estimate showing that Google has somewhere between 1.8 and 2.4 million servers.[9] And even they might not be the biggest. NSA might have more.

Which does raise an interesting question: why would it take the NSA more servers to catalog all my personal data than it does Google? Must be government inefficiency rearing its ugly head.

How much data? The short answer is a LOT. How can we keep up? *Can* we keep up?

The race is on between the explosive growth of data that the Internet of Things and other big data drivers are bringing about, and the substantial reductions in data footprint enabled by in-memory processing (reducing the need for multiple copies of data sets) and ever more sophisticated data compression technologies.

---

[7] "How Much Data is Out There?" *Webopedia* https://goo.gl/9oQ7Iw
[8] "Computer Sales Statistics," *Statistic Brain*, https://goo.gl/4MTs6g
[9] "Google's Datacenters on Punch Cards, *XKCD*, https://goo.gl/bk3yCZ

As it stands now, I would say that big data has a growing, but perhaps not yet insurmountable, lead in that race. Data volumes are, in a sense, relative. I can remember when a megabyte was a lot of data. Today, not so much. Our capacity to store and access data effectively shrinks it.

Plus there is something even more important at work:

> The data flow so fast that the total accumulation of the past two years...dwarfs the prior record of human civilization. “There is a big data revolution,” says Weatherhead University Professor Gary King. But it is not the quantity of data that is revolutionary. “The big data revolution is that now we can do something with the data.”
>
> The revolution lies in improved statistical and computational methods, not in the exponential growth of storage or even computational capacity, King explains. The doubling of computing power every 18 months (Moore’s Law) “is nothing compared to a big algorithm”—a set of rules that can be used to solve a problem a thousand times faster than conventional computational methods could. One colleague, faced with a mountain of data, figured out that he would need a $2-million computer to analyze it. Instead, King and his graduate students came up with an algorithm within two hours that would do the same thing in 20 minutes—on a laptop: a simple example, but illustrative.[10]

Now that is doing more with less!

So the question we should be asking is maybe not so much "How much data is there?" but rather "How much data can we use effectively?" or even better "How much more value are we deriving from data—any amount of data—than we did before?" The growth curves that answer those two questions are the real story of big data.

---

[10] Jonathan Shaw, “Why Big Data Is a Big Deal,” *Harvard Magazine* https://goo.gl/mLcZgL

Where the Possibilities Are

If we are going to look at the growth curves for data value, we might need to first step back and ask a fundamental question: where does the value of big data truly present itself, in the data itself or in the algorithms we use to make sense of it? An executive with a major data warehouse software vendor recently came down sharply on the side of the data:

> ...I'm convinced that new information will beat new algorithms and new metrics based on existing information almost every time.
>
> Indeed, new information can be so powerful that, once it is found, analytics professionals should stop worrying about improving existing models with existing data and focus instead on incorporating and testing that new information.[11]

By "new information," he means information that didn't exist before or that we now have to a level of depth never before possible. Sensor data in Internet of Things environments can represent either of these kinds of data. For example, we may have always used temperature data in performing some calculation, but back in the day we used a daily average. Now we have sensors providing temperature data every few minutes (or seconds.) That's data to a greater depth. Examples of we didn't have before might include sensors on cars that track wear and tear as the vehicle is driven. Previously, vehicle repair occurred in a primarily reactive way. Now we can begin to anticipate repairs before they are needed.

This reminds me of a talk that Eliezer Yudkowsky gave at the Singularity Summit back in 2007. He said:

> In the intelligence explosion the key threshold is criticality of recursive self-improvement. It's not enough to have an AI that improves itself a little. It has to be able to improve itself enough to significantly increase its ability to make further self-improvements, which sounds to me like a software

---

[11] Bill Franks, "It's Not The Algorithms; It's The Information!" *Forbes*, https://goo.gl/BbGny7

> issue, not a hardware issue. So there is a question of, Can you predict that threshold using Moore's Law at all?
>
> Geordie Rose of D-Wave Systems recently was kind enough to provide us with a startling illustration of software progress versus hardware progress. Suppose you want to factor a 75-digit number. Would you rather have a 2007 supercomputer, IBM's Blue Gene/L, running an algorithm from 1977, or a 1977 computer, an Apple II, running a 2007 algorithm? And Geordie Rose calculated that Blue Gene/L with 1977's algorithm would take ten years, and an Apple II with 2007's algorithm would take three years.[12]

There is a progression here, albeit a counter-intuitive one. We might be inclined to think that hardware adds more value than "mere" software and that software is inherently more valuable than "mere" (or the term we like to throw around a lot is "raw") data. The opposite turns out to be the truth. The data itself is where the value is. Hardware and software only help us to focus on the potentialities, the possibilities, that it already contains.

---

[12] Eliezer Yudkowsky, “Introducing the Singularity: Three Major Schools of Thought,” http://archive.is/I6akm

Driving Towards the Data Future

The data industry has witnessed any number of tipping points in recent years as once-obscure ideas and technologies have quickly achieved dominance. Hadoop. Spark. Data Lakes. And now comes the Internet of Cars (AKA the Internet of Automobiles), a phenomenon with huge potential impact both in the industry and in society at large.

The U.S. House of Representatives Oversight Committee recently convened at a hearing to provide "an opportunity to learn about vehicle-to-vehicle communications technology and what it means for our future economy."[13] Called to testify were executives from GM, Toyota, and Tesla as well as IT industry analysts and consumer privacy advocates.

Our cars are becoming data devices in their own right. If you consider its full implications, the Internet of Cars is not just on the verge of a tipping point itself; it is poised, domino-like, to kick off a series of related tipping points.

Let's look at five of the reasons that the Internet of Cars will change everything.

1. Kicking the Internet of Things into high gear

The Internet of Cars is a game-changer for the Internet of Things, of which it is an emerging segment, in large part because there are so many of these particular "things." They're everywhere. The amount and variety of data that automobiles can be called upon to collect and to share is staggering.

For starters, cars will collect information on their own performance, driver behavior, the behavior of other drivers, road and traffic conditions, starting points, destinations, optimized routes, etc. They will track data on where the driver and passengers like to go, what they like to do, what kind of music they like, what kind of restaurants they visit, how early they get up, how late they get to bed — all of which can feed into new products and services we have barely begun to imagine. Think of what happened when mobile phones went from being communication devices to being entertainment, data processing, and social

---

[13] "The Internet of Cars," Oversight & Government Reform, https://goo.gl/gTCu2t

networking machines. We will see an explosion of applications as the Internet of cars follows a trajectory very similar to the mobile Internet before it.

2. Transforming the automobile industry

Chris O'Connor, General Manager of the Internet of Things business at IBM, recently wrote a piece outlining the end-to-end impact of IoT on the automotive industry. Automobile designers and engineers increasingly rely on analysis from data that cars themselves collect and distribute when developing new models. Manufacturing occurs in intelligent factories driven by smart supply chains. Sensor-driven automotive servicing and preventative maintenance now involve the car telling the mechanic far more about what's going on than the driver ever could (and in a more timely fashion.) And, as we'll see in greater detail below, every facet of the automobile consumer experience is changing radically.[14]

3. Changing how we drive

Of course, the big predicted change for how we drive is that we're going to stop doing it altogether and the cars are going to take over. But Gartner's Thilo Koslowski says that connected cars will bring about startling and disruptive changes to the process of driving long before they complete their evolution from "automated to autonomous to unmanned" operation. The more immediate shift will be in the kinds of interactions we will come to expect to have with our cars. Think of the difference between a land-line telephone from 30 years ago and your smartphone today. As Koslowski explains it, your car is about to become "the ultimate mobile device."

He paints an interesting picture of how that might look:

> Imagine you are stopped at a stop light, and you want to know more about the car next to you with these interesting-looking wheels. You wonder if they are available for your car as well, so you just ask your car the question. The car responds by not only saying, "Yes, they are available for your car," but also by giving you pricing information and asking if you would like to stop by a dealer who happens to have them in stock and can install them on your way home. For automakers and

---

[14] Chris O'Connor, "The Internet of Things Drives New Opportunities for the Automotive Industry," IBM Big Data and Analytics Hub, https://goo.gl/Ai7F8M

dealers, this represents a valuable new service model that can help keep customers in the fold.[15]

4. Redefining vehicle ownership

The implications of fully connected cars go beyond these kinds of straight-up sales opportunities. The Internet of Cars raises challenges and opportunities similar to those brought about by the Internet of Homes. Sensor data will prove pivotal in ensuring safety, timely maintenance, fuel efficiency, and so on. But it has other uses.

IBM's Chris O'Connor predicts the Internet of Cars will transform automobile insurance. People will now "pay as they drive," meaning that those who are on the road all the time will face higher premiums than, say, folks who work from home. And there will even be "pay how you drive" variations, meaning that your rates might go up based on information your car collects on how fast you drive, how long it takes you to brake, etc.

Of course, not everyone is thrilled at the idea of marketers, insurance companies, or the government having access to all (or any) of their data. Drivers may begin to eye their cars suspiciously, and begin to wonder who is really in charge around here. Security pundit Bruce Schneier worries that such connected cars only hasten the Internet's transformation into what he describes as "a massive surveillance tool." And, in fact, one of the reasons for that House Oversight Committee meeting mentioned earlier was to "highlight how the automotive industry is tackling important issues around cybersecurity...and privacy" in the face of all these developments.

We can expect to hear a lot more about all this in the days to come.

5. Accelerating the need for big data analysis

As noted above, the Internet of Cars will bring about an explosion of new applications, accompanied by an explosion of data volumes — the latest in a long series of those — as well as a host of new varieties of data and new use cases to derive insights from the data being collected. Big data is only getting bigger, and

---

[15] Thilo Koslowski, "Forget the Internet of Things; Here Comes the Internet of Cars," *Wired,* https://goo.gl/VaJld3

with each new iteration come new risks and complexities. The Internet of Cars offers tremendous potential benefits (and risks) to auto manufacturers, car dealers, retailers, law enforcement, and many others, including the drivers themselves. Realizing these benefits, and avoiding the risks, will require flexible and capable tools for deriving insights from these masses of data.

You Are What You Eat

Is analyzing data more fun than eating? Well, it might just be. For some, at least.

Anyway, that was the premise of Platfora's Soylent giveaway promotion a while back. For those who need catching up: Platfora is a Hadoop-native big data analytics platform. The company was acquired not long ago by Workday. Soylent is an instant meal replacement, designed to provide 100% of the body's nutritional requirements while doing away with all that distracting and time-consuming "eating" that humans are compelled to keep doing.

Where these two meet is in the lives of busy data scientists and hard-core analysts. As Platfora explained it:

> Hunger demands that you go right then and heat up that frozen burrito immediately. No get out of jail free card for you, my friend.
>
> What if I told you there was another way? A magical way to throw off the Shackles of Mealtime and the depression of time-sucking, sad cafeteria lunches. A way to be free to revel in the world of data limitlessly, without the constraints of a growling stomach and hungry mind.[16]

And that "way," of course, is the consumption of Soylent rather than the burrito. To quote the promotional video from the Soylent home page:[17]

> Unlike most other foods which prioritize taste and texture, Soylent was engineered to maximize nutrition, to nourish the body in the most efficient way possible.

No shopping, no cooking, no figuring out what goes with what or worrying about whether you're keeping things in balance. In the video, we meet the creator of Soylent, an engineer who has taken on human nutrition as an engineering problem,

---

[16] Viviana Faga, “Soylent and Platfora: The Only Full Stack Snack Solution,” https://goo.gl/vuTxDT

[17] http://www.soylent.com

one that can be broken down to its constituent parts. In this case, the "parts" that make up nutrition are chemicals. So the solution to human nutrition is ultimately a formula.

Previously we saw how a jet engine could become smaller, cleaner, quieter, and more powerful through changing the relationship between its physical components and its data component. And we looked at the almost magical process that can transform a room full of devices into a single device that fits in the palm of your hand: a smart phone. Now apply that same magic to one of the fundamental physical processes of human survival, and voila! Soylent.

But the Platfora promotion took it even further than that. Why datify the process of eating? One obvious reason: so you can spend more time working with data.

In the movie from which Soylent takes its name, the surprise ending (spoilers ahead) is that people are eating other people. Yikes, that's terrifying. But that isn't what's happening here. In the world of Soylent, the beverage, people are eating data -- or at least food that leverages the maximum value of its data component.

At the same time, it is becoming increasingly apparent that data is eating us. (Some might say that software is eating us, but I say same difference.) Or if not eating us, it is at least getting the upper hand in the relationship. Here we have data maximizing the efficiency of a core human bodily function so that we might better attend to data and its needs.

Sure, a lot of people will tell you that they have no interest in using Soylent. And even among Soylent users, freeing up time to allow for more data analysis is only one of many motivations. Yes, the data is working for us. But increasingly, it seems to have us working for it. Who exactly is running this show?

Datafication

The relentless wave of change that is transforming our world from being one made primarily out of stuff to one made primarily out of data has a name. It's called datafication.

Over the past few decades, we have witnessed the datafication of business, of society, and of everyday life. There appear to be three major phases of datafication. In the first phase, an activity or process becomes increasingly reliant on data. In the second, data begins to transform the activity or process by taking a central role in its execution. In the third phase, the activity is moved entirely into the data substrate.

Take the movie business. Putting artistic considerations aside, the success of any film has always been a measurement of how much revenue it generates. Originally, this was a pretty straightforward matter of counting box office receipts. (Today, what with many and varied distribution channels and considerations such as licensing and merchandising that often come into play, the math for calculating success is considerably more complex.) The film industry entered the first phase of datafication relatively early on, as studios began trying develop formulas for repeat box office success. have witnessed the datafication of business, of society, and of everyday life.

The data points were, at first, relatively few and far between: geographic differences in box office; one star's draw vs. another; westerns vs. romances vs. war movies vs. musicals; summer releases vs. Christmas releases. Over time, the analysis evolved in terms of sophistication until the industry reached the second phase of datafication. This is how we came to live in an age of scripts written for a target adolescent male audience and re-edits and even rewrites following test screenings. The data began to drive the process.

But data wasn't done with the movies yet. The film industry is moving rapidly into the third phase of datafication. Once upon a time, filmmakers made films. Long strips of celluloid with images on them. We've all heard of efforts to preserve decaying movies from the early part of the last century. Film was a chemical and mechanical process resulting in a physical artifact. But not today. The product of the film-making process is now essentially a data artifact. Movies are consumed

over digital networks on TVs, laptops, and smartphones. And, in fact, they can now be made entirely on smartphones. Short messages, tweets, motion pictures...it's all the same. It's all data.

The big data revolution is ultimately about this kind of transformation in all sectors of all industries. The movie and music businesses are obvious examples of industries that have made it at least part of the way to phase three. But then so is the telecommunications industry. Shipping and logistics have become as much about data as they are about moving stuff around. Even manufacturing is moving in that direction -- and will continue to do so as digital fabrication and 3D printing become increasingly mainstream.

Right now the world as whole is really just beginning to move from phase 1 to phase 2. Data is beginning to influence and direct the world in ways never before considered. And we are still in the very early days.

The Evolutionary Approach

While the earlier observation that data is eating us may have come off as tongue-in-cheek, the reality behind it is no joke. Most people aren't (yet) transforming their basic bodily functions in order to have more time to analyze data, but there is no question that the fundamental dynamic between human beings and data is changing rapidly. It comes down to this:

> Most computational neuroscientists estimate that the human brain's storage capacity is somewhere between 10 and 100 terabytes. Compare that to a worldwide data explosion – already at more than 1.8 trillion gigabytes and doubling every two years – and you begin to understand the analytics "pain points" our industry is grappling with.
>
> For one thing, we spend the majority of our time just sifting through data instead of making decisions. We're constantly on our heels in reaction mode, putting out fires instead of thinking about the future. And we can't seem to make decisions fast enough, given that our brains don't scale the way data can. [Emphasis added.][18]

Exactly. It is that difference not only in scale but in scalability that has kicked off the entire big data movement / phenomenon / whatever-you-want-to-call-it. After all, what do we mean by "big" data? We mean data that is bigger than…

- ...we expected.
- ...we were ready for.
- ...we know what to do with.

The three (or four, or however many) V's of big data are all about this core difference. Data volumes expand beyond our storage and handling capacity; data velocity outpaces our ability to respond to it, much less deal with it proactively; data variety confounds not only our existing systems, but our core business processes and the concepts they are built on.

---

[18] Oliver Ratzesberger, "Is Your Enterprise 'Sentient?' Building A Smarter, More Agile Business," *Forbes,* https://goo.gl/VVbvnU

Even if data isn't eating us, it is outgrowing us. In response, we try to keep up and, if possible, get ahead. Our capabilities are growing geometrically even as data is growing exponentially. A dazzling array of new approaches, new technologies, and new players in the field offer hope, but will they be enough? How do we counter that fundamental difference in both scale and scalability?

Some interesting answers are emerging:

> The Sentient Enterprise is an enterprise that can listen to data, conduct analysis and make autonomous decisions at massive scale in real-time. The Sentient Enterprise can listen to data to sense micro-trends. It can act as one organism without being impeded by information silos. It can make autonomous decisions with little or no human intervention. It is always evolving, with emergent intelligence that becomes progressively more sophisticated.[19]

How big a leap is it from self-driving cars to self-running companies? It's easy to imagine a near future where the biggest slowdown for IBM's "Dr." Watson[20]—or some other artificial intelligence tasked with diagnosing sick humans—will be waiting for a *real* doctor to sign off on the diagnosis. How long will we tolerate prolonged suffering or even loss of life because we insist that a human must always make the call? The challenges raised by the sentient enterprise aren't nearly as difficult. If self-running companies are more competitive, they will become the norm. That's just how business works.

No, this is not "I, for one, welcome our new robot overlords." At least not exactly. It is more along the lines of "If you can't beat 'em, join 'em."

It's a question of evolution. If the sentient enterprise is an organism, it represents a new species formed by the symbiosis of two separate species. Yes, that happens sometimes. But this is unlike, say, having two closely related species of fly producing an exciting new species of fly, or the proposed merger of grizzly bears

---

[19] "The Sentient Enterprise: A Revolutionary Approach to Agile Decision Making," Teradata.com, https://goo.gl/XGcJYH

[20] Eliza Strickland, "IBM's Watson Goes to Med School," *IEEE Spectrum*, https://goo.gl/SoGOKQ

and polar bears that you may have read about. The emergence of the Sentient Enterprise represents a much more fundamental shift. In evolutionary biology, there is a theory called symbiogenesis, which states that early single-celled organisms merged into more complex cellular structures that eventually allowed for the development of the plants and animals we have today. (Animals incorporated mitochondria, while plants merged with chloroplasts.[21])

Symbiogenesis is one of the biggest milestones in the history of life. Had it not occurred, all life on earth would pretty much be variants on bacteria.

In the case of the sentient enterprise, the two organisms that are merging are the humans with their non-scalable brains and the whole infrastructure for managing the organization's data, which includes the data itself. Of course we're not literally merging with those systems in the same way that we literally have mitochondria embedded in every cell in our bodies (at least not yet), but I think that it is safe to say that when the writers quoted above describe the sentient enterprise as an organism (or for that matter, when they say that it is sentient), they are engaging in more than just analogy.

Likewise, it is more than just an analogy to say that data is transforming our world and that its reach beyond the realm of the abstract into the physical world is becoming increasingly significant. The sentient enterprise, and other new symbiotic relationships between us and our machines—relationships that have as much to do with the data itself as the systems that access it—could well become one of the focal points for this ongoing (indeed, accelerating) transformation.

---

[21] Heather Scoville, “Symbiogenesis,” ThoughtCo.com, https://goo.gl/hPC6g3

Conclusion

Parting Thoughts

What does it mean to say that data is changing everything? Is the world really turning into data? Or maybe it's better to ask whether *we* are turning the world into data. And if we are…is it a good idea?

How will we like living in a world that is more "bit" than "it?"

Of course, we should face the possibility that we are evolving right along with the world. That is to say, we are *changing ourselves* as rapidly as we are changing the world around us. If true, then at least we have identified the most powerful agents of disruption.

It's us.