

BE DATA LITERATE

THE DATA LITERACY
SKILLS **EVERYONE**
NEEDS TO SUCCEED



JORDAN MORROW



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ABOUT THE AUTHOR

Jordan Morrow is known as the ‘Godfather of Data Literacy’. Seen as one of the founders and pioneers of the data literacy movement, Jordan Morrow has a passion to help organizations achieve their data and analytical potential. When not found in the world of data literacy, Jordan Morrow is a family man, happily married with five children. Jordan is also an avid trail and ultra-marathon runner. He can often be found in the mountains near his home.

PREFACE

*There are three types of lies – lies, damn lies, and statistics.*¹

This quote, unfortunately misattributed to multiple people, such as Mark Twain, tells the story of our lives right now. We live in a world where statistics, data, information, numbers, words, and so many other things (including pictures at times) are shared to tell us stories and convey information. Is it easy for us to understand all the data and information presented to us on a regular basis? Unfortunately, they are often misused and misrepresented with efficacy. Is there something we can do about this?

I started my journey into the world of data literacy officially in June of 2016, but my first ideas were rolling before then. I have been given the nicknames of the Godfather of Data Literacy and Chief Nerd Officer (I really like the second nickname). Over time, I have developed, improved, and evolved my thinking and thought process around data literacy. This book is here to convey my thoughts and help you on your data literacy, data, and analytics journey.

This book will take a different approach than what you may expect from a book that deals with such topics of data and analytics. For most of us, these topics are not at the top of our list of exciting or thrilling subjects, but to me they are fascinating. I hope to convey to you a strong understanding of the world of data literacy and what you can do to take part in this exciting time where the world is truly data driven. Thank you for taking the time to sit

down with me. I hope to spark in you a curiosity and love of data literacy in the hope it will truly impact your life for the better, as it has for me.

Note

- 1 Anon. (2012) Lies, damned lies and statistics, University of York. Available at: www.york.ac.uk/depts/maths/histstat/lies.htm (archived at perma.cc/4RY4-THZX)

01

The world of data

Have you ever wondered to yourself: what does the future look like? What will the job market be like, and are robots and technology truly going to monopolize and take my job away? What inventions await us, and, maybe most importantly, when will my flying car arrive? The future will always be uncertain, and inventions that shape the future will certainly be things we haven't even thought of or created yet. It is an undeniable fact that there will be jobs in the future that we can't begin to imagine. Even though we have all these different uncertainties, there is one thing that we know will be part of the future and is already here: data. The future promises to bring about many waves of inventions and exciting new jobs, but while we wait on those things, we do know that the power of data is here. The fact is, data is here to stay.

The world of data is amazing, vast, and provides countless growth opportunities for individuals. For far too long, individuals and organizations have been halted in their attempts to drive success with data. That should no longer be the case and we must help everyone to capitalize on this vast asset.

Data has been called the 'new oil', as lifesaving as water, and many other clichéd and over-hyped terms. The reality is, data is truly an asset and when used properly it can help everyone move forward and succeed. It can help us to develop stronger understanding and knowledge, prepare our résumés to handle the future, and build within everyone a strong and versatile foundation for the future. This foundational understanding of the world of data is essential.

Data: The world we live in

It is no secret – we are living in a world consumed by technology and data. One can hardly walk down the streets of big cities like London or New York and find people who are not looking down at their phones versus up at the amazing sites and people around them. Take a personal test: next time you are walking in a big city, count how many people are looking down at their phone versus looking up. You can even add up those talking or waving hello. Also, don't forget to look up yourself, saving yourself from a potentially bad trip over a curb or, worse yet, having a nasty run-in with a local vehicle.

Over the last 50 years, and particularly the last 30 years with the advent of the internet, personal computers, smart phones, and so forth, the world has seen amazing advancements in the growth of technology and data. Ponder on those advancements for just a moment. When one looks at the expanse of time, with the universe being around 13.8 billion years old,¹ and the Earth itself around 4.5 billion years old,² we are talking just about 30–50 years. In these 30–50 years, we have seen where personal computers and cell phones have become mainstream. This time period is not even a sliver on the scale that is time. Now, for us in our day and age, it is hard to imagine these items not being a part of life. Each one of these items is data producing. What about the internet? The internet is even younger, gaining mainstream life in the early 1990s,³ and really taking off in the late 1990s. Now the internet is ubiquitous to jobs and life itself. With all this growth in personal computing, technology has sped up in its development and not slowed down. We continually see innovation, advancement, and different aspects of the digital world evolve and expand. All of this has a direct impact on our lives, the way we live, and so forth. Above all, with respect to the topic at hand, all this has an effect on the life and power of data.

Take the more impassioned use of the internet when it went mainstream. The internet changed the way organizations, schools, and our lives operated. Our way of life not only changed, but vastly improved; the internet allowed us to improve, learn, and develop at unprecedented rates. When one combined the internet with the personal

computer, and now the even more powerful personal computer we call smart phones, individuals and families could bring the power of computers into a home. People could bring more than the entirety of the Encyclopedia Britannica, minus the door-to-door salesperson, into their lives. Not only bring it into their lives, they could get answers to their questions much faster. This has evolved in what we know today as Google, with 'google' becoming a verb in the Merriam-Webster dictionary!⁴

As this digital advancement continued, we saw the growth in e-commerce and the birth of companies like Amazon changing consumer habits and monopolizing the market. We saw the rise and fall of the internet bubble, where companies that had no business being valued highly, were valued at enormous sums. One prime example of this was Pets.com. Pets.com was started in 1998 and shuttered its doors in 2000.⁵ With the fall of the internet bubble, different kinds of internet sites came into existence, and the world was introduced to the world of social media. Social media has opened the gates on consumer profiles, making their digital and data worlds public for everyone to see, from selfies and pictures of our food, to what products we are enjoying. All of this is consumable data available to both individuals and enterprises. Because we all want the targeted advertisement making the decision for what we want for dinner this evening!

Along with the advent of social media, and all the fun data it is producing for us, the 2000s saw a new type of technology come to the forefront of connectivity and data collection: the Internet of Things, or IoT. A definition of the IoT is easy: a connectedness of everything. Think of sensors on a car or plane collecting information and data on what is going on with the engine or other parts. A quick question, though: Did the IoT really start in the 2000s? The answer is no, and many will not know this. The term gained its official name in 1999, but one of the first examples of the IoT was found in a simple item that most of us cross or have crossed regularly for years: a Coca-Cola vending machine. The particular vending machine we are talking about was found at Carnegie Mellon University. At this vending machine, individuals would connect to the refrigerated

appliance by the internet and discover if a drink was cold before going to the machine and purchasing said drink.⁶ This use of data to make a smarter decision, through connectedness, ie the IoT, has been on the minds of people for years: how do we use the information and data we are collecting to improve decision-making in our lives and careers? Think of enterprises like Amazon or Netflix: how often are they collecting our data to ‘make recommendations’ on what we want? Often... and guess what? They are right with these recommendations a lot of the time.

Although the IoT starting to form back in the 1980s, it wasn’t until recent years when the world of the IoT gained the steam and momentum we have come to know it by. For example, picture a trail runner who loves running ultra-marathons. When the runner is on the trail or road running, a few years ago there wasn’t that much technology around to collect data and information to help the runner grow... and we can say help a runner ‘grow’ lightly. Do we really need a watch that shows you every single possible aspect of a run: from elevation, to pace, to feet ascended and descended? The data in front of runners today captures more information than they probably need, providing pages and pages to swipe through! The watch data is such a fun example of items we can read through and discuss, but there is one key element to all of this that is occurring in our world today: the connectivity around us and the advancement of technology are producing more and more data in our lives. What are some other real-world examples of the IoT? What are examples where we are seeing advancements or things evolving in ways that help, shape, and decide our lives?

One example of a company harnessing the connectivity, digitization, and production of data is the great company Rolls-Royce. Rolls-Royce is no longer just a great engineering company, producing amazing engines. Now, Rolls-Royce is a powerful, data-driven organization that utilizes the IoT and connectivity to deliver and produce data that is an essential asset to its company.⁷ An example of Rolls-Royce utilizing the power of data is their predictive forecasting

method to monitoring engine maintenance.⁸ By using sensors and the information they produce, Rolls-Royce is mastering how to predict and anticipate any issues that may arise with their aircraft engines, and ensure they keep planes in the air. Another prime example of the connectivity of things empowering our lives can be found within healthcare. Utilizing data and information produced through physical therapy appointments provides better physical therapy programs that can be designed for those in need.⁹ With the rising cost of healthcare, more direct and prescriptive services can help individuals feel better and stay out of the hospital.

The world of sports is another area that has developed and grown massively through the world of data and analytics. How many of us have heard of or seen the movie *Moneyball* starring the ever-amazing Brad Pitt? That movie showed us that data and analytics can greatly influence a sports team, helping drive wins for a smaller baseball market. One great example of this can be found in the international sport of basketball, particularly the National Basketball Association (NBA). Most, if not all, NBA teams have hired data analysts and experts. These experts are tasked with finding trends and patterns in the information they are collecting, such as finding undervalued players and creating value for trades and other options. Another way NBA teams are utilizing data and technology is to monitor fatigue and sleep levels, allowing them to understand how to address training, prevent injuries, etc. One of the fun ways that the NBA is utilizing data and analytics is by hosting an annual hackathon, helping the NBA to find talented new analysts. Did you know that data analysis is largely credited with the increase in 3-point shooting in the league?¹⁰

It's not just the NBA that gets to have all the fun. Everyday objects are now capable of harnessing the power of data, such as smart watches, smart phones, dishwashers, refrigerators, heating and air conditioning systems, cars and vehicles, and more. Along with all these products and tools, many other areas are producing data at unbelievable rates. Think of all the information being produced through social media sites, visits to e-commerce sites like Amazon or Ebay, swipes of credit cards, and more. Overall, we are seeing some

amazing numbers with data production each day. The World Economic Forum stated in 2019:¹¹

- 500 million daily tweets are sent;
- 294 billion emails are sent;
- 4 terabytes of data are created from each connected car;
- by 2025, it's estimated that 463 exabytes of data will be created each day globally.

If we were all still watching DVDs regularly and not Netflix, that would be the equivalent of 212,765,957 DVDs. Wow, that is an unbelievable amount of data! What does that mean for us? It means we cannot watch all the DVDs our data producing is creating. What can we do with all that information?

Surely organizations and individuals are capitalizing on this amazing asset of data, right? Obviously, organizations are not falling short and are able to find insight to make smart, data informed decisions, aren't they? The reality says quite differently, and studies and data show us the truth: there is a large skills gap in the world of data that is hurting organizations' ability to succeed with their own valuable assets of data and analytical investments.

Data: The skills gap

To understand this large skills gap, one needs to understand the overall data skills landscape. The data and analytics firm Qlik helped all of us to understand the world's current data skills landscape and where there may be gaps in those skills. One research study, conducted from August 2017 through February 2018 showed the overall data literacy and data skills landscape, providing valuable insight into people and their skill level and comfort in using data.¹² The results were staggering. In the study, it was found that just 24 per cent of decision-makers felt confident in their data literacy, or data skills. Just 24 per cent! That is a staggeringly low number for those tasked with leading decisions in organizations. In some cases, these same decision-makers are

of a large data skills gap, there are many options. These causes, drivers, or expanders of a skills gap take many forms, from education and schooling to technology and software issues, to the data production itself. As we unwrap these causes, think of how these have impacted your career and ability to utilize data and analytics for success, whether from a personal level or those people you have worked with.

Software and technology

One may ask: how can software and technology be a cause or driver of a data skills gap? Aren't software and technology here to help us? Aren't the advancements and improvements in software and technology decreasing the skills gap? Well, the answer to the last two questions is Yes! Software and technology are here to help us drive solutions and answers to data and analytics problems, generating business outcomes. In reality, software and technology are here to help augment humans, if we are trained and educated enough to let it happen.

The problem lies in the way the different investments in technology and software have been deployed by both individuals and enterprises. Imagine you are a company building a data and analytical strategy, designed to help you succeed with data in the digital and data revolution, and a great sales person comes by your office and says: 'Our new software is designed to assist and empower you to truly succeed with your data and analytical needs.' What if they say: 'Our software will solve all your data and analytical needs.' They can throw any number of awesome phrases at you to buy their software. You get to see the perfect examples and case studies broadcast across their laptops or screens. With those perfect examples, you decide and invest in this software and look to roll it out to the masses. When organizations roll out data and analytical software to the masses, this is called the 'democratization of data', and, a little secret, the democratization of data is what companies should be doing but is also a problem. Let's examine this more.

Historically, data would reside in the information and technology world or another part of the business, with a few people using the data or producing the reports and analyses; the organization was reliant on that team to produce strong, applicable results. As business intelligence tools, like Qlik or Tableau, advanced and grew into powerhouse software companies, organizations looked to spread the data to the masses, thereby democratizing the data and information. When an organization democratizes data to the masses, the organization is hoping to drive strong insights and results. There is one large problem with this: how many of us go to school and university to develop skills in data, analytics, mathematics, statistics, and so forth? This number has risen in recent years with the rise in emphasis on STEM (science, technology, engineering, and math) education, but what about all those who did not go to school for this type of education?

It may seem like we are saying democratizing data is not the answer... wrong! Democratizing data to the masses is the answer – it is how organizations can realize more potential through data and analytical investment. Democratizing data allows the unique talents and abilities of an enterprise's workforce to capitalize on the investments the organization has made in software, data, and technology. The reason democratizing data has expanded the skills gap lies in the educational foundations of an enterprise's workforce. When individuals without backgrounds in data and technology are asked to take on new software and technology and to capitalize on data and information, those people are not effectively prepared to utilize the data in front of them. How many of us do you think are eager and happy to jump in to use these new investments? How often are you excited to jump in and learn something thrust upon you and your job?

The same study from 2019 on the human impact of data literacy stated that 36 per cent of study participants 'would find an alternative method to complete the task without using data', and 14 per cent of study participants 'would avoid the task entirely' rather than use data. This is indicative of a lack of data skills; those who are comfortable with and confident in using data are more comfortable with the investments

made. In the same study, it was found that nearly three-quarters, or 74 per cent, of study participants felt overwhelmed by or unhappy working with data. This last metric shows the fatigue wearing on individuals when it comes to the investments and democratization of data. This overall fatigue and lack of skills to utilize data has truly expanded the data skills gap.

Data production

What would data production have to do with lack of data skills? Data production, as it pertains to what has been discussed, is not new but was covered earlier in the chapter. With the advent of technology and pace with which it grew, and the pace of data production accelerating, organizations and their workforces were not equipped to handle how quickly they were producing data. Those organizations that were born and bred during the digital era were more equipped to succeed with the onslaught of data, as it was a part of who they were. Those enterprises that were not started and built during the digital era? They are trying to build capabilities to use data effectively and are finding it more complicated. You mean I can't just start sourcing and using data? No! These enterprises are learning you can't just invest in software and technology, sourcing data, and poof, the entire enterprise is walking on top of the data and analytical mountain. What was found, on the other hand, were workforces unable to keep up with the rapidly changing environment. The quick onslaught of producing and sourcing data is a cause of the data skills gap.

Lack of data and analytical strategy

Another driver and cause of the data skills gap is the lack of data and analytical strategy within organizations. How can a lack of a strategy drive or expand a skills gap? To start, sit back and think to yourself: does my enterprise have a clear and concise data and analytical strategy? For a lot of enterprises, the unfortunate answer is 'No'. This lack of strategy can put undue burdens on the workforce, who are just trying to figure out how to utilize and adopt the software and

technology invested in (remember our study from 2019? That overwhelming feeling is real!).

What does it mean for an enterprise to have a clear and concise data and analytical strategy? Let's take this to a personal example of needing a strategy by jumping back to running a half-marathon, marathon, or ultra-marathon. To help, let's emphasize this is a beginner or intermediate level runner running the race.

First, imagine you are this runner. You haven't run for a very long time and you see some of your friends, family, or coworkers taking on this task of running a race. You see them get super excited about it, and, let's face it, sometimes they don't stop talking about it (as a runner myself, I know I talk about it way too much). You decide then and there you are going to sign up for a race and toe the starting line. You then sign up for your first race, and it officially starts in a few months. You signed up for this race without a training strategy, not studying the racecourse, getting to know your nutrition or hydration needs, but you train and eat knowing you need to. Without the strategy, you also don't know if that investment is giving you the return you desire.

It's then time for the race. You toe the starting line with some training under your belt. Maybe you have some hydration or nutrition, just hopeful the training you have completed will get you through. The starting timer goes off and the race turns out to be a disaster. You weren't properly prepared, even though you did some training and bought some equipment. In the case of a half-marathon, you get to the finish but really struggle through. For both the full and ultra-marathons, you fall short and do not finish.

Now, contrast this with another race. You sign up, after building a strategy for the event. You know the equipment you need, the hydration and nutrition your body needs, and you hire the right coach to help guide you through the strategy. In fact, this coach helped you build the strategy. There are some bumps and hiccups along the way. In the end, you make it through challenging training and you are set for the race. When that day comes, you are able to get through the finish, even with some pain and frustration. At the end, you knew how to deal with it and succeed because of the strategy and preparation.

Overall, these examples spell out exactly what organizations need to do with data and analytical strategy. For far too long, some companies have gone the more haphazard route. They have known they need to invest in data and analytics, but only going partly in, not knowing what equipment and why they are buying it or knowing if it fits the needs. They aren't using the 'coaches' they should to build the strategy and then implement said strategy. Then they find their investments they have made, in some cases millions of dollars, are falling flat and not giving a good return. Unfortunately, this is the issue many companies are facing.

A strong data and analytical strategy means the enterprise has built a strategy for sourcing and utilizing data and analytics to further the enterprise's goals, vision, and objectives. Trends from around the world are illuminating that most enterprises have not fully vetted strong data and analytical strategy.

When organizations around the world are not prepared with strong data and analytical strategies, this expands the data skills gap. Instead of having a clear strategy that dictates and allows the flow of software, technology, and learning investment, companies have purchased the data and analytical software and technology to do it all for them. In doing so, they are using the technology as the strategy itself, forcing it upon people. This does not allow the strategy to dictate what technology to use. This type of 'strategy' can result in weak adoption by the workforce; the workforce can then go back to the old way of doing things. When they go back to the old way of doing things, the new technology is like the toy placed on a shelf, collecting dust.

As such, organizations were hit with a double whammy: first, the software they have invested in is not being used and adopted effectively, and second, instead of the workforce growing in data skills, they are falling further behind as they push away from the investments and technology that was purchased for their benefit.

Data: What's next?

With a large skills gap, we can ask ourselves: ok, data isn't being used effectively, so what's the point? What's next? Do we really need to

- 12** Qlik (2018) *How to Drive Data Literacy in the Enterprise*, White paper. Available from: https://www.qlik.com/us/bi/-/media/08F37D711A58406E83BA8418EB1D58C9.ashx?ga-link=datlitreport_resource-library (archived at perma.cc/JDM4-89HN)
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02

The four levels of analytics

Data and analytics – there are four levels?

Now that we have a knowledge of the world of data, an understanding of the holistic world of analytics is needed to ensure organizations and individuals can both capitalize on and utilize data and analytics effectively. Having a strong understanding of this world of analytics is a necessity and key to truly implementing a strong data and analytical strategy. Without understanding the different levels of analytics, organizations may buy software, source data, and democratize self-service tools, not knowing if those are the correct things they should be doing. The world of analytics is set on a premise of four levels of analytics: descriptive, diagnostic, predictive, and prescriptive. To understand the necessity of learning these levels of analytics, we need to take a step back and consider how organizations have viewed data and analytics historically. This picture will allow each of us to see how organizations should view data and analytics, and how organizations can use these four levels to drive success.

Now, let's begin: how have organizations viewed data and analytics historically? Historically speaking, organizations have spent a lot on investments in data and analytical technology, software, and tools. They have viewed the software and technology as the 'answers to their prayers', with answers that will drive all the data and analytic solutions. Organizations have been investing in technology that can help them realize their goals and 'data and analytical' dreams... yes, whether you want to believe it or not, data and analytical dreams are