What makes tech companies different?

Software touches almost every facet of modern life today. As technology grows faster and more complex, the data and information about our worlds and lives have grown along with it.

The first computers in the 1960s were mainframes. These computers often occupied the entire floor of an office building, and their main purpose was to perform complex math calculations. We wouldn't even recognize the "programs" they ran today as software. Mainframe software was mostly "procedural" or instructional. These mainframes were sold to universities, government agencies, or other very large organizations because they were the only ones who could afford them. We landed on the moon in part because of these computers.

In the 1970s desktop, or personal, computers, started to come into fashion for business executives. Total game changer. The entire industry had been turned on its head and this really broke open the software market. Now there were software and hardware companies focused on technology solutions for businesses. The first word processor, Electric Pencil, was released in 1976 and in 1979, VisiCalc introduced the world to the spreadsheet.

Some hardware companies, in a desire to expand their market, saw the opportunity to sell PCs to consumers. As Atari introduced the world to gaming at home, software companies rebuilt those games for PCs. Hardware companies started to aggressively market PC use at home showcasing more and better games than Atari. By 1982, there were approximately 600,000 computers in American households. The race to build software *for people* was on.

Computers were still expensive, and they were self-contained. You'd buy software in a store, or through a catalog, and install it yourself. The data you'd create were your personal documents, spreadsheets, high scores in games, etc.

As desktops and laptops got smaller, faster, and cheaper, people were now getting used to having their computer with them all the time. Software companies wanted to engage people in every part of their lives. They built more games, learning tools, and productivity tools. They started working to gather data on all computer users, business people and students alike. Software companies started to understand what people were doing with software. They did so by building *more* software to collect and analyze data on how people interacted with their computers.

In the 1990s, software companies started to take over the innovation cycle. They were now pushing hardware companies to build or include new hardware to power new interactions. There were scanners, web cameras, microphones, and printers. Computer users were making *and sharing* data in various ways. This brings us to 2007 when one of the few integrated hardware and software companies, Apple, introduced the iPhone and changed everything. Again.

The story repeats itself: "New hardware, new software, new use cases, new markets." Each step of the way brought new data to life. The best tech companies recognized the importance and value of data. As computers became more powerful and the internet more prevalent, the sheer amount of data generated only skyrocketed. As long as the world keeps demanding and building software, there will be more data to go with it.

How does software generate data?

Software is the layer between us and our computers. Some of us remember a time when that software was physically packaged and sold on disks or CDs. For us, as computer users, we had to pick and choose software with the features we needed and we had to make sure it would work on the computers we would be using.

In the 1970's Gordon Moore, one of the co-founders of Intel, made an observation that the number of transistors on an integrated circuit (IC) would double every two years and the cost would halve. As this trend played out, people began referring to this as *Moore's Law.*

Simply put, *Moore's Law* means that computers would get more powerful and cheaper over time. With more power, software started to grow and expand. Software companies were identifying *any* repetitive or mundane tasks that the computer could take over using all of this new, cheap computing power and storage. There's one last elephant in the room. The internet.

With *Moore's Law* pushing all of the fundamental changes in computers and the internet connecting all computers, the next innovation was Cloud Computing. "Cloud" is just a marketing word for "someone else's computer." More accurately, the "cloud" means buildings full of computers, a.k.a. data centers. They are run by 3rd party service providers and are all connected

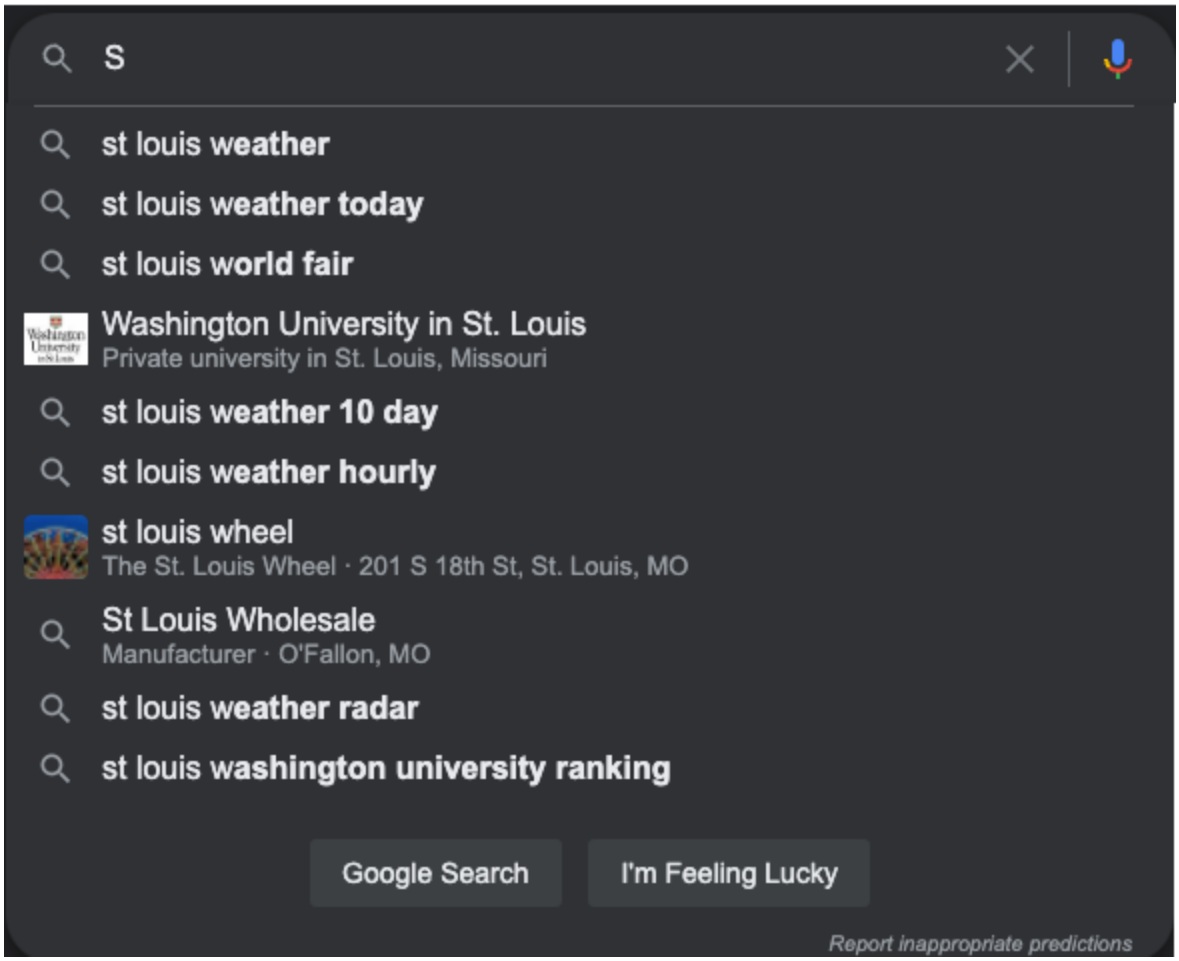
thanks to the internet. In other words, instead of you having to worry about buying the right hardware, putting servers together, installing, and updating the software, a software company can take care of all of that for you. You subscribe as a user and the application is delivered to you via an app or web browser.

The byproduct of the software company managing all of this for you is what they learn in the process. Your use of the software creates new data. The innovations in computing power and storage lets these software companies store this data and use it later.

From a customer point of view, you use software and it does something for you. From the software company's point of view, things like what features you used, how long it took, and what screens you use and don't use, are all data. New data that even the best-designed surveys or group testing couldn't collect. The teams building that software use this data to help plan their next product cycle. Take Google for example.

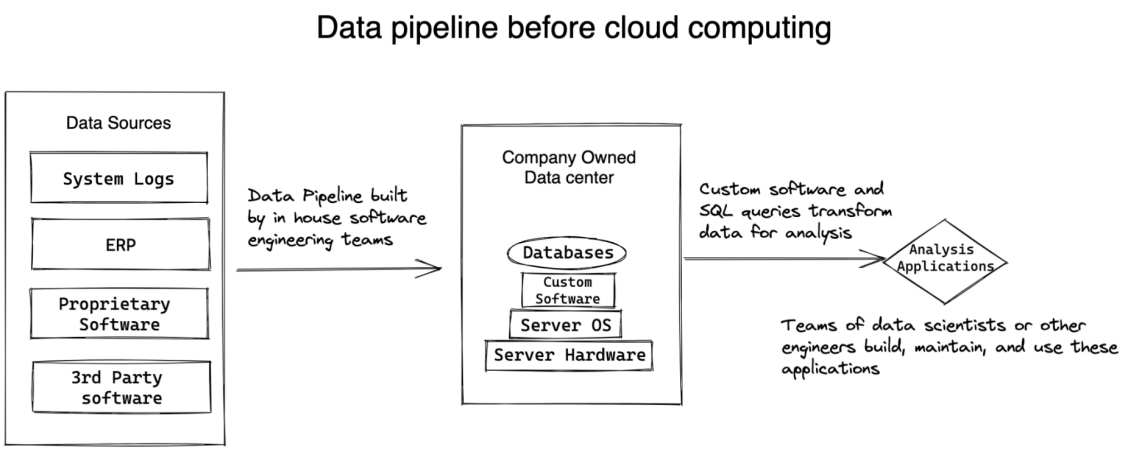
Google's first product - Google Web Search searches the entire internet. Google generates new data from every search someone does. Google stores every search, every click, how long it took to generate the results, how long it took you to click the link, what letters you typed, your typos, etc. They use this data to improve their core search product, but also to build new products.

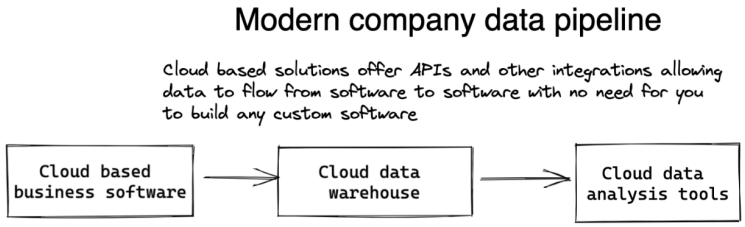
When Google launched in 1998, what you typed into search is what you searched for. In 2004, Google launched "Autosuggest." Now when you start to type the "S," it's 7:45 AM, and you're in St. Louis, Google will assume you're searching for "St Louis weather" and show that as the first option.



Google uses all of that data we outlined, and then some, to build a smarter and faster search. Autosuggest sometimes previews search results and even corrects typos for you. It improves even more if you're signed in so Google knows exactly who you are.

This data-driven development cycle used to only be available to tech companies. One reason for this is that software companies had to build their own tools to collect the data. They had to build teams of data scientists to analyze the data. Tech companies ended up developing a different operating model and mentality from traditional businesses. One that is guided by data.





We are in the midst of another paradigm shift. The same tools that tech companies had to build before are becoming available for everyone. Tools for working collaboratively, project and task management, and most importantly data tools. Like all of the tech before it, those tools are getting cheaper and more accessible.

So...what exactly is data?

For our purposes, we can say that data is information. Weather reports, stock tickers, and traffic updates are all examples of data. We can use this data to make decisions. Do I want to buy or sell this stock? Do I need to leave early? Should I bundle up and bring an umbrella?

Those are all examples of "classic" data points that existed before computers and software. As we saw with the Google search example, modern software is constantly generating new data at an ever-increasing pace. Webpages you open, files you create, and emails you send are all other examples of data. As we continue to use more software tools, there is always new and more data being created. The pace of that new data generation is only increasing. If we want to make any sense of data that is relevant to our business, we need to change our data mindset.

Metadata

While we're talking about data, you may have heard the term "metadata." This very confusing word is used to describe a specific data type. Metadata is additional or extra data that *describes* data.

It's all about the "frame of reference." For example, imagine you're looking at sales revenue data. The customer, the product, and the amount are all sales data. The time of the sale would be metadata. Another way to put it is that metadata is data that describes, or adds details, to the underlying data.

What does this mean for me?

The early eras of computers were based on just that – computation. Software was a means for crunching data that was too cumbersome to do by hand. Today, software goes much further with advanced applications that automate business processes as well as provide analytical insights.

Classic workflow

Take invoicing, for example. The pre-Internet means for invoicing your customer followed the steps below:

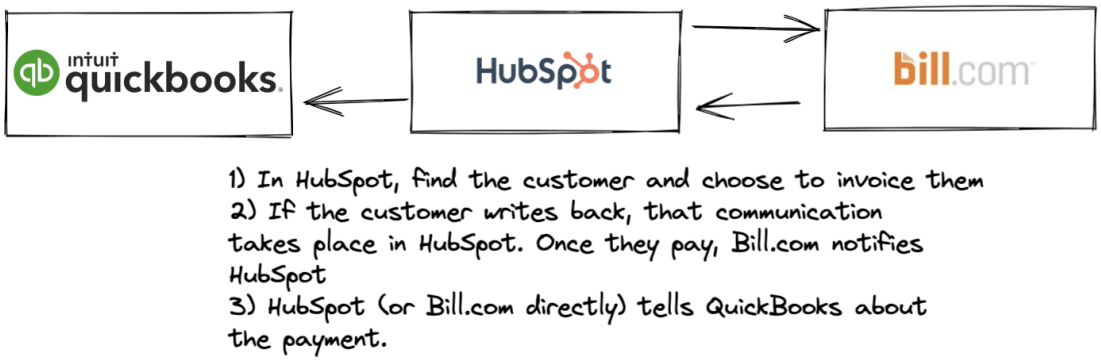
1. Find the customer file
2. Verify the details of the transaction
3. Write it out
4. Mail or fax it to the customer
5. Wait a few days
6. Wait for the inevitable phone call asking for more information
    a. Pull up the file so you can answer questions
7. If you have to make an adjustment, go back to step 3
8. Wait for the check
9. Go to the bank and deposit the check

As a business owner, if you kept *really* good ledgers, you might be able to see when you wrote the invoice and when payment was in your bank account. If you chose to go deeper into one specific transaction you might find some notes of a conversation or a few versions of the invoice.

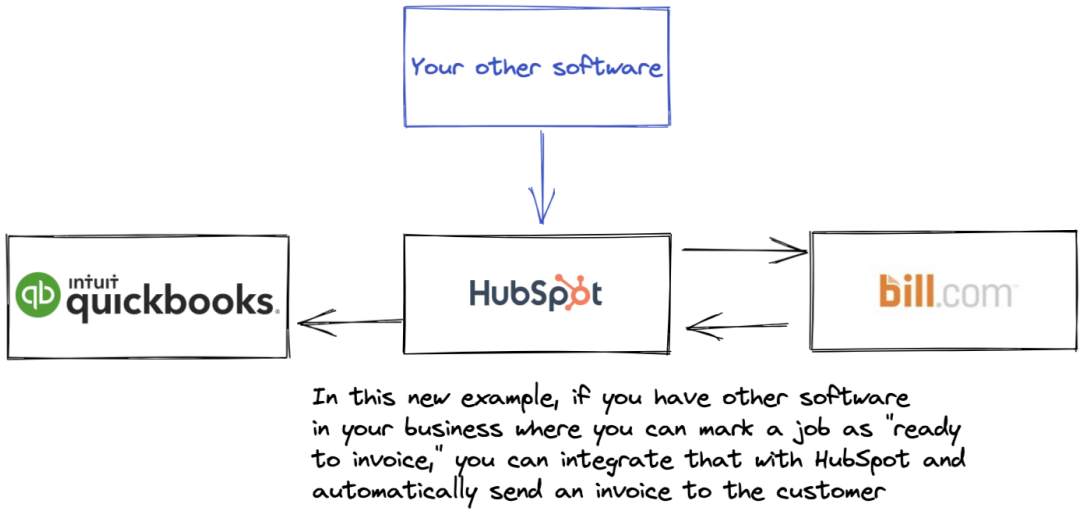
Software enabled workflow

Using software like Quickbooks for your accounting and Bill.com for your invoices will streamline this workflow significantly. Whoever sends invoices can just log into Bill.com and fill out the customer information and invoice amount and send it with one click. If you have a CRM, like

HubSpot, you can skip the data entry and send the invoice from HubSpot with one click. If the customer has questions or reaches out, you can access all of the relevant details in HubSpot.



The next step would be to plug your core business software into this CRM+Invoicing+Account system. Core business software depends on the industry you're in. A home services business may use a tool such as ServiceTitan or Jobber to manage the scheduling and work process. If a technician marks a job complete in that service you can automatically kick off the rest of the flow.



This software implementation becomes important for two reasons. First, you automate what was otherwise a manual, time-consuming process. Second, and just as important, this new software-enabled workflow automatically creates additional metadata about the process and flow.

In this example, data could be the lists of customers 30 days behind or the average time to pay an invoice. Metadata could be one of many new data points. One could be the type of customer or the location of the customer. Overlaying that with service or products ordered, or average invoice size could help you come up with new ideas about how to ensure you get paid in a timely fashion.

The sooner you start learning to use data as a tool, the stronger you'll make your company. Key learnings and insights are waiting in this data. With good practice, you can capture relevant data and as a manager, owner, or operator you can learn from that data. In some cases, you may need to make strategic decisions based on that data while always being mindful that data analysis can be imperfect.

Where do I start?

What information, or data, do you have for your business? The classic examples of that data would include, but are definitely not limited to:

- Inventory
- Payroll
- Revenue
- Rent
- Travel expenses
- Advertising/Marketing

These are all great starting points, but what about new, software-enabled data. Ask yourself, "what KPIs, measurements, or other comparisons are important for operating my business. How do I serve my customers better or provide a stronger value proposition than my competitors? What are the core workflows and processes that drive my business?

The goal is to identify the other drivers or other inputs that make your business run. To become a data-driven organization it's important to look past revenue and expenses. Those are great places to start building experience with the tools and analysis process but don't stop there.

How do I gather the relevant data?

We are huge proponents of software delivered as a service (i.e SaaS) because it creates an efficient means for you to automate processes and collect data without significant infrastructure costs. No servers, no racks, and no IT team to manage it all. Furthermore, most modern SaaS applications have integrations built_in that provide the pathway for data to operate seamlessly. For example, data analysis tools such as Looker and Tableau can be plugged into your workflow applications to paint you a clear picture of the efficiency of your operations.

When software is locally installed on servers you manage, the use cases and opportunities for integration are much more limited. Not to mention the additional infrastructure and security challenges you must directly manage.

What do I do with my own data?

By now, we should know what data is meaningful for our business and how best to collect it. So what's next? It's time to make it "actionable." Fortunately for us, we don't need to assemble a team of software engineers, data scientists, devops engineers, data engineers, etc.

You may be tempted to drop it into a spreadsheet which, honestly, isn't a bad start. Many of us are probably using Excel to store and display some of the data mentioned above. Excel is fantastic. It is the swiss army knife of data analysis. If you want lines, graphs, colors, and/or circles it has them all. Excel has a programming language and you can even open web pages in Excel.

It's only natural to want to take any new data and look at it in Excel. There's nothing wrong with that. Excel is *the* poster child for business software, but it was also released in 1985. Since our data is already in the cloud, there are other options too.

Better spreadsheets

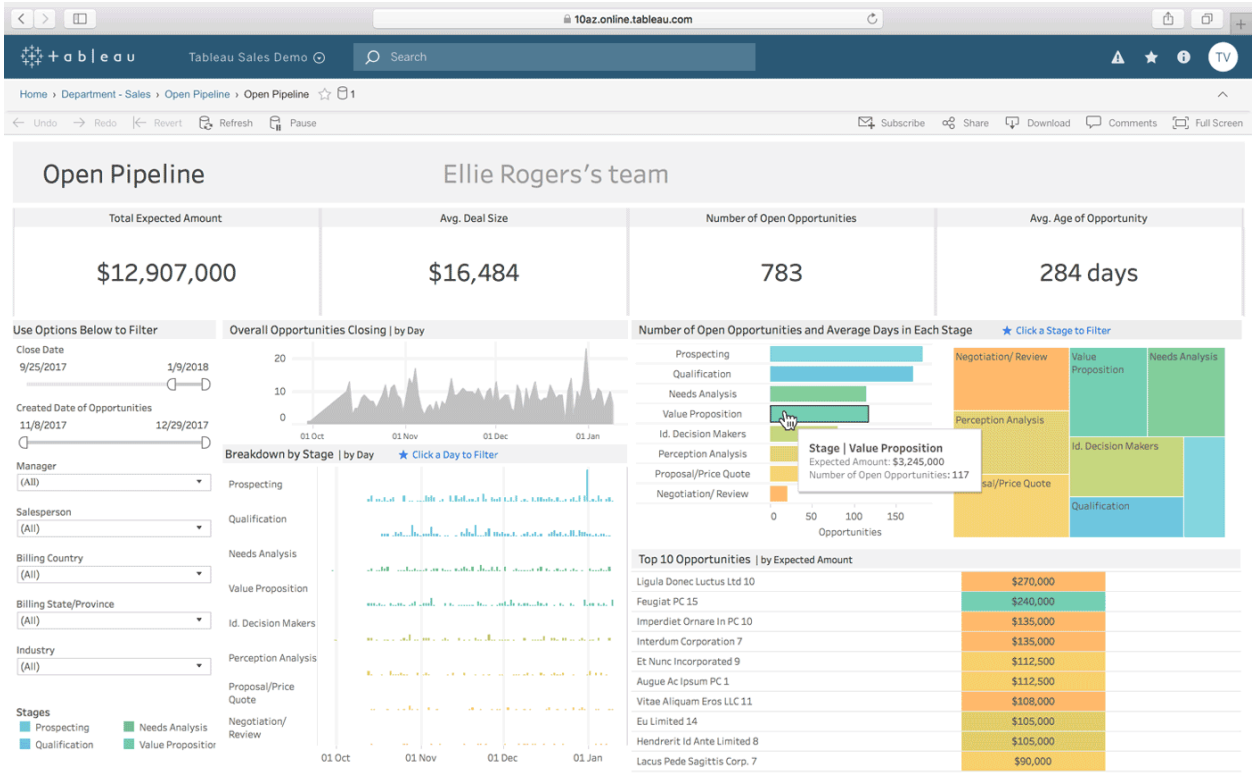
Excel is so flexible that it is usually a solid place to start particularly for data in the old realm. Yet, we now know that modern software tools can be leveraged to generate massive amounts of metadata to gain new insights. Excel was not created with the computational capacity to handle that amount of data.

Modern spreadsheet tools like AirTable not only have the computational requirements but also have integrations and an API. This means you can have your data scheduled to automatically update on a schedule. You can even have it constantly stream into the spreadsheet in real-time creating an always-up-to-date data repository that can be shared in automated reports and dashboards.

Think outside the sheets

For more advanced reporting, or to ask even tougher, deeper questions you will want to familiarize yourself with a new set of "Business Intelligence" (BI) tools. Tools like Tableau, Looker, Amazon QuickSight, Microsoft PowerBI, Google DataStudio, or Qlik.

These tools will all help you take in data from a few sources. You can then categorize and merge the data you see fit. This "data processing" step is crucial. With these BI tools, you won't need a software engineer or data scientist to do it.



The BI tools' real magic comes from the various reports and queries you can run on this data. These tools will learn about your data and even suggest different graphs or queries for you making their predictive insights extremely powerful for the user. The more time you spend with them, the more interesting reports and dashboards you'll come up with.

OK, now what?

The explosion of new software applications will only continue, and simply put, new software means new data. While we only highlighted a few companies/products, there's an entire industry of data gathering and visualization SaaS companies stepping up to help every business make sense of their data.

To summarize, there are 4 key steps to start building the data skillset:

Identify the key measurements

Collect and store the data

Create reports and analyses

Make a decision or a change and start to measure again

Sometimes there won't be an obvious conclusion or decision to be made from the data. You still have "gut" or "intuition" to go along with the data. Maybe you measured the wrong thing or maybe there's just not enough data. In case you measured the wrong thing, you can look at the rest of the data to see if something else changed. Start over, but this time observe and measure that "something else." Remember, you can always collect employee or customer feedback or other methods to provide reassurance.

Three common pitfalls

As we have seen, data is a very powerful and important tool when used properly. Keep in mind that just because you can collect and measure everything, it doesn't mean you should. It's far too easy to get caught in a number of data traps. Three of the most common ones are analysis paralysis, garbage in-garbage out, and over-planning.

Analysis Paralysis

When we are presented with too many options or too much information it's easy to get overloaded. If this happens we get stuck or frozen, like a deer in headlights. There are too many choices, everything starts to look the same and as a result, we don't move. Try to avoid this by staying grounded and remember to start this process by focusing on a few key metrics.

Garbage In - Garbage Out

Even with advanced machine learning and AI, computers can't think. They follow code written letter for letter. They can't extrapolate, they can only work with the inputs provided. In other words if the data you put into an analysis tool is bad, the analysis is guaranteed to be bad. Find ways to make sure the data you're capturing is accurate. This could mean comparing some data with reality by hand. Alternatively, you could try to get a sense of what your data *should* look like by comparing the new data with any old data or industry data. Your analysis can only be as good as your data allows it to be.

Over-Planning

Going back to our invoicing example. The desired result of examining your invoicing process is to improve the process. If you spend more time planning the data gathering and data analysis than on the process, you've fallen into a data trap. At that rate, it will be very hard to actually get the data to find improvements or even to justify the investment in the data. Learning new tools and implementing new processes is hard. Do it incrementally and don't compromise the real end goal of understanding and improving your business.

In conclusion

If it's all done correctly, data analysis should be part of your decision-making process, not *the* decision-making process. As your business grows, you'll add new software tools, new employees, new services, etc. The data sources or data collecting process may change, but the concept of data-driven decision making will remain.

Simultaneously the software industry is only going to continue to evolve. We're in the cloud and data era now. The next revolution is always waiting around the corner. Through it all, novel automations and processes will be introduced and we should remain open and adaptable to how they may impact our business.

Be proactive in considering how software can generate data that will simplify workflows and provide new insights. At the end of the day, you must ensure that you are running your business and your business is not running you!

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