Big Data Ecology:

Optimizing Information for Maximizing Profits

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A White Paper

EXECUTIVE SUMMARY: YOUR KEY TAKEAWAYS

True wisdom comes to each of us when we realize how little we understand about … the world around us.

—Socrates

THE ECOLOGICAL DISASTER OF THE UNHEALTHY ORGANIZATION

Imagine each facet of your company as an organism, all of which must coexist in a delicate balance for optimal health—which in both nature and business, we define as profit and resilience. We know that when something in the marine ecosystem harms the krill, the whole system suffers, all the way up to the whales—and us. And just as in the natural environment, when one aspect of an interdependent business ecosystem falls ill, all the other pieces deteriorate. If your production crew slows, your billing department falters; if your sales team fails, the whole company suffers. And just as in the natural ecosystem, the business ecosystem requires careful data analysis to uncover the information necessary to restore the balance of the overall environment. But who is the chief ecologist at your company? Shouldn't it be you? You're the CEO after all?

TAG, YOU'RE I.T.!

Relying on an I.T. director alone to determine, collect, and study the internal and external data necessary to optimize the health of your company's ecosystem might not seem as dire as letting the lunatics run the asylum—but consider it a mistake nonetheless. Depending on your I.T. department to drive even your company's tech strategy limits your agility when that might be your company's only competitive advantage. It demonstrates a fundamental *dis*-ease in your corporate environment,

and it probably means you've already lost out to your more nimble competitors. As the key stakeholder and decision maker, you're the king or the queen of the company jungle. It's your responsibility to understand the information your company collects – or neglects – in order figure out what data is important. You should also learn to recognize all the other "noise" you can effectively ignore to keep your company in the green. But first you must understand that you need this information, you must demand this information, and it's you who should review and absorb this information. Only then can *you* successfully execute a vision for what to do with the treasures you find buried amid the information trove.

DOG V. CATS

Big Data requires a Big Dog – not a million mewling cats – as master. In the battle between leadership and technology, your business strategy and vision must triumph over the latest gadgets your tech guys trot out every year at your expense. Yes, your company can aggregate, access, and analyze vast storehouses of data in order to optimize your potential profits and dominate your space—but only if you, the leader, know what problems you can to solve with data, what data to use to solve those problems, and how and why to solve them with said data.

INTERPRET THE NERDS

In nature, they say the leopard can never change its spots. But in ecology and business, adaptability and mutation rule in the fight for survival. At some point early in your career, you chose a side—to be a business leader--and left the nerds to handle the networks, platforms, and software. So they speak in megabytes, and you speak in megabucks. They seem like very different animals—but they're not. In the world of Big Data, companies have become utterly reliant on processing massive amounts of information. Now, you simply can't afford anymore to keep those blinders on between your running the company and the data engine that fuels it. Whales die without abundant krill. Given that you're not about to get a Ph.D. in computer science, what you need is a translator, someone to bridge the deadly communication gap between technology and business leadership.

PHYSICIAN, HEAL THYSELF

We've entered a daunting era of information overload – **The Four V's** – in which excessive volume, velocity, variety, and variability of data drive – or should drive – corporate decision-making. But companies that tackle this task tend to look

outward, toward customer acquisition or retention, for instance, thinking this instinct makes sense. Yet most companies, from large to small, can see significant savings by focusing their energies on studying *internal* data to streamline their sales process or accounting procedures, or to link disparate systems in their supply chain, as examples. *Eliminating bottlenecks and cutting waste equals immediate and substantive savings.* What's the nature of your internal ecosystem, and could it be healthier? If you're mired in quicksand, there's no point in dreaming about a blue sky. And whose responsibility is it to extricate your company from the muck? Surely it's not the I.T. director's.

TAKE AWAY THE PAIN

What hurts you most as a business leader? It probably stems from one of these **Five Common Data Deficiencies**:

1. Lack of clarity about your internal processes and procedures
2. Lack of instant access to critical data from all facets of your operation
3. Lack of seamless integration between the logistical systems of your company
4. Lack of understanding of the capacity or limitation of your present and available technology
5. Lack of knowledge about the relative success or malfunction of any given product, service, department, employee, or piece of software.

In short, it's the irony of a *lack of information in an information age.* What you don't know about what you could be doing better hurts you most. This is what we mean by data ecology. What you need is to learn how to become a data ecologist in your own company.

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INTRODUCTION: BIG DATA IS GOOD NEWS

In God we trust. All others must bring data.

—W. Edwards Deming, statistician, professor, author, lecturer, and consultant

YOUR HERO'S JOURNEY

You're in business for a lot of reasons, but we can summarize them in just one-way: You want your business to thrive. You want to ensure your company's health, and you measure health with wealth. Such *wealth* equally entails security and market space, self-confidence and growth, good PR and respect. And, we must never forget, pure profit. But over the past 25 years alone, the business environment has undergone a massive iteration greater than all the changes of the past 5,000 years combined. Yes, fundamentally, we're still all working in a marketplace, a bazaar where we must succeed at the **Four S's**: sell our wares, struggle against competitors, serve our customers, and support our products. But the ways that we conduct all those operations have changed dramatically.

The most significant change comes down to Data Ecology. Heroes in every industry are nimble; those who have learned to adapt quickly depending on conditions uncovered by constantly updated information from their individual business environments, as well as [embodying] more global trends. Nowadays that means collecting and mining through mounds of data—some internally generated, some externally available.

The problem is there's so much data that it confounds our usual processes and machinery, making it hard to sort though quickly and effectively. That makes it challenging, and sometimes impossible, to make wise decisions. In fact, that's the basic definition of *Big Data*—any collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools, traditional

data processing applications, and available human resources. That means either you can collect all that data but don't have the means to process it—or you don't even know that you can collect it in the first place using the resources you do have. And then there's this problem: Assuming you do collect and store data, do you know what to do with it? How do you determine what information to save and what to toss?

The hero in your space is the guy or gal who determines answers to the following issues, which we call the **Data Hero Top Ten Questions**:

1. Who should be in charge of this data job? (The hero should)
2. What are his or her key goals?
3. What data can he or she collect using the tools he or she already has?
4. What data should he or she collect based on its relative value?
5. What help/consultation he or she needs?
6. How to lead and manage his or her I.T. resources?
7. What new technologies, if any, he or she needs to make this happen?
8. How does he or she filter this data effectively to avoid the fluff, and focus on the valuable?
9. How to analyze the meaning of the data?
10. What are the decisions to make based on this analysis?

THE DATA BLIND WILL NOT SURVIVE

Let's take a simplified example. Imagine a shop owner who sells amber trinkets in a family-owned business. He's learned from the example of preceding generations what he needs to know to sell his wares to any number of different customer types. His agility depends upon his familiarity with his customers' cultural preferences, his careful study of their apparent wealth and status, his knowledge of the psychology of buying, and so on. And he might conduct an occasional reconnoiter of his competition, adjusting his products and prices depending on what else is on offer nearby, and the relative placement of his shop in this vast marketplace. This shop owner can achieve what seems to be relative success. Ironically, this fellow doesn't know he's flying blind.

Now imagine one of his competitors has instant access to trillions of bytes of information regarding all the transactions that take place at the bazaar and beyond. He receives wise counsel on how to sift out the meaningless mass of metadata, and hone in on only the relevant information he needs to succeed. The data let this shopkeeper know that his average customer has a relatively high net worth ($250K+), purchases 70 percent of his jewelry online, and routinely visits artisanal gold jewelers'

Facebook pages. Furthermore, although 75 percent of the visitors to the nearby trinket shops are men traveling on business, 95 percent of those men are buying gifts for significant women in their lives, and more than half for anniversaries and birthdays. Among the anniversary shoppers, about two thirds are purchasing for "silver," "golden," and other major anniversaries. Lastly, this seller learns that even among the remaining 25 percent of tourist visitors to the shops, split evenly between male and female, the women make the vast majority of the buying decisions.

This shop owner responds by ordering a line of more expensive gold, silver, and semi-precious jewel necklaces, and displays them prominently in his shop. He modernizes, and sets up an online shop that focuses on slightly higher-end pieces of jewelry, featuring anniversary metals and birthstones. He also spends a little money on links to his updated social media sites.

But where did this "data" come from? It's not magic. This shopkeeper understood that *instinct is important, but information is critical*. He collects small amounts of information from his customers, not enough to cause them a nuisance, and then spends time analyzing it. He also confers with his competitors. He looks for larger data sets available online (the countries from which most tourists travel to his country; the average amount they spend on their trip, their disposable income, their buying histories, etc.). He carefully reviews his sales history. He also studies all the internal data he can collect. How long does each of his salespeople spend with each customer, and how often, on average, does each of those interactions lead to a sale? He knows the problem he wants to solve – find a higher end product and sell more of it – knows what information he needs to collect to make that happen, and what to look for amid that data. Then he acts on it. He decreases the number of salespeople on his floor, from five to four, eliminating the least productive. He trains those remaining to spend more time and energy on certain customers—perhaps the women making the purchasing decisions—on certain products, on certain kinds of pitches, etc.

The key to this shopkeeper's triumph is his ability to determine *what insights are actionable*. Organizations see a potential boon in such actionable insights derived from Big Data, not only to sell more widgets and services, but also to better manage healthcare, stop the flow of counterfeit drugs, locate terrorists, and maybe even track an entire nation's cell phone calls and emails. Hence, it's a given that Big Data isn't inherently good or evil. It's a problem-solving tool. It's how you use it that makes it valuable. If your bottom line is about increasing profitability by better serving customers and eliminating waste, then you need to know what information will be necessary to make that happen—and *you* need to make it happen.

DETERMINING ACTIONABLE INSIGHTS—THE THREE A'S

Business leaders must make collecting, studying, and using Big Data an ongoing process, ever-adapting to changes in the marketplace, conditions on the ground, and internal circumstances. Think of the process as the **Three A's of Big Data Ecology**:

1. Automation
2. Analytics
3. Actionability

Automation manages the data. It's vital for survival in an age of constantly proliferating information. *It's not how much data you have, but how you organize the data, how quickly and efficiently you can sort through it to access what you need that counts.* Nowadays, all companies potentially suffer what's called "data hygiene" and integration issues. That simply means that Big Data comes from a number of sources, and always in multiple formats. It's heterogeneous, and needs to be homogenized if you are to make any sense of it.

Don't overthink this. Just consider whether your sales software can talk to your inventory software and your auditing software, and whether you as business leader can access all of that information quickly and easily from a single source. Fortunately, this problem is not usually the monster many people make it out to be. Business leaders task their I.T. team to solve this problem, and watch them spend inordinate time on this tedious chore, all while postponing the important thing—*taking action on the data science.*

Without automation, Big Data is the proverbial needle in the haystack. Automation is fundamental to sorting through, cleaning, and updating data—that's the definition of "data hygiene." You can't unlock the value of Big Data until you wrap such automation around it. You need to automate in order to normalize data and integrate it within your current systems. However, you also need to do it on a continuous basis, in order to produce fast, real-time results, necessary to act nimbly in a mutable marketplace. That's the definition of automation.

As a business leader, you don't need to become a wizard at robust machine learning algorithms that take analytics to the next level. You just need to know the algorithms exist, and you probably need to implement them—or supervise their implementation—at some level. But you almost certainly need to leverage existing and also propriety software to discover the hidden patterns that affect your bottom line. With guidance, you can learn from this machine-generated (automated) data, what is important to view and examine—and what is not.

Analytics *masters* the data. We could write thousands of complex pages trying to explain analytics. But to the average small- to mid-size business leader, Big Data analytics means simply this: the process of examining large data sets containing a variety of data types to uncover hidden patterns, unknown correlations, market trends, customer preferences, and other *useful business information you can use to make adaptive decisions in the marketplace.* You've managed the data. Now you master it. Essentially, you're looking for detailed, novel solutions to solve specific problems. Sometimes you're searching for the problems themselves.

In any case, Big Data analytics gives insight into solutions that you cannot see through traditional means, or provides you confidence to further explore them. Big Data analytics not only offers insights that traditional analytics overlook, but it also helps create more efficient infrastructure and streamlined operations. Analytics supports your business objectives, and helps integrate those values into the model.

Action *deploys* the data. It's the final step. Using Big Data analytics, you can streamline your systems and processes to become faster, more efficient and above all, take action on your core business objectives. Deployed wisely and rapidly, Big Data can yield a high ROI, even after factoring in startup costs. To successfully take action on your Big Data solutions, you must align those solutions with your key business objectives, they must be easy for employees to implement and support, and, perhaps most importantly (and often overlooked), they must be *completely integrated into your company's operational procedures.*

Big Data is growing exponentially—experts anticipate a 4,300 percent increase in data generation by 2020. And let's be clear. Unless you incorporate a plan to properly manage and leverage Big Data into your company culture, and initiate a targeted campaign for deploying resources based on the key information you glean, you risk getting buried. Without a solid plan aligned with your business objectives, that is, one that includes Automation, Analytics, and Action, you will miss out on an elegant solution with a solid return on investment.

But, you might wonder, isn't this sort of Big Data plan only for the Big Guys?

BIG DOGS

There's no doubt that that bigger the whale, the more krill it needs to survive.

Take Walmart, the world's largest retailer, as an example. More than 200 million people visit brick and mortar Walmart stores weekly. Including their online operation, more than a million customers transact every hour with the world's

largest retailer. The company tracks millions of products, billions of customers, and hundreds of millions of keywords entered into social media and other platforms to study customer habits and trends. Walmart stores all this unstructured data in electronic data warehouses with a storage capacity measured in petabytes (1 petabyte = 1m gigabytes). Walmart is the big successful whale that consumes a lot of krill but also knows how to find the krill and decides where to feed as a result. It uses all this data to make smart decisions to maintain its status as the world's largest retailer.

There's a lot at stake here. *If the average Fortune 1000 company increased the usability of its data by just 10 percent, the company could expect an increase of more than $2 billion profit.*

Facebook, which has connected one fifth of the human population with a mouse click, makes a lot of money with targeted advertising based on insights its Data Science team uncovers about us, including how long we "hover" our cursor over certain parts of a page, and what websites we visit. Facebook uses facial recognition software to find out whom we're photographing and posting about. It sleuths and studies vast storehouses of data to determine with disturbing accuracy our intelligence, political leanings, even our emotional stability. In fact, Facebook discovered through a series of covert experiments a few years ago that it could manually alter the collective mood of its 1.35B users by manipulating the ratio of negative versus positive posts it feeds us, and in what order. It is also able to safely predict, with disturbing accuracy, when a user will change his or her relationship status from "single" to "in a relationship."

The bottom line here is not about privacy or lack thereof: Big Data is neutral. But *how* we utilize data is far from neutral. The key in this example is that Facebook used Big Data to develop algorithms to determine which advertisements to flash in front of us while we're surfing, all but guaranteeing their advertisers a healthy ROI. This, in turn, guaranteed Facebook's profitability. What if your company could profit from the research of Facebook's Data Science division? Would you also be the position to give away $45 billion?

Of course, Big Data makes big sense to heavy hitters like Macy's, Progressive Insurance, and publisher McGraw-Hill, not to mention major hospitals and university systems. They've got the need *and* the budget.

MOMS AND POPS

But it's not only huge businesses that see the value added by incorporating Big Data into their metrics. Small business has recognized Big Data's value to their market. This is a good thing, given that there are nearly 28 million small businesses in the U.S. today with 500 employees or less. According to the U.S. Small Business Administration (SBA), small businesses represent 99.7 percent of all employer firms; account for 60 to 80 percent of all U. S. jobs; produce 13 times more patents than larger firms; and, most impressively, pump billions into the economy.

Data consultant Bernard Marr argued just that in *Business Standard* in June 2015: "In many ways, big data is suited to small business in ways that it never was for big business—even the most potent insights are valueless if your business is not agile enough to act on them in a timely fashion. Small businesses have the advantage of agility, making it perfectly suited to act on data-derived insights with speed and efficiency."

Big Data and small business make profitable partners. Small businesses have more specific problems, more limited data sets through which to sift, and, finally, they can adjust much more quickly to information garnered from analytics.

A FEW CASE STUDIES

We made quick work of implementing GPS tracking beacons on all the equipment leased out by a mid-sized equipment rental company. This allowed its leadership team to track detailed usage data, culminating in a decision to relocate a satellite office in a location more amenable to a large population of its renters. This increased sales by 17 percent in the first year. Other usage data we collected through a software overhaul included real time status of the equipment through the network – optimizing what's called the "Internet of Things" – allowing the vendor to proactively realize, report, and act on functionality and maintenance of equipment. This resulted in all the "proof" required for the leader of this company to secure a better maintenance contract from the supplier of one of its lines, and the discontinuation of another.

Similarly, at a small guerrilla marketing company specializing in wild-posting construction sites in major metropolitan areas, we put in place a simple, yet high effective tablet reporting system, allowing the firm's street agents to map, photograph, and document each posting assignment, and record the number of "eyes" passing the advertisements in a given period of time, all of which the agent could upload in real time directly to the client. This increased client confidence, and required the company leadership team to dramatically adjust its estimates – which had been considered industry standard for a decade – for the average time each

passerby looked at the ads (<2 seconds) in key locations such as New York City's Time Square. The aggregated information gathered from this simple tactic caused a major shift in the entire advertising strategy of some of the firm's major clients.

At a mid-sized clothing manufacturer with foreign suppliers and multistate distributors/retailers, we found it necessary to overhaul the entire operation, concluding in the development of a "health technical ecosystem," which allowed the CEO and her core team to manage and report seamlessly on everything from inventory, accounting, sales, marketing, HR, and PR. This realized significant cost savings throughout the entire enterprise. Their goal was to find the funds to launch a new website, which they accomplished by the end of year one.

SMALL BUSINESS, AND BIG (PROPRIETARY AND PUBLIC) DATA

In June 2015, Kevin Tully, writing at *Smart Data Collective*, offered more good news for small businesses regarding Big Data: "Believe it or not, if your company has been operating for a year or more, you likely have a ton of 'Big Data' sitting in your company records. If you've been keeping track of your sales in a ledger of some sort (excel, QuickBooks, etc.), then you have an excellent set of sales statistics to cross-reference with other information in your tool chest."

And beyond your own books, you can access massive data sets online – some for free or nearly free – on everything from weather patterns, utilities consumption, demographics, sales histories, consumer spending habits, travel routines, parking locations, competitors' sites, among other things. The information is there; it's literally beamed out all over the place. You just have to know what information would help your bottom line decision-making, and where to look for it. According to *Forbes*, small businesses have access to Big Data in the same way they have access to big infrastructure through Amazon AWS, Microsoft Azure, or any other IaaS provider. In the same way you can now lease massive processing power, *you're no longer locked out of taking advantage of Big Data simply because of your size.*

In 2014, *Business News Daily* reminded small business leaders you can start with Google Analytics and graduate to other "business intelligence" providers. There are so many public sector sources available now that the main problem is choosing among them. And, according to *Forbes*, "the basic tools to make sense of the data are also free and becoming increasingly simple for anyone to use." When you compare and contrast the data you're collecting with this more "public" data, a world of information opens up to you.

Background: What's the Real Problem?

Bad data or poor data quality costs US businesses $600 billion annually.

—Chad Luckie, Digital Marketing Analyst, *Fathom*

Data Tsunami

Given all we know about Big Data and the reality that it's now permanently ensconced in a majority of our business-, social-, and governmental endeavors, why don't we all just tap into the spring, and nourish ourselves with its bounty?

It's obviously more complicated than that. For one thing, the sheer volume of data is daunting. In 2011, humans created about 1.8 zettabytes (ZB) of data. A zettabyte is a trillion gigabytes. That would be equivalent to 200 billion high-definition movies that are each at least two hours long. It would take one person 47 million years to watch all those movies—that's a lot of popcorn. That number has doubled, exponentially, every year. Now, The Internet of Things (if we add in our thermostats and Boeing aircraft engines and automatic Cloud backups, etc.) will generate a staggering 400 zettabytes (ZB) of data a year by 2018, according to a report from Cisco.

It's also the astonishing velocity with which this data arrives. The aforementioned Boeing 787 aircraft generates data at a rate of 40TB per hour of flight; a Rio Tinto mining operation can generate up to 2.4TB of data every minute.

And it should be obvious that variability rules the day with data. For example, just one single weather app, Accuweather, receives and processes more than 9.5 billion digital requests for accurate and personalized weather forecasts daily from locations all over the world—every single one is different, and changes constantly.

And each differs from the kind of data that say, Google Maps, requires, directing you from San Francisco to San Jose. That's where variety comes in. Data is heterogonous, and must be "treated" to standardize it so that it can be compared, contrasted, integrated, and acted upon effectively.

The good news is the vast majority of small to mid-sized companies doesn't need to get mired in minutia or swamped in the information tsunami. The key is to sit down with an expert and triage some goals and objectives where Big Data can play a critical role.

THE WHAT VS. THE WHY AND HOW

It's human nature for each of us to focus narrowly on what we know: our individual areas of interest, knowledge, understanding, and confidence. In business, we have assigned the production (if not the analysis) of data to I.T. managers and their departments. I.T. boasts a particular intelligence and its own language, and this task *seems* to belong to them. When I.T. asks management for the newest hardware and the most up-to-date software, business leaders tend to acquiesce. After all, it's I.T.'s job to know all about technology—that's why you hired them. Your job is to provide I.T. with a budget, and step aside, right? You know what you know and you aren't about to learn what they know. Besides, their language is foreign to you.

And when management asks I.T. for a solution to a problem, they're typically sketching ideas on a napkin while asking the techies to build a skyscraper. Either way, the two "sides" are not working together toward a common objective. Neither is producing the blueprint for that skyscraper.

Soon enough, I.T. begins earnestly producing – or ignoring – enormous amounts of data. You have reams and reams of WHAT's available, saved onto various hard drives and backup drives in the Cloud or at data centers in Dubuque. Suddenly your business' data ecosystem appears to be up and running. But is it? What do YOU know about any of it? What good is it doing you as the organization's leader? Have you mastered any of it? Have you even managed any of it?

The Walmarts and Targets of the world spend vast amounts of money to create and design their own ecosystems. We all know there's nothing you can't do with endless supplies of time and money. Just look at Facebook's eerie forays into mass psych warfare. The big guys of the world turn to the newest rage in I.T. and customize it. Hadoop is a great example, as everyone agrees it's the software gold standard in big data processing. It's the software big companies *need* to process huge amounts of information. Hadoop is technically free, but can be very expensive to implement, especially when you start adding all kinds of associated platforms and build an environment to support Hadoop clustering. And however powerful or costly, **Hadoop doesn't know what data to manipulate, why to use only that data, nor how to answer the questions the data might suggest**. Only you can know that. That, in fact, is the essence of your job.

No software program, no matter how powerful or expensive, can tell you WHY all that information is important, or HOW it can help you reach your goals, or enhance your bottom line. Big companies have entire departments for analytics that mid- and small companies can't afford anyway. But those latter companies face the same challenge, on a different scale. The WHAT is readily available: Sales numbers, margins, inventory data, customer demographics, conversion rates, etc. But the WHY and HOW are up to you to determine, even if you're using modest internally-generated data and online resources or bought lists, and the like.

That's the real problem here, and the good news is we can almost always solve that problem by sitting down with key stakeholders across the company and asking some penetrating questions. To reveal deficiencies, we must conduct an honest inventory that incorporates technical know-how and corporate vision.

BE A DATA DR. DOOLITTLE

More often than not, business leaders need a master translator to help them understand what sorts of data are available, and how and why they would be useful to understand and act upon. The master translator can help the business leader see the utility of all the WHAT and move Big Data to HOW and WHY. In that translation, the business leader will better understand his or her business ecosystem.

Big or small, data ecosystems constantly change and evolve. And we know from history that today's Hadoop is tomorrow's Dodo bird. That further complicates things for your business, especially long term. Ideally, you find a resource person who teaches you the basics of this translation, guides you through the questions to ask, and the techniques for interpretive analytics—no matter where your business is in its evolution. This way you're not permanently reliant on consultants every time the wind blows or, God forbid, crisis strikes.

Keep in mind; you already have data systems in place. Even if you haven't optimized them, or even scratched the surface of what they can do – even if you haven't spent a fortune on technology – you have a business ecosystem driven by data. All businesses – large, medium, or small – run on large amounts of data available internally and externally. Why is that data important? How can we get disparate smaller systems in our business to work together to utilize the data? *Ultimately, it's all about understanding the interoperability of the whole system*.

Think of yourself as the Chief Ecological Officer of your company, responsible for the overall health of those systems. Remember, the thighbone's connected to the shinbone, and so on. Only you can keep all those parts working together seamlessly as a single, functioning, thriving organism.

IF YOU BUILD IT …

Given the short life expectancy of technology in the face of newer and newer products, do you just scrap what you have and start over again every few years? Has your business ecosystem evolved to the point of extinction? To use another analogy, are you being asked to tear down the building you've carefully designed and constructed—to build an entirely new structure for reasons and functions you don't quite comprehend? Or is there a way that the building's original foundation can serve as a platform to design custom, highly functional architecture that will get you to your goals? Is your current system scalable? Can your ecosystem continue to evolve? Do you have the knowledge to answer those questions today, on your own, or would consultation help?

If you have an I.T. department, or even an I.T. "guy," you have business ecosystem fully catalogued by genus and species by information scientists—but something is missing: true wisdom. What do you truly understand, even with all that information at your fingertips? Why is it relevant at all? Again, you have all the WHAT, but you really need is a way to use the WHAT to get to HOW and WHY.

This requires *expertise in identifying your pain points, then uncovering data-based solutions*. Typically, problems include decreased profitability, bottlenecks that cause waste, and departments/individuals in your company acting as "islands" without bridges between them, perhaps through no fault of their own, but owing to systemic flaws. The information you need to uncover these problems, and to heal them, is almost certainly available, if you know where to hunt for it.

Generally, businesses are data rich and analysis poor. Ultimately, as the Harvard Business School has argued, we must understand and analyzed data *with very specific goals and targets in mind*. The savvy business leader knows where the company must go in the future. I.T. knows – or should know – all the information that technology has produced and can produce. But, a veritable Grand Canyon stands between them. How do we build the bridge between the production of Big Data and the utilization of Big Data as a superhighway to business success? How can you best get from the WHAT of descriptive analytics to the WHY and HOW of both predictive and prescriptive analytics?

In the answers to these questions lie both wisdom and a competitive advantage.

SOLUTION: DATA ECOLOGY

Poor data can cost businesses twenty to thirty-five percent of their operating revenue

—Lloyd Marino, Big Data expert, Avetta Global

AN ECO-SAVE FOR YOUR BUSINESS

Clearly, efficient hardware coupled with appropriate software can provide us with all sorts of information points. This is one important function of technology today. However, as we have argued, getting the WHAT is only part of understanding the business ecosystem. *No information is valuable unless it gets us somewhere specific.* A good business leader can envision where his or her company needs to go and how the business needs to evolve. However, between those two knowledge sets is a gap. Bridging that gap requires someone who understands both the business and the I.T. worlds, someone who has one foot in each world, having evolved out of both.

In big business, the solution is to hire a whole department of analysts, a "dream team" of Data Scientists. Obviously, small and medium sized businesses do not have the resources to do that. And, anyway, our world increasingly demands we all become our own Data Scientists, so you might as well start your training now. Whatever you do, though—don't leave it up to I.T.

Getting to HOW and WHY will not happen if you leave this problem up to I.T., no matter what hardware and software they tout and roll out. One respected tech blogger, Sergey Sheinblum, argues that ultimately smaller businesses (and big business, too, to some degree) need human help—they need people outside their infrastructure who can see with unjaundiced eyes what a company has and what it needs from a data perspective. I agree wholeheartedly.

Even where Big Data works, as a writer for *Mashable* notes, it "still requires the human touch" and, "you need the right tools and the right people to use them." You, as the leader and visionary behind your business, need to position yourself as that human. But you likely need an expert to get you there.

Now, let's say that a small or medium sized business takes the leap from WHAT to HOW and WHY and action. How can that eventually lead to a major impact on the business?

REAL WORLD APPLICATIONS: MORE EXAMPLES OF MODEL DATA USE

According to a new survey commissioned by Dell and conducted by Competitive Edge Research Reports, 41 percent of mid-market businesses have one or more Big Data projects already in place, with another 55 percent planning to start one in the near future. A full 80 percent agree they need to better analyze their expanding data collections, and *89 percent of those mid-sized companies with a Big Data initiative in progress report significant improvements in company decision making*. These company leaders have decided first that they can't afford not to take on these Big Data projects.

But the average small- to midsized business doesn't necessarily possess the resources required to mount a massive Big Data project. Big companies have Big Data solutions available because they have big money to buy big platforms. What about small and mid-sized companies? Again, you already have significant intelligence available internally. You just have to know where to look for it, how to study it, and what to do with it.

As a business professor in the Ourso College of Business suggested: "most businesses use accounting, payroll and customer relationship management software that include some basic analytic tools." As a writer for *Entrepreneur Magazine* notes: "A big-data solution for small businesses must allow them to choose only the capabilities they need and leverage the solutions and systems already in place."

A good data strategist can help the business professional determine how to optimize legacy systems without tremendous cost—and in the process help the bottom line. Those choices and that solution are best led by you, not I.T., and ideally guided by someone who understands both the business and I.T. functions.

Then, the right questions need to be asked. The focal point here is "a quantitative understanding" matched with a "qualitative understanding of the problem," or what we have called the HOW and WHY versus the mere heap of WHAT.

Remember, the underpinning of this is problem-solving is determining with guidance the HOW and WHY of things. I.T. can produce the WHAT, but the business leader has to determine the core problem(s). Someone then needs to figure out how to build the problem-solving bridge between the problem and the data. That's not I.T.'s responsibility—it rests on the business leader's shoulders. However, no matter how clear the business leader's vision of the big picture is, there is a utilization problem: How can I use the data to solve my problem?

The solution is a data strategist who understands both sides of the equation—the business side and the I.T. world; someone who knows and can translate both languages – being technically bilingual – and can determine the flow of the business ecosystem. A good translator will analyze how your ecosystem's parts work toward the health of the whole. As predictive analytics expert Meta S. Brown notes: "The process for analyzing big data is the same as the process for eating an elephant; you do it one bite at a time."

The difference between a traditional data strategist and a Data Ecologist is that the latter will, in conjunction with the business leader, figure out where the first bite of the data elephant should take place. *In the final analysis, the Data Ecologist will teach the business leader how to translate the language of data into the communication and action of specific, mission-based, and goal-oriented business success.*

The Data Ecologist is a consultant who can bridge the gap, see the big picture, help determine the pain points, and ask the right questions, focus on the sick parts, and teach the business leader how to do the same.

Small Retail Shop

The approach we took with a small suburban cupcake retailer began with analyzing their captured credit card transaction data, and, using external data sources, determining economic, demographic, and psychographic information, which the business then used to make direct marketing decisions. Once the small business owner has learned how this data is useful, (s)he can apply the three "A's" discussed earlier and determine future strategies for the company that utilize information. In

the case of the cupcake bakery, business increased by 50 percent in the first six months, and the owner has just leased a property to open a second location.

Mid to Large Sized Insurance Company

Think risk avoidance. In previous generations, one knew the customer or business personally and could determine much about appropriate products from that knowledge—at least anecdotally. Today, contacts are more virtual, so hard data is more important to assess risk. Underwriters discovered the utility in aggregated data centuries ago, hence the advent of actuarials. Nowadays, insurers might use weather satellite data, employment statistics, or detailed driving histories to determine risk on real estate or car insurance underwriting. Health insurers still use highly advanced actuarial data to underwrite policies.

It's obvious, isn't it, that if you knew for a fact that 76 percent of all 34 year olds diagnosed with Type 2 diabetes would have heart attacks by age 68, and the treatments for those heart attacks would cost on average $217,000, that would influence the proposed rate?

Now think product personalization, where again data is key. "Scoring models of customer behavior based on demographics, account information, collection performance, driving records, health information, and other data can aid insurers in tailoring products and premiums for individual customers based on their needs and risk factors." Progressive Insurance is famously getting data from the OBDI ports on cars, and using drivers' habits to determine rates. Industry experts estimate 25 percent of future auto insurance revenue will be based on miles traveled and how those miles are traveled, otherwise known as "telematics." Ultimately, and very meaningfully, though, *the way to use the data was, is, and will be determined by humans, not software.*

We help such companies increase revenue by wedding the tech touch with the business vision, and training key stakeholders to vest in themselves the responsibility for decision-making based on analytics.

Small and Medium-sized Client Services

The strategies we've outlined in this white paper works particularly well in mid-size client services firms. For example, consider a ghostwriting firm for which we consulted last year. The partners had good instincts about their future, but hadn't studied their past scientifically. What were their conversion rates from web traffic?

From direct marketing? What percentage of their new business came from referrals? Was there commercially available software to streamline their production process, which included multiple writers, editors, agents, designers, and clients? How much time were their subcontractors really spending on projects (as measured by their hours logged into the company portal, and how did that translate into a premium margin to the partners?) How much time did the partners spend on selling new clients instead of writing for current ones? Did the answer to that question (50 percent of their time) mean that they should hire more top writers—or a sales manager? After a month of such analysis, the firm made a few key decisions, and increased their monthly margins by 28 percent, even after new hires.

Mid-sized Private College

A college about 25 miles from New York City has a major problem, determined to be employee turnover, poor productivity, and low job satisfaction. We can connect this college to an online interviewing service, utilizing externally-sourced Big-Data for recruiters and HR departments. This hard data – called "XQ" factors – is used for hiring decisions by companies worldwide. It's no longer about "gut feelings" in the employment industry, but decisions borne of information culled and processed from detailed queries developed by the US military and other institutions, and carefully vetted against performance.

Employers are increasingly resorting to such Big Data analysis of millions of personality tests to facilitate the hiring of workers. (These tests are also used by employers to check the personality traits of candidates for promotions or transfers.) This approach has worked for big companies for years, and has resulted in a 20 percent reduction in attrition for new hires at Xerox. It's knowing that *asking the right questions is a function of humans understanding how data can best be used to solve the problem,* in this case, of employee turnover. We estimate a staggering ROI for this college.

Mid-sized Zoo

Along similar lines, a Pacific Northwest animal park used a combination of data about patterns and trends in visitors' exhibit preferences and their feedback on Facebook, to market and enhance visitor experiences. The result was a 700 percent growth in

online ticket sales. If 90 percent of your customers respond to your polar bear exhibits, and only three percent take any interest in the lemurs, Pareto's 80/20 Principle tells you to invest more in the big white bears, for they will pay you back in spades. Again, once a business leader learns how to act on extant data to solve a business problem, that's learned forever.

In the final analysis, we can solve the problem of Big Data in the nexus between the information and its *meaningful translation*. That is a human nexus—not a software problem, not an I.T. challenge, but a leadership challenge. Business leaders need to take the responsibility for the use of Big Data, learn its language, then use that knowledge to advance their businesses.

THE COMING REVOLUTION

Both business and tech experts have widely heralded Big Data as the agent of a third industrial revolution—"one with raw materials measured in bits, rather than tons of steel or barrels of oil," according to Mark Huberty in the *Journal of Industry, Competition and Trade*. But a key feature of the industrial revolution was that it transformed not just *how* companies *produced things*, but the fundamental *way* they *created value* within the economy. That's why they called it a "revolution." Has Big Data managed this kind of transformation yet?

It looks as though companies are collecting and analyzing data to "scale old modes of value creation, rather than invent new ones altogether." Ideally, the Data Ecology model will seek answers to deeper questions, even as it helps secure the bottom line. It will explore occult data we've yet to study, innovate solutions, and adapt business ecosystems in response.

Big Data Market Revenue - Global
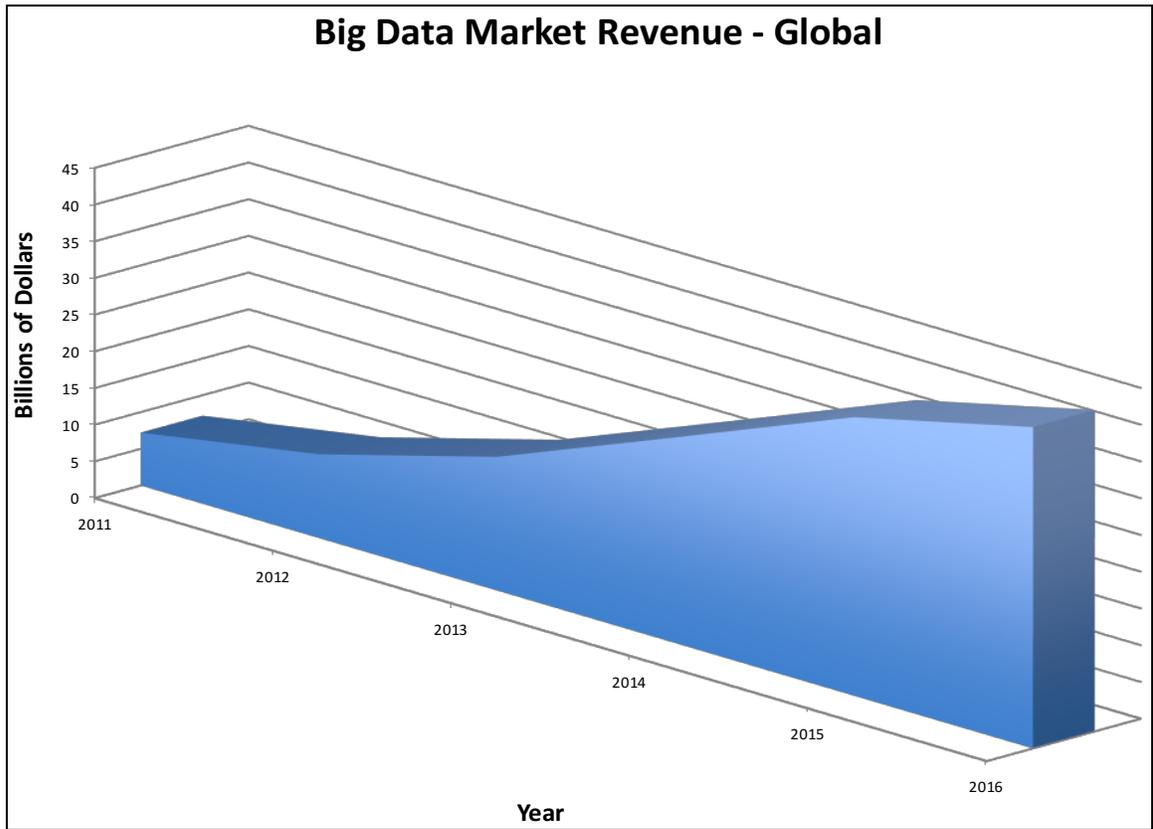
Conclusion: It's Your Move

Business environments are data rich but analysis poor. Savvy business leaders will not assign responsibility for the analysis and use of Big Data to I.T. They will accept that responsibility. I.T. might know the WHAT, but only you as the business leader knows – or should know – the HOW and WHY. But how we get from WHAT to HOW and WHY is the key to everything you as the business leader needs to accomplish. It's really a question of the limits of knowledge. Do you know how well your company's disparate departments and entities and their systems interact with each other? Do you have personal access to data at each stage of your production, sales, service, and other processes? Do you know where the bottlenecks in your procedures are?

You might very well require new software. But new software and equipment alone cannot build the bridge between these two areas of expertise. What most companies need is a translator, someone who understands the language of both I.T. and business. A translator can help you as business leader learn to expand your knowledge base, help you learn exactly how the business ecosystem works, and how all its parts interact.

It's not just a question of better and more advanced technology—it's a human question. As Atul Butte of Stanford University writes, "Hiding within those mounds of data is knowledge that could change [a life], or change the world."

Only a human can turn data into knowledge.

Big Data Market Revenue by Type - Global Percentage

Hardware ■ Software ■ Services
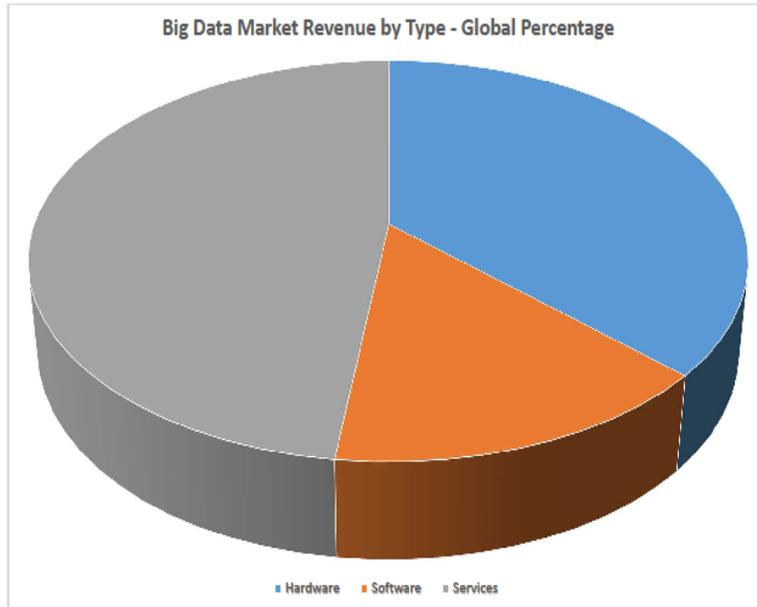
Because you as the leader know where your business must go, you needs to take hold of the wheel, steer your business across that bridge and down the road to success. Big Data might provide the fuel, but as the business leader, you – not some guy in the I.T. suite – should sit in the driver's seat.

Once the data strategist/translator has fulfilled his or her role in training you as business leader in Data Ecology, it will be up to you to maintain the health of your business ecosystem.

When you decide to take on a Big Data project, you can join mid-size business leaders who expect these **Top Four Big Data Hopes**:

- Faster response to opportunities and threats (57%)
- Improving efficiency (57%)
- Improving customer experience (48%)
- Gaining competitive advantage (43%)

And after implementation of a Big Data project, leaders cite the following benefits most often, what we call the **Top Four Big Data Benefits**:

- Better communication and knowledge sharing (51%)
- Gaining competitive advantage (51%)
- Improved efficiency in business processes (49%)
- Improved customer experience and satisfaction (46%)

In the modern age, Big Data is vital to any size business. It can help you as business leader understand exactly where your business is, has been, and needs to go. Importantly, a business leader who has accepted the role of chief ecological officer has taken charge in the most important ways—you have used the human intelligence gained from an expert translator in order to utilize the three A's, and to translate and interpret Big Data to determine the most appropriate pathway to success now and in the future.

CITATIONS / ADDITIONAL RESOURCES

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