Considering the Data Analytics Revolution and Lessons for Christian Business Faculty

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ABSTRACT: Data is playing an increasingly important role in business. The demand for skilled data analysts and data scientists is growing rapidly. In response, universities and colleges are creating new programs to meet the swelling demand and distinctively Christian universities and colleges, too, are adding programs in data analytics. This paper comments on the trend toward data-driven decision making and offers both exhortation and caution to Christian educators and practitioners moving in this direction.

INTRODUCTION

Data analytics is transforming business practices across many industries. Retail, especially online retail, businesses are among the most voracious consumers of data analytics. Applications, though, are wide and varied from litigation, to health care, to logistics, and even higher education.

Many widely cited statistics around data analytics come from industry publications. This is not surprising given industry's appetite for analytics skills. A 2011 report from McKinsey & Company's research arm, McKinsey Global Institute, forecasted a talent shortage of between 140,000 and 190,000 people by 2018 (Manyika et al., 2011). *Harvard Business Review* and Deloitte forecasted significant skill shortages around the same time (Davenport & Patil, 2012; Davenport, 2013).

In 2016, consulting and technology firms recognized continuing shortages in talent despite the creation of new college and university programs in analytics. The top schools were the most aggressive to respond with all but seven of the top 150-ranked national universities offering formal analytics programs (Tableau, 2016). Overall, four-year colleges and universities responded more quickly than two-year colleges, but both are lagging the top-tier schools. Only 20% of four-year colleges and 2% of two-year colleges offer formal analytics programs (Tableau, 2016).

A survey by PwC, Gallup, and the Business Higher Education Forum (BHEF) found that while 69% of employers prefer graduates with data analytic skills, only 23% of educators said that all of their graduates would possess such skills.

The shortages are not solely about the volume graduates but also a skills mismatch. Neither supply side nor the demand side have defined what skills characterize data analytics and data science. For example, 32% of data analytics programs focus on business analytics (Tableau, 2016). Indeed, most analytics programs are offered by computer science or statistics departments. McKinsey, however, identifies roles like "Business Translator" to connect analytical talent with business applications (Henke et al., 2016).

One goal of this essay is to highlight the disconnect between business education and data analytics training. Another goal is to highlight potential pitfalls associated with industry's demand for and reliance on data analytics as relevant, reliable, and meaningful information for decision making purposes (Spetzler, Winter, & Meyer, 2016). This essay seeks to encourage Christian business faculty to proactively engage with other departments as they consider offering data analytics programs. Finally, the recommendations here are meant to encourage Christian business and data analytics students and practitioners that engage the business world with data and data analytics.

POTENTIAL PITFALLS

In this section, we describe some anecdotal observations of data analytics from our experiences with different organizations. It is clear that businesses of all kinds are keen to apply data analytics despite talent shortages and skill mismatches. In our experience, though, this enthusiasm manifests in different ways. In some organizations, in-house staff are being equipped with new analytic skills with staff enrolling in certificate programs, massive open online courses, and other online, non-degree programs. In other situations, businesses are making more use of consulting services. For example, small, regional banks without in-house analysts hire external data analysts solely to support their regulatory stress tests. In yet other cases, businesses are engaging in strategic partnerships with data analytic specialists to support long-term planning. Technology and healthcare companies can collaborate to use analytics to find new treatments and to accelerate drug research. For instance, IBM Watson Health is working with the Barrow Neurological Institute to help identify new targets for ALS research.

None of this is new, of course. Markets reward those who are resourceful, strategic, innovative, and adaptive. We caution, though, that the swift rate of adoption may be outpaced by a swifter trust in data and the analytics itself. Overemphasizing analytics could be problematic when stakes are high because investment outlays are large, time horizons are long, and success is uncertain. Yet, it is tempting to trust in data and data analytics and diminish the uniquely human role and capacity to interpret and discern.

Potential Pitfall 1: Data Comforts and Volume Reassures

Hard decisions are those that involve some uncertainties, multiple stakeholders, conflicting objectives, long planning horizons, a high degree of complexity, limited resources, or some combination of these (Clemen, 2013). In these cases, human decision makers are prone to making mistakes, inappropriate simplifications, psychological heuristics and biases, and even experience a dose of bad luck. The possibility of making the "wrong decision" or a "bad decision" (or litigation) is frightening.

Statistically, more data and larger sample sizes reduce standard error estimates, which in turn narrow confidence intervals. Tighter "confidence" intervals give decision makers comfort, in both a statistical and emotional sense, that they are making decisions based on relevant and reliable information. Statistical and emotional comfort may be appropriate when historical data is relevant and reliable, but this is not always the case. For example, no amount of historical data can predict with certainty how consumers will respond to a completely new product. Statistical and emotional confidence is misplaced because the random variable being estimated is, by definition, unpredictable. Even when statistical confidence is appropriately high, it is important to remember that inference provides no guarantees. Analysts and decision makers may have enough evidence to draw a conclusion, but they always face the possibility of erroneously rejecting true hypotheses or failing to reject a false one. Yet data analysts act with an inflated sense of confidence, and decision makers act with an inflated sense of control over their environments. They believe they have power and influence over their environments when in reality they do not.

The temptation to trust in data and data analytics is increasingly intense because data is relatively inexpensive to store and analyze. Unlike other raw materials, which are consumed with use, data can seem to be truly abundant. Data is easy to collect and store and is reusable for multiple purposes. If the reports cited above are right, the binding constraint for business is the availability of analytics talent, which organizations are addressing in different ways.

Potential pitfall 2: Data suggests rationality and predictability

In our experience, decision makers give special emphasis to "hard data." On the one hand, data and analysis suggest virtues like objectivity and precision. One the other hand, acting upon experience or instincts seems to be the stuff of whimsy. Intuition and experience yield to empirical evidence even when the data does not agree with intuition or experience. Yet, data is prepared, analyzed, and presented by people with idiosyncratic perspectives, organizational contexts, experiences, objectives, and risk preferences. For example, data gathered for reporting purposes may differ from data prepared for planning purposes. Banks facing regulatory stress tests have an incentive to demonstrate their resilience to an adverse economy, whereas the same banks courting investors have an incentive to demonstrate that their capital is well utilized. Even machine learning algorithms that sort through mortgage applications, employment applications, insurance applications, and school applications are learning and codifying human biases. Decision-makers can operate under the impression that data-based recommendations are logical, rational, and predictable. In reality, though, these recommendations depend crucially on the data collected, the data analyst's assumptions, and the decision makers' interpretation of the analysis. Data can be selectively used, distributional assumptions imposed, and analytics output curated to support particular narratives or

organizational objectives. None of this is necessarily devious or even deliberate. Different assumptions generate different predictions, which may be more appropriate in different contexts and for different audiences. Consider, for example, that financial data collected for tax purposes is often different from data collected for planning purposes. Consider also the multitude of converging and diverging forecasts associated with recent hurricanes, forest fires, and mudslides.

As techniques grow more sophisticated, the paths connecting inputs and output are increasingly opaque. Even the scientists that program neural networks may not understand how the model reaches its conclusions and recommendations.

These two pitfalls suggest a tendency for decision-makers to put data and data analytics at the center of the decision-making process. In the next section, we offer a Christian perspective and suggestions for students, teachers, and practitioners in this field.

CHRISTIAN PERSPECTIVE

In response to these potential pitfalls, we begin with the inerrant and infallible Word of God (Scripture) to help and to guide us in understanding mankind's responsibilities in business and in the decision-making process. This section explores four responsibilities with broad thematic support throughout Scripture.

First, God uniquely created humans in his image. Adam received verbal revelation directly from God to "be fruitful and multiply and fill the earth and subdue it, and have dominion over the fish of the sea and over the birds of the heavens and over every living thing that moves on the earth" (Gen 1:28). This Dominion Mandate means that people, under God's sovereignty, rule, and providence, are responsible for cultivating and fashioning creation, bringing order from chaos, and building a New Jerusalem from the Garden of Eden. Data Analytics agrees with this perspective insofar as large volumes of meaningless structured and unstructured data are interpreted and transformed into narratives and insights with meaning and value. The world, and the data that describes it, is being ordered and advanced by analytics.

Second, God is the sovereign creator Lord who gives humans the role as stewards of creation (see, for example, Matthew 25:14-30 or Luke 19:12-27). Humans can take no credit for progressing matters created by God, and therefore ought not to boast of the fruits of their work. Though people earn their incomes off the sweat of their brows, they ought to give thanks for their brows that sweat that allow them to earn the income in the first place. The creation and all its goodness and fruits belong to God. The work of data

analytics involves the faithful and humble stewardship of data, technology, and knowledge.

Third, humans are created to live in community with each other, dependent on God and interdependent on each other. This is evidenced throughout Scripture. Analytics, performed in isolation and squarely in the "back office," does not create value until it is shared. Analytics also creates community by providing a platform to share diverse gifts God imparts on different people and unifies people around particular views of the world.

Fourth, doing good and faithful analytical work is hard. Consciously or not, human beings rely on God and his revelation to interpret the environments in which they live and work. People are dependent on God's law and Spirit-guided wisdom to discern the information they receive, collect, analyze, and act upon.

Consider, for example, the story of the fall. God instructed Adam, "You may surely eat of every tree of the garden, but of the tree of the knowledge of good and evil you shall not eat, for in the day that you eat of it you shall surely die" (Genesis 1:16-17). When Eve was tempted by Satan, Eve syncretized God's words, the prohibition command given to Adam, and Satan's words. Eve adjudicated the decision to eat the forbidden fruit using her own assessment, reasoning, and standard (Genesis 3:6). In the pre-fall state, Adam and Eve faltered when presented with perfect information from God when he provided clear commandment and communicated clear consequences.

Data is generated, collected, analyzed, and synthesized by fallen people in a broken world operating within complex systems. People have limited knowledge, cognitive power, time, and energy. Their interpretation of data is prone to biases. The tools we have are imperfect; economic models of markets and economies are only abstractions of reality. Even in idyllic conditions, there are still ethical issues around the storage, use, and privacy of data. For decision makers, the consumers of the analytics, good and bad data and data analytics may be indistinguishable. We should, therefore, recognize that fallen human beings will struggle with data and data analytics, and applications.

As an example, consider recent natural disasters that plagued the United States in 2017: hurricanes in gulf coast, fires and mudslides on the west coast. Data tells us that each one of these was a once-in-a-lifetime event. Analytics produced a multitude of predictions (so called "spaghetti plots") with wide variations that often contradict each other. In each case, people needed to interpret, discern, and make decisions about whether to evacuate or not and these decisions had significant humanitarian and economic consequences. Despite the many challenges asso-

ciated with real-life data analytics, our scriptural responsibilities remain unchanged.

SUGGESTIONS

How can we, as Christian business educators, help our students navigate these potential pitfalls? We have four broad suggestions:

1. Frame data and data analytics within a context of Christian theology of human beings

One prominent theme in this discussion is a temptation to move data and analytics to the center of the decision-making process. An appropriate theology ought to recognize that even though people are "only stewards" of God's creation, they are still ultimately responsible for the decisions they make (though not necessarily the outcome).

An appropriate theology ought to recognize that the greatest need of humanity is not abundant data, sophisticated technique, or perfect predictions. Data analytics, or indeed any manifestation of human wisdom, cannot correct or redeem creation from its brokenness. Rather, humanity needs redemption so the only solution is the atoning sacrifice and the life, death, and resurrection of Christ. In a world marred by sin and marked by issues such as disease and death, the hope lies in the new heavens and new earth (Rev 21:4) (Burge, Green, & Cohick, 2009).

Ultimately, the Gospel should instill a sense of reverence for the omniscience, omnipresence, and omnipotence of God; the recognition of the creator-creation order; and a sense of humility. This is also true for those involved in data and data analytics as they use their use of gifts to serve the church and to benefit humanity.

2. Offer classes that develop the human side of decision making

Decision making ought to be motivated by the values of the decision maker. Data collection and analysis should help people understand how their behavior reveals their underlying—and often unarticulated—values, which are an important part of the decision-making process.

Decision analysis (Howard, 1966), for example, is a methodology that emphasizes careful framing, modeling, and reflection throughout the decision process. Although this is traditionally offered as part of a graduate education in business, business and analytics, undergraduates would benefit from this kind of context.

Traditional business classes that focus on strategy and organizational behavior ought to be part of analytics programs. These classes provide business context but also emphasize the human side of management.

3. Foster diverse perspectives

We certainly advocate for business programs having a voice in the creation of data analytics programs. Liberal arts programs, too, have much to contribute to the training of data analysts. Students capable of simultaneously maintaining diverse opinions are less likely to be trapped in narrow ways of thinking.

Schools ought to continue to focus on recruiting students and faculty with diverse academic backgrounds and interests.

4. Enhance outside ties

In the same way that data analytics students ought to have diverse perspectives, they must engage with people from "real-world" organizations. Either as internships or research projects, students ought to be engaged with people as much as they are engaged with data. These organizations may come from any sector: professional societies, for-profit and nonprofit organizations, and church and parachurch organizations.

SUMMARY

The analytics profession is malleable. Data and data analytics play an increasingly important and prominent role within academic and business in the development and unfolding of cultural progression. There is a tendency to "delegate" decision-making, which places disproportionate emphasis on collected, analyzed, and synthesized data. Christian perspective provides the foundational understanding of the role of God, man, and data to ensure data and data analytics is placed and used within its God-given context for Christian business faculty, students, and Christian business practitioners.

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