Business Horizons (2017) xxx, xxx—xxx

Available online at www.sciencedirect.com

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Big data dreams: A framework for corporate strategy

Matthew J. Mazzei [a,*], David Noble [b]

[a] *Brock School of Business, Samford University, 800 Lakeshore Drive, Birmingham, AL 35229, U.S.A.*
[b] *School of Business, University of Connecticut, Storrs, CT 06269, U.S.A.*

KEYWORDS
Big data;
Corporate innovation;
Big data strategy;
Data collection;
Business intelligence

Abstract The phenomenon of big data—large, diverse, complex, and/or longitudinal data sets—is having a stark influence on organizational strategy making. An increase in levels of data and technological capabilities is redefining innovation, competition, and productivity. This article contributes to both practical strategic application and academic research in the strategic management domain by presenting a framework that identifies how big data improves functional capabilities within organizations, shapes entirely new industries, and is a key component of innovative and disruptive strategies used by learning organizations to diversify and break down barriers of traditionally defined industries. This framework provides an appropriate basis for internal corporate strategy discussions that surround big data investments by explaining how firms create value through various approaches. In addition, this we offer guidance for how firms might derive their own big data approach through the merits of aligning data strategy aspirations with data strategy authenticity.

1. The big data phenomenon

As characters walk through the mall in the 2002 science-fiction thriller *Minority Report*, the future is envisioned as a place where various companies can immediately and personally advertise their products to individual consumers using troves of historical data and biometric recognition. As Tom Cruise's character, John Anderton, strolls into a Gap store along with other shoppers, a digitized young woman greets the customers with personalized messages: "Hello, Mr. Yakamoto! Welcome back to the Gap. How did those assorted tank tops work out for you?" and "Hey Miss Belfour, did you come back for another pair of those chamois lace-ups?" With data capture and data analytic capabilities on the rise, this *Minority Report* reality is quickly approaching (see Ghose, Li, & Liu, 2016). We are moving toward individualized shopping experiences both online and in traditional brick-and-mortar stores thanks to the knowledge extracted by firms

* Corresponding author
E-mail addresses: mmazzei@samford.edu (M.J. Mazzei), dnoble@business.uconn.edu (D. Noble)

0007-6813/$ — see front matter
http://dx.doi.org/10.1016/j.bushor.2017.01.010

from our purchases, mouse clicks, social media posts, and various other actions.

Central to this movement is the availability and accessibility of big data: large, diverse, complex, and/or longitudinal data sets generated from a variety of instruments, sensors, and/or computer-based transactions (Megahed & Jones-Farmer, 2013). Executives across many industries are plunging resources into big data projects with aims to better monitor, measure, and manage their organizations in hopes of solving many of their long-standing operational concerns. Retail, manufacturing, financial services, and firms of virtually all other sectors are actively investing in the search for and development of new competitive advantages, such as offering personalized customer service (as in the futuristic Gap), more efficient processes and supply chains, or improved product offerings. Even the entertainment industry has jumped on the trend, as content creators like Netflix use big data initiatives to determine casting and storylines (Carr, 2013) and sports team employ analytics to gain an edge on the playing field (Steinberg, 2015).

Despite the obvious operational advantages of big data, trends toward its use have also created new challenges and consternation among firms. The collection, storage, and analyses of data are of primary concern to companies as they attempt to come to terms with the technical demands associated with such new capabilities. Perhaps more importantly, firms pursuing big data initiatives need to clarify a vision and strategy for how to leverage their capabilities successfully into an improved return on investment. We present a framework that lays out how firms adapt and thrive due to the big data phenomenon through several different approaches. Additionally, we offer guidance on how companies can fortify a realistic vision for their organizational efforts to engage the big data phenomenon successfully. First, however, we look at the growing impact of big data and its evolving role in reshaping corporate strategy.

1.1. Big data's growing impact

According to the McKinsey Global Institute (2011), big data represents the next wave of innovation, competition, and productivity. McKinsey researchers estimate the continued emergence of big data will have large-scale increases in manufacturing, logistics, health care, financial services, government, and technology, among other sectors, with an annual impact of nearly $300 billion in the health care industry alone (McKinsey Global Institute, 2011). In light of such staggering numbers and the potential influence of big data spanning all functional areas of an organization, we argue that the disruptive potential of big data necessitates firms' engagement with it at a strategic level (Morabito, 2015).

Big data has caught the attention of most every industry, with executives across the globe seeking guidance for best practices and greater understanding of the role big data should play in strategic decision making. The increasing power afforded to chief information officers, chief technology officers, chief knowledge officers, and chief data officers within organizations will have an undoubtedly significant effect on corporate strategy (Menz, 2012; PwC, 2015). Yet, despite this emphasis on data and, often, massive investment in data collection and analyses, a considerable number of executives still are not quite sure what to make of this influx of data and how to properly apply it within their organization. Managers are faced with a myriad of questions: what data to collect; how to best collect, codify, and store it; how it should be analyzed and interpreted; and how insights can be transformed into value. Answers to these vital questions assist corporate strategists in deploying resources and deciphering how their firm's big data investments can translate into greater organizational success.

1.2. How big data is changing strategy

As data continues to be produced in previously unfathomable quantities, digitization promises additional shifts to the strategic landscape and further evolution of existing business models. However, while big data initiatives have become more mainstream in business settings, the management field has largely ignored serious practical and academic implications. In careful examination of the limited discussion of big data in the management academic literature, it is striking that most dialogue revolves around how big data will affect management research (e.g., how scholars can use sensors to collect more robust data sets), rather than exploring how big data is revolutionizing the thought processes of corporate strategists and managers (George, Haas, & Pentland, 2014). The discussion has coalesced around new modes of data collection and statistical techniques. Generally, scholars are not exploring big data as a firm-level phenomenon with the potential to shift organizational decision making and leadership.

The simplistic perspective of big data as an avenue to existing process improvement assuredly creates value to an organization (McAfee & Brynjolfsson, 2012), but this thinking limits the potential for the impact of digitization. It is imperative that we take a

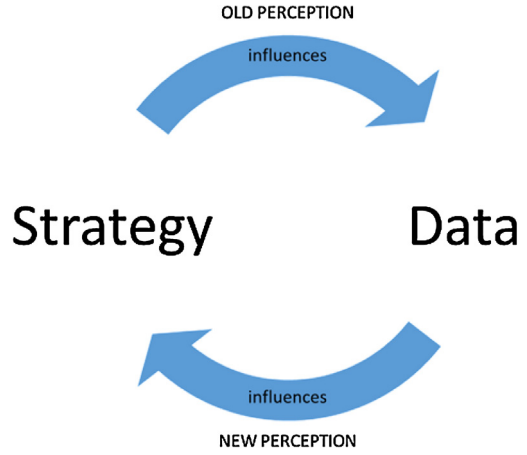
more substantial assessment of big data and view it as more than a means to an end via target marketing or supply chain logistics. There is a need to develop and share greater insights for how big data is influencing organizations above and beyond traditional analytics (Davenport, Barth, & Bean, 2012). Access to massive amounts of data and advancing analytic capabilities requires a reexamination of prior assumptions, as we evaluate how big data is helping transform organizations and industries. While initial scholarly inquiry has been focused around the functions of operations management, human resources, and information technology (IT) management (e.g., Cheng & Hackett, 2015; Mithas, Lee, Earley, Murugesan, & Djavanshir, 2013; Robak, Franczyk, & Robak, 2013), our motivation is to move the conversation in a direction that broadens the insights around big data to include its influence on strategic management.

Extant research supports the notion that IT function positively influences organizational success and contributes to a firm's business-level strategy, specifically in how it competes in a given product market (Drnevich & Croson, 2013). This scholarship, however, fails to address the dramatic influence the big data phenomenon is having on corporate-level strategy. Does a firm's business-level strategy dictate how it uses data to exploit current markets, or do data flows generated from a firm's positioning play a more important role in diversification and the development of corporate strategy?

Whereas traditional views in the field of strategic management suggest that a chosen strategy determines the metrics of value and the selection or applicability of data, we argue that numerous firms have altered this approach. Rather than corporate strategy dictating which data should be collected and analyzed, our observations suggest that in some instances the data collected and analyzed is having a dramatic influence on corporate strategy (see Figure 1). Companies that embrace the opportunities for innovation and exploration presented by big data are realizing new value creation and improved firm performance (Lavalle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011), and are doing so on a scale not seen before.

We are witness to a movement in practice that has begun to unravel much of the known strategic management theory developed over the last 40 years by eviscerating traditional value chains and competitive forces (Evans, 2013). The uses for data are shifting as collected data helps to determine what markets to explore and how consumer trends are changing, and the data can drive these determinations in real time. We are seeing firms take on non-traditional markets, leveraging their data and analytic resources—in conjuncture

Figure 1. The evolving relationship between data and strategy



with massive amounts of human and financial capital—to upend traditional barriers to entry. The ultimate goal of big data movers and innovators is to build greater knowledge and dynamic capabilities and to apply the benefits of big data analytics in a way that creates unique and sustainable competitive advantage through the development of diverse ecosystems and data flows. Through these advances in the consumption and application of big data, competition and competitive forces are being redefined. We further this conversation through the introduction of a new framework, which outlines three distinct approaches for how organizations can embrace and use big data.

2. Three tiers of big data

Our framework presents the idea that the big data phenomenon reaches beyond the improvement of traditional firm capabilities. We view big data not only as a functional tool or asset of a firm's IT strategy, but also a burgeoning industry unto itself and, further, an evolutionary strategy development embraced by a growing number of successful firms. We introduce our three-tier framework alongside multiple examples of existing firms that have seized the opportunities presented by the increasing availability of data, technological advances, and the digitization of business models. Table 1 helps to illustrate the progression of big data as it has advanced and been adopted for each tier.

2.1. Tier one: Big data as a tool in the traditional value chain

Improving core function performance has become the most easily identifiable application of big data

Table 1. Three tiers of value creation due to the big data phenomenon

Data as a tool	Managers are able to solve traditional value chain problems more efficiently and effectively; existing capabilities are improved through real-time, customized decision making for individual consumers
Data as an industry	Spin-offs and new ventures are created to specialize in acquisition, storage, and analysis of data, construction of infrastructure, and development of software devoted to handling big data
Data as a strategy	Visionary leaders develop companies dedicated to building data resources to allow them to develop radically innovative business models that wed traditional and modern strategic thought

analytic technologies. Organizational leaders see data as a resource and analytics as an organizational capability—both valuable tools that lead to competitive success (Wernerfelt, 1984). Access to data is viewed as a gateway that allows executives to solve traditional value chain problems more efficiently and effectively. Companies cultivate expansive data sets and apply analytics to process information more quickly, which permits associates to draw meaningful conclusions from the data. Through the active collection of data and development of analytical capabilities, these companies improve product development, marketing, sales, distribution, customer service, and other traditional value chain activities. These organizational capabilities and operational enhancements create value by improving the timeliness and customization of decisions for individual consumers, delivering more effective advertising, introducing incremental product or manufacturing innovations that advance additional revenue streams, and increasing rates of customer acquisition and retention.

The use of big data and analytics has become commonplace and far-reaching. Firms across the globe and in a multitude of industries see data and analytics as a means for innovation, operational efficiency, and future success. For example, international beverage behemoth Coca-Cola actively utilizes big data as a tool to improve sourcing, inventory management, product innovation, and consumer perception. Coca-Cola has developed analytic capabilities so it can consistently make orange juice to its customers' preferences 12 months a year. Through careful application of analytics, Coca-Cola is able to use data from satellite imaging, orange growth historical records, and climate indications to standardize the taste of its juices (Stanford, 2013). Coca-Cola has also worked diligently to improve its own data collection tools to better understand customer tastes and preferences, including through its innovative smart fountains known as Freestyle machines (Weier, 2009). These machines dispense over 100 combinations of drinks, allowing Coca-Cola to gain insights on geographic and time-related consumption, innovative new flavor mixtures, and inventory replenishment.

Big data is actively put to work in manufacturing sectors as well. Intel has been using big data to improve its processor manufacturing for years. Historically, processing chips have had to run through as many as 19,000 quality assurance tests as they come off the production line. Through predictive analytics using big data, Intel was able to reduce the overall time and number of tests required significantly, with overall savings expected to exceed $30 million in manufacturing costs (Bertolucci, 2013).

Analytics are readily seen in the financial services and insurance sectors, too. Capital One has been an early adopter of analytics in the lending area, using big data to better understand consumer spending patterns and introduce products and offers best suited to the needs of customers. Incenting customers to sign up for customized cards while also managing repayment risk has allowed Capital One to grow organically while deftly managing expenses for charge-off rates (Dee, 2015). With comparable aspirations, Progressive Insurance is using real-time analytics from in-vehicle telecommunications devices to monitor driving activity, creating a competitive advantage by identifying risky behaviors. This allows the company to rate each driver more accurately based on their actual driving habits, while also encouraging positive changes in the driving behaviors of its consumers (National Association of Insurance Commissioners, 2015).

2.2. Tier two: Big data as a stimulus for new ventures and industry development

While more and more firms are realizing the potential value in big data analytics, this potential is hindered by their own shortcomings. As firms assess their own value chains and some, as noted above, develop analytics to drive internal improvements, others are faced with a reality that they may be

behind in the internal analytic capabilities necessary to create value. Either they do not have the knowledge in-house or do not desire to focus resources on the required technical infrastructure and capabilities. As with traditional value chain analyses, such realizations may lead to an interest in strategic partnerships to assist with big data initiatives, as it may be more cost-effective to purchase another firm's expertise than to develop such capabilities on-site.

The availability and immense volume of data, as well as the recognition that not all firms have the technical knowledge needed for big data analytics, is significant enough that an entire industry has developed around it. Spin-offs and new ventures are being created that specialize in the purchase, sale, collection, storage, and analysis of data. Other entrants to this new industry are focused on building infrastructure and/or developing software devoted to handling big data, and they often provide services to organizations unable to do so on a proprietary level because of cost, size, and scope. These big data companies deliver novel value in an industry that did not exist 10 years ago and generate new job types that require cutting-edge skills.

Companies like Palantir, Pivotal, SQream, and Cloudera provide big data products or services to a broad range of companies unable or unwilling to develop them internally. Palantir Technologies—a well-funded, early mover in the industry—provides infrastructure and analytical capabilities to numerous industries. The private firm, previously valued at nearly $20 billion, has gained notoriety for its ability to piece together critical patterns from mountains of structured and unstructured data (Reuters, 2015). Using proprietary software, Palantir builds relationships with its clients on a "joint effort of exploration and discovery" (Lev-Ram, 2016). Beyond helping numerous Fortune 500 firms with their big data needs related to fraud protection, consumer behavior, and other potential sources of competitive advantage, Palantir does work on immunization and chronic disease screenings, humanitarian aid, and counterintelligence; the firm is credited with helping military operations in the search for Osama bin Laden.

Pivotal, the big data spin-off from EMC and VMware, is a "platform as a service" company that allows clients to build open source applications in its cloud (Backaitis, 2015). As an example of its utility, prominent client Ford Motor Company used Pivotal's platform and innovative programming methodology to develop FordPass, a new application which allows drivers to find parking spaces and monitor their cars from a smart device (Miller, 2016). Another firm, Israeli startup SQream Technologies, functions to deliver big data analytics faster than ever imagined. The database infrastructure platform they developed costs far less than existing platforms while providing faster results and creating a 100x cost-performance ratio, which allows enterprises to achieve analytics beyond the realm of what was once imagined (Gray, 2014).

Service provider Cloudera offers a high-performance, low-cost data management and analytics platform to well-known clients in many sectors (e.g., Samsung, Cisco, Allstate, Disney). CEO Tom Reilly cites the adoption of Cloudera's technology by the world's largest companies as evidence that the industry should see growth and receive additional investment (Hof, 2016). An increasing rate of success among these new ventures creates more opportunities for the industry to expand. With this growth, the industry matures and learns more and more about the application of such capabilities. The examples herein show a sampling of the range and depth of this industry as it emerges based on the different strategic needs of firms in the marketplace. Despite the many advances these new firms are bringing to the industry, these companies usually do not have the same strategic objectives as firms characterized in our third tier.

2.3. Tier three: Big data as a driver of competitive strategy

There are a number of visionary executives who are dedicated to building data resources that allow their firms to develop radically innovative business models that wed traditional and modern strategic thought. In essence, these leaders focus on data as central to their organizational strategy and choose to concentrate on data flows rather than data stocks (Davenport et al., 2012). These companies develop ecosystems devoted to their products and services based on the data they are able to accumulate. The application of knowledge in using this data contributes to the creation of value in the lifestyles of everyday consumers. Many of the traditional constraints to expansion and diversification are devalued as these learning organizations dynamically evolve based on trends uncovered through data analyses. These companies create leverage—due to their access to data, knowledge, and resources gained from past and current revenue sources—that leave traditional competitive barriers (e.g., bargaining power of buyers/suppliers, barriers to entry) meaningless in many instances (Porter & Heppelmann, 2014).

The primary issues surrounding expansion and diversification for these firms are whether (1) their existing data collection and analyses inform new

opportunities; (2) exploration allows for richer, more insightful data collection and analyses; or (3) the expansion effort improves the organization's data ecosystem, wherein the end customer is viewed as a living, breathing data source. These organizations perceive the compilation of data as a source of value creation in and of itself. They do not need to monetize data immediately, for if they capture enough data it can be leveraged in innumerable—and perhaps currently unrealized—ways in the future as they broaden and navigate new industries as part of the development of their dynamic capabilities and digital ecosystem.

Facebook epitomizes the learning approach suggested by the third tier of our framework. Facebook went public in 2012 with an unproven revenue model, vis-à-vis advertising, and many questions about its long-term strategy (Peterson, 2012). It was not that Facebook did not have a strategy at that time; Facebook had simply embraced a data-focused strategy. Its adoption of 'the hacker way' as a means of cultivating competitive advantage (Meijer & Kapoor, 2014; Zuckerberg, 2012) was a marked turning point for strategic management in a data-driven economy. As Zuckerberg (2012) stated at the time of the Facebook IPO, the company's approach involves "continuous innovation and iteration," building tools and services that "extend people's capacity to build and maintain relationships." From the Facebook perspective, relationships enable users to "discover new ideas, understand our world, and ultimately derive long-term happiness" and also allow Facebook to secure new revenues that can be plowed back into an ever-increasing array of services on an expanding platform that continues to accrue more and more data on consumers (Zuckerberg, 2012). Zuckerberg's initial focus has been on creating an ecosystem to collect data and consistently increase data flows, which has paved the way for numerous learning opportunities and subsequent entry into select product markets and technologies (D'Onfro, 2016).

Apple is another company focused on an advancing ecosystem of data flows. Starting out initially as a personal computer manufacturer, Apple's model evolved to leverage existing relationships with consumers as the company developed enhanced products and services (Adner, 2012). Moving from desktop and laptop computers, Apple expanded its ecosystem by collecting data in digital music, then video, and advancing into telecommunications and other markets. The promise of simpler lives to Apple's users has led to a devoted customer base and afforded the company opportunities to diversify and expand into new markets, including wearables (e.g., Apple Watch), automobiles (e.g., Apple Car), and mobile payment services (e.g., Apple Pay), all of which strategically integrate with the company's core hardware and software platforms.

Alphabet (previously Google) has also developed an ecosystem, based largely on the open-source Android platform. Android serves as the brains for numerous products and devices from a large variety of manufacturers. While many are confused about its corporate strategy, Alphabet continues to explore and diversify into new markets, expanding its data capture, analytical, and learning capabilities (Favaro, 2015). Among the firms mentioned here, there are numerous acquisitions or product line expansions that at first blush appear to be misguided, unless you envision the data flows as the output that the firm seeks. Companies in our third tier that view data in a strategic capacity are able to experiment with their offerings without the immediate need for profit (e.g., Facebook into virtual reality, Apple into automotive, Alphabet into space travel and self-driving cars), so they can continuously innovate and learn what they do not know.

Strategically, this is a far different conceptualization than that of data as a tool, as data flows and new knowledge become the driving force behind strategic policy and decision making. Firms in the third tier continually develop their platforms into expansive ecosystems that permeate consumers' lives, build data stocks, and increase the number of data flows that will be monetized through later products and technologies, which in turn are likely to continue adding data flows. Beyond consumer transactions and the analysis of our human social behaviors and interactions (Simonite, 2012), companies like Facebook and Google have moved into more private aspects of our lives. They have developed connected products, built homes for employees, and even worked toward the design of 'smart cities' (E. Brown, 2016; Kastrenakes, 2016; Subramanian, 2013), which undoubtedly will keep dwellers connected—and also leave even more data breadcrumbs for these firms to collect, analyze, and monetize.

3. An example of development across the three tiers

Amazon offers an iconic example of how a firm might apply data and analytics to evolve strategically and mature across all three tiers. Starting as an e-commerce firm focused on books, Amazon was able to gain information and apply analytics to the mouse clicks of consumers viewing its inventory of books. The firm captured browsing history, including search terms, books purchased, those not

purchased, those placed on wish lists, and the length of time items were viewed. This led to increased selection, improved target marketing, and ultimately an expansion into additional market segments by the e-retailer. Amazon now sells virtually any product on the e-commerce website, including electronics, sports equipment, apparel, and even construction materials.

Improved analytic capabilities helped reinforce the power of big data, catapulting Amazon into a nascent industry as a cloud computing services provider. Amazon Web Services (AWS) is now a $5 billion business that leads the cloud computing and analytics infrastructure market, offering flexible and comprehensive services to companies of all sizes (Novet, 2015). Taking advantage of Amazon.com's global computing infrastructure, AWS has serviced clients like Netflix in taking their businesses to international markets, while also handling incredible volume; Netflix serves customers in nearly 200 countries and accounts for approximately 37% of all internet traffic in North America (Groden, 2015).

Finally, one can see how Amazon's data strategy has evolved over the last 20 years to reach the third tier of big data analytics. Having already used data as a tool to improve e-commerce transactions and revenues and conquered the big data industry with the AWS business unit, CEO Jeff Bezos has tasked his firm to exploit new markets through an evolving ecosystem that captures increasing levels of data (van Rijmenam, 2015). Amazon is challenging new markets with hardware (e.g., Kindle e-readers, Fire tablets, and smartphones) and groceries (e.g., Amazon Fresh and the Dash ordering device), yet has also reached into delivery (e.g., drones) and media content creation and streaming services (e.g., Amazon Instant Video). Bezos has personally expanded into the arena of space tourism via his company Blue Origin. Amazon's ecosystem is adding to its already considerable revenues and data stocks by creating new data flows and revenue streams that allow the company to accrue profits over the lifetime of the customer; there is tremendous potential for returns on its investments (Adner, 2012).

4. How to find your company's approach

This article contributes to both practical strategic application and academic research in the strategic management domain by presenting a framework that identifies how big data influences functional decisions within organizations, shapes entirely new industries, and establishes unique and innovative strategies for organizations that break down barriers of traditionally defined industries. This framework provides an appropriate basis for internal corporate strategy discussions that surround big data investments and knowledge.

To develop a sound and successful big data strategy for an organization using the three-tier framework, strategic decision makers need to avoid a discrepancy between two constructs: data strategy aspirations and data strategy authenticity. *Data strategy aspirations* constitute the interpretation of the firm's competitive landscape and its role therein, as well as its goals and motivations for big data investments. Does the focal organization envision itself outperforming firms in current markets, or is it willing to take on the hazards of exploring new ones? Can leaders foresee and be supportive of substantial investments to develop digital ecosystems and technical competencies? Does the firm hope to solve specific problems or complete a digital transformation to disrupt multiple industries? The risks in pursuing each of the three big data approaches are considerable, but they become nearly insurmountable when a discrepancy exists between the firm's data strategy aspirations and its data strategy authenticity.

Data strategy authenticity comprises the firm's existing digital capabilities, including its current human capital pool, organizational knowledge, and physical and financial resources to add specific technical capabilities where lacking. This is the 'reality check' assessing the firm's situation and its capacity to evolve. Does the firm have considerable human and financial assets as well as significant technological capabilities? If not, are the internal and external stakeholders prepared and equipped to undergo a major shift? Does the firm have the resilience to survive and thrive in a changing digital economy? Even under the best circumstances, firms with advanced technical competencies can experience extremely challenging situations when retooling for a massive strategic restructuring. Consider the case of Interactive Intelligence, which saw shareholders weathering a 75% loss to their shares as the company retooled for a future in the cloud (D. Brown, 2016). Those investments have since begun to pay dividends, but the takeaway for executives is that there is a cost to disrupting your own organization that you must be aware of before pursuing this path. Executives must be honest in their assessment of the appropriateness of the firm's data strategy aspirations.

When a gap between a firm's data strategy aspirations and authenticity is recognized, firms will need to rectify this misalignment or face a downfall characterized by years of struggle and increasing

levels of competitive disadvantage. The easiest gap to overcome is a firm's lack of resources or technological capabilities. In this situation, firms unable to reach tier one goals can simply seek out strategic partners to assist. Tier two is full of data firms that can provide any number of services to bridge the gap. Many such companies were founded to be specialists in exactly one area of the big data world. Concerns with this relationship are that tier one firms outsourcing big data functions may never develop necessary capabilities themselves, potentially being left behind by competitors that develop such internal knowledge.

If the focal company aspires to employ data to improve existing capabilities within the current business model (i.e., tier one strategy), the firm needs to develop the human capital and invest in the infrastructure necessary to convert that particular opportunity. Tier one firms do not have to transform the way they do business; rather, they need to focus on their core business while investing in data resources and analytic capabilities. Over the short term, the successful tier one data play will provide structural competitive advantages to the firm using a resource-based approach to strategic development. This competitive advantage is much less likely to be sustainable unless data resources are truly inimitable, though we are already seeing reductions in the utility of proprietary data sets. Today's data executive may look to extend the period of competitive advantage by leveraging proprietary data with other unique and advanced data resources and capabilities. As the tier one firm becomes more data savvy and experienced, it may develop the talent and capabilities sufficiently so that its data strategy authenticity increases. In concert, the firm's data aspirations may also evolve and increase over time, allowing for the tier one firm to offer tier two services to its competitors or firms in other markets.

Tier two firms that have been on the forefront of the emerging big data industry have likely developed competitive advantage through expertise and innovative technologies. However, with growing big data needs and more firms seeking partners to help with infrastructure and analytics, competition is on the rise. Competitive advantage for the tier two firm is reliant upon innovative products and services that keep pace with clients' data aspirations and stay ahead of the company's data strategy authenticity. Therefore, it is wise for tier two executives to monitor their own data strategy aspirations continually, such that their companies evolve to offer a growing and complete set of products and services beyond those initially envisioned. As with traditional strategic positioning, these firms must find their niche within an industry (like SQream) or be willing to seek diverse applications for their capabilities across industries (as Palantir has done).

Tier three firms like Facebook, Amazon, and Alphabet are the envy of today's corporate executives as they convert data insights into escalating competitive advantage. Executives in even the most static of industries fear they will soon have a tier three competitor lurking to disrupt, upend, and transform their industry. Tier three aspirations are aggressive for most any firm, as the organization would need to have a high level of capabilities or be willing to reinvent the firm continually, taking on massive risk. Tier three aspirations require considerable human and financial capital, as well as a level of authenticity that cannot just be serviced by a tier two firm. In fact, firms with tier three aspirations are more likely to employ an acquisition approach to tier two firms rather than seeking partnership, as possession of big data capabilities allows for more efficient use than through a secondary service and will also keep data resources and capabilities away from competitors. Aspirations to reach tier three require an organizational focus on learning through increased data flows as the means to create and enhance competitive advantage and new opportunities to diversify into non-traditional industries. While there may only be a handful of organizations in the world warranting tier three authenticity at this time, the digitization of business models and an increasingly data-driven economy are opening the door to more firms with tier three aspirations.

5. Final remarks

The big data phenomenon, once prophesized in pop culture content like the *Minority Report*, is changing our world. The framework offered within this work reveals how proactive firms are leveraging big data initiatives to develop and sustain competitive advantage in varying degrees. Despite the success of firms referenced in the preceding paragraphs, most companies continue to struggle with big data initiatives: Nearly 80% fail to integrate their data fully and 65% consider their data management practices to be weak (Baldwin, 2015). The same study reported that 67% of surveyed companies had no "well-defined criteria to measure the success" of big data investments. Executives should align their big data aspirations—within the provided framework—with an authentic view of their own capabilities to get on the right track and stay ahead of the curve on innovation, competition, and productivity.

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