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The Role of Big Data in Influencing Strategic Decision-Making for Organizations: A Review

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Abstract

This paper provides a focused review of literature on the increasingly important role of Big Data in strategic management, with special attention to the role of Big Data in strategic decision-making. There are major questions investigated through this review of literature. This review has shown that Big Data represents one of the most important assets available to strategic decision-makers. Extracting and analyzing information from Big Data enables managers and leaders to make informed predictions and decisions about critical business issues.

Keywords: Big data; Strategic Decisions; Organizations.

1. Introduction

In an issue of Financial Executive, authors in [1] argued that "tomorrow's competitive advantage will be driven by the ability to consume, produce and govern complex information inside and outside the company walls" . Johnson's statement reflects the belief shared by a growing number of business analysts that Big Data offers many opportunities for companies to make better decisions and to increase the value of their products and services [2,3,4,5]. Big Data, which is one of the hottest topics in the business press and scholarly business literature, can be generally defined as high-volume, extremely large scale data gathering and data analytics [4]. This paper provides a focused review of literature on the increasingly important role of Big Data in strategic management, with special attention to the role of Big Data in strategic decision-making. The major questions investigated through this review of literature were: What kind of decisions is being supported by Big Data in organizations today? Does Big Data help organizations make better decisions? How can organizations best make use of Big Data to support strategic decision-making?

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1.1 Methodology

To identify articles suitable for inclusion in this review, a search of academic business databases (ProQuest/ABI Inform and EBSCO/Business Source Premier) was conducted using the search words "big data" and "strategic decisions". Since there were a large number of very recent articles on this topic, it was decided to select only articles published within the past 5 years (2012-2017). Thirteen (13) articles were selected for inclusion in this literature review. All of the selected articles came from well-respected English-language business journals and periodicals. All of the articles selected indicated what the author meant by "Big Data", discussed one or more uses for Big Data, discussed the connection between Big Data and strategic decision-making, and addressed one or more of the three main previously defined research questions.

1.2 Results and Discussions

This review provide an overview of Big Data; illustrates how Big Data is differentiated from traditional analytics and ordinary data and discusses Big Data applications and strategies.

1.3 Overview of Big Data

There is no single, definitive definition of Big Data. Many of the definitions, such as the one cited in the introduction, define Big Data as kind of a bigger, more complex version of analytics. Like business analytics, Big Data extracts, organizes and analyses raw data (in the case of Big Data, huge amounts of data) so that it can be used for a variety of business purposes [2]. Some authors, in [3] offer a definition of Big Data that connects it to its benefits: "a capability that allows companies to extract value from large volumes of data".

1.4 Characteristics/Components

Big Data is differentiated from traditional analytics and ordinary data by three characteristics referred to as the three "Vs": volume, velocity and variety [2,6,7].

Volume. The proliferation of the Internet, social media, mobile networks and advanced computing technologies and networks has dramatically increased the volume of data produced by individuals and organizations over the past several years. The volume of data has increased not only because of the proliferation of new data sources (e.g., web pages, social media, mobile networks, etc.) but also because even old data types such as sales data are now being captured and collected in much greater detail than in the past [7]. For example, previously it has been fairly standard for retailers when recording sales that they would just record that a particular unit or item sold at a particular location. Now, however, there are many more details regarding the sale: price, quantity, items sold, time of day, date, and customer data. Customer data is also more detailed and may encompass details on customer decision-making and purchasing behavior including browsing habits, timing of purchases, average value of purchases, etc. [7]. All of these extra details mean more data.

The volume of data is increasing at an amazing rate. In early 2011, IBM estimated that 90% of all of the data in the world had been produced in the previous two years [7]. Authors in [7], reported that "as of 2012, about 2.5

exabytes of data are created each day, and that number is doubling every 40 months or so".

This means that in 2012, more than 912 exabytes of data were created. Compare this to the situation in 1999, when scientists estimated that he sum of all the information ever produced by humans up through 1999 was equivalent to 16 exabytes of data [8]. A couple of examples from the business world will also illustrate the huge volume represented by Big Data. The world's biggest retailer Wal-Mart collects information on the more than one million customer transactions occurring in its stores every hour and feeds an estimated 2.5 petabytes of data into company databases; these means that every hour, Wal-Mart is collecting a volume of data which is the equivalent of 167 times the information represented in all of the books in the U.S. Library of Congress [1]. It is not only giant companies such as Wal-Mart that are generating their own Big Data. Authors in [1] note that 15 out of 17 U.S. industry sectors "have more data stored per company than the U.S. Library of Congress". The volume of data will continue to increase both as a result of new data and new types of data generated from existing sources as well as the result of additional data generated by new and perhaps unimagined sources. Authors in [6] noted that analysts estimated that the volume of business-related data is growing at the rate of 59% per year.

Velocity refers to both the speed at which data is being created and to the speed at which stored or newly generated data can be accessed for use, with effective Big Data management involving real-time or near- real-time access [2,8]. Authors in [2] cited an example of extreme velocity in Big Data analysis involving researchers who used location data from shoppers in a store's parking lot prior to the start of a busy shopping day to predict (very accurately) the store's total sales that day before the store had even recorded a single sale . In terms of the velocity of data creation, the intervals between the creations of similar categories of data have grown shorter. For example, instead of collecting monthly or weekly data on sales, data on sales may now be collected hourly or even minute-by-minute. Likewise, the inventory data that used to be updated monthly might now is updated hourly [7].

Variety refers to the type of data that is being collected, stored and retrieved. In the past, the types of data stored tended to be highly structured and of fairly limited variety [8]. Big Data, on the other hand, is often unstructured and comes in an amazing variety from many sources. Some of the different types of data include messages, internal documents, web pages, customer comments, Facebook "Likes", "Tweets", sales data, survey data, video, images, streams from social media, readings from sensors, GPS signals from cell phones, face profiling data on shoppers, eye tracking data, RF tracking of products as they move through the distribution and shipping network, and more [8].

1.5 Value for Business

The review of literature suggests that when talking about Big Data, it might be more appropriate to refer to four, rather than just three "Vs". The fourth V would be "value". As author in [3] commented Big Data involves companies extracting value from large volumes of data. Observing that there were many case studies and anecdotal reports of how business were extracting value through Big Data but few scientific investigations of the notion that Big Data creates value for companies, Authors in [2] conducted a more systematic analysis of the

benefits of Big Data for business. Their key finding was that companies which characterized themselves as "data driven" and which had active Big Data strategies were 5% more productive and 6% more profitable than their competitors who did not specifically view themselves as "data driven".

Economists and business leaders have recognised the value of Big Data. At the 2012 World Economic Forum in Davos, Switzerland, participants passed a declaration stating that data (as in Big Data) is so important and powerful that it should be considered as a new class of economic asset [1].

Some companies are already attempting to quantify the value of the asset of Big Data on their financial statements. According to UK market research firm Dynamic Markets, 20% of all large companies, and 30% of large companies with more than 10,000 employees quantify data as an asset on their balance sheets. How does Big Data create value? In many different ways; Big Data creates value by providing important information about customers, suppliers, partners, employees, and products and services. It creates value by allowing companies to make accurate predictions about business operations, markets, and customers. It creates value by cutting costs. It creates value by enabling business to add value to products and services. It creates value by enabling companies to better satisfy their customers. It creates value by allowing companies to better manage and reward their employees. Overall, it creates value by providing organizations with the information they need to make better strategic decisions.

1.6 Big Data Applications and Strategies

Although Big Data goes far beyond its predecessors, Business Intelligence and Business Analytics, in terms of both the sheer volume and complexity of data and the possibilities to extract business value, it has some of the same basic limitations as its predecessors. The most important limitation or consideration is that companies will not obtain value from Big Data unless they have a plan for getting that value. Given the sheer volume of data, information overload is likely without both a plan on how to use it and the expertise to extract it [10,11]. This is the reason that a "data scientist" – an expert in statistics and Big Data analysis – is one of the hottest jobs of the decade [10].

In addition to recommending hiring a Data Scientist or two, the authors reviewed here emphasized the importance of approaching the Big Data challenge systematically and with a plan. Authors in [12] state that based on their research with dozens of companies using Big Data across six different industries, companies must develop a strategy on how they plan to use data to compete and they must develop capabilities and resources related to Big Data technology. Once this foundation is in place, the successful exploitation of Big Data requires "three mutually supportive capabilities" [12].

1. The capability to identify, combines, and manages multiple sources of data;

2. The capability to build advanced analytics models for predicting and optimizing outcomes" and

3. Management must have the capacity to transform the organization so that data and models actually yield better decisions.

For using Big Data for strategic decision-making, Author in [13] recommends a six-step process, noting that business managers and leaders who are not trained in data analytics should focus on the first and the sixth step in the process.

1. "Recognize the problem or question". This is the most important, critical first step. Author in [13] recommends thoroughly and clearly defining the problem or question and then taking the time to identify possible alternative ways of framing the problem or question because this will allow for better analysis.

2. "Review the previous findings." This involves identifying previous attempt to solve the problem or one similar to it and reviewing the approaches and the outcomes.

3. "Model the solution and select the variable." This is where the expert takes over and formulates detailed, testable hypotheses and specifies the variables.

4. "Collect the data". Both primary and secondary data should be gathered.

5. "Analyze the data." Again, this is a job for the data scientist, as it involves running various statistical models and interpreting the results.

6. "Present and act on the results." Based on the information provided from the analysis, managers can then "tell a story to decision makers and stakeholders so that they will take action" [13].

Big Data can be used in strategic decision making across many different functions and for many different strategic concerns.

There are so many possibilities and opportunities with Big Data that it makes sense to break it down into smaller components.

One major categorical division in Big Data is between transactional and non-transactional data [3].

Transactional data, as its name implies, are data which are derived from business and organizational transactions (e.g., sales, quality data, performance data, financial data, etc.).

Transactional data is usually structured. Non-transactional data do not come from the organization's own business transactions.

This type of data comes from other sources (e.g., social media data) and is often unstructured. The data type provides one side of the Big Data framework.

The other side concerns the business objective. Authors in [3] state that there are two main categories of business objectives for use with Big Data: 1) measurement and 2) experimentation. Putting the framework together results in four possible Big Data strategy categories as shown below:

	Non-Transactional Data	Social Analytics	Decision Science
DATA TYPE		Performance Management	Data Exploration
	Transactional Data		
DATA TYPE		Measurement	Experimentation

Figure 1: created based on [3]

Strategic decision-making is likely a component in all four of the major strategy areas above. For example, Big Data information on performance metrics could lead to new decisions about compensation and incentive plans. Social analytics provides an opportunity to gain information on customers and develop new competitive strategies. Decision science provides opportunities to hypothesize and run experiments on non-transactional data such as Twitter streams or customer-create product reviews.

1.7 Conclusion

This review has shown that Big Data represents one of the most important assets available to strategic decision-makers. Extracting and analyzing information from Big Data enables managers and leaders to make informed predictions and decisions about critical business issues. As more companies are moving to a data-based decision-making approach, as it is vital in enabling organization invest in their employees. Organization should take into consideration that spending more on research regarding to analytical tools will empower both employers and employees as well as enhancing their the knowledge and skills that are needed for promising informed decision-making.

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