

Role of Big Data in Achieving Competitive Advantage

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Introduction

The scope and area of Big Data have gained significant momentum from the tandem of academics and business parlance over the last couple of decades. It assists organizations in gaining business insights, fostering a competitive edge, and transforming whole business processes (Dahiya et al., 2021; Shah, 2022; Talwar et al., 2021; Wamba & Mishra, 2017). According to McKinsey (2011), Big Data would be a unique source of improving the productivity, competitiveness, and innovation of the business organization. Similarly, McAfee et al. (2012) argued that Big Data can enhance the entire decision-making function of a firm. According to Brown et al. (2011), the reasoning behind this transformation of the entire decision-making function of a firm lies in the caliber of Big Data to change the footprint of competitiveness by fostering innovation, shifting business ecosystems, and revamping business processes.

Therefore, it is significant to study Big Data due to its enormous capability of transforming entire business processes. Scholars have argued that competitive advantage in this era comprehensively depends on the firm's ability to work with Big Data, enabling firms to obtain business insights and surpass their rivals (Oh et al., 2012; Wong, 2012). In this case, McKinsey & Company argued that Big Data would undoubtedly add value for the global economy while improving the competitiveness and productivity of the firms and eventually leveraging an ample surplus for the customers (Manyika et al., 2011).

Concept of Big Data

Although Big Data is generating tremendous attention worldwide these days, its genesis can be traced back to the mid-1990s. Diebold (2012) pointed out that in the mid-1990s, during the lunch-table discussion at Silicon Graphics Inc., Big Data was most likely originated with the hand of John Mashey. However, the increasing prominence of Big Data can be linked to the reality that the term Big Data was google-searched about

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0.252 million times in November 2011 (Flory, 2012) and later achieved the remarkable figure of 801 million hits in October 2015 (Mishra et al., 2017). The phenomena are predominantly driven by the increasing usage and widespread diffusion of mobile phones as well as social networking sites, i.e., Facebook, YouTube, WhatsApp, Twitter, and the Internet of Things (IoT) related concepts (Wamba et al., 2017).

According to some researchers and practitioners, Big Data refers to data collected through a wide variety of sources, including satellites, sensors, social media feeds, photographs, video, mobile phone, and Global Positioning System signals – the amount of data generated each day is around 2.5 quintillion bytes (Brown et al., 2011; Jones, 2012; McAfee et al., 2012). Researchers have attempted to define Big Data from several viewpoints in the past literature. One of the most simple and straightforward definitions of Big Data is the “*datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze*” (Manyika et al., 2011, p. 1). This definition reflects the vast volume and variety of data that is impossible to deal with typical tools and software that companies usually use. While focusing on the attributes of Big Data, Beyer & Laney (2012, p. 1) defined that “*Big data are high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization*”. Considering the massive volume, variety, and velocity of information, the preceding definitions emphasize the utilization of Big Data.

Big Data, however, is data that is massive in volume, velocity, and variety that continues to increase drastically over time. It is a data set that is so huge and complicated that no typical data management technologies can effectively store or process it.

Characteristics of Big Data

Some scholars and practitioners have identified 3V's while characterizing Big Data – volume, variety, and velocity (Beyer & Laney, 2012; Kwon & Sim, 2013; McAfee et al., 2012). First, the volume of data shows the tremendous amount of information available, which has expanded dramatically in recent years. There is a broad range of sizes for Big Data, ranging from many terabytes to petabytes. Volume may be defined as “a large amount of data that either consumes huge storage or entails a large number of records” (Wamba et al., 2015, p. 3). Because of the significant rise in the quantity of data passing over the internet every second, businesses

now can deal with several petabytes of data in a single dataset (Mishra et al., 2017). For example, approximately 1.5 billion new data points are added to Tesco's database every month. More than 2.5 petabytes of data are stored in the data warehouse of Wal-Mart (Manyika et al., 2011). Second, *variety* reflects the reality that data is generated after a broader range of formats, sources, and multidimensional data fields that include both organized and unorganized data. (Russom, 2011). For example, Procter & Gamble established a group of about 100 analysts from several departments, including marketing & consumer research, production & operations, supply chain, research & development, and human resource, to improve company performance by evaluating interrelatedness within firm's domains (Davenport, 2006). Third, "the frequency or pace at which data is generated and/or delivered is referred to as *velocity*" (Russom, 2011, p. 7). For instance, Amazon maintains a continuous stream of customers, suppliers, and new products to its ever-growing list of items, and the company maintains its commitment to on-time deliveries (Davenport, 2006).

In addition to these 3Vs, researchers (Gantz & Reinsel, 2012; Gogia, 2012; Oracle, 2012) have incorporated an additional 'V' – Value focusing on the needs of reaping economic advantages from Big Data. The fourth V, *value*, reveals the economic advantages of Big Data. Businesses must recognize the vast quantity of data available and extract what is valuable from that data to do additional analysis (Gogia, 2012; Oracle, 2012). For example, Premier Healthcare Alliance employed improved data analytics and exchange to enhance patient well-being while simultaneously cutting costs by approximately US\$2.85 billion (IBM, 2012). Some scholars (Gandomi & Haider, 2015; White, 2012) have recommended the fifth dimension of 'V' – *veracity* to identify the "unreliability inherent in some sources of data" (Gandomi & Haider, 2015, p. 139). It refers to the quality and significance of data and the degree of confidence placed on the data source (White, 2012). For example, because it has between 20-50 times variations of the same data distributed across its many data marts, eBay Inc. was confronted with a massive data replication issue. Later on, eBay established a data hub (internal website) that allows managers to filter out data duplication and other information (Davenport et al., 2012). Finally, Gandomi & Haider (2015) identified the sixth component of 'V' – *variability* to refer to the irregular pace and varying data flow rates from many sources. Complexity emerges owing to the fact that Big Data is derived from many sources. For instance, to make sense of the data, the organization must first comprehend and then clean it (to deal with

variability) (Mishra et al., 2018).

To sum up, altogether, these six characteristics, i.e., volume, variety, velocity, value, veracity, and variability, can make a fine-tuning illustration of Big Data that creates a probability for firms to achieve competitive advantage.

Sources of Competitive Advantage

Competitive advantage, as popularized by Michael Porter in the 1980s, indicates a company's capacity to generate more profit than its rivals (Porter, 1985). Such a more profit-generating ability is evaluated by a company's stance in its industry and its capacity to maintain that stance despite challenges of new entrants, existing rivals, suppliers, and even shifts in consumer preferences. Companies' strategy is targeted to control every area of business activity and even planned to guarantee that the industry is protected against new entrants. Exclusive contracts with suppliers, intense advertising to orient customer preferences, clandestine price-fixing, and extensive capital investments are just a few moves directed by companies to play in the competition chess board (Morabito, 2015).

Some other scholars have claimed that the competitive advantage could be attained through efficient utilization of firm's resources, comprising nurturing companies own talents – employees, condensing the transaction costs in the value chain, and increasing competencies (David et al., 2013; Hill et al., 2014). Scholars who claim that competence is a spring of competitive advantage emphasize that companies concentrate on building their crucial capabilities, “a set of valuable, rare, imperfectly imitable, non-substitutable resources” that can boost a business towards competitive advantage (Bartosik-Purgat & Ratajczak-Mrozek, 2018; Wu, 2013).

However, with the growth of e-commerce and the ‘maverick’ entrepreneur, the firm's mentality toward control versus openness has shifted, and flexibility as a reservoir of competitive advantage became more prominent (Lestari et al., 2020). Companies with a high level of operational and managerial flexibility can respond swiftly to the challenges that emerge from changing preferences of the customer, new entrants' changes in industry conventions, and unexpected rival manoeuvres (Dubey et al., 2018; Rialti et al., 2020; Rukanova et al., 2019).

As a result, the strategic game has evolved from a deliberate and slow stationing on the chessboard of competition to a fast-paced game in which tempo is critical, and Big Data-driven business strategies accelerate the

tendency to achieve more operational and managerial flexibility along with the effective utilization of organizational resources. For example, with the help of real-time and location-based offerings powered by Big Data have already mushroomed these trends and become a part of most inner-city inhabitants' daily lives with the hand of Rokomari.com, Khaas food, Foodpanda, Pathao, Bongo, and so on.

The Role of Big Data Achieving Competitive Advantage

Because of its enormous operational and strategic potential, Big Data is now widely seen as a game-changer, allowing increased corporate efficiency and effectiveness via enhanced decision-making (Wamba et al., 2017). To fully benefit from the disruptive potential of Big Data, companies must align it at their strategic level. However, how businesses integrate this technological trend into their existing strategy will indeed depend on the degree of their business orientation. Nevertheless, several scholars have argued that Big Data has a favorable impact across strategy, operation, and hence to achieve competitive advantage (Akter et al., 2016; Woerner & Wixom, 2015).

First, Big Data has immense potential to transform how organizations identify and connect with their consumers. Businesses may undoubtedly improve their existing marketing strategies by using Big Data technologies. Companies craft market penetration strategies while capitalizing on the power and vigor of Big Data to retain the current customers by performing repetitive sales. In addition, new customer acquisition strategies can also be tailored with the help of Big Data (Paharia, 2013). For instance, cross-selling uses a firm's familiarity and expertise with its market to sell a variety of products and services to the same customers. Banks, in particular, have practiced analyzing large volumes of their clients' transactions in connection to social networking sites to recognize their preferences better and develop new service offerings to their clients (Rahman & Aldhaban, 2015). Furthermore, identifying a new market niche is now the actual strength of Big Data. The need to approach the market in broad demographic chunks is no longer necessary for businesses. Instead, they may employ emerging analytics to uncover potential niches or even partition current target markets into more cohesive and smaller sects to maximize profitability (Nemati & Khajeheian, 2018).

Second, combining Big Data with other emerging technologies, i.e., Hadoop Ecosystem, Artificial Intelligence, NoSQL Database, TensorFlow, Beam, Blockchain, and Docker, may spur design-driven innovations.

These innovations are crunch-point of competition because they bring advanced features that customers did not assume, but eventually, they love (Trabucchi & Buganza, 2019). For instance, Apple did not alter the way we make phone calls from our mobile devices, but rather the things we do with our mobile and the way we think about it; there is now an app for anything we want to do, from selecting color combinations for our baby's room to time passing by playing angry birds to reading the news to enjoying a movie stream to calculating the measurements of our rooms, and everything. When it comes to iPhones, it is no longer just a phone anymore, it is a multitasking device, and Apple is not solely a phone-manufacturing company; it's the company that has revolutionized our regular lives, and the majority of folks enjoy it.

Third, Big Data may change not just how we approach the market with a product or service, but also how we create the product or service from the very beginning. Open innovation is typically based on the notion that businesses should not confine themselves to harnessing ideas from inside the organization only; instead, useful ideas might also arise outside the organization. Big Data brings this concept to a new height (Del Vecchio et al., 2018). The vast volume and variety of data outside the organization can be a great source of innovative product design. Further, recognizing the product requirements, social networking sites can also be a powerful source for addressing customer complaints and preparing product-centric feature lists. It helps organizations get better insights into the market and even respond accordingly (Fortunato et al., 2017).

Apart from these, according to McKinsey (2011), Big Data can add value to businesses utilizing some different ways: first, it enables firms to make experiments, i.e., experiments to change or modify a process that companies may generate and analyze vast volumes of data from these experiments to uncover potential performance improvements. Second, more specific customer segmentation would be created via Big Data, which can then be utilized to tailor particular offerings for customers. Third, new business models, products, and services may be created or improved using data. Big Data can also help enhance existing ones while addressing current problems to enhance future versions of the product or service.

Due to its substantial strategic and operational potential, Big Data has been seen as one of the robust weapons for achieving competitive advantage. Big Data changes how organizations identify and maintain their relationship with customers. Further, from experiments to modify the existing features and even new offerings, any firm may utilize the potential

of Big Data to accelerate design-driven innovations. Thus, improving offerings based on customer data would be indispensable for staying in the swirling competitive game, and Big Data will indeed become the game changer paradigm of competitive advantage in the decades ahead.

Conclusion

The idea and application of Big Data have been gaining significant momentum in recent years. It reflects the vast amount of data dominantly unstructured, and some are semi-structured, which come from a wide variety of sources, including social media platforms. Due to its immense operational and strategic potential, Big Data is now widely seen as a game-changer, allowing increased corporate efficiency and effectiveness via enhanced decision-making. Big Data enables businesses to bring higher transparency of information, facilitates accurate and deeper insights, and eventually improves decision-making in all departments of organizations. It helps companies tailor offerings to specific target markets, fosters design-driven innovation, champions cloud innovation, and finally achieve overarching competitive advantage.

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