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Application of Big Data and Analytics to Increase Competitive Advantage

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ABSTRACT

In the digital era, the volume of data continues to increase rapidly, big data and analytics are important tools for companies to utilize the data and increase competitive advantage. The purpose of this research is to find out how big data and analytics can be applied to increase competitive advantage. This research uses qualitative research methods. The data collection technique in this research is a literature study. The data that has been collected is then analyzed in three stages, namely data reduction, data presentation and conclusion drawing. The results showed that big data and analytics are important tools for companies to increase competitive advantage in this digital era including through personalization of customer experience, operational optimization, and business strategy development. The implementation of big data and analytics is expected to have an impact on companies so that they can make better decisions, develop new products and services, improve operating efficiency, and strengthen relationships with customers.

Introduction

Technological developments have been a key driver of change in the business world, changing the way organisations operate and interact with customers. This phenomenon brings about a major transformation in the way businesses are managed, this is because with more and more companies switching to digitally managed business models. Along with the acceleration of digitalization flows, companies not only rely on technology infrastructure to run operations, but also use technology as a tool to understand and respond to market dynamics more quickly and effectively (Manik, 2023).

The main impact of digitizing businesses is a drastic increase in the volume of data generated every day. Every transaction, customer interaction, or operational activity generates a digital footprint that creates big data (Awali, 2020). Big data is a term used to describe the large volume, speed, and diversity of data generated by multiple sources and channels, including business transactions, IoT sensors, social

media, and more. These data have unique characteristics referred to as "3V", namely volume (large amounts of data), velocity (the speed at which data is created and exchanged), and variety (diversity of data formats and types) (Lubis & Hayadi, 2022).

The characteristics of big data can also be expanded to "5V" by adding value (usability and relevance) and veracity (level of trust and accuracy of data). This large-scale data often cannot be processed using traditional tools and techniques, thus requiring innovative approaches and specialized technologies to utilize it effectively (Alyasiri &; Ali, 2023). These changes pose new challenges for companies but also open up new opportunities. On the one hand, companies must address challenges related to data management, analysis, and protection. On the other hand, large volumes of data also provide great potential to generate valuable insights into customer behavior, market trends, and business opportunities that have not been revealed before.

Previous research by (Nugrahanti, Sudarmanto, Bakri, Susanto, & Male, 2023) examined the effect of the application of big data technology, auditor independence, and the quality of financial reporting on the effectiveness of the audit process, the results showed that the integration of Big Data technology substantially had a positive effect on audit effectiveness. Although auditor independence is generally maintained, concerns arise regarding the provision of non-audit services. The quality of financial statements remains high, increasing audit effectiveness. The interplay of these factors underscores the complexity of auditing in Jakarta's manufacturing sector. The implications emphasize the adoption of strategic technology, the protection of auditor independence, and a continued focus on the quality of financial reporting.

Another study by (Sirait, 2016) examined the implementation of big data technology in Indonesian government institutions, the results showed that four institutions studied, three of which were the Government Procurement Policy Institute (LKPP), the Directorate General of Taxes of the Ministry of Finance, and the Geospatial Information Agency (BIG) were at the pre-adoption stage, referring to the TDWI Big Data Maturity Model. While the Bandung City Government can be categorized as being at the corporate option stage. Regarding the challenges in the adoption of Big Data technology in the Indonesian government, 5 things can be concluded, including data availability, government data standardization, data privacy, HR competence, and supporting infrastructure.

The novelty of this research is from the object of his research, namely the implementation of big data and analytics to increase competitive advantage that has never been studied before. This research can contribute to the development of business theory by broadening understanding of the role of big data and analytics in creating competitive advantage. This can help in the development of a more complete and detailed theoretical framework for understanding how information technology affects business strategy and company performance. The purpose of this study is to find out how big data and analytics can be applied to increase competitive advantage.

Research Methods

This study used qualitative research methods. Qualitative research is a scientific research method that aims to understand social phenomena deeply and thoroughly. This research focuses on an in-depth understanding of the perspectives, experiences, and contexts experienced by a particular individual or group. The qualitative approach uses non-numerical data, such as interviews, observations, and text analysis, to explore qualitative aspects of the research subject (Kusumastuti &; Khoiron, 2019). The data collection technique in this study is a literature study. The process of literature study involves searching, collecting, and reading various literature sources, such as scientific journals, books, theses, conferences, and other articles relevant to the research topic. Once the relevant literature is gathered, researchers then analyze and synthesize the information found to gain a comprehensive understanding of the topic. The data that has been collected is then analyzed in three stages, namely data reduction, data presentation and conclusions.

Results and Discussion

Developments in information and communication technology have changed the way of communication, especially in the dissemination of information. Initially, the method of communication and information distribution was only limited to written media (paper, letters) and electronic media (radio, television, and telephone), so that the information circulating was still very limited, both from the scale of information circulating and the area that could be reached, especially in cross-country information distribution. People in one country cannot easily obtain and access information related to other countries, and vice versa. The development of the internet in the era of advanced technology allows the circulation of information that is increasing, fast, and almost unlimited by space and time (Kusumasari &; Rafizan, 2017). Through information technology, trillions of bytes of data are created every day from a variety of sources, such as from social media, video surveillance, and smart grids. This sea of data leads to one terminology, namely big data (PG, 2018).

Big data is the latest technology that is currently considered effective for processing and analyzing data, both structured and unstructured, has a very large volume, variety, and velocity which is used as a competitive advantage for companies (Rahman, 2017). Big data is a new and important technological development that allows the storage and integration of very large volumes of data from various sources (Ferdiansyah & Nasution, 2023). Big Data Analytics refers to technologies that are largely based on data mining: text mining, web mining, process mining, audio and video analysis, statistical analysis, network analysis, social media analytics, and web analytics (Batko & Ślęzak, 2022).

Big data analytics has emerged as an important tool to support managerial decision making. Before the invention of computers, humans' ability to store and process data was very limited. Nowadays, big data analytics has emerged as one of the most important factors for generating deep insights and understanding for decision

making. Due to the important role of big data analytics in organizations, scholarly attention has focused on exploring the relationship between big data analytics and decision-making performance in companies with ever-evolving markets (Nugraha, Ritchi, & Adrianto, 2023). Laney in (Efgivia, 2020) states that it is universally accepted in three dimensions or "3V" big data, namely variety, volume, and velocity. Variety is a type of data that is collected and generated. Volume refers to the amount of data produced by Perpusnas. While the velocity (speed) of data growth is being created.

Big Data has support in the form of: 1) Accurate, in the form of information data sought by searching for the source itself. 2) Accessible, is the database power of a data, where a data requires storage itself and then collected, when it has been collected the data can be managed. 3) Analysis, in the form of data information to be sought, by searching for data information by analyzing, can be in the form of predictive analysis, exploratory analysis, regression analysis, data mining and perspective analysis. 4) Application, in the results of the analysis that has been done, a data requires software and hardware devices to provide analysis services, this method can make it easier for companies to carry out an analysis service for central government agencies or forums as well as regions, the mining, aviation, and health industries (Syira et al., 2023).

Data sources for Big Data can be structured databases or unstructured data. The benefits of Big Data technology have been widely felt in various sectors. Companies engaged in the business sector can utilize valuable information generated by Big Data to optimize the decision-making process, so that the target of maximizing profit can be achieved. Meanwhile, institutions engaged in public services can use information output from Big Data to maximize the level of service satisfaction to their clients / customers (Duha, Fajriyah, Setiawan, & Dewi, 2022).

The application of big data in the business world is very important because the form of data that exists in a business is unstructured so that with the existence of big data data can be used for operations and business development. If a company does not adopt the technology, then gradually the company will be left behind. In the business world, the most important thing about data is not about its quantity, but how it can be managed and utilized to develop an ongoing business (Erislan, 2024).

In Big Data, data is too big and too fast or does not fit into the conventional database architecture structure. So to get value from data, technology must be used to extract and obtain more specific information. Cloud technology is needed because Big Data needs to be supported by a strong server with a large storage area and easy to develop (Hapsari, 2020). Big data brings transparency and more accessible data. This has never happened before, many businesses that rely on proprietary data as a competitive asset are threatened. Many new businesses are starting to offer data and analytics services in almost every domain, they help other businesses to grow faster and smarter, for example, manufacturing businesses integrate data collected from production floors and other sources, collecting data from suppliers from all over the world (Shahid & Sheikh, 2021). The five ways to utilize Big Data according to McGuire et al. (2012) are as follows.

1. Big Data can provide significant value by making information transparent. There is still a lot of information that has not been recorded in digital form, for example data that is on paper, or is not easily accessed and searched through the network. We found that up to 25 percent of efforts across multiple knowledge worker workgroups consisted of searching for data and then transferring it to another (sometimes virtual) location. These efforts are a significant source of inefficiencies.
2. As organizations create and store more transactional data in digital form, they can gather more accurate and detailed performance information on everything from product inventory to sick days, uncovering variability and improving performance. In fact, some leading companies are using their ability to collect and analyze big data to conduct controlled experiments to make better management decisions.
3. Big Data allows for narrower customer segmentation so that products or services can be tailored more precisely.
4. Sophisticated analytics can significantly improve decision-making, minimize risk, and uncover valuable insights that may still be hidden.
5. Big Data can be used to develop next-generation products and services. For example, manufacturers use data obtained from sensors embedded in products to create innovative after-sales service offerings such as proactive maintenance to avoid failures in new products.

The purpose or main thing of this Big Data phenomenon is, there is a very exponential growth of data and information, speed in data accretion (volume), and increasingly varied content of the data that has the potential to create new challenges, new opportunities, and new sales or marketing strategies. This indicates that optimal data processing in a big data warehouse will be able to maximize the company's goals in winning the competition (Mantik & Awaludin, 2023). Competitive advantage is an advancement of a process or value that a company is able to create for its buyers. Not only that, but competitive advantage is also something that can make a company gain more advantages compared to the advantages of competitors / competitors (Khasanah & Hudaya, 2024).

Big Data solutions are ideal when all or most of the data needs to be analyzed or when data sampling is not as effective as larger data sets. By using Big Data and leveraging its benefits, a company can gain a huge competitive advantage and stay ahead of its competitors. Big Data offers much greater growth potential to businesses than traditional technology, although it is still poorly understood. Companies that are still far from this concept can make their competitors, who have understood the importance of Big Data faster, gain a leading position in the market. Organizations should not underestimate the importance of this concept (Kubina, Varmus, & Kubinova, 2015).

Thus, the application of big data becomes one of the main things in increasing competitive advantage for companies. Big data has the ability to process large-volume, diverse, and high-speed data, allowing companies to gain in-depth knowledge about customers, markets, and business operations. By utilizing Big Data effectively,

companies can create significant added value and gain a sustainable advantage in market competition. Therefore, big data is not only a technology but also a vital strategy for achieving business success in this digital era.

Conclusion

Big data and analytics have a crucial role for companies in increasing competitive advantage in this digital era. One of the main ways in which this happens is through personalization of customer experience, which allows companies to better understand customers' individual preferences and needs as well as tailor their services or products more precisely. In addition, big data and analytics are also used to optimize company operations, enabling the identification of areas that can be improved in business processes to achieve greater efficiency. In addition, companies are also using big data and analytics to develop smarter and more responsive business strategies, by analyzing market trends, consumer behavior, and internal data to inform strategic decisions. Therefore, by effectively applying big data and analytics, companies are expected to make better decisions, produce innovative new products and services, improve operational efficiency, and strengthen connections with customers, all of which contribute to increasing their competitive advantage in an increasingly changing and competitive market.

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