

UTILIZATION OF BIG DATA IN THE CLOUD AMONG INDUSTRIES: A REVIEW

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Abstract

Big data and cloud computing have gained popularity in research and have been implemented in various industries. Several benefits are expected in utilizing these technologies. To be more specific, the use of big data in the cloud has been an ongoing interest because of the real-time processing capability. This investigation was conducted to identify various industries that utilize big data in the cloud as well as identify the specific uses and benefits of such implementation. Employing a narrative literature review of different article reviews, it was found that most of the articles mentioned about Energy and Healthcare industries. The implementations were different from each industry type.

Keywords: Big Data, Cloud Computing

INTRODUCTION

The advancement in information and communications technology posted an opportunity to accumulate vast amount of data in various forms and in speedy manner. Hence, big data concept was formally introduced. This field takes into consideration structured, semi-structured, and unstructured data. Initially, big data was characterized with these three attributes: volume, variety, and velocity, which prompted an alternative approach and type of data storage.

To respond to the challenges associated with big data, cloud computing becomes a promising solution. It allows organizations to maximize the benefit of big data by real-time processing. Furthermore, different analysis were developed, generally for the improvement of living. Consequently, additional characteristics of big data were identified, which include value and veracity.

With big data, various industries take advantage of its capabilities in order to gain competitive advantage, aside from just coping with the pace of technology.

In relation, this investigation was conducted to identify types of industry that utilize big data in the cloud. Moreover, this study aimed to determine the existing uses and benefits of such action.

METHOD

This investigation employed the narrative literature review. It is among the types of review that does not intend to collect all pieces of evidence on a chosen topic (Cornell University Library, 2019). With the large number of articles on big data in the cloud, only selected materials were covered in this study. Figure 1 illustrates the activities employed in identifying the articles

included in this review.



Figure 1: The selection process

The search of the articles used in this study was limited to the Scopus indexed materials, which happened on March 10, 2023. Figure 2 is the screenshot containing the parameter used to search for the relevant articles reviewed.

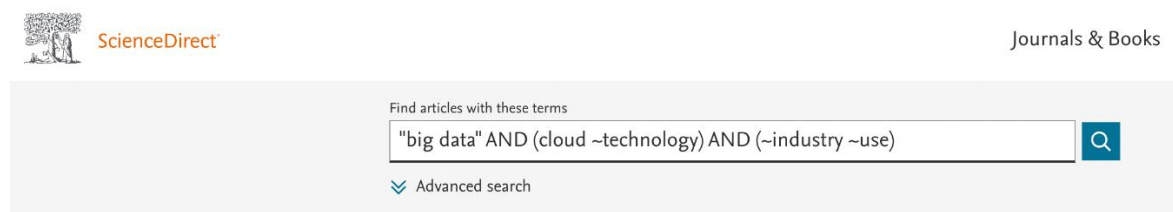


Figure 2: Search parameter used and the obtained number of results

The search obtained 3,751 articles. Since this number of articles was too large and this investigation did not intend to cover all available evidence, refinement of search was made. The refinement was set to as follows: a) 2023 for the year, b) review articles for the article type, and c) open access and open archive for the access type. Only review articles were considered since such material already incorporated many research papers. Also, only 2023 publication was set since those materials are review articles that had covered certain range of years. Applying the described filtering, results obtained went down to 80 articles.

The identified articles were downloaded and subjected to further assessment. The contents of each article were checked and the articles with the following issues were excluded: a) pre-proofs, b) using the find function, either or both the terms “big data” and “cloud” were not found in the results section, and c) no specific industry type identified. After the content assessment, only 56 articles were included.

The contents of the 56 materials were analyzed to identify the industries that utilize big data in the cloud. Then, for each industry the respective uses or benefits of such implementation were listed.

RESULTS AND DISCUSSION

Several industries were mentioned in the reviewed articles. Although, there were only 56 materials used, but the total citation was 58 since there were two articles that mentioned two types of industry. Figure 3 presents the different industries, some were grouped by sector.

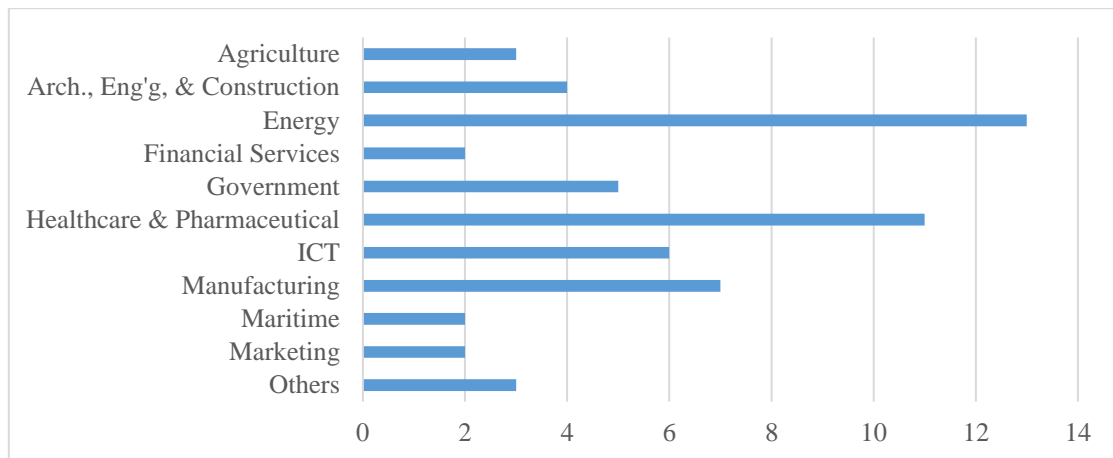


Figure 3: Industry types and the corresponding numbers of article mentions

In the Agriculture sector, three different industries were mentioned, one by each of the three articles: Farming (Purcell & Neubauer, 2023), Fishing (Rowan, 2023), and Plant Breeding (Dipta et al., 2023). The Architecture, Engineering, and Construction (Huang et al., 2023; Morewood, 2023; Saka et al., 2023; Wu et al., 2023) were all mentioned as one industry by four different articles. The Energy Industry were mentioned in 13 articles. Aside from Electric Power (Edadl et al., 2023; Maghami et al., 2023; Zhaoa et al., 2023; Dominguez et al., 2023; Y. Li, et al., 2023; Chena at al., 2023; Qays et al., 2023; J. Li et al., 2023; Alanazi et al., 2023; Sifat et al., 2023;Alcañez et al., 2023), one specifically focused on Solar (Zhua et al, 2023), while one named the Oil and Gas (Gjelsvik et al., 2023). The Financial Services (Cherif et al., 2023; Ashiru et al., 2023) was mentioned in two articles. In the Government, three industry types were identified: Defense (Laghari et al., 2023), Public Administration (Madan & Ashok, 2023), and Transportation (Lv & Shang, 2023). The combined Healthcare (Jiao et al., 2023; Ramanathan et al., 2023; Ross et al., 2023; Ahmad et al., 2023; Paula et al., 2023; Arji et al., 2023; Grobe et al., 2023; Sumitha et al., 2023; Rejeb et al., 2023; Furtado et al., 2023) and Pharmaceutical (Vemula et al., 2023) were from the 11 articles. The Information and Communications Technology, composed of Infrastructure-as-a-Service (Pour et al., 2023) and Telecommunications (Yi et al., 2023; Singh et al., 2023; Begum & Nandury, 2023; Khan et al., 2023; Gerodimos et al., 2023) were identified in the six articles. The Manufacturing were mentioned in seven articles, one in Food Processing (Hassoun et al., 2023), one in Textile (Meena et al., 2023), one in Coating (Verma & Khanna, 2023), and the rest were generic (Deepu & Ravi, 2023; Nunes et al., 2023; Reis & Melao, 2023; Soori et al., 2023). The Maritime Industry (Mauro & Kana, 2023; Baker et al., 2023) was identified from two articles. The Marketing (Haba et al., 2023; Buhalis et al., 2023) was mentioned in two articles. While, the other three were mentioned individually in different articles: Mineral (Ghorbani et., al), Robotics (Mazumder at al., 2023), and Tourism (Buhalis et al., 2023).

For the uses and benefits of utilizing big data in the cloud from each sector or industry type, varied results were observed.

With the Agriculture sector, the uses and benefits are presented in Figure 4. Big data in the cloud were used for digitalization that is for the collection and management of data (Dipta et al., 2023), fish production increase (Rowan, 2023), and livestock optimal growth using through Digital Twin (Purcell & Neubauer, 2023).

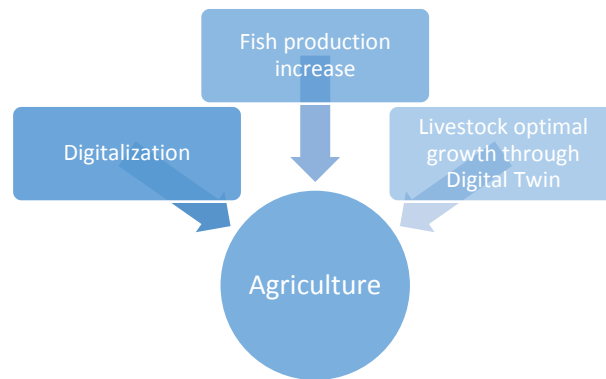


Figure 4: Uses and benefits in the Agriculture sector

Among the Architecture, Engineering, and Construction industry, big data in the cloud were used in conversational application of artificial intelligence (Saka et al., 2023), data extraction (Huang et al., 2023; Morewood, 2023) with the support of the Building Information Modeling (BIM) and Internet of Things (IoT), and engineering rock mass quality assessment (Wu et al., 2023) as shown in Figure 5.

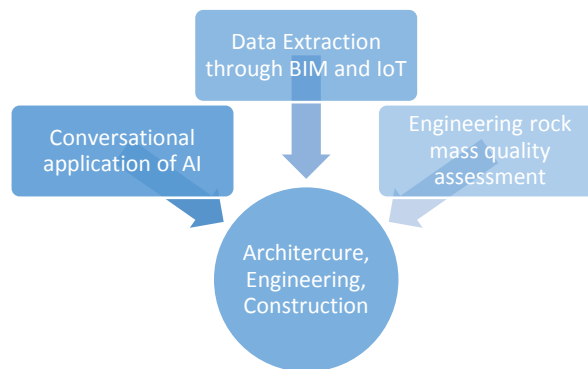


Figure 5: Uses and benefits in the Architecture, Engineering, and Construction industries

In the Energy industry, the uses and benefits of big data in the cloud ranges from monitoring, prediction, security, and sustainability. Specifically, in monitoring, it includes collection of relevant data and visualization (Alanzi et al., 2023; Dominguez et al., 2023; Eladl et al., 2023; Gjelsvik et al., 2023; Y. Li et al., 2023). The prediction includes energy consumption (Dominguez et al., 2023; Maghami & Mutambara, 2023), photovoltaic power (Alcañez et al., 2023; Zhua et al., 2023), and pricing (Dominguez et al., 2023). On security, it includes fault, anomaly, malware detection (Dominguez et al., 2023; Qays et al., 2023), and assessment and

classification (Dominguez et al., 2023). In terms of sustainability, it covers increasing efficiency (Chena et al., 2023), management and strategies (J. Li et al., 2023), sustainable system operations (Zhaoa et al., 2023), and service recommendation (J. Li et al., 2023). The results are depicted in Figure 6.

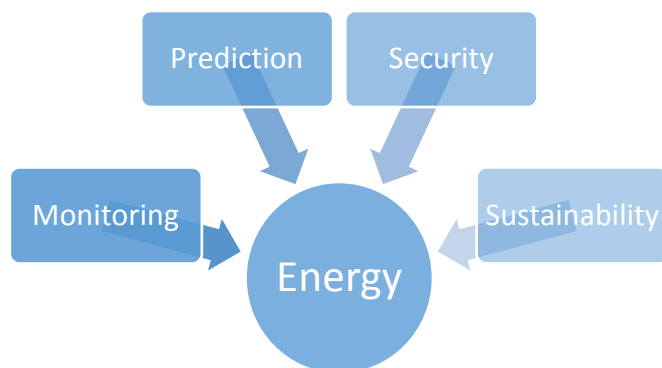


Figure 6: Uses and benefits in the Energy Industry

Among the Financial Services industry, big data in the cloud were utilized for branchless banking (Ashiru et al., 2023) and fraud detection and prediction (Cherif et al., 2023), as reflected in Figure 7.

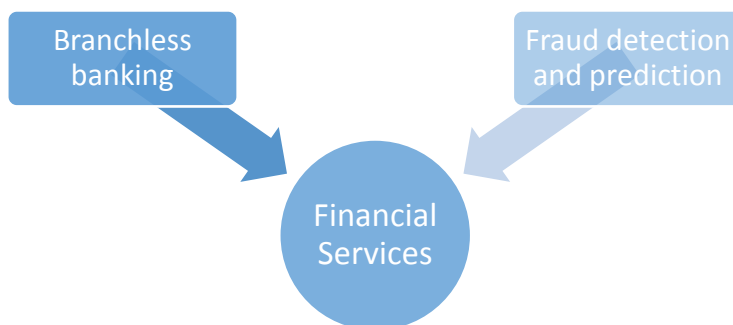


Figure 7: Uses and benefits in the Financial Services industry

In the Government sector, their utilizations of big data in the cloud are presented in Figure 8. Digitalization (Lv & Shang, 2023; Madan & Ashok, 2023) was identified in the Public Administration. In terms of assessment, prevention of crimes through digital investigation (Reedy, 2023) was recognized in the Forensic industry. While optimization includes emission reduction, energy conservation, and traffic congestion alleviation (Lv & Shang, 2023) with the Transportation industry and unmanned aerial vehicles (Laghari, et al., 2023) with the Defense industry.

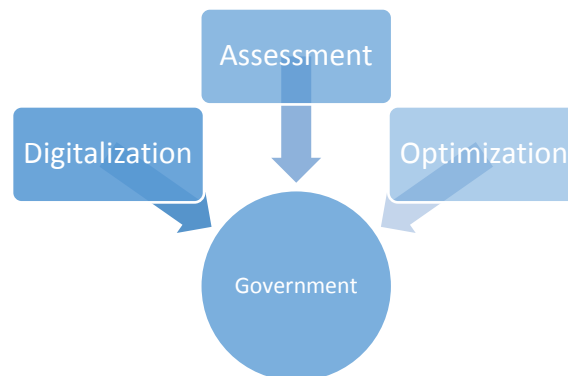


Figure 8: Uses and benefits in the Government sector

For the Healthcare and Pharmaceutical industries, the uses and benefits of big data in cloud include digitalization, monitoring, assessment, discovery, and surgery as illustrated in Figure 9. For digitalization, that is for medical record archiving and retrieval (Paula et al., 2023). In terms of monitoring, big data in the cloud were used for epidemic-related tracing (Jiao et al., 2023) and fitness tracking (Ahmad et al., 2023). Assessment covers the disease screening (Ramanathan et al., 2023; Sumitha & Xavier, et al., 2023), guided self-testing (Ross et al., 2023), intelligent and improved health care (Arji et al., 2023; Furtado et al., 2023; Grobe et al., Rejeb et al., 2023), and online consultation (Ahmad et al., 2023). On discovery, it includes drug design and discovery (Jiao et al., 2023; Vemula et al., 2023), disease outbreak mapping (Ross et al., 2023), epidemic development trend prediction (Jiao et al., 2023), omics application (Grobe et al., 2023), and vaccine discovery (Jiao et al., 2023). Also, robotics surgery (Ahmad et al., 2023) was identified.

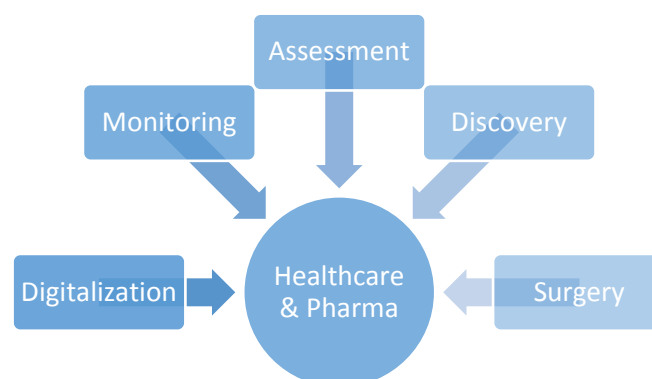


Figure 9: Uses and benefits in the Healthcare and Pharmaceutical industries

In the ICT industries, Figure 10 depicts their utilization of big data in the cloud, namely, digitalization, prediction, security, and sustainability. Digitalization (Singh et al., 2023) was identified. Prediction was focused on failure recovery technique (Khan et al., 2023). Security use includes detection of attack (Yi et al., 2023;), failure recovery (Khan et al., 2023), and threat analysis (Pour et a;., 2023;). On sustainability, it includes resource optimization (Begum &

Nandury, 2023) and improved channel recognition (Singh et al., 2023).

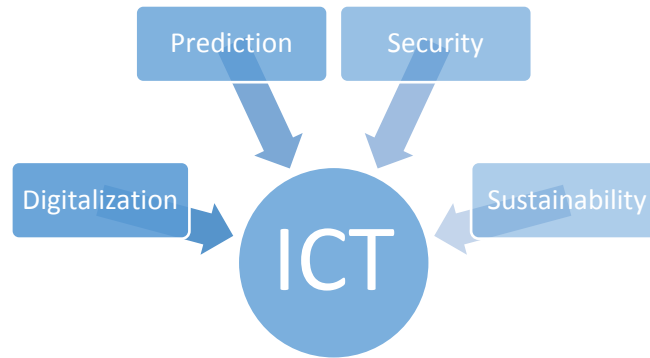


Figure 10: Uses and benefits in the ICT industries

With the utilization of big data in the cloud among manufacturing industries, Figure 11 depicts the results.

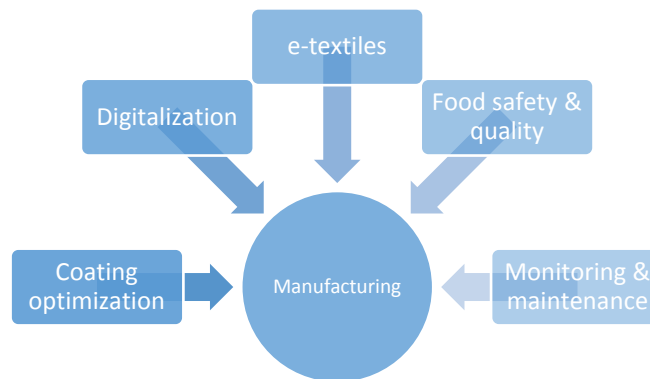


Figure 11: Uses and benefits in the Manufacturing industries

Utilizations include coating optimization (Verma & Khanna, 2023), digitalization (Deepu & Ravi, 2023; Reis & Melao, 2023), e-textiles (Meena et al., 2023), safety and quality of processed food products (Hassoun et al., 2023), and monitoring and maintenance (Deepu & Ravi, 2023; Nunes et al., 2023; Reis & Melao, 2023; Soori et al., 2023).

In the Maritime industries, big data in the cloud uses are presented in Figure 12. Among the uses was on Digital Twin (Mauro & Kana, 2023). In addition, big data in the cloud were used for safety improvement (Baker et al., 2023). As part optimization, big data in the cloud were used for cost, time, waste, and carbon emission reduction as well as for freight and transport procedure optimization (Baker et al., 2023).

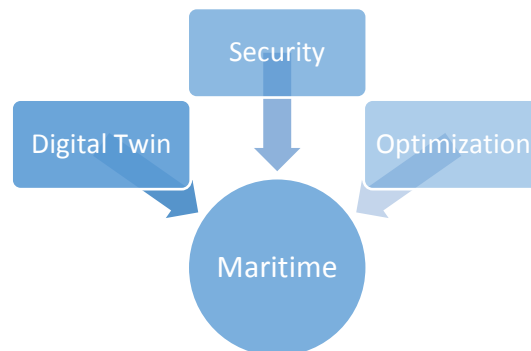


Figure 12: Uses and benefits in the Maritime industries

Figure 13 shows the utilization of big data in the cloud among the Marketing industries. These include detection of consumer buying behavior and sustainable development (Haba et al., 2023) as well as metaverse ecosystem (Buhalis et al., 2023).

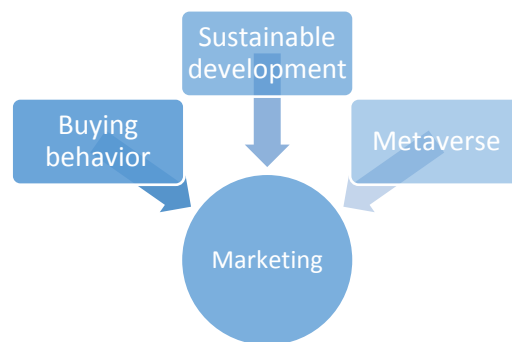


Figure 13: Uses and benefits in the Marketing industries

For other industries, Figure 14 shows their use of big data in the cloud. For the Mineral industry, mineral exploration and processing as well as predictive maintenance for the dry laboratories (Ghorbani et al., 2023) were identified. In Robotics Industry, Digital Twin integration (Mazumder et al., 2023) was mentioned. While in Tourism Industry, metaverse ecosystem (Buhalis et al., 2023) was named.

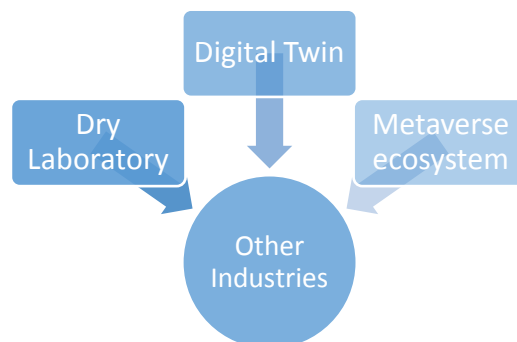


Figure 14: Uses and benefits in Mineral, Robotics, and Tourism industries

CONCLUSIONS

Most of the articles reviewed in this investigation covered the uses of big data in the cloud among the Energy industries, followed by the Healthcare and Pharmaceutical industries. Although, many other industries implemented such technique in their processes, these two categories of industry showed more interests among researchers, hence more publications were made available.

Several uses and benefits were identified across the various industries mentioned in this investigation. Some utilization were mere digitalization, but there were already on metaverse. This only proves how interesting and valuable the implementation of big data in the cloud.

Declaration of Interest

The authors declare no potential conflicts of interest with respect to this research, authorship and publication.

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