JCBI
Journal of Computing & Biomedical Informatics
ISSN: 2710 - 1606
Volume 04 Issue 02
2023

Research Article
https://doi.org/10.56979/402/2023

Blockchain and Big Data to Revolutionize Archaeological Photogrammetry (AP): A Safe and Effective Method

Fatima Bukhari[1,2,3], Shaista Ilyas[1,2], Laiba Rehman[2], Humera Batool Gill[2], Khadija Kanwal[2] and Nadeem Iqbal Kajla[4,*]

[1]NFC Institute of Engineering and Technology Multan, Pakistan.
[2]The Women University, Multan, 60000, Pakistan.
[3]Emerson University, Multan, Pakistan.
[4]Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan.
[*]Corresponding Author: Nadeem Iqbal Kajla Email: nadeem.iqbal@mnsuam.edu.pk

Received: November 12, 2022 **Accepted:** February 26, 2023 **Published:** March 29, 2023

Abstract: The enormous amount of data circulating via the internet today has resulted in the generation of a vast amount of complex information. Large datasets from various sectors, including academia, businesses, energy, healthcare, and more, contain extremely large and diverse sets of data that are difficult to manage. This is known as "big data," and it presents a significant challenge in terms of effectively handling such large volumes of data, particularly in the field of photogrammetry. Traditional methods are incapable of dealing with large amounts of data, necessitating the development of more sophisticated tools. Big data is often described using the "V's" characteristics, which originally included volume, velocity, and variety. Over time, these six V's have been expanded through research to a total of 65 V's. Some of these V's were identified by the author of this paper, which means the number has increased by almost twenty times. Researchers have conducted numerous studies to identify and compare all of these characteristics in order to answer the longstanding question of "How many V's characteristics are there in big data with artificial intelligence and blockchain?" This paper provides a comprehensive overview of all known big data V's characteristics, as well as their strengths and limitations in the context of photogrammetry and blockchain.

Keywords: Big Data; Characteristics of V's; Blockchain; Photogrammetry.

1. Introduction

The amount processing data is rapidly increasing in the modern era. The rise can be attributed to the widespread usage of data-producing gadgets, including but not limited to wearable technology, mobile phones, tablets, and diverse types of sensors. In 2021 alone, it is estimated that 59 ZB of data will be processed and generated. According to IDC, the massive saved data will have increased to 163 ZB by 2025 figure 1. Fig. 1 Data Evolution [1] Storage capacity has grown exponentially, with capacity predicted to increase from MB to EB and ZB in the near future [2]. This surge in data generation has been driven by the proliferation of new technologies and the increasing amount of data produced in a variety of formats, including photos, audio, text messages, and server logs. As a result, managing and handling this rapidly growing volume of data has become a challenge. We are now entering the exabyte era, with the petabyte era coming to a close, due in part to the extensive amount of data created by the technological revolution, which has Storage capacity has grown exponentially, with capacity predicted to increase from MB to EB and ZB in the near future [2]. This surge in data generation has been driven by the proliferation of new technologies and the increasing amount of data produced in a variety of formats, including photos, audio,

text messages, and server logs. As a result, managing and handling this rapidly growing volume of data has become a challenge.

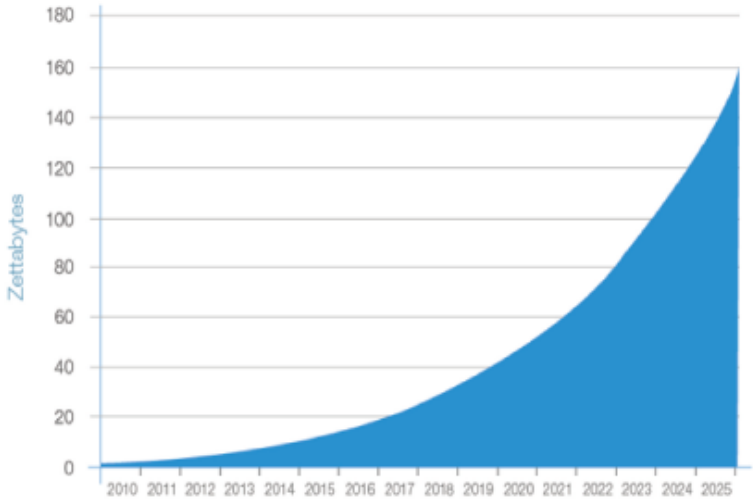

Figure 1. Data Evaluation [1]

We are now entering the exabyte era, with the petabyte era coming to a close, due in part to the extensive amount of data created by the technological revolution, which has been referred to as ”Big Data”[3]. ”Big Data” is generally understood to refer to a large amount of data that cannot be processed efficiently using traditional database tools and methods [4]. As new storage media are developed, the amount of data that can be accessed and retrieved increases due to the ease of access. BD was thought to be primarily structured data at first, but it has since become clear due to extensive information in an unstructured world, with images and text being common types. The global proliferation of complex and diverse information is a BD age, with some researchers referring to it as a ”Data Deluge”[5]. IBM has provided multiple definitions for the conviction of ”Big Data”:

Big Data” refers to large, unstructured sets of data from numerous sources, together with social media posts, purchase records, climate sensors, GPS signals, text, pictures, and videos.

It is frequently distinguished by its enormous size, which exceeds the processing capacity of infrastructure and traditional database systems [6].

The goal for data storage capacity was to have systems with 10 to 100 gigabytes of data. Now, the aim is to have systems with tens to hundreds of terabytes of data storage capacity. In other words, Big Data is constantly evolving and represents the amount of data that is currently out of reach. The exponential growth of massive data is astounding. According to a 2013 survey, the use of Big Data will rise from 19% to 50% between 2013 and 2016 [7]. Big Data volume increased to more than ”forty trillion GB” in 2020, and is double expected in the next two years, dominating the IT industry until 2030. Prior to the advent of Big Data, only about 25% of data was stored digitally, with the rest stored in various formats. However, data growth has been so rapid that only 2% of the population is digitally connected [8]. Big data (BD) will be essential for the growth and competitiveness of individual companies. Every organization should prioritize BD to be able to innovate, compete, and extort value from the most up-to-date data. This is true for both established organizations and new entrants in any field. However, dealing with the large volume of BD can be challenging, and It is critical to ensure that the information is accurate and trustworthy. Due to the difficulty of checking such a large amount of data, this can be difficult. Data is stored in EB units by Microsoft, Google, Yahoo, and Amazon, whereas YouTube, Twitter, Facebook, and Instagram have millions of users who generate data every second. BD analytics, a key area of data science research, has attracted significant investment from a wide range of organizations seeking to develop products for data analysis, simulation, testing, and other business and knowledge requirements. BD analytics, on the other hand, faces a number of challenges, such as raw format variations, streaming data speed, reliable data analysis, the distributed nature of sources, and algorithm scalability, to name a few [9]. Inconsistencies and incompleteness are common in data collected from a variety of sources, including sensors, social media, and financial

records. Advanced techniques and tools are required for quick analysis and accurate predictions of future actions. The accumulation of data can lead to uncertainty and mistrust in the analytical process and decision-making. Traditional business intelligence and analytics methods are more efficient and scalable than AI technologies [10]. BD and photogrammetry [1] are gaining popularity in the hospitality and tourism industries because they have the potential to significantly transform business processes and the way companies analyze customer and market trends.

Researchers have been analyzing big data using various types of big data and advanced methods, which has greatly influenced how traditional hospitality and tourism research is conducted. This is because big data analysis can overcome some of the limitations of traditional data sources, such as self-ported survey data [11]. Photogrammetry, artificial intelligence (AI), bigdata (BD), and advanced digital technologies (ADT) are expected to play important roles in our society in the future, similar to how oil did previously [12]. While BD, AI, and ADT are not perfect solutions for the energy sector right now, their importance is expected to grow as renewable energy sources become more prevalent. We conduct a literature review on BD, AI, and ADT in this review paper to investigate their potential integration in the design and implementation of smart energy management systems (SEMS). Numerous reports and review papers on various aspects of BD, AI, and ADT in SEM have been published. These papers go into greater detail about individual technologies' performance, whereas our work focuses on their interactions [13]. In [14] Six BD analytic issues that affect BD learning performance are discussed. Uncertainty management in large data sets, on the other hand, is a distinct challenge. Nonetheless, timeliness, scalability, complexity, heterogeneity, and privacy concerns can all stymie progress at any point along the data-value-creation pipeline. These difficulties arise during data collection when a large amount of data makes discarding difficult, as well as deciding how to store data consistently with important information. 3D technology, laser technology, geographic data technology, database modeling, and other advanced technologies have provided significant benefits for the management, monitoring, planning, and representation of social legacies. They are enabled by the advanced transformation of social legacy management and digital technology tools. Database management systems are one example of digital technology that has been useful in this regard [15].

Data becomes more valuable when it is linked to other data, making data integration a valuable tool. The proliferation of digital data brings both opportunities and challenges, such as the ability to shape its creation and connect it to existing data, as well as modeling and retrieval difficulties. Data analysis may be particularly difficult due to scalability constraints and the complexities of the data being analysed [16]. Because of technological and methodological advances such as the development of specialized equipment and the use of digital techniques to control the photographic process and environment, AP has undergone a process of continuous improvement and scrutiny over time [17]. Education, industry security, healthcare, industry, and agencies are all seeing an increase in the use of BD processing. BD is centered around several key factors, referred to as "Vs". There could be more than 100 of these Vs, and we will continue to investigate and discover new ones in the future. Big Data has many advantages and applications, but it also has some drawbacks, such as the need for effective analysis, security, and management [18]. Blockchain, due to its decentralized and secure characteristics, has the potential to improve and advance Big Data services and applications [19]. Big Data and the Internet of Things (IoT) offer innovative solutions for ensuring the security and trust of the electrical energy grid, known as the "energy Internet". Blockchain technology has several key characteristics that make it an excellent choice for regulating smart grids and addressing security concerns. This study will take an in-depth look at blockchain implementations in smart systems for network security and energy data protection [20]. Integrating big data with photogrammetry and blockchain technology can help address and manage many of big data's key issues and challenges.

With the rise of bitcoin and other cryptocurrencies, blockchain technology first gained widespread attention [21]. It is a decentralized ledger that verifies every bitcoin transaction via a peer-to-peer network, making it a secure and transparent method of conducting digital transactions and record keeping. While blockchain was initially used for cryptocurrency transactions, the concept can be applied to a wide range of transactions, including those in agriculture. In addition to improving data integrity, the shared data layer that blockchain creates has the potential to unlock new possibilities for archaeological photogrammetry capabilities and insights [22]. Decentralized control and immutability can serve as a foundation for photogrammetry, allowing for more data to be used for improved modeling and the possibility of discovering entirely new models [23].

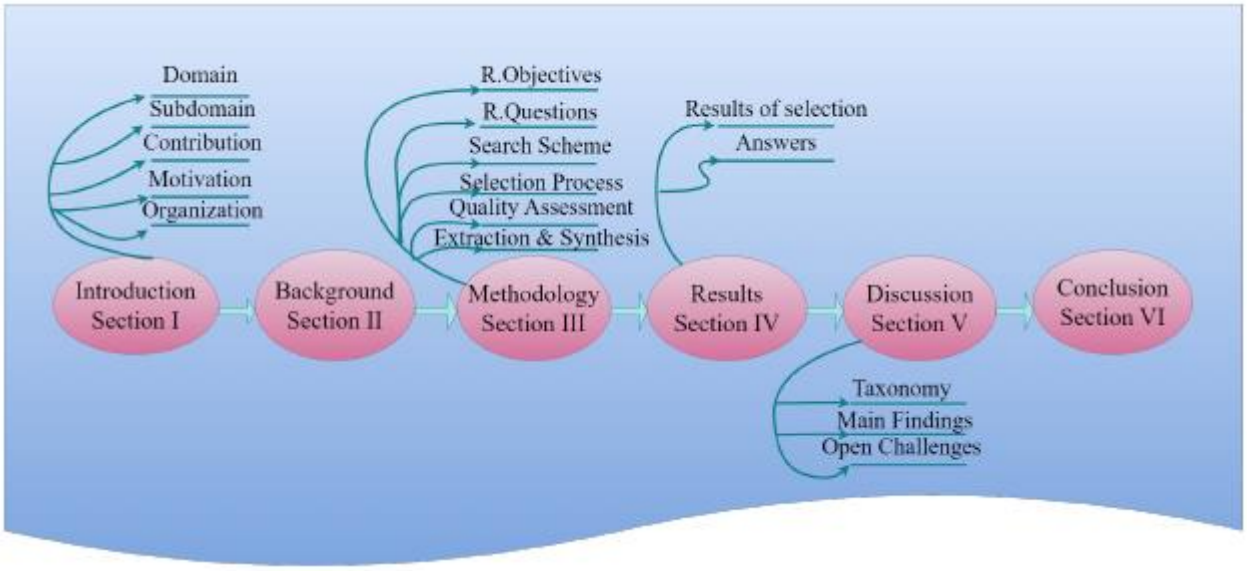

Figure 2. Paper Taxonomy

Research is divided into 6 subsections: As Sec II summarizes previous research studies in a related field with a diagram 2 showing the structure of the article. Sections III and IV describe how to conduct a literature review, including research questions, search strings, inclusion/exclusion criteria, quality assessment, and conclusion. Sec V delves into the proposed taxonomy, which includes both key discoveries and unresolved issues. The findings are summarized in Section VI, Section VII concludes the article.

2. Background

VELOCITY: G(Generation) Speed Data volume refers to the rate at which data is generated and collected from various plate forms including businesses, machines, and also for online media platforms. Massive data can be continuous and vast. Batch data and streaming data are two distinct types. It's important to consider these techniques when selecting a big data analysis platform, as streaming data often requires faster real-time analysis. Hadoop is well-suited for batch processing of large data sets, while Apache Spark is known for its performance in interactive tasks and instantaneous analysis. In some cases, it is critical to analyze data as it is generated, such as in fraud detection, where processing time-sensitive data can increase its value. For example, 5 million transactions and events are analyzed daily to identify potential fraud [24], [25].

VOLUME: Massive Amount, Scalability It refers the huge data from various sources, such as scientific and technological research, organizational records, and collaborative efforts. This data can include text, sound, video, social media communications, weather forecasts, crime reports, and natural disasters. Managing such a large volume of data can be time-consuming and labor-intensive. However, advancements in data storage technology, such as the use of cloud and edge computing, have made it easier and more cost-effective to store and handle large amounts of data. Despite these improvements, data volume remains a significant factor that can impact how organizations manage and analyze data [26].

VARIETY: Multifariousness Data organization is evaluated based on the degree of data variety. Poorly organized data is unstructured data, whereas well-organized data is referred to as structured data. It alludes to the diversity and massive data represented in various formats, such as video, images text, and audio. Analytically, data variety is frequently the most difficult challenge in effectively utilizing large amounts of data. Because unstructured and semi-structured data are more difficult to analyze and make decisions with the diversity of data formats contributes to the overall intricacy. Traditional data analysis systems, such as relational database management systems (RDBMS), can only handle structured data and are costly to implement.

VERACITY: Meaningfulness and Quality. It refers accuracy of data with consistency. It is also concerned with the reliability and precision of data and ensuring that security decisions are made based on the information gathered. Data can be graded as good, bad, or undefined due to inconsistencies, incompleteness, ambiguity, delays, deception, and approximations. Veracity is important when gathering and analyzing

data to solve a particular problem [27]. It involves extracting useful information from data and ensuring that it is reliable and accurate [28].

VALUE: Means Mining, for making decisions data analytics are being critically observed because it has the potential to significantly impact a company's financial performance. For example, a report [29], [30], [31] found that implementing data analytics in the healthcare industry could lead to cost savings of between 300 billion and 450 billion dollars or 12 to 17% of the total healthcare costs in the US. Furthermore, research has shown that the utilization of business data and analytics can differentiate between high-performing and low-performing companies across a variety of industries. Correspondingly, the value of data is found in its careful examination and ability to yield useful insights [32], [33]. However, simply collecting and storing large amounts of data is not the goal of every organization. They aim to derive actual business benefits and enhance decision- making through data analysis. Some companies may be willing to invest more in higher-tier data storage if it provides better security, leading to improved value and cost efficiency. Despite this, extracting value from big data analytics remains a challenge, as noted by multiple studies.

VALIDITY: superiority, comprehension While data validity and truthfulness are related, they are not the same thing. The precision and correctness of the data in relation to its intended purpose are referred to as data validity, whereas data truthfulness refers to the data being actual and true. When data is used for decision-making or other actionable purposes, its validity must be ensured. Data collection, on the other hand, may be true but not necessarily legitimate if not properly understood or accepted. Furthermore, the same information may be suitable for one application but not for another. Validating the data by verifying the connections between pieces of information is critical [30].

VOLATILITY: Lifetime, Availability, Durability In big data, the concept of data validity refers to the length of time during which the data is considered accurate and useful. Acknowledging the point when real-time data becomes irrelevant for ongoing research in a particular field is crucial. Although some data may remain accessible indefinitely, this may not be the case for all sources. As a result, obtaining the specified requirements, as well as the availability and longevity of the data being used, is critical. In traditional data contexts, it is frequently retained for long periods of time in order to build a knowledge base. However, in the world of big data, data retention times may transcend. Data storage and security may become prohibitively expensive. Big data volatility has become a significant issue that must be addressed in terms of data retention due to its variety, volume, velocity, and storage.

VIABILITY: Activeness Big data should be able to continue to exist and generate new data indefinitely, as well as evolve over time to meet changing needs. However, researchers must analyze large data sets, which requires careful evaluation of the characteristics and factors that are most likely to have a significant impact on business outcomes. When collecting big data, it is important to consider a range of multidimensional data, Rather than just a large number of records, including a variety of factors. When examining large sets of data, researchers may wish to take into account how the timing of the day or week affects consumer buying behavior.

VISUALIZATION: Attractiveness, Intelligence, Data visualization and interpretation are highly valued because they allow users to quickly and effectively understand data and make informed decisions. In business intelligence, visualization is used to identify trends and patterns in data that are relevant to achieving specific goals or objectives. To effectively use visualization in this context, data from various sources can be combined and converted into a model that helps decision-makers understand the data and make decisions quickly. However, visualizing large volumes of data that involve multiple variables and are complex in nature can be a challenge. The key to effectively visualizing such data is to create clear and legible visualizations that accurately represent the data and make it easy to understand. Without the correct analysis and visualization, raw data is often difficult to use and understand [34].

VERIFICATION: Authenticity is the appealed outcome. The proceeding of evaluating data to determine its accuracy, precision, and validity is known as data verification. When it comes to business intelligence, it's crucial to verify the validity and predicted results of data processing in order to guarantee that the value of the data is greater than the expenses associated with its maintenance or ownership. Stakeholders should also understand the importance of investing in dependable data storage, as using low-cost, unstable storage may save money in the short term but jeopardize sensitive data in the long run. For example, storing clinical data for a new treatment at less cost, and wobbling storage may jeopardize the data's integrity and have serious consequences [35].

VERBOSITY: Loquacity, Volubility, Garrulity, Gathering and analyzing large amounts of data from various sources, including structured and unstructured data, is what business intelligence entails. This data can be both good and bad, with bad data being incorrect information. Understanding the risks associated with inadequate data storage and taking steps to ensure the security, relevance, completeness, and reliability of the stored data is of utmost importance. In order to efficiently process and analyze data, it is also important to be able to differentiate between meaningful information and repetition. This requires the ability to quickly recognize interpret the meaning of data, which can be crucial for improving the speed and efficiency of data processing [36].

VERSATILITY: Alterable, Adaptable, Business intelligence is constantly evolving to meet the needs of companies, researchers, and government agencies in a variety of industries. It provides tools and techniques for urban planning, manufacturing, data visualization, quality classification, environmental security, and computational analysis among other applications. The versatility of data is called how useful it is in many different situations. By using advanced research outcomes and cost models/frameworks, businesses can harness the power of business intelligence to extract valuable insights and make informed decisions[37].

VARIABILITY: Changing Behavior Inconsistent data flow or data variability is a common problem that can occur when there is a high demand for digital media, causing data load peaks. Data variability can be a problem because it affects the accuracy and reliability of data analysis. To address this issue, it is important to implement strategies for managing data variability and ensuring consistent data flow. This may involve using techniques such as data cleaning and normalization to set the seal on that the data is precise and consistent, as well as implementing appropriate technologies and systems for handling high volumes of data [38].

VISCOSITY: Complexity The complexity of tasks such as connecting, transforming, and matching data can make managing large data sets difficult, especially when they come from multiple sources. Big data complexity refers to the intricate relationships and interdependencies that exist within large data structures, where small changes can have large effects on system behavior or have no effect at all [39]. This complexity can make it difficult to manage and analyze large data sets effectively, necessitating sophisticated data management techniques and tools.

VOCABULARY: Models, Semantics, Structures Business intelligence is a popular academic topic that encompasses many different topics. Big data's prevalence in modern society is largely due to technological advances that enable us to collect, analyze, and sample bulk data. The real challenge is in the transformation of this big data into meaningful, and actionable information, which necessitates the massive use of math's, stats, and CS tools and their approaches. Metadata is a crucial component of big data analysis, as it encompasses details concerning data structure, syntax, content, and source. This may include number of data models, blueprints, taxonomies, ontologies and so on. Understanding and effectively using metadata can help to make sense of large volumes of data and extract valuable insights [40].

VENUE: "Distributed, Heterogeneous, Multiple" In the near future, geo-tagged real-time location data will be added to traditional OSN (online social network) interaction in (OSN) data. Additionally, to the landscape, location-based data will most likely include 3D interaction and volume rendering technology based on GPU technology. One study investigated data-driven and visualization software for the hydrological environment. This technology has the potential to shed light on a wide range of applications and environments [41], [42].

VIOLATION: Terrorist Activities, Crimes, Business intelligence and data science techniques have been used by businesses and governments to analyze and solve a wide range of problems. Governments have used big data applications to detect terrorism and track criminal activities. "Smart city" detectors and sensors, like, able to track vehicle movement to collect data on traffic trends. Data combined with the owner of the vehicle, for identification of correlations among different groups and their work. Data can be used for decision-making [43].

VERSIONING: Can Control System's Version Writing code is a requirement for both software development and data science. Data science, on the other hand, is iterative, with each cycle beginning with a fundamental understanding of the data. Before building, validating, and deploying machine learning models, gathered data, analyzed, cleaning, and its transformation. Large datasets are frequently analyzed by researchers and data science extracts valuable scientific knowledge. It can be chaotic, with lots of back-and-forth communication experimentation for right analyzing tools, programs, and its parameters. Data science

teams to track and reason about the datasets used during this process is critical, so a system for tracking dataset versions overtime must be implemented [44].

VAGUENESS: The lack of clarity regarding the meanings of terms and tools used. Even when large amounts of data are available, it can be difficult to determine the significance or meaning of the data. In the past, the focus was often on finding the truth in information, regardless of what the data might indicate or how it was collected. However, it is important to consider the context and sources of data in order to accurately interpret and understand its significance [45].

VITALITY: Another important concept in business intelligence is the idea in criticality of data, which is closely related to value of concept. Data criticality refers to the importance or relevance of data in relation to fundamental business goals. Prioritize data that is more critical, as this data is more likely to influence decision-making and business outcomes. This can help to ensure that the data used is accurate and relevant and that resources are directed toward the most critical areas [46].

VIRALITY: Speed of Spreading Virality refers to the rate at which data is shared or disseminated among users and received by others. It measures the speed and breadth with which information spreads across a network or community. Virality is a term that is frequently used to assess the popularity or impact of a specific piece of information, and it can be a critical factor in determining the success of a marketing campaign or the reach of a message [45].

VALOR: Dealing with Serious Problems, The strategies and methods that should be used to confront and solve BD's major issues are referred to as valor. This entails addressing the major issues that BD is facing [47].

VANE: In the right direction, The ability to make well-informed and timely decisions by effectively navigating towards the most appropriate course of action is critical in data science and business analytics [26].

VANILLA: Immediate Worth, "Vanilla" cite the most fundamental and well-established Big Data models that, when properly implemented, can quickly provide value. Simple approaches, when used with caution, can be favorable [48].

VANTAGE: The ability of Big Data to provide a unique and insightful perspective on complex systems and structures is referred to as vantage [47].

VARIFOCAL: Exceptional comprehension It refers the ability of BD for understanding and analyze the overall context of specific details of a situation simultaneously [47].

VARMINT: "Generation(G) of errors" Software errors and bugs become outdated or irrelevant as Big Data grows and evolves rapidly in it [36].

VARNISH: Polish Stain refers to the final step in the process of presenting and delivering our work, where the focus is on making it as polished and refined as possible. Ensuring that it is of high quality and presents well is crucial.

VASTNESS: Bigness acceleration the increased speed and efficiency brought about by the Internet of Things (IoT) have also contributed to the rapid growth and expansion of Big Data. The 'bigness' of Big Data is therefore accelerating at a faster rate [36].

VATICINATION: Predictive analytics Vaticination Analytical foresight is the practice of making predictions or forecasts about the future based on careful analysis and consideration of the current situation. The level of detail and complexity involved determines the precision of these predictions [40] [48].

VAULT: Because of the reliance on software and information science applications that handle large amounts of sensitive data, data security has become a critical aspect of data storage. As a result, safeguarding this information has become increasingly important.

VEER: Veer allows us to be agile and adaptable in our data science efforts by enabling us to continually assess and respond to the evolving needs and requirements of our clients. It allows us to pivot and adjust our direction as needed.

VEIL: The Veil allows us to see unseen current constraints, and explore or discover hidden features in data.

VERDICT: Affection, as more and more people are influenced by the choices made by replicas, the importance of validity and veracity has grown and is receiving more attention.

VERSED: Required more familiarity Versed explores a further possibility in the realm of "Big Data," emphasizing the importance of data analysts possessing fundamental knowledge in programming, science, and measurement.

VET: Possibility's complication Veteran of Big Data highlights the method by which data allows the confirmation of our assumed evidence.
VIBRANT: amorousness, Vitality, Active Big Data practices are unmistakably passionate, dynamic, powerful, energizing, and sparkling. These characteristics help us with insights, ideas, and support in many aspects of our data science endeavors.
VEXED: revealing Complex issues, Big Data has the ability to reveal insights into complex and significant problems in data science.
VICTUAL: Fuels, Nutrition, Nourishment Victual refers to the provision of information in the form of Big Data for data science.
VIRTUOSITY: In order to gain a basic understanding of data science, researchers and even the average user should be well-versed in the various types of data that are necessary to fully grasp this rapidly growing field. It is important for individuals to have a comprehensive knowledge of data in order to keep up with the fast-paced developments in the field of data science.
VISIBILITY: "Big Data" should be fully transparent and accessible to all. Visibility is just as important as voluntariness. "Big Data" offers visibility into complex Big data issues in DS [47].
VIVIFICATION: Broad Application BD in the field of DS has the ability to enhance various business and operational processes, ranging by advertising fraud detections.
VOGUE: fashion and Influence, BD has an impact on the lives of ordinary people. Business development trends, on the other hand, are constantly shifting, such as the shift from machine learning to artificial intelligence, cloud computing to edge computing, and the Internet of Things to the Internet of Everything.
VOICE: Speaks Loudly and Conveys Information, Data science enables the analysis and presentation of current data (but not all data) on a wide range of topics as big data.
VOODOOISM: Not Juju, Not Wizard, Real Data science must demonstrate its value in producing verifiable results for potential clients. Both BD and DS do not have magical abilities; rather, they rely on proven methods and technologies. In conclusion, big data will be reliable and trustworthy.
VOYAGE: getting knowledge, Big data and Data science can tackle a range of complex issues. The pursuit of these challenges fosters an environment in which DS can be continuously grasped and developed.
VENDIBLE: Customers' actual presence for big data demonstrates that it is transparent, as evidenced by the communication of certain well-known methods for exchanging data with clients.
VULPINE: Crafty Each BD user engages with various social media networks and communities and works intelligently. Moreover, it should be able to deal with the types of users.
VORACITY: Big data has the potential to be so consuming that it could potentially end up consuming itself and losing control.
VANITY: The unproductive data indicates that it is content with the influence it exerts on others.
VULNERABILITY: It means that no system is ideal, but it's hardware and software are understandable, and thus any related data can potentially be accessed or manipulated.
VISUAL: Researchers in the world of data science have the ability to analyze, observe, and trade photos and videos, whether they are personal or product images or weather photos, through the internet.
VINCULARITY: This emphasizes the true definition of a relationship. This is especially true in today's internet-connected world.
VALENCE: It is a process that demonstrates how dense the data is.
VERITABLE: Data is in fact real and not imaginary, false, or fictitious.
VIRILITY: With big data, it means that it creates itself. The more big data you have, the more big data becomes powerful and strong.
VENALITY: Being corrupt, or being ready to sell one's services or influence for personal gain.
VISCIDITY: having a strong and tenacious hold.
VICISSITUDE: Scalability pertains to the challenges of expanding intricate Big Data workflows.

3. Materials and Methods

This "systematic literature review (SLR)" aims to evaluate the existing research on Big Data using established outlining methods and to examine and analyze various Big Data experiences, technologies, and processes. For this, the research methodology being used is SMS. The deliberate charting study outlines the three steps involved in this process: 1) planning, 2) conducting the scoping study, and 3) conclusions

and review. SLR [49] [50], the goal is to examine the evolution of the association of the show and highlight the most relevant examples, while also addressing any lack of clarity or inconsistency in the natural writing. However, this is not a review of articles or papers, as that type of detailed analysis is not the focus here. The main objective is to organize the content, perform a qualitative analysis, and identify the publishing groups involved [51] [49].

3.1 Research Objectives

1. This study aims to review past research and its findings and to summarize the use of Big Data and photogrammetry in conjunction with blockchain technology within the field of Data Science (DS).
2. The focus is on research activities related to these topics.
3. A taxonomy has been proposed for the various aspects of Big Data.
4. The primary goal is to identify future research opportunities, primary difficulties, and outstanding challenges, as well as to provide a map of ongoing research.
5. The goal is also to identify potential areas for practical application of research findings as well as new research trends.
6. To determine the focus or scope of the articles under consideration.

Table 1. R. Questions

Qs#	R Questions	Main Motivation
Q#1	How the acceptance of related technology of BD changes over time & how it varies among different fields?	For categorizing the publications patterns of BD research over time by its focus on different domains.
Q#2	What are the most highly sought-after areas of study within the realm of "Big Data" research related to Venus?	To find out how can BD domains identified the suitable Venus, for future publications.
Q#3	Discuss the different types of BD researches?	To learn about the various forms of research that have been identified within the field of Big Data.
Q#4	What kinds of publications carried out in a simultaneous investigation of BD V's?	To find recent research that can assist in the future.
Q#5	What are the ongoing challenges and vulnerabilities in the field of Big Data?	Identify and determine unanswered research questions in ongoing Big Data domains.
Q#6	What new aspects areas of "Big Data and AP" using BC is explored?	To determine the recent field of BD and AI using blockchain.

Figure 3. Strings

Table 2. Search String

Venue	String
MDPI	1,3
GS	1,2,4,5
Elsevier	1,2
Springer	1,2,3,5
ACM	2,4

3.2 Search Scheme

To gather relevant papers for the selected achievement, the following databases/sources were used: "Research Gate(RG), MDPI, Springer, ACM, Elsevier, and GS. GS(Google Scholar) was specifically utilized for bibliometric analysis. Three different search strings were employed to guide the targeted search in each repository Fig 3. A systematic review was conducted across various data sets to identify relevant studies, as shown in the tab 2. Multiple search strings were used across the data sets to find the desired results.

3.3 Process for selection

The criteria for selection were created to identify areas of investigation that are broadly relevant to the review. Duplicate articles from multiple sources were also eliminated. To determine whether an article should be included, it was carefully reviewed using keywords, abstracts, and titles. The review excluded titles with similar titles. The following step was to choose articles based on the criteria outlined in the table. 3. Figure 4 shows the selection process. Out of a total of 318 identified studies, 30 publications were ultimately chosen.

3.4 Quality Evaluation

Another important consideration in the evaluation process was the type of review article. In addition, questions were posed [50] [52] [49] to access.

(1) The answers to the questions can be found in the articles. The possible outcomes are No (+0), Moderate (+0.5), and Yes (+1).

(2) The publications were judged on their contribution to the discussion of Big Data and its issues. There were three options: No (+0), Moderate (+0.5), and Yes (+1).

Table 3 Inclusion and exclusion criteria

IC (Inclusion Criteria)	EC (Exclusion Criteria)
1-Following a rigorous review process, papers were from conferences and journals.	Repeated related papers.
2-Publications from "2014 to 2023"	The articles do not address the V's of BD.
3-The studies cover various domains with related articles	Related abstract and thesis.
4-Publications can be around the world.	Pre 2014 publications.

(3) The publications were graded on their ability to clearly identify future research objectives and gaps. No (+0), Modest (+0.5), and Yes (+1) were the options.

(4) The articles were sourced from well-known databases. The conference and journal rankings from the CORE ranking system were considered. The articles were evaluated using the following questions (Q#1-4) and JCR reports. The following questions were used to determine whether or not the articles could be included in the review:

Position for core (CO) :

- CO(A) ranking(2)
- CO(B) ranking(1.5)
- CO(C) ranking(1)
- Without ranking in CO(0)

Journals Ranking:

• Q1. rated (2)
• Q2 rated (1.5)
• Q3 and Q.4 rated (1)
• While in JCR list (0)

To assign the score to paper on a scale of 0 to 5 by evaluating each article based on the questions.

3.5 Data Extraction Methodology:

The aim is to obtain positive responses. Q#1. To circumvent publicizing the bias, the papers should grouped proportionate publication year. Q#2. It's important for publishing medium. Q#3. Adherent categories for defining the articles [53]:

• Proposal for solution: These articles propose new solutions or significant refinements of existing methods in the field of Big Data. They may include examples of justification, potential performance, and the relationship of the solution to previous work.
• Conceptual Proposals: These studies focus on closely examining and analyzing existing concepts in the Big Data domain, without any practical inquiries.
• Evaluation Research: These articles evaluate and analyze previously defined areas of Big Data, identifying challenges and issues in exploring new areas of BD.

Q#4. RQs are to understand the current research on BD and its various aspects (Vs). Aim is to provide a comprehensive overview of big data and track current research trends by compiling relevant studies from scientific sources. This study will add to the existing body of knowledge and provide practical insights into existing research challenges as Vs. In below table lists various strategies for determining the number of Vs

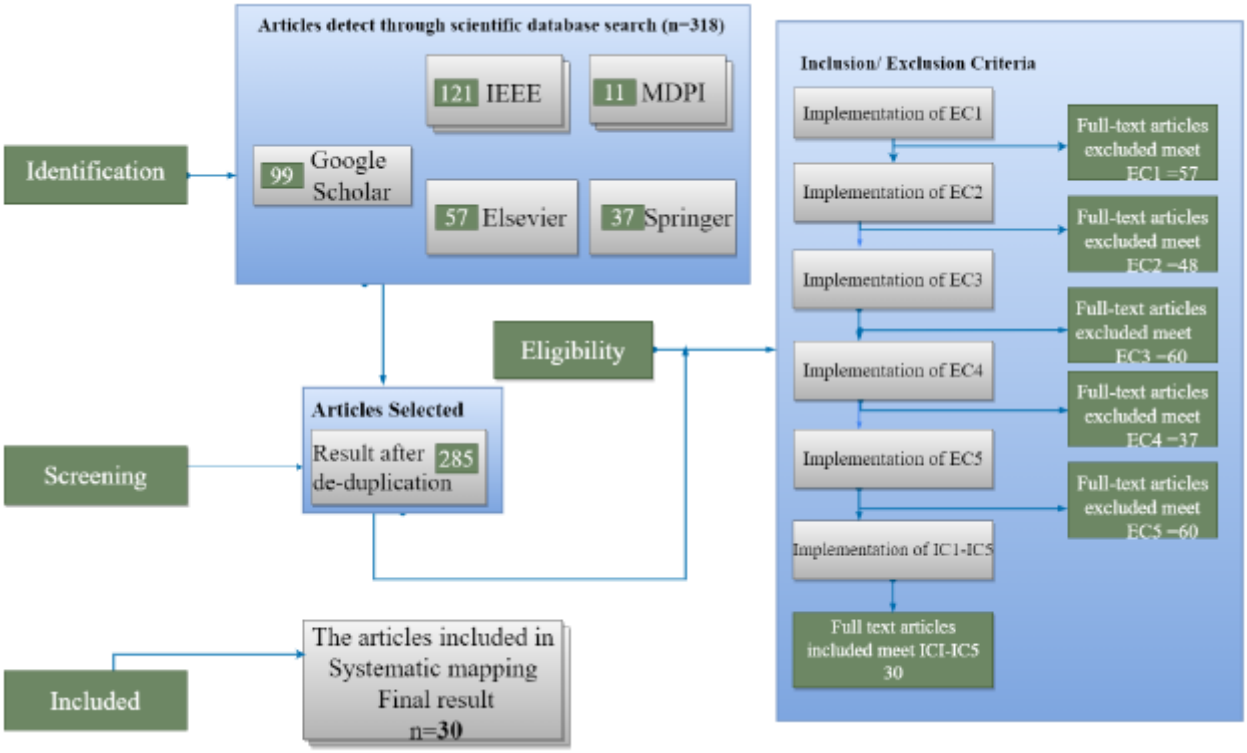

Figure 4. Systematic Mapping Study

based on the year. Q#5. Given systematic literature review (SLR) helps to identify gaps in current research on specific issues, enabling researchers to build upon and improve upon previous work where further investigation is needed. The current state of research on the various aspects (Vs) of "BigData" for given questions. Q#6. [53] aggregates, categorized the approaches as a recommendation:

Infrastructure: The administrative frameworks required for blockchain to be used in business.

Method: A multi-phase process aimed at increasing the number of "Vs" in "BigData".

Model: System's content in "BigData" and photogrammetry combined with blockchain, which shapes the evolution of Vs.
Architecture: "BigData" structure planning, design, and construction.
Framework': Theoretical infrastructure for shaping guiding development to transform.
Tool: Anything used in the "BigData" implementation with photogrammetry and blockchain.
Guideline: Vs model or pattern that can be used to generate a set of conditions.
The amalgamation approach was designed to incorporate the key findings that were identified through the research questions, previous studies that provided a foundation for the questions and answers, and visual representation of the categorized results.

4. Results

This section presents the results for the research questions (RQs) defined in Table 1.We chose a number of publications to demonstrate the model for each RQ. These publications are regarded as significant contributions to the field of big data.

4.1 Results of selection

We conducted an in-depth review of 318 research studies based on their keywords, abstracts, and titles, and chose 30 publications for further examination. There were 285 papers that were rejected. The 30 publications chosen were used to answer the research questions. a breakdown of the selected articles shown in classification table, along with a summary of the classification results and their quality assessment.

Table 4. Q/A Scoring

Articles	Total S.	Total
[54],[28]	4	2
[55]	3.5	1
[26],[39],[40],[32]	3	4
[1],[25],[56],[36]	2.5	4
[20],[11],[57],[58]	2	4
[27],[59],[48],[47],[13],[60],[19],[22]	1.5	8
[23],[15],[17]	1	3
[61],[21],[18]	0	3

Q1. How the acceptance of related technology of BD changes over time & how it varies among different fields?

Figure 5 represents the overall duration of the original study. Figure 5 illustrates the distribution of "V's" in big data over the years, as well as the publication databases for this research. Figure 5 shows publications from 2014 to 2022. Despite this evolution and adaptation of big data over the years, there have been very few research publications on the topic. This may be due to the challenges faced by big data architects in managing the advantages and drawbacks of the "V's". There have been no studies on this topic in 2021, but it is possible that more research will be conducted in the future. Figure 5 indicates that there were many "V's" in journals. As shown in the figure, there were limited studies published in journals each year.

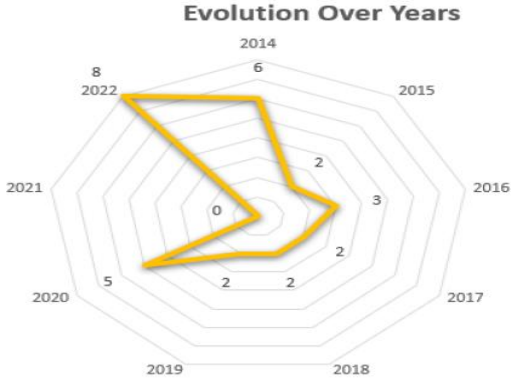

Figure 5. Yearly paper evaluation

Table 5. Classified Articles

Articles	PYears	PChannels	Article Type	Approaches	V.#	1.	2.	3.	4.	TS
[26]	2019	Conference	Solution	Guideline	51	1	1	1	0	3
[57]	2014	Journal	Investigation	Method	8	0.5	0.5	1	0	2
[54]	2014	Journal	Survey	Guideline	1	0.5	0.5	1	2	4
[58]	2014	Journal	Survey	Guideline	6	0.5	0.5	1	0	2
[25]	2018	Conference	Solution	Method	10	1	0.5	1	0	2.5
[55]	2014	Journal	Survey	Method	5	0.5	0.5	1	1.5	3.5
[28]	2016	Journal	Solution	Method	5	0.5	0.5	1	2	4
[27]	2020	Journal	Experimental	Model	5	0	0.5	1	0	1.5
[30]	2014	Conference	Survey	Guideline	7	1	0.5	1	0	2.5
[32]	2015	Journal	Solution	Framework	5	0.5	0.5	1	1	3
[59]	2016	Journal	Solution	Method	1	0.5	0.5	0.5	0	1.5
[39]	2015	Journal	Survey	Method	6	0	0.5	1	1.5	3
[56]	2014	Journal	Solution	Method	1	1	0.5	1	0	2.5
[36]	2020	Journal	Survey	Method	3	1	1	0.5	0	2.5
[40]	2020	Journal	Survey	Method	2	1	1	1	0	3
[48]	2020	Journal	Survey	Method	8	0.5	0.5	0.5	0	1.5
[47]	2019	Book	Survey	Method	42	0.5	0.5	0.5	0	1.5
[17]	2022	Journal	Investigative	Method	0	0	0	0.5	0.5	1
[13]	2022	Journal	Investigation	Method	0	0.5	0.5	0.5	0	1.5
[11]	2022	Journal	Experimental	Framework	0	0	1	1	0	2
[60]	2022	Journal	Investigation	Framework	0	0.5	0	0	1	1.5
[19]	2022	Journal	Solution	Model	1	1	0	0	0.5	1.5
[20]	2022	Journal	Survey	Guideline	0	0	1	1	0	2
[15]	2020	Conference	Investigation	Guideline	0	0.5	0	0.5	0	1
[61]	2022	Journal	Solution	Method	0	0	0	0	0.5	0.5
[21]	2017	Journal	Survey	Guideline	0	0	0	0	0.5	0.5

[22]	2017	Journal	Survey	Guideline	2	0	0.5	0.5	0.5	1.5
[23]	2018	Journal	Survey	Method	1	0	0.5	0	0.5	1
[1]	2022	Journal	Survey	Guideline	59	1	0.5	0.5	0.5	2.5
[18]	2016	Journal	Experi-mental	Guideline	1	1	0	0	0.5	0.5

Q2. What are the most highly sought-after areas of study within the realm of Big Data research related to Venus?

It shows 6 selected papers. Figure 6 displays the selected papers' publication databases. Maximum publications (25, 83%) were in journals, with books (1, 3%) and conferences (4, 14%) trailing behind. Whereas this table 6 shows the publications.

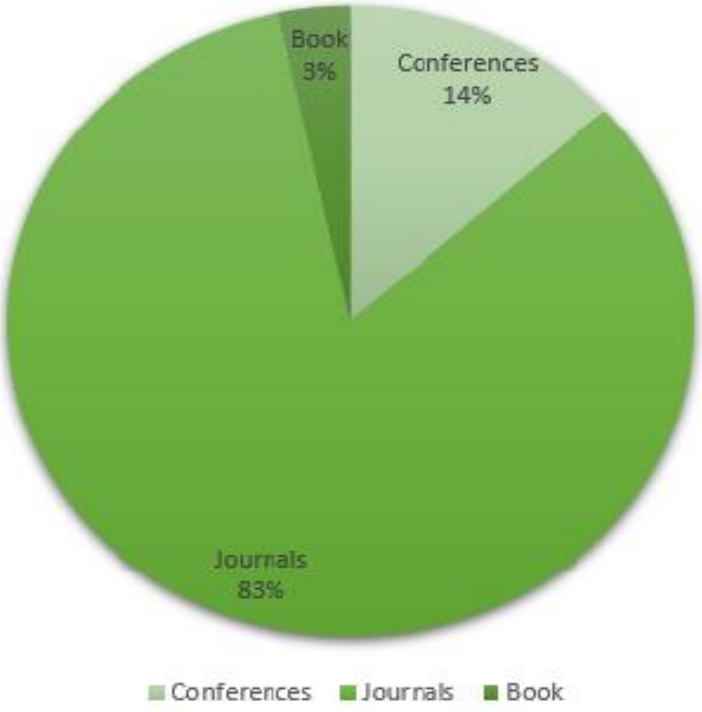

Figure 6. R-Database

Q3. Discuss the different types of BD researches?

Our study identified four categories of research, as shown in Figure 8: survey (33%), solution proposal (27%), evolution (13%) investigative study (17%), and experimental study (10%). Maximum papers are experimental in Big data, as shown in Figure 9, consists of several "V's". There are various types of research models for organizing and managing large amounts of data, particularly when it comes from diverse sources. These models can be complex due to the importance of tasks such as linking, matching, and transforming data in big data management. Multifaceted information organization is particularly challenging for massive data sets [39]. The complexity of big data contracts can vary depending on the level of interdependence or mutuality in big data constructs, and can have significant impacts on the system, behavior, and potential outcomes. Small variations in these factors can result in complicated big data contracts [4]. There is a problem of efficiently and securely retrieving information from databases for the upcoming era of the "V's". The increasing traffic on "social media", is a major source in data volume, is challenged the ability to handle this property. There are various approaches to address this issue[38].

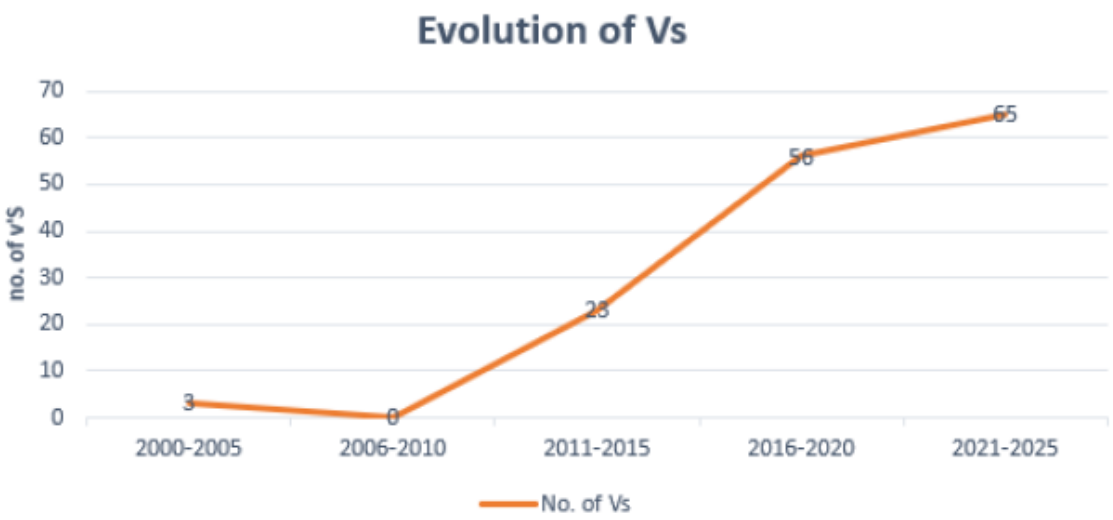

Figure 7. Evolution of V's over years

Q4. What kinds of publications carried out in a simultaneous investigation of BD V's?

We assessed 30 research papers after conducting a thorough review of 318 papers. We discovered that only one book and four conferences on BD domain and also it's characteristics had been published, and none of them were in well-known conferences. On this topic, we discovered 25 journal articles, 4 conferences , and 1 book with high rankings, as well as 11 journal articles with low rankings.

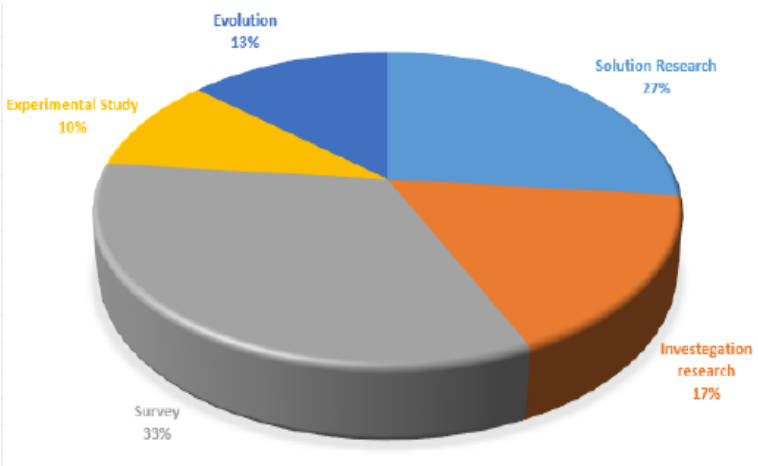

Figure 8. Study Genre

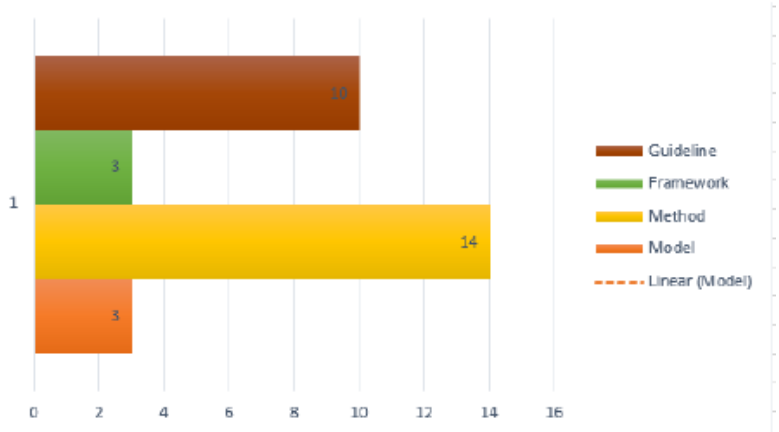

Figure 9. Approaches

Q5. What are the ongoing challenges and vulnerabilities in the field of Big Data?

However, there are several gaps in current research. One significant gap is the lack of attention given to the role of the ”V’s” in big data-based techniques. More research is necessary on this matter. Also, there aren’t many publications on this subject that have been presented at significant conferences. It is crucial that more works on this subject be presented at renowned conferences.

Q6. What new aspects areas of ”Big Data and AP” using BC is explored?

The growth of data has arrived and shows no signs of slowing down. The volume of data being produced is constantly increasing, and this trend is expected to continue. In 2023, the number of ”V’s” (dimensions of big data) is expected to grow from 6 to 59, and it is projected to reach 100 V’s in the coming years. Photogrammetry can utilize open source software to generate large amounts of data, which can be secured using blockchain technology.

4.2 Quality assessment

The table 4 presents the quality assessment (QA) scores of various articles. About 25% of the articles have an average score, 59% have a standard score, and 16% do not have a score. QA can help to identify well cited articles with clearly stated claims.

5. Discussion

This systematic literature review (SLR) on V’s in big data aims to provide answers to the research questions (RQs) proposed by the study. It shows that V’s have been studied extensively over the years.

5.1 Taxonomy

It has had a significant impact on various aspects of society, such as economic development, education, science, and healthcare. Whereas, the use of BD also presents challenges and concerns. BD evolved over time, with various characteristics or ”Vs” being added to its definition. Initially, three Vs were identified: variety, volume, and velocity. In 2012, varacity was added as the fourth V. In 2013, 12 additional pillars were identified, and in 2014, visibility and vocabulary were also added to the list. Vs increased to twenty three in 2k15, by 2017, there were fifty nine known Vs in 2022 [1]. Some researchers predict it will continue to increase in the future, potentially reaching 100. The evolution of the various Vs has allowed for more efficient acquisition of information and also reduced complexity in data as shown in fig 7. Recently, Big Data widely recognized concept in the field of information technology and other industries such as business. Taxonomy is being proposed to show yearly addition of Vs in figure 10. The various characteristics or ”Vs” of Big Data provide opportunities for researchers and practitioners to effectively work with it. The study of Big Data focuses on these features, which can also help to address various challenges and issues related to it. These features also help to define the nature of Big Data and distinguish it from other types of data.

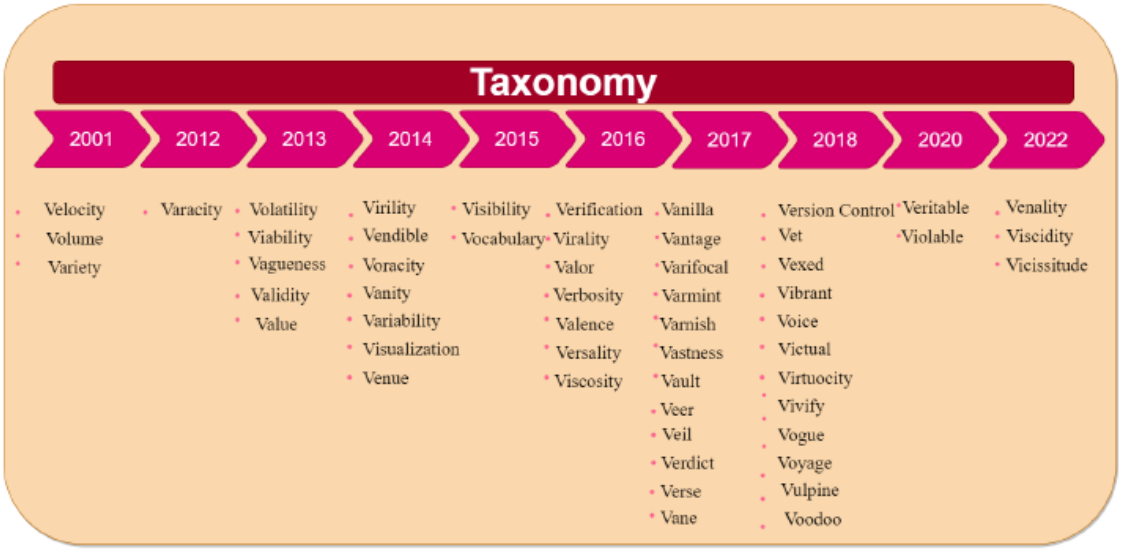

Figure 10. Taxonomy

5.2 Major Findings

We thoroughly examined 318 articles, rejecting 288 of them based on their titles, keywords, and abstracts. Out of the remaining 30 articles, we selected those that could provide answers to the questions we had. We provided a summary of the categorization and queries for the chosen 30 papers. The main The majority of the research we analyzed took place between 2014 and 2022 and faced challenges due to the advancement of technology. Findings of our research are as follows:

Our research revealed that 83% of the articles were published in various journals, 3% were turned into books, and 13% were delivered as conference presentations.

Our analysis identified four categories of research: survey articles (37%), solution proposal studies (35%), experimental studies (18%), and investigative studies (18%).

Most of the research focused on four to five V's, and we did not find a significant number of studies on V's in "archaeological photogrammetry(AP) with BC and BD".

Most common methods were the method (52%), model (10%), framework (6%), and guideline (31%).

The author also introduces six new domains and V's in their discussion.

Veritably In a veritable manner; in a way that truly and accurately describes something.

Veritableness the quality of being changeable (discussion)

Verve vigour and spirit or enthusiasm.

Viscousness deliberate cruelty or violence.

Villainy wicked or criminal behavior.

Vivacity the quality or state of being vivacious.

Vagrant a person without a settled home or regular work who wanders from place to place and lives by begging.

5.3 Open Challenges

In this section, open challenges and limitations in the use of big data, photogrammetry, and blockchain are discussed. One issue identified is that some variables have not been thoroughly examined. Another challenge is that the adoption of these technologies in big data has been unhurried. Every new variable has been seen to be investigated in a different paper. The intention to publish a report that addresses as many variables as feasible, however, necessitates more investigation and the creation of standards for analysing these characteristics in big data for photogrammetry and BC.

6. Conclusion

This study analyzed 30 different articles that focused on the use of big data, photogrammetry, artificial intelligence, and blockchain. After reviewing past research, it was found that most of the existing data did not cover the use of these technologies. The main goal of the research was to consolidate as much of this data as possible. It was discovered that the use of these technologies in BC and photogrammetry with BD had not received much attention until recent years. Although some were also published in conference proceedings, maximum publications are in different journals . The articles in this study were divided into two categories: those that presented experimental solutions and those that suggested potential solutions. But only a small number of the publications in this study covered the development and application of these technologies in photography, AI with BC. In addition to presenting six new Vs, this study also included a taxonomy to help other researchers identify various approaches that could enhance the performance of their studies. Further research on the evolution of these technologies in big data should be conducted to evaluate current strategies. This study provides a comprehensive overview of the use of big data, photogrammetry, artificial intelligence, and blockchain, along with an explanation of the associated variables.

References

1. Aziz, O., Farooq, M.S., Khelifi, A.: Domain and challenges of big data and archaeological photogrammetry with blockchain. IEEE Access 10, 101495–101514 (2022)
2. Bahri, S., Zoghlami, N., Abed, M., Tavares, J.M.R.: Big data for healthcare: A survey. IEEE access 7, 7397–7408 (2018)
3. Hong, B., Meng, X., Chen, L., Winiwarter, W., Song, W.: Database Sys- tems for Advanced Applications: 18th International Conference, DASFAA 2013, International Workshops: BDMA, SNSM, SeCoP, Wuhan, China, April 22-25, 2013, Proceedings vol. 7827. Springer, ??? (2013)
4. Kaisler, S., Armour, F., Espinosa, J.A., Money, W.: Big data: Issues and challenges moving forward. In: 2013 46th Hawaii International Conference on System Sciences, pp. 995–1004 (2013). IEEE
5. Blockchain and Big Data to Revolutionize Archaeological Photogrammetry(AP): A S
6. Sivarajah, U., Kamal, M.M., Irani, Z., Weerakkody, V.: Critical analysis of big data challenges and analytical methods. Journal of Business Research 70, 263–286 (2017)
7. Michalik, P., Sˇtofa, J., Zolotova, I.: Concept definition for big data architecture in the education system. In: 2014 IEEE 12th International Symposium on Applied Machine Intelligence and Informatics (SAMI), pp. 331–334 (2014). IEEE
8. Davenport, T.: Big data executive survey 2013: The state of big data in the large corporate world. Boston San Francisco New York: NewVantage Partnes LLC (2013)
9. Cukier, K., Mayer-Schoenberger, V.: The rise of big data: How it's changing the way we think about the world. Foreign Aff. 92, 28 (2013)
10. Najafabadi, M.M., Villanustre, F., Khoshgoftaar, T.M., Seliya, N., Wald, R., Muharemagic, E.: Deep learning applications and challenges in big data analytics. Journal of Big Data 2(1), 1 (2015)
11. Hariri, R.H., Fredericks, E.M., Bowers, K.M.: Uncertainty in big data analytics: survey, opportunities, and challenges. Journal of Big Data 6(1), 44 (2019)
12. Lv, H., Shi, S., Gursoy, D.: A look back and a leap forward: a review and synthesis of big data and artificial intelligence literature in hospitality and tourism. Journal of Hospitality Marketing & Management 31(2), 145–175 (2022)
13. Wang, M., Wang, C.C., Sepasgozar, S., Zlatanova, S.: A systematic review of digital technology adoption in off-site construction: Current status and future direction towards industry 4.0. Buildings 10(11), 204 (2020)
14. Li, J., Herdem, M.S., Nathwani, J., Wen, J.Z.: Methods and applications for artificial intelligence, big data, internet-of-things, and blockchain in smart energy management. Energy and AI, 100208 (2022)
15. Wang, X., He, Y.: Learning from uncertainty for big data: future ana- lytical challenges and strategies. IEEE Systems, Man, and Cybernetics Magazine 2(2), 26–31 (2016)
16. Zhou, X., Zhang, C., Pan, Z., Wei, P.: Tourism industry is leading the digi- tal transformation of cultural heritage management: Bibliometric analysis based on web of science database. In: 2020 Management Science Informa- tization and Economic Innovation Development Conference (MSIEID), pp. 273–276 (2020). IEEE
17. Blockchain and Big Data to Revolutionize Archaeological Photogrammetry(AP): A Safe and Agrawal, D., Bernstein, P., Bertino, E., Davidson, S., Dayal, U., Franklin, M., Gehrke, J., Haas, L., Halevy, A., Han, J., et al.: Challenges and opportunities with big data 2011-1 (2011)
18. Cerasoni, J.N., do Nascimento Rodrigues, F., Tang, Y., Hallett, E.Y.: Do- it-yourself digital archaeology: Introduction and practical applications of photography and photogrammetry for the 2d and 3d representation of small objects and artefacts. PloS one 17(4), 0267168 (2022)
19. Swan, M.: Blockchain temporality: Smart contract time specifiability with blocktime. In: International Symposium on Rules and Rule Markup Languages for the Semantic Web, pp. 184–196 (2016). Springer
20. Deepa, N., Pham, Q.-V., Nguyen, D.C., Bhattacharya, S., Prabadevi, B., Gadekallu, T.R., Maddikunta, P.K.R., Fang, F., Pathirana, P.N.: A sur- vey on blockchain for big data: approaches, opportunities, and future directions. Future Generation Computer Systems (2022)
21. Hasan, M.K., Alkhalifah, A., Islam, S., Babiker, N., Habib, A., Aman, A.H.M., Hossain, M., et al.: Blockchain technology on smart grid, energy trading, and big data: security issues, challenges, and recommendations. Wireless Communications and Mobile Computing 2022 (2022)
22. Sutton, A., Samavi, R.: Blockchain enabled privacy audit logs. In: International Semantic Web Conference, pp. 645–660 (2017). Springer
23. Rabah, K.: Challenges & opportunities of implementing blockchain secu- rity & privacy. Mara International Journal of Computer Science & Information Security 1(1), 1–11 (2017)
24. Rabah, K.: Convergence of ai, iot, big data and blockchain: a review. The lake institute Journal 1(1), 1–18 (2018)
25. Salehian, S., Yan, Y.: Comparison of spark resource managers and distributed file systems. In: 2016 IEEE International Conferences on Big Data and Cloud Computing (BDCloud), Social Computing and Networking (SocialCom), Sustainable Computing and Communications (SustainCom)(BDCloud-SocialCom-SustainCom), pp. 567–572 (2016). IEEE
26. Khan, N., Alsaqer, M., Shah, H., Badsha, G., Abbasi, A.A., Salehian, S.: The 10 vs, issues and challenges of big data. In: Proceedings of the 2018 International Conference on Big Data and Education, pp. 52–56 (2018)

27. Khan, N., Naim, A., Hussain, M.R., Naveed, Q.N., Ahmad, N., Qamar, S.: The 51 v's of big data: survey, technologies, characteristics, opportunities, issues and challenges. In: Proceedings of the International Conference on
28. Blockchain and Big Data to Revolutionize Archaeological Photogrammetry(AP): A S
29. Omni-layer Intelligent Systems, pp. 19–24 (2019)
30. Mills, S., Lucas, S., Irakliotis, L., Rappa, M., Carlson, T., Perlowitz, B.: Demystifying big data: a practical guide to transforming the business of government. TechAmerica Foundation, Washington (2012)
31. Yaqoob, I., Hashem, I.A.T., Gani, A., Mokhtar, S., Ahmed, E., Anuar, N.B., Vasilakos, A.V.: Big data: From beginning to future. International Journal of Information Management 36(6), 1231–1247 (2016)
32. Igarashi, M.d.O., Sartorelli, P.E., de Lima, M.Z.: Twenty years survey of big data: Definition, concepts, and applications in engineering. In: Brazilian Technology Symposium, pp. 509–517 (2019). Springer
33. Uddin, M.F., Gupta, N., et al.: Seven v's of big data understanding big data to extract value. In: Proceedings of the 2014 Zone 1 Conference of the American Society for Engineering Education, pp. 1–5 (2014). IEEE
34. Ward, J.S., Barker, A.: Undefined by data: a survey of big data definitions. arXiv preprint arXiv:1309.5821 (2013)
35. Wamba, S.F., Akter, S., Edwards, A., Chopin, G., Gnanzou, D.: How 'big data'can make big impact: Findings from a systematic review and a longitudinal case study. International Journal of Production Economics 165, 234–246 (2015)
36. Hartmann, P.M., Zaki, M., Feldmann, N., Neely, A.: Big data for big business? a taxonomy of data-driven business models used by start-up firms. Cambridge Service Alliance, 1–29 (2014)
37. Monali Sahoo1, M.P. Siddharth Swarup Rautaray: The emergence of big data: A survey. International Journal of Computer Science and Mobile Applications 6, 23–32 (2018)
38. Sravanthi, K., Reddy, T.S.: Applications of big data in various fields. International Journal of Computer Science and Information Technologies 6(5), 4629–4632 (2015)
39. Hussien, A.A.: How many old and new big data v's characteristics, processing technology, and applications (bd1). International Journal of Application or Innovation in Engineering & Management 9, 15–27 (2020)
40. Priyadarshy, S.: The 7 pillars of big data. Petrolium Review 14 (2015)
41. Katal, A., Wazid, M., Goudar, R.H.: Big data: issues, challenges, tools and good practices. In: 2013 Sixth International Conference on Contemporary Computing (IC3), pp. 404–409 (2013). IEEE
42. Blockchain and Big Data to Revolutionize Archaeological Photogrammetry(AP): A Safe and
43. Gani, A., Siddiqa, A., Shamshirband, S., Hanum, F.: A survey on index- ing techniques for big data: taxonomy and performance evaluation. Knowledge and information systems 46(2), 241–284 (2016)
44. Hussein, A.A., et al.: Fifty-six big data v's characteristics and proposed strategies to overcome security and privacy challenges (bd2). Journal of Information Security 11(04), 304 (2020)
45. Silva, T.H., De Melo, P.O.V., Almeida, J.M., Loureiro, A.A.: Large-scale study of city dynamics and urban social behavior using participatory sensing. IEEE Wireless Communications 21(1), 42–51 (2014)
46. Guo, H., Li, X., Wang, W., Lv, Z., Wu, C., Xu, W.: An event-driven dynamic updating method for 3d geo-databases. Geo-spatial Information Science 19(2), 140–147 (2016)
47. Shamsi, J.A., Khojaye, M.A.: Understanding privacy violations in big data systems. IT Professional 20(3), 73–81 (2018)
48. Bhardwaj, A., Bhattacherjee, S., Chavan, A., Deshpande, A., Elmore, A.J., Madden, S., Parameswaran, A.G.: Datahub: Collaborative data science & dataset version management at scale. arXiv preprint arXiv:1409.0798 (2014)
49. Panimalar, A., Shree, V., Kathrine, V.: The 17 v's of big data. Inter- national Research Journal of Engineering and Technology (IRJET) 4(9) (2017)
50. Cartledge, C.: How many vs are there in big data. Technical report, Working Paper (2016)
51. Farooqi, M.M., Shah, M.A., Wahid, A., Akhunzada, A., Khan, F., ul Amin, N., Ali, I.: Big data in healthcare: A survey. In: Applications of Intelligent Technologies in Healthcare, pp. 143–152. Springer, ??? (2019)
52. Hussein, A.A.: Using hadoop technology to overcome big data problems by choosing proposed cost-efficient scheduler algorithm for heterogeneous hadoop system (bd3). Journal of Scientific Research and Reports, 58–84 (2020)
53. Aziz, O., Farooq, M.S., Abid, A., Saher, R., Aslam, N.: Research trends in enterprise service bus (esb) applications: A systematic mapping study. IEEE Access 8, 31180–31197 (2020). https://doi.org/10.1109/ACCESS. 2020.2972195
54. Khelifi, A., Aziz, O., Farooq, M.S., Abid, A., Bukhari, F.: Social and economic contribution of 5g and blockchain with green computing:
55. Blockchain and Big Data to Revolutionize Archaeological Photogrammetry(AP): A S Taxonomy, challenges, and opportunities. IEEE Access 9, 69082–69099 (2021)
56. Khelifi, A., Aziz, O., Farooq, M.S., Abid, A., Bukhari, F.: Social and economic contribution of 5g and blockchain with green computing: Taxon- omy, challenges, and opportunities. IEEE Access 9, 69082–69099 (2021). https://doi.org/10.1109/ACCESS.2021.3075642
57. Fernandez, A., Insfran, E., Abrah˜ao, S.: Usability evaluation methods for the web: A systematic mapping study. Information and software Technology 53(8), 789–817 (2011)
58. Barmi, Z.A., Ebrahimi, A.H., Feldt, R.: Alignment of requirements spec- ification and testing: A systematic mapping study. In: 2011 IEEE Fourth International Conference on Software Testing, Verification and Validation Workshops, pp. 476–485 (2011). IEEE

59. Chen, C.P., Zhang, C.-Y.: Data-intensive applications, challenges, tech- niques and technologies: A survey on big data. Information sciences 275, 314–347 (2014)
60. Chen, M., Mao, S., Liu, Y.: Big data: A survey. Mobile networks and applications 19(2), 171–209 (2014) Kitchin, R.: The real-time city? big data and smart urbanism. GeoJournal 79(1), 1–14 (2014)
61. G´eczy, P.: Big data characteristics. The Macrotheme Review 3(6), 94–104 (2014)
62. Khan, N., Yaqoob, I., Hashem, I.A.T., Inayat, Z., Mahmoud Ali, W.K., Alam, M., Shiraz, M., Gani, A.: Big data: survey, technologies, opportu- nities, and challenges. The scientific world journal 2014 (2014)
63. Davenport, T., et al.: Competing on analytics. harvard business review, 84 (1), 98. 3, 14 (2006)
64. Fiorucci, M., Verschoof-van der Vaart, W.B., Soleni, P., Le Saux, B., Trav- iglia, A.: Deep learning for archaeological object detection on lidar: New evaluation measures and insights. Remote Sensing 14(7), 1694 (2022)
65. Tr˘cek, D.: Cultural heritage preservation by using blockchain technologies. Heritage Science 10(1), 1–11 (2022)