Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

The Impact of Big Data on Enterprise Architectural Design: A Conceptual Review

Ira Diana Sholihati [*1)], Bayu Yasa Wedha[2)], Sari Ningsih[3)], Ratih Titi Komala Sari[4)]
[1,3)] Prodi Sistem Informasi, Fakultas Teknologi Komunikasi dan Informatika, Universitas Nasional Jakarta
[2,4)] Prodi Informatika, Fakultas Teknologi Komunikasi dan Informatika, Universitas Nasional Jakarta
[1)]ira.diana@civitas.unas.ac.id, [2)]bayu.yasa.wedha@civitas.unas.ac.id; [4)]sari.ningsih@civitas.unas.ac.id; [5)]ratih.titi@civitas.unas.ac.id

ABSTRACT

A conceptual analysis of the impact of big data on enterprise architecture design is provided in this article. Within the framework of expanding digitalization, big data has emerged as a pivotal component in delineating the strategy and framework of organizations. The objective of this study is to investigate the ways in which big data can impact and facilitate the growth of efficient enterprise architecture. Qualitative analysis is the method utilized by researchers to comprehend the intricacies of the interaction between enterprise architecture and big data. This article examines several facets by conducting an extensive review of the literature, including the ways in which big data can facilitate the enhancement of analytical capabilities, innovation in business processes, and strategic decision-making. Emerging challenges, including data security, privacy, and the necessity for IT infrastructure adaptation, are also considered in this study. The outcomes of the review indicate that the implementation of big data in enterprise architecture may substantially alter business strategies and operations. These encompass enhanced system adaptability, customized service provision, and predictive functionalities. Nonetheless, these modifications necessitate modifications to privacy policies, risk management, and data governance. This study presents novel findings regarding the influence of big data on enterprise architecture and provides researchers and practitioners with recommendations for developing and executing successful big data strategies. This research thereby enhances the current body of literature and offers practical guidance in the field.

Keywords: Keywords: Enterprise Architecture; Big Data; Architectural Design; Big Data Integration; Conceptual Overview

INTRODUCTION

The utilization of big data has emerged as a critical factor in establishing organizational strategy and structure in the current digital age. Organizations must continuously adapt and integrate new technologies, such as big data, into their enterprise architecture to undergo digital transformation. The primary challenge in this integration pertains to the efficient implementation of big data to bolster evolving business requirements and enhance strategic decision-making. Managing existing IT infrastructure, ensuring data security, and maintaining privacy are additional obstacles. The ongoing expansion of big data necessitates a comprehension of its integration potential within established or upcoming enterprise architectures. The reliance of organizations on data to inform their strategic decisions has increased substantially. Significant potential exists for big data processing and analysis of massive amounts of data to generate insights that can inform business decisions.

Nevertheless, this gives rise to the inquiry of how to devise an enterprise architecture (Afarini & Hindarto, 2023), (Hindarto, 2023b) capable of efficiently accommodating, processing, and utilizing this enormous amount of data. Consequently, organizations need help determining the most effective means of incorporating big data into their infrastructure while considering factors including scalability, flexibility, and security. As new obstacles emerge in the implementation of big data, issues become more complicated. Concerns such as privacy, data security, and regulatory compliance are gaining importance. In addition to ensuring technological efficiency, businesses must ensure that the integration of big data adheres to data security and privacy regulations. In addition, a skills gap exists in the analysis of big data, necessitating investments in human resource development and training. All these factors necessitate additional investigation into the optimal methods for incorporating big data into enterprise architecture.

Prior studies have investigated diverse facets of big data and its impact on enterprise architecture. A multitude of scholarly investigations have examined the capacity of big data to revolutionize business operations and decision-

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

making. (Smith & Nichols, 2018) conducted research that demonstrates the potential of big data to enhance business analytics and exert an impact on organizational strategy. Nevertheless, these investigations primarily concentrate on technological facets and neglect to account for implementation obstacles in the broader framework of enterprise architecture. (L. Zhao et al., 2020) examine in a separate study how organizations can integrate big data to boost innovation and competitive advantage. This research merely touches upon the strategic advantages of big data. It needs to comprehensively tackle the complexities associated with the design and administration of enterprise architectures that are well-suited for the hosting of such data. Regarding the pragmatic approaches taken by organizations to tackle security, privacy, and IT infrastructure concerns in the realm of big data, more scholarly work is needed.

The research problem at hand pertains to the effective integration of big data into enterprise architecture (Hindarto, 2023c), with consideration given to technological, business, and regulatory factors. The purpose of this study is to provide an answer to the question of how organizations can incorporate big data into the design of secure and adaptable enterprise architectures. In addition, this study seeks to identify the obstacles that may arise during the implementation of big data, such as concerns regarding data security, privacy, and the development of analytical capabilities. Thus, the purpose of this study is to offer conceptual and practical insights regarding the incorporation of big data into enterprise architectures that are currently in development or already in place.

The primary objective of this study is to furnish a comprehensive comprehension of the integration of big data into enterprise architecture (Hindarto, 2023a). This study aims to identify the most efficient methods and tactics for incorporating big data into current business systems and procedures. The aim is to assist organizations in optimizing innovation, operational efficiency, and strategic decision-making through the utilization of big data to its total capacity. This investigation seeks to examine remedies for the obstacles encountered by organizations, encompassing concerns related to data security, privacy, and IT infrastructure adaptation, with a specific emphasis on the integration of big data. Practicing and theoretical individuals in the domains of enterprise architecture and data management stand to gain immeasurably from this research. The objective of this study is to provide valuable insights into the effective incorporation of large-scale data into the structure of a business., thereby assisting organizations in the development of strategies that are more flexible and responsive to business environment fluctuations. In addition, organizations will be able to obtain valuable guidance from the findings of this study regarding how to overcome the critical issues of data security and privacy in the current digital age. An increased understanding of the skills and human resource requirements associated with extensive data management is an additional advantage. This research also aims to contribute to the formulation of policies and optimal methodologies for the management of large-scale data within corporate settings. This research will likely assist organizations in comprehending the significance of big data and the ways in which this technology can fortify enterprise architecture (Judijanto & Hindarto, 2023). This will not only enhance the data management efficiency of an organization but also serve as the foundation for decision-making that is more informed and precise. Therefore, this study possesses the capacity to influence business practice and subsequent research profoundly.

The primary contribution of this research is to provide a comprehensive notion of knowledge for the integration of big data into enterprise architecture. Consistent with prior research that concentrated on the technical aspect of the implementation of big data strategy, this study incorporates both of those aspects into a single operational framework. This study presents a model that incorporates technological, benchmark, and regulatory factors; it also provides a practical framework that can be implemented across various organizational structures. The novelty of this research lies in its holistic nature; it does not merely pertain to the technological aspect of big data but rather constitutes an integral part of the enterprise's business strategy and architecture in a closed-circuit manner.

LITERATURE REVIEW

Big data has transformed business management and human resource management. An intelligent data-based enterprise business management system is proposed in this paper to improve business management efficiency. The improved C4.5 algorithm saves the shipping company A 220.21 yuan and 11050.12 yuan in fuel costs. Ship speed optimization boosts operating profit. Enterprise business management systems can use decision tree-based algorithms, according to this study (Peng & Bao, 2023). Big data is essential to the internet, and the energy industry is leading the third industrial revolution. Information is used to improve power energy enterprise management and service quality data analysis and mining. The system collects and displays electricity consumption data in three dimensions using big data and cloud computing. Operation and maintenance managers' intuition and judgment improve with data integration (X. Zhao, 2022). To address new ICT challenges, the article proposes a new government enterprise architecture framework. Cloud computing-based partial architectures for ample and open-linked data storage, processing, and

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

publishing are proposed. To adapt to ICT trends, evolve government enterprise architecture, and represent current architectural components and relationships, the framework was created. Details are provided for critical concepts, roles, and components (Lnenicka & Komarkova, 2019). Government and stakeholders pressure networked enterprises to promote ethical use of natural resources and ecosystem impact. They face economic, market, and environmental issues. This paper addresses these vulnerabilities by using big data analytics to make sustainable enterprises elastic and robust. This flexible and robust approach uses big data analytics to help NEs grow sustainability and value. The corporate environmental impact database shows the approach's efficiency (Tamym et al., 2023). A novel MaaS resilience analysis and design method for integrated service reliability is presented in this paper. Enterprise architecture modeling shows how resilience and reliability are linked. The paper uses a controlled experiment to prove the method's efficacy and compare it to a referenced method (Zhou et al., 2023).

A gap analysis of several studies shows that big data for business and human resource management is still maturing. (Peng & Bao, 2023) and (X. Zhao, 2022) found that decision tree-based algorithms and data integration improve operational efficiency, but they should be applied to other industries. The government enterprise architecture framework proposed by (Lnenicka & Komarkova, 2019) has potential, but it needs to be tailored to different government and private sector organizations. (Tamym et al., 2023) recommend big data analytics for corporate sustainability, but more research is needed to address economic, market, and environmental issues. (Zhou et al., 2023) introduced an innovative MaaS resilience analysis method, but it could be expanded and compared to other methods. Finally, big data's potential in various sectors and contexts and its long-term impact on business and human resource management are enormous.

METHOD

In this investigation, a normative approach was utilized as the research method. The purpose of this study was to investigate the incorporation of big data into enterprise architecture. Document analysis is the primary focus of this approach, which makes use of the literature gathered from journals that Scopus indexes. Because of this, the information and data that are obtained are guaranteed to be accurate and pertinent to the most recent developments. The literature review was carried out comprehensively, covering various aspects of Enterprise Architecture Design as well as the application of big data within a business setting. The process of collecting data involves selecting articles based on predetermined criteria, such as how relevant they are to the research topic, how recently they were published, how credible the source is, and how recently they were published. The researchers chose articles that offer a variety of perspectives and a comprehensive analysis of the application of big data in enterprise architecture. These articles include case studies, theoretical frameworks, and practical applications.

To ensure that the researchers have a thorough grasp of the topic at hand, they meticulously analyze each of the selected articles. This research not only investigates the ways in which big data is utilized in the contemporary business environment but also investigates the ways in which advancements in this technology can have an impact on the design of enterprise architecture in the future. Particular attention is paid to the ways in which businesses can modify and incorporate big data to achieve a competitive advantage, improve operational efficiency, and foster innovation. This analysis also considers the difficulties that arose during the process of integration, such as concerns regarding data security and privacy, as well as the requirement to upgrade the existing information technology infrastructure. This method ensures that the research covers both theoretical and practical aspects of extensive data implementation in enterprise architecture, thereby providing a balanced and in-depth perspective on the topic. This research makes a significant contribution to the academic and practical understanding of extensive data integration in the business world through the utilization of this methodology.

The Enterprise Architecture Design framework (Yu & Madiraju, 2014), (Kornyshova & Deneckère, 2022) is the primary focus of this research. It serves as a foundation for analyzing the integration of big data in enterprise architecture. With the help of this methodology, researchers can carry out an in-depth investigation into three crucial aspects of enterprise architecture: application architecture, data architecture, and technology architecture. The purpose of this research is to investigate how business applications can be optimized through the utilization of big data to enhance the efficiency and effectiveness of business processes. This research is conducted within the context of Application Architecture. Not only does this analysis take into consideration the creation of new data-driven applications, but it also involves a review of the integration of big data into the application systems that are already in place. The objective is to gain an understanding of how big data can be utilized to enhance the functionality of business applications, which will ultimately result in improved performance and competitive advantage. Additionally, the

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

potential of big data to improve interactions between business applications and users, as well as to support decision-making that is based on data, is investigated in this research.

This research then moves on to investigate the Data Architecture aspect in greater depth. The primary focus of this investigation is on the ways in which data architecture can be modified to accommodate and make use of the potential of big data. As part of this process, data structures, storage methods, and data management strategies that are suitable for the requirements of big data will be evaluated. The findings of this study highlight the significance of having a data architecture that is both flexible and scalable and that can manage large amounts of data that come from a variety of sources and various formats. This analysis also discusses the difficulties that arise when attempting to manage and secure large amounts of data, as well as the implications for concerns regarding privacy and compliance with regulations. The purpose of this research is to provide insights into practical ways to integrate big data into existing data architectures. Additionally, it explores innovative approaches to designing new data architectures that are more adaptable and responsive to current significant data trends. The research focuses on Data Architecture.

In the context of data architecture, research on big data emphasizes the significance of structures that are both flexible and scalable to accommodate large data volumes, high velocity, and data variability. To implement this strategy, it is necessary to design a data architecture that not only effectively manages data storage but also maximizes the efficiency of real-time data processing and statistical analysis. One of the most critical aspects of this research is the incorporation of big data into the data architecture systems that are already in place. Among these are the evaluation and modification of the existing data infrastructure to meet the requirements of big data. These requirements include the utilization of technologies such as distributed data storage and parallel processing.

Another factor to consider is the issue of data security and the implementation of efficient data governance, both of which become more significant as the quantity and complexity of data increases. In addition, research investigates the implementation of emerging technologies in data architecture, such as artificial intelligence (AI) and machine learning (ML), with the goal of enabling more advanced analysis and the automation of processes. In addition, the adaptability of the data architecture is a primary concern, with the goal of ensuring that the system can develop in response to shifting demands in both the business and the technological realm. This research will ultimately produce recommendations on how organizations can design new data architectures that not only support the big data that is being collected today but are also flexible enough to accommodate the data that will be collected in the future.

This research identifies the technology and infrastructure that is required to support the implementation of big data. This aspect of the study deals with technology architecture. To achieve this objective, an examination of data storage technologies, including databases and data warehouses, alongside data processing and analysis technologies, including advanced analytical tools and machine learning, is imperative. A flexible and scalable information technology infrastructure is required to support the growth and diversification of data, which is another topic that is addressed by the research. In general, the purpose of this research method is to offer a comprehensive analysis of the ways in which several aspects of enterprise architecture can be incorporated with big data. To generate valuable insights for organizations that are looking to optimize the use of big data in their enterprise architecture, this research intends to use a combination of literature analysis and case studies. Research can provide recommendations that are based on sound theory as well as practices that have been demonstrated to be successful when it is conducted using this approach.

RESULT

In this research, the integration of big data into enterprise architecture is a crucial topic. Scholars have discovered that technological elements significantly influence this integration. By implementing technologies such as distributed data processing systems and cloud computing, the capacity and velocity of big data processing have been increased considerably. This diverges from the conventional methodology that places greater emphasis on hardware enhancements. This study demonstrates that cloud and distributed technologies not only enhance scalability but also provide increased flexibility in the context of extensive data management. This research indicates that the integration of big data necessitates an enterprise-wide collaboration between the IT department and other business divisions. This requires modifications to business processes and existing organizational structures. This research underscores the significance of interdepartmental collaboration, as opposed to prior investigations that often isolate technical and business facets. This enables organizations to optimize the storage and management of large-scale data while also harnessing its potential to inform business decisions. Concerning regulations, the research findings indicate that data regulations and privacy policies significantly impact the integration and management of big data by organizations. Regulatory modifications that occur across jurisdictions necessitate a flexible data management strategy. This is in opposition to the results obtained in prior research that failed to consider the dynamic influence of regulation.

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

Organizations must, according to researchers, monitor regulatory changes continuously to ensure compliance and mitigate legal risks. Aspects of data security are also a significant focus of this research. Data security challenges in big data environments necessitate more comprehensive and layered security solutions, according to research. This extends beyond the conclusions drawn in prior research that primarily examined conventional approaches to data security. This study underscores the criticality of incorporating sophisticated data encryption technologies and robust authentication mechanisms to safeguard large-scale data against cybersecurity risks.

Moreover, this study investigates the effects of cutting-edge analytical technologies, including AI and ML, on the process of integrating massive amounts of data. This study demonstrates that AI and ML can be utilized to enhance the processing and analysis of massive amounts of data. This creates opportunities for more informed decision-making and the automation of business processes. This discovery diverges from prior research that predominantly utilized manual or semi-automatic data analysis methods. The primary obstacle in the integration of big data, according to this study, is ensuring the consistency and integrity of the data. Researchers recommend implementing a robust data management system in this context to preserve data integrity. Previous research that placed less emphasis on the significance of data consistency in big data environments has advanced in this regard. In summary, this study offers novel perspectives and actionable suggestions regarding the successful incorporation of big data into enterprise architecture. The incorporation of cutting-edge analytical technologies like Artificial Intelligence (AI) and Machine Learning (ML) into data architecture presents a significant opportunity to enhance decision-making and the automation of processes. Based on the results of this research, big data analysis can be made much faster and more accurate by utilizing artificial intelligence and machine learning. Consequently, this leads to decisions that are better informed and more responsive to the dynamics of the market. This study delves into the integration of AI and ML into a data architecture, as opposed to previous research that focused on AI and ML's application to specific tasks. Consequently, this makes it possible for data processing to be more effective and adaptable to a wide range of business scenarios.

In addition, this research sheds light on the difficulties that arise when integrating AI and ML because of the need to preserve the quality and integrity of the data. According to the findings of the researchers, the likelihood of bias and data errors in machine learning increases when proper data management is not implemented. For this reason, it is necessary to implement a comprehensive strategy for the management and cleaning of data to guarantee that the input that is supplied to AI and ML models is reliable and accurate. This contrasts with previous research, which often needs to consider how important good data is for using AI and ML. On the other hand, the findings of this research indicate that the incorporation of AI and ML necessitates modifications to both the IT infrastructure and the culture of the relevant organization. Through their research, the researchers discovered that for organizations to accommodate automated learning and advanced analytics, they need to adapt not only their technology but also their processes and policies. This includes the training of staff members, the creation of new policies regarding data privacy, and the improvement of cybersecurity policies. When compared to previous studies, which tend to separate technological aspects from organizational transformation, this finding brings about a contrast.

In conclusion, this study highlights the significance of incorporating AI and ML in a manner that is ethical in the processing of large amounts of data. Researchers emphasize that the application of artificial intelligence and machine learning must be carried out with ethical considerations and transparency to reduce the likelihood of discrimination and misuse of data. This is a significant departure from earlier studies, which frequently should have considered ethical and responsible considerations when it came to the application of advanced technology. As a result, does this research offer comprehensive guidance on the right way to use AI and machine learning in data architectures?

Application Architecture

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

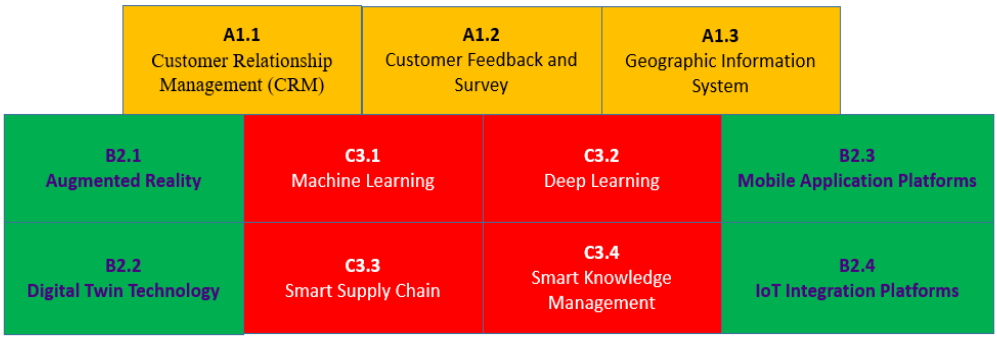

Figure 1. Application Architecture Integration Big Data
Source: Property Researcher

The architecture of the Big Data Integration Application is depicted in Figure 1. This architecture can be described as follows: At the initial stage (A1), the emphasis is on systems that directly engage with customers. The mentioned tools are:

- Customer Relationship Management (CRM) (A1.1), which is crucial for managing customer interactions;
- customer Feedback and Surveys (A1.2) for gathering customer feedback and preferences and
- Geographic Information Systems (GIS) (A1.3) is utilized to analyze spatial and geographic data related to customers.

At the B2 level, technologies that enhance customer experience and optimize operations are implemented. The technologies encompassed in this category are Augmented Reality (B2.1), which enhances interactive experiences; Digital Twin Technology (B2.2), which generates digital representations of physical assets; Mobile Application Platform (B2.3), which facilitates wider accessibility and customer interactions through mobile devices, and an IoT Integration Platform (B2.4), which links IoT devices to gather and analyze data from various sources. The primary emphasis of the third level (C3) is the utilization of sophisticated technologies in the analysis of data. These encompass Machine Learning (C3.1) and Deep Learning (C3.2), which are two subdivisions of artificial intelligence that enable systems to acquire knowledge and enhance their performance through experience without the need for explicit programming. In addition, Smart Supply Chain (C3.3) incorporates sophisticated technologies designed to improve the functioning of the supply chain. Smart Knowledge Management (C3.4) utilizes artificial intelligence and other technologies to enhance the processes by which organizations generate, distribute, and oversee knowledge. This architecture integrates diverse technologies to enhance the gathering, examination, and utilization of large-scale data in different facets of a company, ranging from customer engagements to more streamlined and inventive internal processes.

Information Architecture

Figure 2. Information Architecture Integration Big Data
Source: Property Researcher

An all-encompassing and integrated structure that is designed to manage and make use of large amounts of data is depicted in Figure 2 as the Big Data Integration Information Architecture. The collection of data from a variety of

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

sources, such as data from internal organizations, data from real-time streaming, and data from external sources, to integrate it into a single ecosystem is the fundamental component of this architecture. To guarantee the consistency and quality of the data, this integration process includes all the following steps: cleansing, transformation, and unification. Data lakes and big data warehouses are two examples of technologies that are utilized to store and manage data effectively after the data has been integrated. After that, to gain insights and make predictions based on the data, Artificial intelligence, and machine learning are employed as data analysis tools. The data visualization layer is also a part of this architecture, and it gives users the ability to view and comprehend data using interactive dashboards and reports. Through the implementation of stringent security protocols, this structure guarantees the protection of sensitive data and prevents unauthorized individuals from accessing private information. In conclusion, this structure guarantees the security and privacy of data.

Technology Architecture

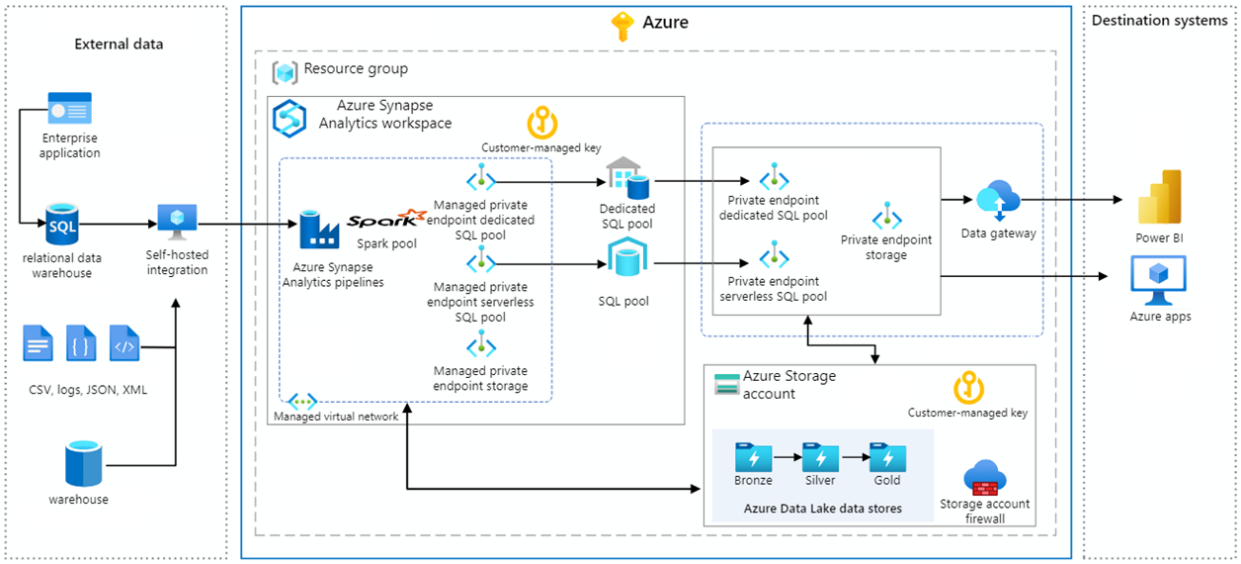

Figure 3. Technology Architecture Integration Big Data and Enterprise Architecture (Microsoft, 2023)
Source: Microsoft

Figure 3, In Azure Synapse Analytics, data moves through several stages. First, Synapse pipeline copy operations are used to get data from different sources, such as external relational data warehouses, semi-structured files, logs, flat files, and XML. The data is then put through some steps and saved in Azure Data Lake Storage Gen2. A self-hosted integration runtime controls copy operations between on-premises and cloud data stores to keep them safe. Azure Data Lake Storage Gen2 is the second generation of storage that is safe. Limiting access to trusted Azure services with a firewall is suggested to make your system less open to attacks from outside sources. You can set up private endpoints on your Azure storage accounts to allow safe access through Private Link. All communications stay on the private network and the Microsoft backbone network.

The data is encrypted while it is in the data lake. Using customer-managed keys can improve the security of encryption keys and give you more control over who can see what. Spark's Synapse stack and Data Lake tools are used to process data in small chunks. A dedicated directory in Azure Data Lake Storage Gen2 is used to store data in an Azure storage account. The process starts with a copy operation in the Synapse pipeline that takes data from the original system and stores it in the bronze data lake directory as raw data. Next, the Spark Synapse pool cleans the raw data with data quality rules. The data is then stored in the silver data lake directory. After being cleaned, data from the silver directory is transformed and normalized, and business rules are applied to it in the Spark pool. It is then stored in the gold data lake directory.

The normalized data is then sent to the Synapse SQL pool by the Synapse Apache Spark to Synapse SQL connector. This lets other applications and reporting services, like Power BI, use it. This connector is made to move data between SQL pools and serverless Apache Spark pools in Azure Synapse Analytics workspaces quickly and easily. When the Power BI service uses Direct Query mode, it gets secure data from Synapse SQL pools. A data gateway that is installed

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

on a virtual machine in a private VNet makes the connection between the Power BI service and the Synapse SQL pool safe. To make a connection, this gateway uses a Private Endpoint in the same VNet. By connecting to the right private endpoint in the VNet, outside programs can get data stored in a Synapse serverless pool or a dedicated SQL pool.

DISCUSSIONS

The findings of this study provide a comprehensive guide on how to incorporate ML and AI into data architecture appropriately. Methods for effectively and ethically integrating AI and ML are the primary emphasis of this booklet, with a particular focus on preserving the quality and integrity of data. An extensive description of this is given in the following manual. The essential steps involved in integrating these cutting-edge technologies into pre-existing systems while simultaneously ensuring that they make a positive contribution to the decision-making and automation processes. Another significant issue that was brought up was the requirement for robust data governance and data security protocols to lessen the likelihood of artificial intelligence and machine learning producing results that are biased or risky.

With respect to the practical implementation of AI and ML, the guide acknowledges the significance of making ethical considerations and maintaining transparency. In addition to ensuring that the application of artificial intelligence and machine learning is in accordance with the values and ethics of the organization, this research advocates for the development and implementation of clear policies regarding the use of data, privacy, and security. The goal of this guide is to assist organizations in maximizing the potential of artificial intelligence and machine learning by providing a comprehensive framework for the integration of these technologies. This guide also aims to ensure that organizations' data processing procedures continue to be trustworthy and honest.

CONCLUSION

To effectively manage and make use of large amounts of data, this research has been successful in demonstrating the significance of Big Data Integration Information Architecture. To ensure that high-quality data is readily available for analysis, it was discovered that the integration of data from a variety of sources and the utilization of technologies such as data warehouses and data lakes are both essential components. This design has proven its mettle in efficiently mining large data sets for valuable insights by utilizing AI and ML. The results of this study indicate that through the implementation of appropriate organizational structures, businesses can enhance their analytical capabilities, which ultimately leads to decisions that are better informed and more strategic. Research suggests that organizations that want to make the most of big data should implement an integrated information architecture strategy. This recommendation is based on the findings of the research studied. Not only does this approach contribute to the management of data more effectively, but it also paves the way for additional opportunities for innovation through the utilization of advanced data analysis. It is imperative that data security and privacy, which are both essential components of this architecture, are always given top priority to safeguard data from being accessed by unauthorized parties and to ensure compliance with any applicable regulations. Significant advancements in the field of extensive data management are anticipated because of this research, which paves the way for further study in the optimization of information architecture for various kinds of data and business environments.

REFERENCES

Afarini, N., & Hindarto, D. (2023). *The Proposed Implementation of Enterprise Architecture in E-Government Development and Services*. *3*(December), 219–229.

Hindarto, D. (2023a). Application Of Customer Service Enterprise Architecture In The Transportation Industry. *Journal of Computer Networks , Architecture and High Performance Computing*, *5*(2), 682–692.

Hindarto, D. (2023b). *Blockchain-Based Academic Identity and Transcript Management in University Enterprise Architecture*. *8*(4), 2547–2559.

Hindarto, D. (2023c). *The Management of Projects is Improved Through Enterprise Architecture on Project Management Application Systems*. *3*(August), 151–161.

Judijanto, L., & Hindarto, D. (2023). *Edge of Enterprise Architecture in Addressing Cyber Security Threats and Business Risks*. *3*(December), 386–396.

Kornyshova, E., & Deneckère, R. (2022). A Proposal of a Situational Approach for Enterprise Architecture Frameworks: Application to TOGAF. *Procedia Computer Science*, *207*, 3493–3500. https://doi.org/10.1016/j.procs.2022.09.408

Lnenicka, M., & Komarkova, J. (2019). Developing a government enterprise architecture framework to support the

* Corresponding author

Journal of Computer Networks, Architecture and High Performance Computing
Volume 6, Number 1, January 2024
https://doi.org/10.47709/cnahpc.v6i1.3449

Submitted : Jan 3, 2024
Accepted : Jan 17, 2024
Published : Jan 21, 2024

requirements of big and open linked data with the use of cloud computing. *International Journal of Information Management*, *46*(December 2018), 124–141. https://doi.org/10.1016/j.ijinfomgt.2018.12.003

Microsoft. (2023). *Big data analytics with enterprise-grade security using Azure Synapse*. Microsoft. https://learn.microsoft.com/id-id/azure/architecture/solution-ideas/articles/big-data-analytics-enterprise-grade-security

Peng, J., & Bao, L. (2023). Construction of enterprise business management analysis framework based on big data technology. *Heliyon*, *9*(6), e17144. https://doi.org/10.1016/j.heliyon.2023.e17144

Smith, S. M., & Nichols, T. E. (2018). *Statistical Challenges in ‘‘‘Big Data’’’ Human Neuroimaging*. 263–268.

Tamym, L., Benyoucef, L., Nait, A., Moh, S., Driss, M., & Ouadghiri, E. (2023). *Big data analytics-based approach for robust, flexible and sustainable collaborative networked enterprises*. *55*(January).

Yu, Y., & Madiraju, S. (2014). Enterprise application transformation strategy and roadmap design: A business value driven and IT supportability based approach. *Proceedings - 2nd International Conference on Enterprise Systems, ES 2014*, 66–71. https://doi.org/10.1109/ES.2014.37

Zhao, L., Tan, W., Xie, N., & Huang, L. (2020). *An optimal service selection approach for service-oriented business collaboration using crowd-based cooperative computing*. *92*.

Zhao, X. (2022). *Research on management informatization construction of electric power enterprise based on big data technology*. *8*, 535–545.

Zhou, Z., Matsubara, Y., & Takada, H. (2023). *Resilience analysis and design for mobility-as-a-service based on enterprise architecture modeling*. *229*(March 2022).

* Corresponding author