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Cite This: J. of Cloud. Computing. And Supply Chain. Manage. 2025, 1-1, 47-56

SciForce

International Journal of Cloud Computing and Supply Chain Management

Journal homepage: www.sciforce.org

Understanding its Big Data Analytics Potential Benefits for Healthcare Organizations

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ARTICLE INFO

Article history:
Received: 20250112
Received in revised form: 20250118
Accepted: 20250203
Available online: 20250218

Keywords:
MCDM;
e-Readiness;
Technology;
Environment;
Organization.

ABSTRACT

Big data analytics involves the examination and analysis of extensive and intricate datasets to discover shape business strategies, or deepen understanding of a specific phenomenon. It encompasses the use of advanced analytic techniques like data mining, machine learning, and statistical analysis to extract valuable information from vast quantities of data. datasets characterized by their size, speed, and diversity. It involves rephrasing or restating the information in a different way, using different words and sentence structures. Paraphrasing helps to avoid plagiarism and can be used to clarify complex concepts or make information more accessible to a specific audience. It is important to accurately represent the original source while incorporating your own writing style. Storing the processed data in appropriate storage systems, such as data lakes or distributed file systems, Data analysis: Applying various analytic techniques to extract insights and discover patterns, correlations, and trends within, predictive analytics.

Researchers can Through the utilization of advanced analytical techniques like unveil concealed patterns, correlations, and trends that might not be evident through conventional analysis approaches. This allows researchers decision-making processes. These insights can lead to new discoveries, novel findings, and a deeper understanding of complex phenomena. Nonmetal mineral product industry, General equipment manufacturing, Mining and washing of coal, Textile industry, Food manufacturing industry. e-Readiness, Technology, Environment, Organization, People. e-Readiness is got the first rank whereas is the Organization is having the Lowest rank. Rank using the DEMATEL for e-Readiness is got the first rank whereas is the Organization is having the Lowest rank.

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Introduction

To effectively harness the power of big data analytics, enterprises require a workforce equipped with advanced technical skills to utilize and optimize these systems. The aim is to obtain actionable knowledge that can be utilized by end users, particularly those in executive positions (C-suite). Key competencies that individuals need for this role include expertise in large datasets and facilitating informed decision-making processes. However, the demand for professionals with these skill sets, such as data scientists and data analysts, far exceeds the available supply. Consequently, organizations face challenges in recruiting individuals who possess both analytics proficiency and domain-specific knowledge. This scarcity underscores the difficulty in finding suitable candidates for these positions, given the highly specialized nature of the required skill set. [2] Furthermore, from a system perspective, we have conducted an extensive review of different approaches and mechanisms employed in various stages of big data processing.

During the big data generation phase, we have identified and discussed several potential sources of substantial data and examined their inherent characteristics. Moving on to the big data acquisition phase, we have explored common technologies used for data collection, followed by an investigation into methods for transmitting and preprocessing big data. In the big data storage phase, we have introduced numerous NoSQL stores based on cloud infrastructure, comparing their key features to aid in making informed decisions regarding big data design. Recognizing the significance of programming models in conjunction with data storage approaches for big data analytics, we have presented several influential and representative computation models. Regarding the data analytics phase, we have delved into diverse methods of data analysis organized according to data characteristics. Finally, we have introduced Hadoop as a central component of the big data movement, along with an overview of big data benchmarks, which serve as a cornerstone for evaluating performance and capabilities. [3] Failing to do so may result in the loss of valuable data or the inability to identify meaningful patterns amidst the noise. In the subsequent sections, we will delve into the overall hurdles and advancements in big data analytics, followed by an exploration of the specific challenges posed by business applications and their analytics. [4] According to a study by Jun, Liu, and Fleming (2014), the performance of big data analytics is often hindered by the transfer of large data volumes from hard disks to memory.

To address this issue, the researchers suggest an architecture that can greatly enhance data throughput. Their proposed approach involves utilizing a chip-to-chip backplane network managed by flash controllers to efficiently share numerous flash chips. The experiment conducted demonstrates that the average latency for user software to access the flash store is less than 70 µs, significantly outperforming traditional methods. [6] Currently, there is a lack of the topic. Their review provided an overview of the content, scope, findings, and opportunities associated with big data analytics. They examined literature from three primary databases: Compendia, GEOBASE Inspect, and Engineering Village. However, literature from popular databases such as IEEE Explore, Elsevier's Scopus, Google Scholar, SCI, and SSCI. bridge the gap by focusing on the SCI and SSCI databases and conducting an expanded literature review on big data. [8] Conventional data analysis methods are inadequate for big data analytics. holds significant value in medical research and clinical practice across different fields. In cases where patients exhibit clear symptoms and abnormalities, existing healthcare schemes can provide treatment.

Timely diagnosis of severe illnesses contributes to better patient outcomes by reducing risks involved. [9] I propose an aimed at enhancing productivity in diverse industries through improved information analysis and knowledge acquisition methods. This system specifically emphasizes industrial big data analytics and incorporates a range of data analytics components that can be reconfigured and interchanged to cater to varying business requirements. To address the challenges associated with industrial informatics, the authors introduce a novel context intelligence framework that leverages sensor data, location information, [10] The field of agriculture is generating a substantial amount of information through Agricultural IoT (Internet of Things) In order to gain valuable insights from this vast and diverse data, agricultural companies are increasingly adopting big data technologies. These technologies offer the potential to address real-time issues, handle incomplete data, overcome the lack of prior knowledge, and capture various complex data types. One prominent smart agriculture, which involves the use of sensors as key components. [11] The current process data analytics approach typically focuses on specific data samples and selected variables that closely match the current operating conditions. Little effort is made to gather data from diverse sources, including historical operations spanning multiple years and plants distributed globally, even if they produce the same products. [12] The Earth Observation field is currently grappling known as Big Data.

To address this issue, there is a pressing requirement for sophisticated solutions that can effectively handle and analyze such large datasets. There is a demand for adaptable solutions that allow for on-the-fly analysis of Big Data, specifically tailored for scientific data exploration whenever needed. Users in this domain are in need of Big Data technologies that can accommodate multiple data models and minimize the need for data transfer between different systems. Users also seek advanced visualization techniques that can seamlessly integrate into various graphical user interfaces (GUIs), including web and mobile platforms. [14] The primary objectives of this research are twofold. Firstly, the aim is to recognize the capabilities of big data analytics. Secondly, the goal is to investigate the potential advantages that can be derived from utilizing big data analytics. By accomplishing these objectives, our intention is to equip healthcare organizations with an in transforming their operations. To achieve these aims, this paper adopts a sequential approach. Initially, we provide a historical overview and establish Through this analysis, we were able to identify five major capabilities. [16]

Materials and method

E-Readiness: e-Readiness refers to the preparedness of individuals, organizations, and societies to effectively utilize and benefit from information and communication technologies (ICTs), particularly the internet. It is a concept that assesses the level of digital infrastructure, skills, and policies necessary for meaningful engagement with the digital world. The term e-Readiness emerged of life, such as education, business, governance, and communication. It encompasses multiple dimensions that collectively determine the readiness of a person, organization, or country to engage in the digital realm. Technological Infrastructure: This dimension assesses the availability and quality of ICT infrastructure, including internet connectivity, access to computers or mobile devices, and the presence of reliable telecommunications networks. It examines factors like bandwidth, coverage, and the affordability of technology. Access and Connectivity: This dimension focuses on the accessibility and affordability of internet services. It considers factors such as the availability of internet service providers, the cost of internet access, and the extent of broadband penetration. It also takes into account issues related to digital divide, ensuring equitable access to all segments of society.

Technology: Connectivity and Networking: Technology has revolutionized the way we connect and interact with others. Through networking technologies like the internet, social media, and mobile communication, people can communicate, collaborate, and share information across vast distances. This has transformed various industries and brought people from different parts of the world closer together. Innovation and Iteration: Technology is a continuously evolving field, characterized by constant innovation and iteration. New technologies are developed, and existing ones are improved upon to address emerging needs and challenges. This iterative process drives progress and leads to breakthroughs in various domains, ranging from healthcare and transportation to entertainment and energy. Ethical and Societal Implications: Technology also raises important ethical and societal questions. As it becomes deeply ingrained in our daily lives, it impacts privacy, security, social interactions, employment, and even the distribution of resources. It is essential to consider.

Environment: The environment life and development of organisms, including humans. The environment includes both natural elements, such as air, water, landforms, and biodiversity, as well as human-made or anthropogenic components, such as buildings, infrastructure, and pollution. Here are some key aspects of the environment: ecological processes. However, pollution, over-extraction, and mismanagement of water resources have led to water scarcity and degradation of aquatic ecosystems. the uppermost part of the mantle. It consists of rocks, minerals, and landforms. The lithosphere provides habitats for organisms and serves as a source of natural resources, such as minerals, fossil fuels, and fertile soils.

Organization: an organization is a structured is to coordinate and align the efforts of individuals towards a specific objective. This involves setting goals, defining roles and responsibilities, establishing communication channels, and creating processes and procedures to facilitate the smooth functioning of the organization. Organizations typically have a hierarchical structure with different levels of authority and decision-making. At the top, there is usually a leadership team or employees or members are distributed across these departments or teams based on their roles and responsibilities. Organizations also have various functions or departments that handle specific areas of operations, such as finance, human resources, marketing, sales, production, and so on. These functions work together to support the overall goals of the organization. Communication is vital within an organization to ensure effective coordination and collaboration. It can take place through formal channels like meetings, emails, reports, and memos, as well as informal channels like conversations and networking.

People: The process of people explaining can take various forms depending on the context. It can involve verbal communication, such as delivering a presentation, giving a lecture, or participating in a conversation. People can also explain things through written mediums, such as articles, essays, blog posts, or instructional materials. The goal of people explaining is to bridge the knowledge gap and facilitate learning or understanding. It involves breaking down complex ideas into simpler components, providing examples and illustrations, and adapting the explanation to the audience's level of knowledge and background. Effective people explaining requires effective communication skills, including clear and concise language, the ability to listen and understand the audience's needs, and the use of appropriate examples or analogies to enhance comprehension. It is crucial to adapt the explanation to the audience's level of understanding and address any questions or concerns that may arise. In a broader sense, people explaining is a fundamental aspect of education, training, and knowledge sharing in various fields and disciplines. Teachers, professors, mentors, and subject matter experts often engage in people explaining to impart knowledge and help others grasp complex concepts.

Method: Problem Identification: The first step is to clearly define the problem or the system under consideration. It could be a decision-making process, an organizational structure, a project, or any other complex system. Factor Identification: Next, identify the factors or elements that play a role in the system. These factors can be tangible or intangible, qualitative or quantitative. For example, in the context of decision-making, factors could include different criteria, alternatives, stakeholders, or constraints. Constructing the Influence Matrix: Create a square matrix that represents The matrix shows how each factor influences or is influenced by other factors within the system. Each element in the matrix indicates the and Causal Relationship: Calculate the total effect and causal relationship values for each factor. The total Constructing the Relation Matrix: Based on the total effect and causal relationship values, construct a relation matrix that represents the interdependencies among the factors.

This matrix helps visualize the cause-and-effect relationships in the system more comprehensively. Calculating the Direct and Indirect Effects: Calculate the values in the corresponding rows and columns of the relation matrix. The direct effect represents the immediate impact of a factor, while the indirect effect indicates the cumulative influence through other factors. Analyzing and Prioritizing Factors: Analyze the direct and indirect effects to prioritize the factors. Factors with high direct effects and high indirect effects are considered critical and should be given more attention and resources. Interpretation and Decision Making: Finally, interpret the results and use them to make informed decisions or recommendations. The DEMATEL method provides insights into the cause-and-effect relationships within the system, helping stakeholders understand the key factors that drive the system's behavior and make appropriate interventions or improvements. The DEMATEL method is widely used in various fields, including management, engineering, healthcare, and policy-making, to analyze complex problems, evaluate system performance, and support decision-making processes. It enables a systematic approach to understanding the interconnectedness of factors and provides a visual representation of their relationships, aiding stakeholders in addressing critical issues effectively.

Results and discussion

Table 1. Big data analytics

	e-Readiness	Technology	Environment	Organization	People	Sum
e-Readiness	0	4	4	2	3	13
Technology	1	0	1	3	2	7
Environment	2	1	0	3	1	7
Organization	3	3	1	0	2	9
People	1	2	3	2	0	8

Table 1 shows that DEMATEL Decision making trail and evaluation laboratory in Big data analytics with respect to Power Electronics in Power Systems, e-Readiness, Technology, Environment, Organization and People sum this value.

Table 2. Normalization of direct relation matrix

Normalisation of direct relation matrix					
	e-Readiness	Technology	Environment	Organization	People
e-Readiness	0	0.363636364	0.36363636	0.181818182	0.272727273
Technology	0.090909091	0	0.09090909	0.272727273	0.181818182
Environment	0.181818182	0.090909091	0	0.272727273	0.090909091
Organization	0.272727273	0.272727273	0.09090909	0	0.181818182
People	0.090909091	0.181818182	0.27272727	0.181818182	0

Table 2 shows that the Normalizing of the direct relation matrix in Big data analytics in Big data analytics, e-Readiness, Technology, Environment, Organization and People value of all the data set is zero.

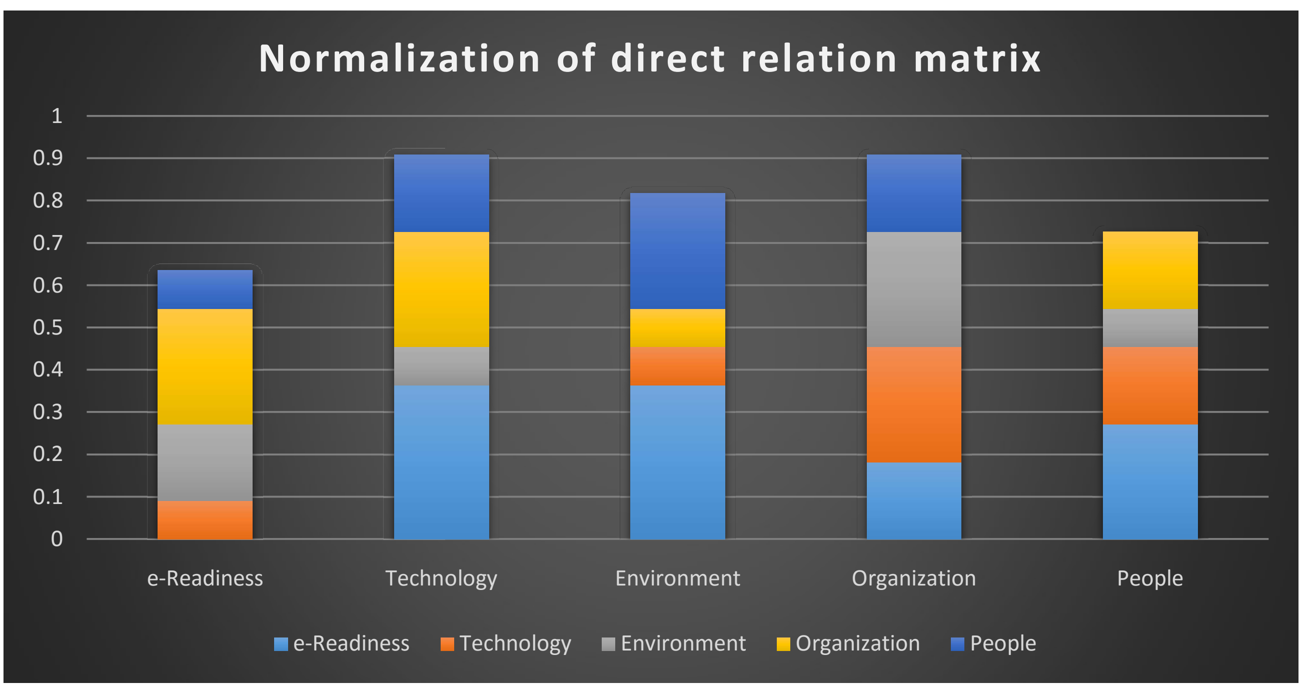

Table 2. Normalization of direct relation matrix

Figure 2 Shows that chart for Normalizing of direct relation matrix Big data analytics in Big data analytics, e-Readiness, Technology, Environment, Organization and People has Different value.

Table 3. Calculate the Total Relation Matrix

Calculate the total relation matrix					
	e-Readiness	Technology	Environment	Organization	People
e-Readiness	0	0.181818182	0.363636	0.181818182	0.272727273
Technology	0.272727273	0	0.181818	0.090909091	0.181818182
Environment	0.181818182	0.090909091	0	0.272727273	0.181818182
Organization	0.090909091	0.272727273	0.181818	0	0.181818182
People	0.181818182	0.181818182	0.090909	0.181818182	0

Table 3 Shows the Calculate the total relation matrix in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People is Calculate the Value.

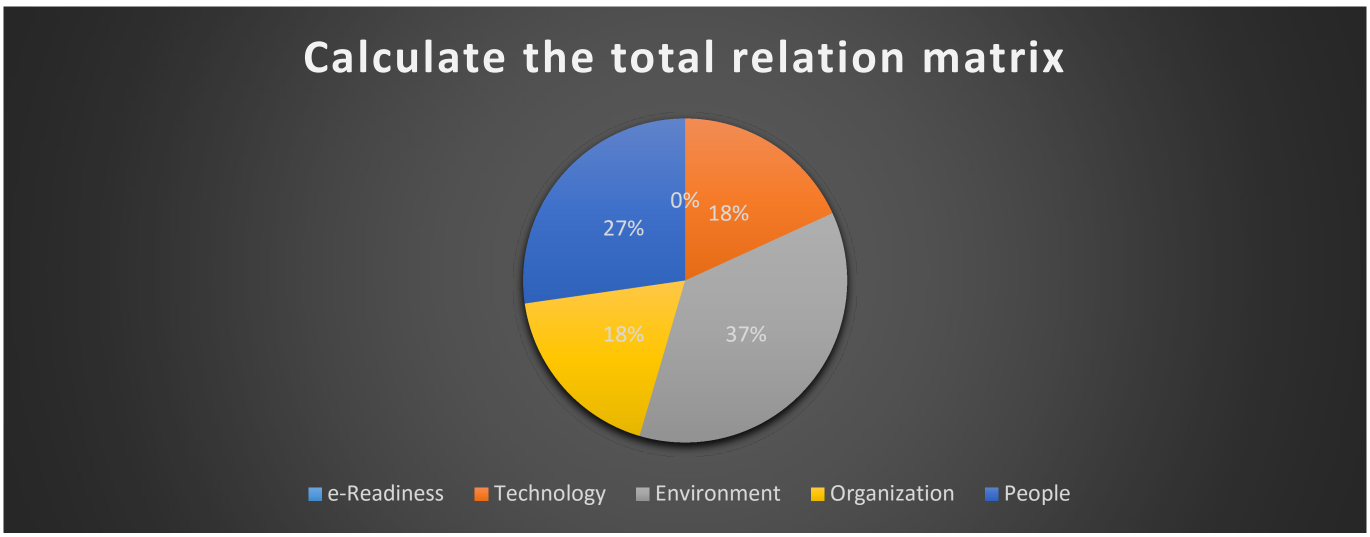

Figure 3. Calculate the Total Relation Matrix

Figure 3 Shows the Calculate the total relation matrix in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People is Calculate the Value.

Table 4. T= Y(I-Y)-1, I= Identity matrix

I				
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	0	1

Table 4 Shows the T= Y(I-Y)-1, I= Identity matrix in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People is the common Value.

Table 5. Y Value

Y				
0	0.181818182	0.363636364	0.181818182	0.272727273
0.272727	0	0.181818182	0.090909091	0.181818182
0.181818	0.090909091	0	0.272727273	0.181818182
0.090909	0.272727273	0.181818182	0	0.181818182
0.181818	0.181818182	0.090909091	0.181818182	0

Table 5 Shows the Y Value in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People is Calculate the total relation matrix Value and Y Value is the same value.

Table 6. I-Y Value

I-Y				
1	-0.181818182	-0.36363636	-0.18181818	-0.27272727
-0.27272727	1	-0.18181818	-0.09090909	-0.18181818
-0.18181818	-0.090909091	1	-0.27272727	-0.18181818
-0.09090909	-0.272727273	-0.18181818	1	-0.18181818
-0.18181818	-0.181818182	-0.09090909	-0.18181818	1

Table 6 Shows the I-Y Value in Power Systems and in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People table 4 T= Y(I-Y)-1, I= Identity matrix and table 5 Y Value Subtraction Value.

TABLE 7. (I-Y)-1 Value

(I-Y)-1				
1.61023177	0.753533	0.945449	0.78095	0.890051
0.70633126	1.474562	0.692764	0.577162	0.691634
0.61362352	0.561334	1.513002	0.697287	0.671283
0.55568118	0.678067	0.65065	1.459864	0.658564
0.57801018	0.579423	0.553703	0.575749	1.468344

Table 7 shows the (I-Y)-1Value in in e-Readiness with respect to Big data analytics, e-Readiness, Technology, Environment, Organization and People Table 6 shows the Minvers shows used.

Table 8. Total Relation matrix (T)

	Total Relation matrix (T)					Ri
	0.610232	0.753533	0.945449	0.78095	0.890051	3.980215
	0.706331	0.474562	0.692764	0.577162	0.691634	3.142453
	0.613624	0.561334	0.513002	0.697287	0.671283	3.056529
	0.555681	0.678067	0.65065	0.459864	0.658564	3.002826
	0.57801	0.579423	0.553703	0.575749	0.468344	2.755229
ci	3.063878	3.046919	3.355568	3.091012	3.379876	

Table 8 shows the Total Relation Matrix (T) the direct relation matrix is multiplied by the inverse of the value that the direct relation matrix is subtracted from the identity matrix.

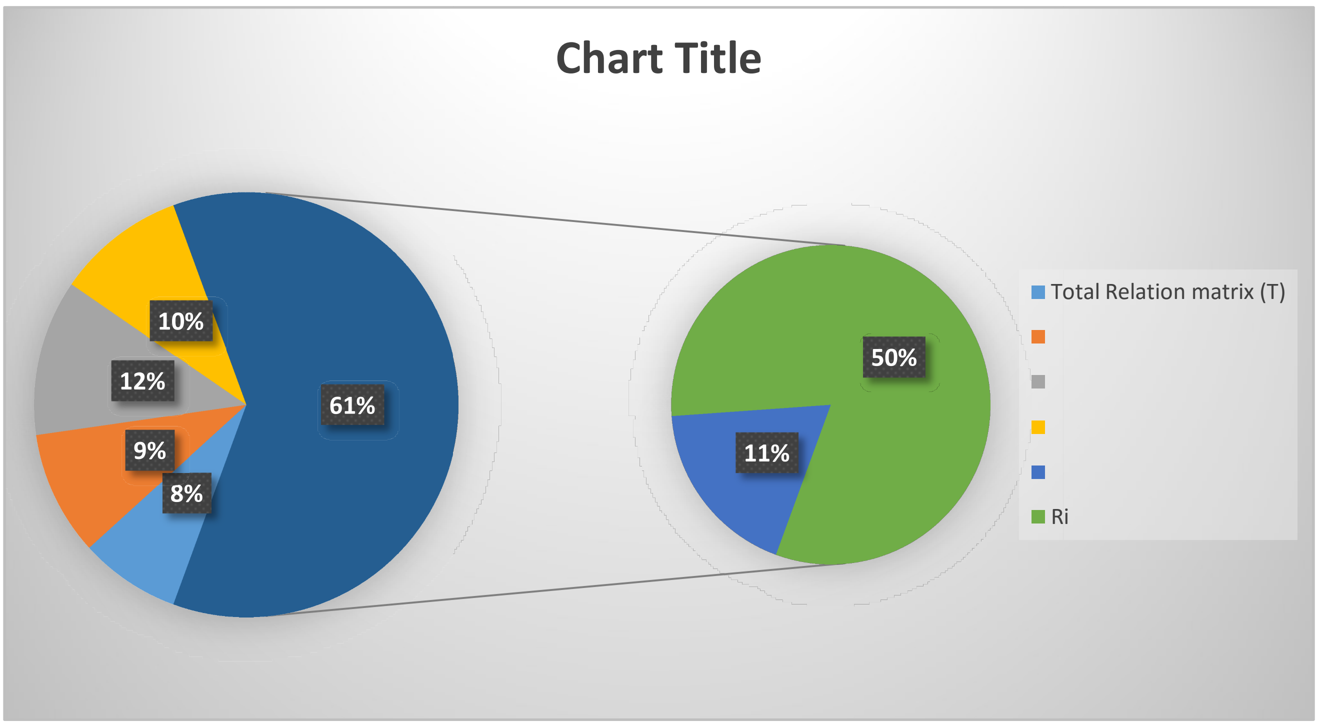

Figure 4. Total Relation matrix (T)

Figure 4. shows the Total Relation Matrix (T) the direct relation matrix is multiplied with the inverse of the value that the direct relation matrix is subtracted from the identity matrix.

Table 9. Power Systems and Power Electronics Ri & Ci Value

	Ri	Ci
e-Readiness	3.980215	3.063877897
Technology	3.142453	3.046919163
Environment	3.056529	3.355568118
Organization	3.002826	3.091011871
People	2.755229	3.379875636

Table 9 shows the e-Readiness Ri, Ci Value e-Readiness, People, Energy Conservation, Heating & Lighting Control and Environment in Organization is showing the Highest Value for Ri and Energy Conservation is showing the lowest value. Organization is showing the Highest Value for Ci and Environment is showing the lowest value.

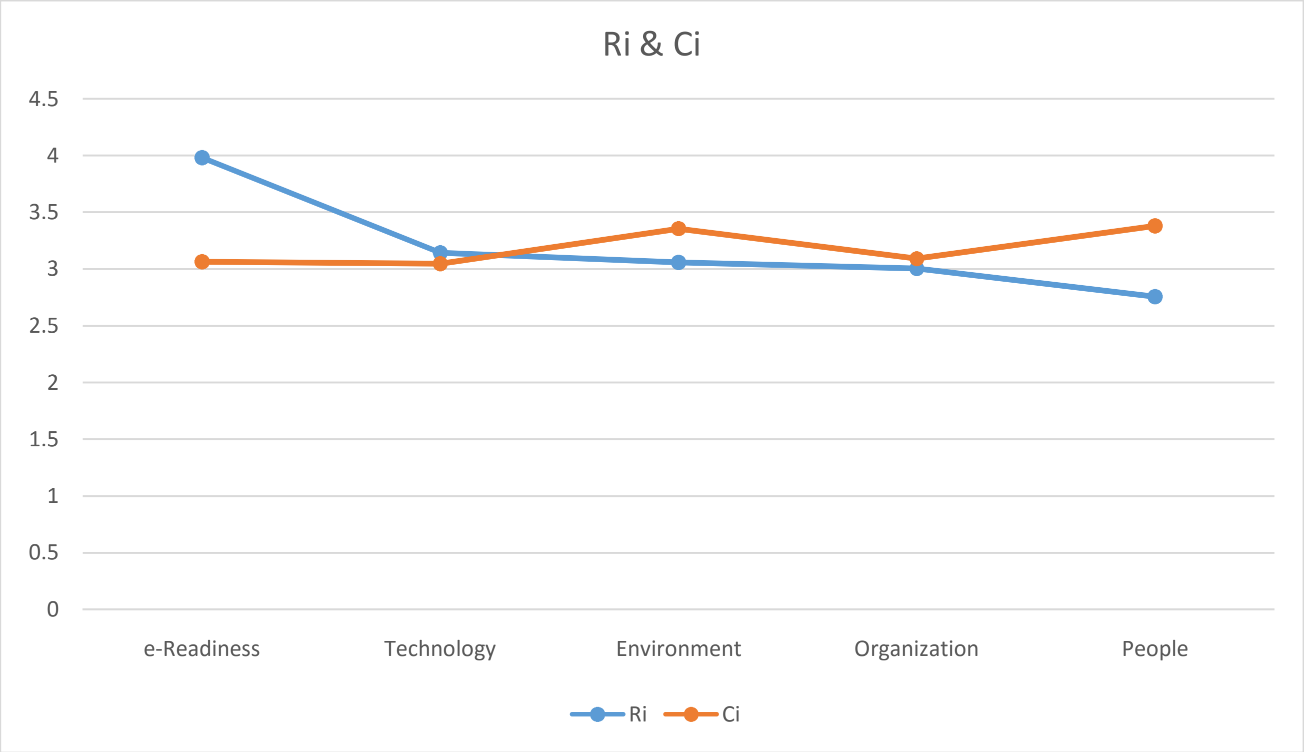

Figure 5. Total Relation Matrix (T) Ri, Ci Value

Figure 5 shows the e-Readiness Ri, Ci Value e-Readiness, People, Energy Conservation, Heating & Lighting Control and Environment in Organization is showing the Highest Value for Ri and Energy Conservation is showing the lowest value. Organization is showing the Highest Value for Ci and Environment is showing the lowest value.

Table 10. Calculation of Ri+Ci and Ri-Ci To Get The Cause And Effect

	Ri+Ci	Ri-Ci	Rank	Identity
e-Readiness	7.044092708	0.916336914	1	cause
Technology	6.189372527	0.0955342	3	cause
Environment	6.41209723	-0.299039005	2	effect
Organization	6.093838327	-0.088185415	5	effect
People	6.135104579	-0.624646693	4	effect

Table 10 shows the Calculation of Ri+Ci and Ri-Ci to Get the Cause and Effect. e-Readiness, Technology, Environment, Organization in Organization is Showing the highest Value of cause. e-Readiness, Organization is showing the lowest Value of effect.

Table 11. T matrix value

T matrix				
0.610232	0.753533	0.945449	0.78095	0.890051
0.706331	0.474562	0.692764	0.577162	0.691634
0.613624	0.561334	0.513002	0.697287	0.671283
0.555681	0.678067	0.65065	0.459864	0.658564
0.57801	0.579423	0.553703	0.575749	0.468344

Table 11. Shows the T matrix calculate the average of the matrix and its threshold value (alpha) Alpha 0.63749 If the T matrix value is greater than threshold value then bold it

Figure 6. Rank

Figure 6 shows the Rank using the DEMATEL for e-Readiness is got the first rank whereas is the Organization is having the Lowest rank.

Conclusion

Furthermore, from a system perspective, we have conducted an extensive review of different approaches and mechanisms employed in various stages of big data processing. During the big data generation phase, we have identified and discussed several potential sources of substantial data and examined their inherent characteristics. Moving on to the big data acquisition phase, we have explored common technologies used for data collection, followed by an investigation into methods for transmitting and preprocessing big data. In the big data storage phase, we have introduced numerous NoSQL stores based on cloud infrastructure, comparing their key features to aid in making informed decisions regarding big data design. Recognizing the significance of programming models in conjunction with data storage approaches for big data analytics, we have presented several influential and representative computation models.

Regarding the data analytics phase, we have delved into diverse methods of data analysis organized according to data characteristics. Finally, we have introduced Hadoop as a central component of the big data movement, along with an overview of big data benchmarks, which serve as a cornerstone for evaluating performance and capabilities. Failing to do so may result in the loss of valuable data or the inability to identify meaningful patterns amidst the noise. In the subsequent sections, we will delve into the overall hurdles and advancements in big data analytics, followed by an exploration of the specific challenges posed by business applications and their analytics. The environment life and development of organisms, including humans.

The environment includes both natural elements, such as air, water, landforms, and biodiversity, as well as human-made or anthropogenic components, such as buildings, infrastructure, and pollution. Here are some key aspects of the environment: ecological processes. However, pollution, over-extraction, and mismanagement of water resources have led to water scarcity and degradation of aquatic ecosystems. the uppermost part of the mantle. It consists of rocks, minerals, and landforms. The lithosphere provides habitats for organisms and serves as a source of natural resources, such as minerals, fossil fuels, and fertile soils.

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