

# The Relevance and Challenges of Big Data for Leadership

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## Abstract

**Purpose:** This research is a study of ‘The Relevance and challenges of Big Data for Leadership’. The purpose of this study is to examine the level of understanding, knowledge, and skill of leadership to drive a data driven organisation, and to determine the shortcomings and areas for improvement for necessary adjustments. **Research Design:** The research involves an exploratory study of the leadership needs and abilities for effectively leading in the big data environment. Method used include literature review and qualitative analysis of interviews of people at different levels of leadership, as primary research. **Findings:** The analysis is a combination of a deductive and an inductive approach, and the themes help analyse big data benefits and challenges for leadership, and the leadership style adopted by leaders. Findings reveal the underlying issues of lack of skill and knowledge among leaders. **Implications for Research and Practice:** The findings enable organisations and leaders understand the gaps in using data efficiently, and recommendations help to take measures to improve effectiveness. Big data and leadership are under explored and there is scope for continuing research in these areas.

**Keywords:** Big Data, Data Driven Decision Making, Big Data Analytics, Leadership, Leadership Skills

## Introduction

Artificial Intelligence (AI) and technological advancement have completely revolutionised the business world. The capability of technology to capture large volumes of data enabling analysis, has remodelled the way businesses operate and the process of strategic leadership, which leads to innovation and growth (Pothineni, 2023). The advent of the computer age made it possible to gather and store data digitally, and the progress through e-commerce, social media and IoT, together with AI (artificial intelligence), ML (machine learning), and superior computing capabilities, has enabled easy access, collection, analysis and sharing of large volumes of data (Lee 2017). The relevance of big data for leadership, and the challenges leaders face in a data centric organisation have been explored in this research. The study reveals the significance of big data, how it helps to improve decision making and in building sustainable practices.

Research by Shabbir and Gardezi (2020) brings out the significance of big data for strategic decision making and to achieve competitive advantage. Although big data analytics is an emerging area and continues to be explored, big data has considerable impact on leadership creating a need for leaders to acquire skills to manage and lead organisations efficiently (Schmidt, Dierendonck and Weber, 2023). According to research, big data analytics is a strategic tool that enables innovation, necessitating dynamic capabilities to leverage big data for growth (Capurro et al., 2021). Research suggests that data driven decision making results in superior decisions and companies that are data driven perform better, while

others may not survive in the competitive environment (Pugna, Duțescu and Stănilă, 2019). However, though the insights from information based on data analytics, creates values for organisations, it poses multiple challenges in data driven leadership (Lavallo et al., 2011), as mentioned in an article in MIT Sloan Management Review. Data driven leaders confront obstacles in the transformation process and in integrating people to the data driven culture (Windt, Borgman and Amrit, 2019). Another study focusses on the design of information flow which influences data collection and decision-making process, while creating a need for data to be relevant for the purpose (Wulff and Finnestrand, 2023).

The new insights created by technology reshapes the available information and opportunities for businesses, making it difficult for them to survive without adapting to the changes in the environment. Big data effect on leadership is constantly evolving leading to transformation, and its use is permeating across functions and processes in the organisation. Ongoing research is necessary to understand how to integrate data in the changing environment while exploring new opportunities and to determine its impact on leadership. This research is an effort to identify gaps and contribute to prior knowledge.

## **Research Aim and Objectives**

### **Aim**

The aim of this research is to identify the significance of big data for leaders in strategic decision making, and determine the challenges for leadership, while assessing skills and the knowledge leadership needs to lead effectively in the dynamic business environment.

### **Objectives**

- Assessing the importance of big data for leaders and businesses and examining its benefits and the challenges for leadership.
- Identifying the value of data driven leadership, data quality, data culture, security, data governance and so on.
- Understanding how using big data requires change in skills, shift in culture, and innovative leadership styles for achieving competitive advantage.
- Ascertaining the significance, challenges, and best practices through research analysis and critical review of literature and providing recommendations to improve data driven leadership and strategic decision making.

## **Literature Review**

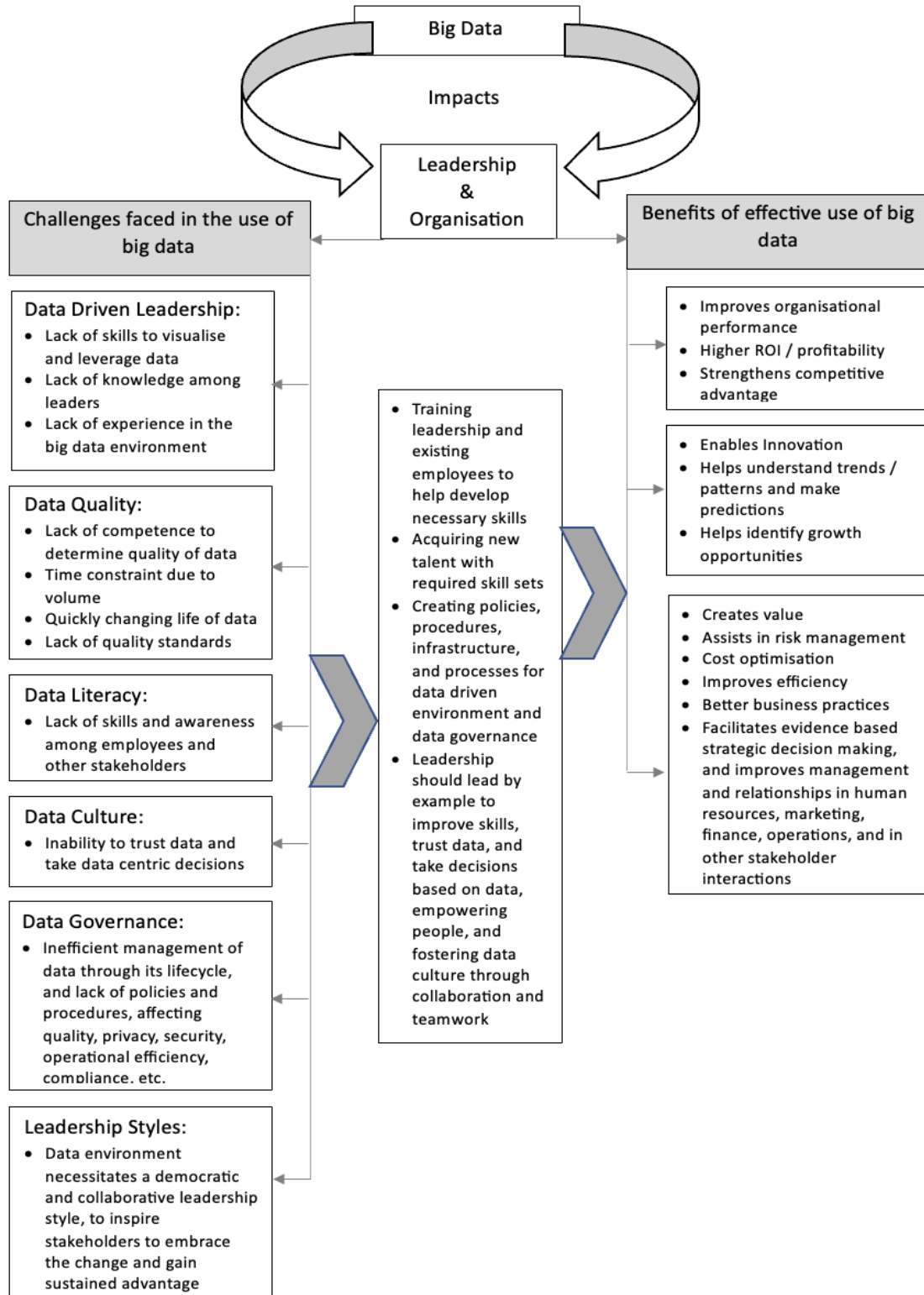
### **Introduction**

Big data has been in existence for decades, but the advancement in technology with the ability to access, handle and process large volumes of data at high speed, has increased the utility of data for businesses multi-fold. This review centres around the benefits of leveraging data, the challenges faced by leadership and the means to overcome these challenges. The research primarily focuses on leaders and their abilities to steer a data driven organisation.

The theoretical framework presented below provides the structure for the literature review of this topic.

**Theoretical Framework**

**Figure 1 Research Topic: The Relevance and Challenges of Big Data for Leadership**



### **What is Big Data?**

Data is information based on facts that is used to make decisions (Olson, 2021). Big data is complex mass of data, which is generated from diverse sources, and may be structured, semi-structured or unstructured (Ishwarappa and Anuradha, 2015; Gandomi and Haider, 2015). The sources add that big data has characteristics such as volume as it is a large quantity of complex data, velocity as it relates to generating and processing of data rapidly, variety as there are multiple sources and types of data, veracity as reliability of data is critical for analysis, and value that is achieved through processing and analysis of data. Big data has enormous volumes of data, that traditional tools cannot be used to store, process, or analyse it, and it helps in understanding trends and patterns enabling predictions (Smaya, 2022). An example of structured data is an excel sheet wherein data is grouped together and presented in rows and columns (Marr, 2019). Unstructured data is large volume of complex data such as email text, audio, video, etc., which require machines to seek, analyse and manage information, and it is made easier with artificial intelligence and machine learning (Marr, 2019). Semi-structured data has structured elements such as time, date, etc., as in the case of email or photographs in phones (Marr, 2019).

### **Leadership Definition**

In the context of this topic, it is important to understand what leadership is. There are multiple definitions of leadership, and it is not just a trait or quality, but a complex interaction and relationship between leaders and followers (Silva, 2016). A well-known scholar defines leadership as ‘the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives’ (Yukl, 2019). Leadership is a skill that can be developed, and it evolves over time, with the leader influencing the followers to achieve objectives through guidance and unified actions. Furthermore, leadership concept is continuously changing with the focus shifting from the traditional view of position of leader, to a wider connotation relating to the ability of a leader to get tasks completed through collaborative effort (Eddy, VanDerLinden and Hartman, 2022). In the hierarchy of organisations there are leaders at multiple levels who work in a co-ordinated manner, and as mentioned by Kjellström, Stålné and Törnblom (2020) each level of leadership requires a different skill, to achieve organisational goals.

### **Big Data and Leadership**

Leaders at all levels must understand data driven decision making, as big data has an impact on leadership, and competencies to exploit the benefits of data are essential (Schmidt, Dierendonck and Weber, 2023). Management and processing of data has become faster and smarter, providing valuable insights, using advanced computing power, artificial intelligence, and machine learning (Xu et al., 2021). However, the complexity of the data poses a challenge for leaders to analyse, gain insights and leverage data for the benefit of the business (Lavalle et al., 2011) and organisations struggle to recognise how to use big data for strategic decision making (Brewis, Dibb and Meadows, 2023). The aim of this study is to examine past research and perform qualitative primary research on the impact of big data on leadership and organisation and explore the benefits and challenges for leadership. It also discusses the leadership styles used in the big data environment.

### **Benefits and Challenges of Big Data**

Big data has multiple benefits but also presents many challenges for leadership, as enumerated in the

following paragraphs.

### **Data Driven Leadership**

Technological advancement has made the discovery, collection and analysis of big data, and its interpretation analysing trends and patterns enabling effective decision making through predictions, easy (Ojokoh, et al., 2020). Big data must be viewed by the leadership as a strategic resource to make informed decisions and it plays a huge role in the growth of the organisation and to achieve competitive advantage (Barham, 2017; Lavallo et al., 2011). Big data helps in identifying need, allocation of resources, finding opportunities, reducing risk and costs, improving efficiency, etc. (Batko and Ślęzak, 2022). The insights and the knowledge derived from big data helps implement best practices to create value, contributing to superior performance of firm, though leadership faces many challenges in the process (McAfee and Brynjolfsson, 2012; Shabbir and Gardezi, 2020). However, the continuous development of analytical capabilities of organisations, necessitate data driven leadership at the top for effective strategy and implementation (Lavallo et al., 2011). Moreover, data scientists may use technology for analytics, but it is the responsibility of the leaders to use the insights from analytics for the benefit of the organisation, and so all leaders and managers must have a basic awareness of analytics, making it a part of the culture of the organisation (Zettelmeyer and Bolling, 2014). Leaders must visualise the benefits of big data for improving organisational performance and work towards implementation of knowledge management strategies to share information and exploit it to its highest potential to gain advantage (Shabbir and Gardezi, 2020; Deloitte and CII, 2018). Nevertheless, while the purpose of big data is to help business leaders in strategic decision making, only some leaders effectively implement it, due to lack of knowledge and understanding of the benefits of big data and how to utilise it to the fullest (Lukić, 2017). Skill, talent, and knowledge are necessary for leaders in data driven organisations (Schmidt, Dierendonck and Weber, 2023), but competencies are often lacking among the leadership. Furthermore, the quality of data determines the benefits realised from it and as mentioned by Schmidt, Dierendonck and Weber (2023) leaders must be capable of recognising the quality of data and understand analysis, the trends and the process of evidence-based decision making, though they may not be data scientists.

### **Data Quality**

Research suggests that the quality of data has an impact on the value it generates through analysis and other processes (Cai and Zhu, 2015; Wook et al., 2021). Moreover, according to Wulff and Finnestrand (2023) data quality may be different for different users, as the utility of the insights depend on the purpose for which data has been analysed or the way it is used, and sometimes one team forms insights for another, making it challenging to provide the required information. However, leaders need to appreciate that the quality of data may not be perfect for processing at a given point in time, and leaders must continue using the data for the organisational benefit (Compton, 2023), while they undertake an ongoing process to improve the quality of data. Some of the challenges leaders face in ensuring quality of data include time constraint to extract quality data from large volumes of data, constantly changing life of data requiring quick processing, and lack of quality standards (Cai and Zhu, 2015). Hence, there is a need for continuous research to understand what constitutes quality data for a given purpose, keeping pace with the changes in the environment, as big data is used for strategic decision making. Nevertheless, the high quality of data is of no use, if people do not have the data skills to interpret data and draw insights, which brings out the importance of data literacy.



### **Data literacy**

Data literacy is the ability to understand the need and collect, process, analyse, interpret, and manage data, as it generates useful information (Henderson and Corry, 2020). However, the challenge for leaders and organisations, is the inadequate data competencies and the deficiency in data governance expertise (Lavallo et al., 2011; Compton, 2023). For a strategy to be effective, leaders must have the awareness or ability to optimally utilise the data driven environment and make data literacy pervasive creating a data culture, enabling people in the organisation develop skills to use and trust data (Brown, 2023). As stated by Compton (2023) and Koltay (2015) data literacy can be achieved through effective training. In addition, democratisation of data leads to a larger number of people in the organisation getting access to data, enabling better utilisation of data than otherwise (Lefebvre, Legner, and Fadler, 2021). While empowering employees to use data for better decision making, it becomes necessary to improve data literacy in the organisation to enable people to understand the importance, analysis, and interpretation of data efficiently (Lefebvre, Legner and Teracino, 2023). Furthermore, since data literacy enables a greater number of people in the organisation to use data, data governance becomes crucial.

### **Data Governance**

Research by Wulff and Finnestrand (2023) points out that re-design of organisation improves the use of data, by providing multiple users access to data, aided by data sharing and enabling innovation. This highlights the significance of data governance, and studies indicate its pivotal role in driving digital transformation (Deloitte and CII, 2018; Compton 2023). Data governance is management of data to create value reducing the risk through policies and procedures, and streamlining availability, usability, reliability, integrity, and security, monitoring privacy and other compliances through control and authority (Abraham, Schneider and Vom Brocke, 2019). The continuous flow of data from various sources and managing data to gain insights requires policies on decision making responsibility and the nature of decisions, data management, implementation, the technology required, etc. (Nadal et al., 2022). However, data governance is complex, and it involves handling issues of security and privacy which have legal implications. It must balance the challenges of protecting values, the rights of people and the interests of all stakeholders, while pursuing the organisational goals, and data governance includes maintaining data quality, making data available, having appropriate infrastructure, and ensuring trust worthiness in all respects (Zygmuntowski, 2023). Furthermore, data governance must have flexibility to suit the needs of the situation, to enable quick decision-making, assessing investment and risk (Goasduff, 2022). A sound system of data governance is essential, however effectively implementing data governance depends on the data culture of the organisation.

### **Data Culture**

Data culture is getting people in the organisation into the habit of using data for decision making which leads to innovation and superior performance (Chatterjee, Chaudhuri and Vrontis, 2021), improving the ability to use analytics, a strategic tool for innovation (Capurro et al., 2021), and making data driven decisions a part of the identity of the organisation. Creating a culture around using data for decision making, necessitates collaboration and improving data literacy among all employees (Deloitte, 2023). However, study shows that most CEOs are not familiar with guiding and supporting employees through revolutionary changes (IBM, 2023), and the pace of change in technology is faster than the organisation's ability to adapt to the change effectively, creating a necessity for leaders to understand the need for skills

and encourage learning and development among employees, to develop a data culture and help employees be aware of the advantages of a data driven business (Forrester, 2022). Besides, another study reveals that while organisations invest in AI technology, top executives lack the skills to identify the problems to be solved using advanced analytics, failing to yield the desired results, and successful adoption requires encouraging people with business skills, technology skills and analytical skills to work collaboratively fostering data culture (Díaz, Rowshankish and Saleh, 2018). The availability of large quantities of data has prompted businesses to invest heavily in technology and talent for analytics, though often organisations do not use data effectively for decision making (Waller, 2020), due to lack of data culture. This implies big data necessitates a leadership style influencing people, utilising data, and orchestrating a transformation of the business.

### **Leadership Style**

Effective change management is essential in driving transformations within a data-centric environment and leadership struggles with articulating the advantages of embracing data-driven practices, sourcing essential resources, and instilling a culture that prioritises data (Windt, Borgman and Amrit, 2019). However, the authors suggest, based on leadership theories, digital transformation might not be categorized as a radical change necessitating transformational leadership. This needs to be researched further, as big data, AI and ML cause radical disruptions, and create a need for transformational leadership. Alternatively, research suggests that transformational leadership is focused on the behaviour of the leaders while LMX (Leader-Member Exchange theory) centres around the interaction between the leader and the follower, and has characteristics of trust and respect for each other, enabling cooperation and collaboration which is essential for digital transformation (Cortellazzo, Bruni and Zampieri, 2019). The source also adds that decision making is no longer leader centric and is more democratic, necessitating sharing of information for decision making and empowering people. Therefore, the big data environment requires visionary leaders capable of understanding the importance of data, having the willingness to share knowledge nurturing collaboration, empowering people, and enabling transformation and innovation (Kane et al., 2018).

### **Overcoming Challenges**

The main challenges in creating data driven organisations are people related, and fall under leadership, skill, creating a data driven culture, acquisition of new skills, identifying opportunities, and taking data driven informed decisions (Pugna, Duțescu and Stănilă, 2019). The behaviour and attitude of leadership has an impact on making organisations data driven, and while technology enables highly advanced data analytics, the data strategy must be aligned to the organisational strategy as it is affected by inaccurate predictions, lack of skills or lack of appropriate decision making (Pugna et al., 2022). However, effective implementation of data strategy is complex, and alternate research highlights the steps required to implement data strategies which include, providing support, effective communication and acquiring required knowledge (Tabesh, Mousavidin and Hasani, 2019). The rapidly changing technological advancement creates a need for new skills, new talent, upskilling and training of employees (Rožman, Tominc and Štrukelj, 2023), to address the issue of lack of skills. There is a need to create policies, procedures, and standards as part of data governance for digital innovation and transformation (Davidson et al., 2023). Therefore, to overcome challenges a leader must work towards improving data literacy to understand data environment, creating a data culture, ensuring effective data governance, embracing a

collaborative leadership style, and have the vision to lead the data driven transformation. Organisations must create opportunities for leaders to learn about the fundamental analytics tools and its application, which the leaders apply in their business for change management, without the need to be data scientists, by redesigning jobs and creating a data culture (Court, 2015). It is important to understand the strategic role of big data and invest in infrastructure, training, tools, people with required skills and create strategic value by leveraging data for the benefit of the organisation (Grover et al., 2018). In summary, this review has identified the benefits and challenges for leadership in the big data environment, and the means to overcome them.

### **Methodology**

The methodological approach of this research on the impact of big data on leadership is presented in this section. The description includes the details of sample and the research process. It explains the research design, the process of sample selection, method used for data collection, the approach to analysis, validity and reliability and ethical concerns, including challenges of the research.

### **Research Design**

Research design acts as a framework for the research and is a plan for the process of collecting and analysing the data for the research project (Woodrow, 2014). Exploratory research is used when the research area is new and unexplored (Casula, Rangarajan and Shields, 2020) and big data and leadership is a relatively unexplored emerging area (Schmidt, Dierendonck and Weber, 2023). Research approaches may be quantitative which is expressed numerically and is positivist, or qualitative, expressed using texts and words and is interpretivist (Pilcher and Cortazzi, 2023). As mentioned by Mwita (2022), qualitative research is suitable for social sciences due to its flexibility in extracting detailed information through human interactions and increasing reliability through the process of triangulation. This supports the exploratory, qualitative approach used for the current research on big data and leadership. However, a qualitative research design may have issues relating to sampling, ability, and knowledge of the researcher, earning trust and in stimulating discussions around the theme, bias issue due to prior knowledge, measurement of outcomes, method of data collection and data analysis (McGrath and O'Toole, 2012). An effort was made to address the issue of stimulating discussions by preparing the participants for interview and providing them an idea about the topics proposed to be discussed prior to the interview. Another important consideration is the ethical issue in any research (Drolet et al., 2022). This research has been undertaken as per ethical standards, with prior approvals. In secondary research data collected by earlier researchers is used, and primary research is collection and analysis of data to find answers for a research problem (Wickham, 2019). Since big data and leadership is still not fully explored, secondary sources of data are not easily available. Moreover, the purpose of data collection by a previous researcher may be different and may not be appropriate for another research question (Wickham, 2019). Reliability is higher in primary research as it is a direct source (Sileyew, 2019), and it also offers the ability to explore new areas. Interviews enable the researcher to collect detailed information regarding the opinions and experiences of the interviewee, especially semi-structured interviews which are open-ended (DeJonckheere and Vaughn, 2019). Interviews may be face to face, telephonic, chats, video, email, etc. The process of qualitative analysis of data may be inductive or deductive. An inductive approach involves making generalisations about a specific phenomenon, while a deductive approach is arriving at specific conclusion from a general theory or idea (Woiceshyn and Daellenbach, 2018). Keeping these in view,



primary research in the form of interviews has been used for this research and the analysis includes a combination of deductive and inductive approach. The success of a research depends on the methodology, and it influences the reliability of the outcomes (Garg, 2016), hence the methodology has been adopted after evaluating options.

### **Sample Selection and Size**

Employees must use data for evidence-based decision making, which includes leaders at all levels, to plan and effectively implement data driven strategies. Therefore, the sample chosen for interviews include top leadership and mid-level leaders, in the age group ranging from thirty years of age to over sixty years of age. To stay competitive and for business innovation, using big data has become a necessity across industries, and hence it is not specific to any industry. As a result, the samples used include top and mid-level leaders from diverse industries/areas, such as banking, insurance, business operations, human resources, marketing communications, entrepreneurs, and so on. The aim is to assess the awareness and depth of knowledge of leaders about the big data environment. The sample size is small though there has been an effort to identify leaders at different levels from diverse industries, as participants. The process of interview required participants to devote time for the conversation, making time a constraint. The geographic location of the participants was predominantly Asia.

### **Data Collection Process**

To prepare the target for the interview, some questions/indicative note was sent prior to the interview as shown in Appendix A. The interviews lasting about 30 to 60 minutes, were informal conversations, telephonic or online, between the researcher and the target, to understand the target's perspective. The interview was transcribed and then the responses were tabulated in Microsoft excel for analysis. The discussions covered understanding of big data, its relevance, challenges, need for skills, leadership style in data driven environment, data quality, data literacy, data culture, data governance and best practices adopted.

### **Measurements**

Interviews enable the researcher to collect in-depth data by framing questions for each participant in a manner to gain as much information as possible (Saunders, Lewis and Thornhill, 2019). The interview was semi-structured, and the scope of conversation often went beyond the set of questions. Questions were mostly open ended. The interview questions were based on deductive themes that were related to the research question, and the interview process led to new inductive themes.

**Table 1: Linking the Research Question to the Themes**

<b>Research Question</b>	The relevance and challenges of big data for leadership
<b>Themes</b>	
Based on priori codes using a deductive process	Big data awareness and its benefits
	Challenges faced by leaders
	Data driven culture
	Data literacy
	Data governance
	Data quality
	Leadership skills
	Leadership styles
	Overcoming challenges
	Best practices
Based on inductive process	Communication
	Identification of problem and data strategy required to solve it
	Sustained advantage
	Agility

The ideas and inspiration for themes and questions were from earlier research of Cheong and Chang (2007), Walls and Barnard (2020) and Berndtsson et al. (2020), and the literature review.

### Analysis of Findings

In management research, inductive study is often used to study and find answers to problems, developing knowledge in the process, and deductive approach is used to test theories and propose new theories (Woiceshyn and Daellenbach, 2018). Inductive approach helps to research new ideas, and deductive approach has a pre-determined focus. A hybrid approach of deductive priori codes based on past research, and an inductive approach creating new codes derived from the data gathered through interviews, in the form of opinions, beliefs, and experiences of leaders at different levels, has been used for this research. The combined methodology of deductive and inductive, enables the researcher derive benefits of both approaches creating a balance, and analyse both philosophical framework and the interview data (Fereday and Muir-Cochrane, 2006).

The process of analysing qualitative data includes organising data, transcribing, conducting initial analysis and coding data to identify categories or themes and interpreting and presenting data (Lester, Cho and Lochmiller, 2020). Accordingly, the first step has been to gather the data and organise it to ensure that all the data is recorded. Coding is an iterative process, and the content has been analysed and categorised into themes based on the priori codes first using excel. Further examination of the transcribed text, led to the emergence of new inductive themes. As mentioned by Skjott Linneberg and Korsgaard (2019) for inductive approach the transcribed text is coded using phrases from the interviews, for interpretation later, ensuring that the codes are not influenced by the researcher’s ideas. Categorising and analysing the predetermined themes and new themes, provided an overall insight into the perceptions. The analysis and interpretation also included dividing the respondents based on their level of leadership, to understand the degree of awareness about leading in a data driven environment.

### Credibility, Transferability, Dependability and Confirmability

The participants mix of different levels of leaders including seasoned professionals, increases the credibility of the research extracting rich data. The description of the sample provided above, enhances the transferability of the data making it useful for others. As the analysis, interpretation and

recommendation are based on the data extracted, it increases dependability. The fact that the findings of this research have been established by other researchers, suggests confirmability. Research shows that lack of skill and lack of understanding of big data insights are challenges of data driven environment (Berndtsson et al., 2020), and this corroborates with the findings of this research. The quality of the research depends on these factors of credibility of data and interpretation, transferability to other situations, dependability of findings and confirmability through validation by other research papers (Korstjens and Moser, 2018), which have all been considered in this research.

### **Ethics**

Ethical behaviour is the responsibility of the researcher, and it is important to understand the ethical implications of the research project (Sivasubramaniam et al., 2021). Ethical approval is essential to check if research standards are followed and no harm is done knowingly or unknowingly to anyone. Ethics approval not only protects the participant, but also the researcher, as it makes the research legitimate, ensures quality and reduces harm, and the ethics form is submitted to an ethics committee for approval (Newson and Lipworth, 2015). Ethics approval was sought for this research from the concerned committee, which had a set of questions to check if the research can cause any harm to individuals, both physical and emotional, and its approval confirms that no harm is caused by the research. The participants of the interview have been guaranteed anonymity and security of information.

### **Challenges**

Time available for conducting the research was a constraint. As data analytics is an emerging area, people were not sure about their knowledge about big data, which made it a challenge to get participants. Sometimes targets were preoccupied otherwise, to devote time for the interview. It was also not possible to get specific details from participants about adoption and implementation of data strategies in their respective organisations, due to confidentiality issues.

This methodology is well-suited for this research and qualitative analysis helps to determine the leader perception at different levels about data driven leadership, and its impact on decision making. A combination of inductive and deductive approach has been adopted with many iterations for coding and categorising into themes. The literature review and the primary research results together enabled an evidence-based conclusion and recommendations to derive greater benefits.cs

### **Findings**

#### **Introduction**

The findings of the interviews, based on the pre-determined themes against the facts derived from the interviews are presented in this section. The pre-determined themes of the research question include data driven leadership, data quality, data literacy, data culture, data governance, leadership skills and the leadership styles. The inductive process of analysis also helped arrive at new themes. All these themes are an integral part of data driven leadership and impact the leadership and the organisation.

#### **Descriptive Findings**

The findings are based on interview responses of people at multiple levels of leadership. Their experiences and opinions provided insights into the impact of big data on leadership, the challenges they face, and how

to overcome them while achieving outcomes. The findings have been elaborated below. However, as a first step the profile of the people who were interviewed has been outlined.

### Demographic Characteristics

The participants of the interview in senior leadership positions are professionals in finance, information technology, insurance, or entrepreneurs, and include people who have nearly three decades of experience in their field. Some of them hold executive management level positions in organisations. The middle level leaders work in banking, learning and development, marketing communications and scientific research, with at least a decade of experience. The demographic characteristics have been presented in Table 2.

**Table 2: Demographic Characteristics of Study Participants**

	Number of Participants (n=12)	Percentage
<b>Gender</b>		
Male	9	75%
Female	3	25%
<b>Age</b>		
30-42	5	41.6%
43-55	4	33.3%
56-68	3	25%
<b>Leadership Level</b>		
Mid-level	5	41.7
Senior level	7	58.3
<b>Years of work experience</b>		
≥12	3	25%
13–25	4	33.3%
≤ 26	5	41.6%

All responses to interviews were coded, categorised into themes, and analysed, as explained in the following sections.

### Findings Based on the Data in Tables in Appendix B

The findings are based on an analysis of the comments of participants, tabulated and presented as key words, in tables 1 to 10 in Appendix B. The findings and analysis are as follows.

#### Understanding of Big Data and Benefits for Leadership (Appendix B - Table 1)

Participants seemed aware that big data relates to the large volumes of data from various sources. Senior level leaders articulated the overall benefit to organisation, and some mentioned informed decision making as a benefit for leadership. Participants 5 and 6 specified “tactical” use and participants 2 and 5 mentioned “strategic” use. Participants 5 and 7 believe it enables “innovation”. Participant 7 added benefits such as “improved efficiency, growth, risk management, measuring performance, etc.”. However, some mid-level leaders associated the benefit to specific areas of the business. Participants 8 and 9 associated it to “marketing”, although participant 11 mentioned “strategic planning and competitive advantage” as benefits. Participant 12 added “optimise things to increase profits”.

Analysis of the above shows, senior leadership could articulate multiple benefits of big data. However, many participants in mid-level leadership did not have a holistic view of the effects of big data on the business and attributed it to specific areas such as insights on consumer behaviour. Research shows that big data drives overall organisational success and analytics provides insights which help achieve competitive advantage (Cui et al., 2022). Therefore, there is a need to educate and increase knowledge about advantages of big data, especially at the lower levels.

### **Challenges for Leadership in Data Environment (Appendix B – Table 2)**

Most of the participants at both levels enumerated collection and interpretation of data, and relevant skills, as a challenge. Participant 1 highlighted challenges of data “quality and integrity”. Participants 4 and 5 added the need for “communication” and participant 2 indicated “challenges are multidimensional”. Participant 7 said “infrastructure, costs, data integration, ethical issues and creating value”. Participant 9 mentioned “deriving the right insight” as a challenge, and participant 11 added “identifying the right talent, managing data, securing and implementing”.

Overall, the participants could identify many challenges and these challenges may be grouped under data collection, interpretation and management of data which requires skilled professionals. Besides these, management of data includes implementation which was mentioned by one participant. Efficient implementation of strategies and creating value are critical for leveraging data and is a challenge. Effective implementation constitutes coordination and support from leaders which is necessary for the success of the data initiative (Tabesh, Mousavidin and Hasani, 2019), and it involves collaboration and teamwork. The inductive process helped identify communication as an important element of data driven leadership. Teamwork and communication are essential components of big data analytics (Schmidt, Dierendonck and Weber, 2023). Leaders must identify and communicate problems and foster team spirit, by sharing insights.

### **Overcoming Challenges (Appendix B – Table 3)**

While finding right talent and training employees was the general opinion, the use of “AI” and “ML” tools were suggested by participants 6, 9 and 12. Participant 2 and participant 5 talked about “processes”. Participant 7 mentioned “ensuring data flow is streamlined”. The mid-level leadership participants 8 added “using appropriate tools” and participants 8 and 11 mentioned “appropriate manpower”.

Overcoming challenges posed by big data requires training and development. Streamlining processes, hiring new talent, and using AI and ML also help to overcome challenges. Research suggests that challenges of big data may be related to data characteristics, the process or to its management (Sivarajah et al., 2017) and all of these must be addressed for a positive outcome, which requires knowledge enhancement.

### **Leadership Skills to Leverage Data (Appendix B – Table 4)**

All the participants express lack of skills as a challenge and emphasised the need for training and development to leverage big data. Some participants suggested hiring new talent or external consultants. Participant 3 suggested the need to use “agile methodology”. Participant 4 highlighted the need for “communication” and “collaboration”. Participant 5 felt that “skill is required for sustained advantage”.



Participant 7 stated there is a “lack of skill” in “using data for strategic decision making”. All the mid-level leaders identified the need for training, and participant 12 mentioned “effective communication at different levels of leadership is needed”. Participant 11 suggested “hire leaders who can drive change”.

The participants were unanimous in acknowledging lack of relevant skills among leadership, the need for training and development and hiring new talent or external consultants. Studies reveal that some of the key skills leadership can develop are, to analyse and use data, identify problems, enable knowledge sharing and collaboration (Schmidt, Dierendonck and Weber, 2023). Hence there is a need to have people with relevant skills for the data environment, either by training leaders, or by finding new talent internally or externally.

### **Data Quality (Appendix B – Table 5)**

Almost all participants mentioned quality of data has an impact on the decisions made, and participant 4 added it helps “reducing risk of errors, enhancing overall confidence in the process”. Participant 7 stressed on “robustness of data for consistency, reliability, accuracy, completeness and relevance”. Participant 11 remarked data quality “fosters trust among stakeholders” and participant 12 added “high quality of data will make the rationale behind the decisions more clear-cut, less ambiguous”.

All participants acknowledged that data quality has a direct bearing on the quality of output and decision making, and it is a challenge. Some senior leaders identified accuracy and reliability among others, as important for ensuring quality. The complex nature of data and the multiple sources of data, requiring quick processing, makes it challenging to ensure quality (Cai and Zhu, 2015). It is essential to invest in technology and create processes, while adhering to standards to improve quality.

### **Data Literacy (Appendix B - Table 6)**

Participants recognised the need for improved organisational data literacy for enhanced decision-making. Participant 6 mentioned “imperative for everyone to appreciate data”, participant 3 felt it helps “compliance with regulations” and participant 4 believed it “fosters innovation”. Participant 7 said “ability to use data effectively” and requires “training and development”. Participant 8 explained it is necessary for “growth”, participant 9 mentioned “market success”, and participant 10 said necessary “to future-proof the skillset of workers”. Participant 12 pointed out it “enables organisation to effectively implement learnings from big data”, and participant 11 stated it “empowers employees”.

Participants mentioned data literacy enables people to use data effectively for informed decisions. While the participants were aware of the need for data literacy, they felt that there was a dearth of relevant skills, which reduces chances of data literacy in organisations. Most organisations are unable to keep pace with required data literacy due to the dynamic technology, large amount of data and the rapid changes in the business environment (Ghodoosi et al., 2023). Some of the ways in which data literacy can be improved, as mentioned by Sabar (2021) are by enhancing competencies through training, rewarding data driven decisions, and connecting data skills to business (Sabar, 2021). The power to design information according to the needs must be given to more people to enable decision making and innovation, and the ability to use data appropriately, require data literacy.

**Data Culture (Appendix B - Table 7)**

The participants highlighted that data culture enables informed decision making and improves performance. Participant 2 considered it necessary “to get the entire organisation on the same page”. Participant 3 included “transparency and “better employee and external stakeholder engagement” and participant 5 said “team members working in coordination”. Participant 7 said “overall belief of the people”. Participant 8 felt “it is the only way forward”, while participant 12 felt it is the “objective and quantifiable way of understanding organization performance”. Participant 9 indicated “reduced bias and proactive insights”, and participant 10 stated “to keep competition at bay”.

‘Technically, data culture is the collective beliefs and behaviours of the people in the organization for leveraging data for improved business performance’ (Southekal, 2022). However, most of the participants did not have a clear understanding of the meaning of data culture and mentioned outcomes rather than focussing on the attitude of people. Data culture can be achieved by helping people understand the utility of data for business, how data can help solve problems, how data is used by all and not just the technical departments (Harbert, 2021). This creates a need for people to be trained to use and trust data and make evidence-based decisions a part of the culture.

**Data governance (Appendix B - Table 8)**

Participants expressed data governance as availability, access, usability, security, and overall management of data. Participant 1 stated data governance “maximises the value of their data”. Participants 4 associated it to “enhances our efficiency and reduced risk”. Participant 7 attributed it to “policies, framework and processes”. Participant 8 said it helps to “optimise operations and decision making”, and participant 9 called it a “set of rules and tools”. Participant 10 related it to “data protection” and “privacy” while participant 12 said it “refers to how the data is being managed “. Participant 11 called it the “foundation for ensuring quality, reliability and security”.

The above highlights, participants realise the importance of data governance, as it impacts effective and appropriate use of data, determining decision making powers and controlling it. Although there is awareness about the need for data governance, effective data governance is a challenge for organisations (Al-Badi, Tarhini and Khan, 2018). Research identifies that lack of knowledge and understanding of the framework of data governance hampers creating value (Abraham, Schneider and Vom Brocke, 2019). For effective data governance, data literacy and data culture are essential, which require skill and knowledge. Analysis shows that leadership skills are lacking, and so there is a need for training and skill development for data governance, to be able to create strategies and implement them effectively.

**Impact of Big Data on Leadership Style (Appendix B - Table 9)**

The participants have a wide range of views on how big data impacts leadership styles. Participant 1 mentioned “new opportunities and challenges influence decision-making”, while participant 2 said “management has to elaborate big data guidelines and policy framework to follow”. Participant 3 talked about “data driven mindset - skilled professionals to analyse - foster a data driven culture”. Participant 4 attributed leadership style to “effective sales strategies streamlined technical processes, and targeted marketing efforts”. Participant 5 indicated “the need for coordination and step-in step alignment of large teams”. Participant 6 stated “leadership style relies more on data and less on emotion” and this was echoed

by participant 9. Participant 7 suggested the leader must be “adaptable – a visionary – be transformational – foster a collaborative culture - empowering people”. Participant 8 said leadership style is to “take decisions quickly and see that it is implemented”. “Decisions will be data driven and less on gut feel” was the opinion of participant 9. Participant 10 was not aware of leadership styles. Participant 11 mentioned “if used effectively, organisations benefit from it”. Finally participant 12 described “it can tell you if the existing leadership style is bringing the best out of its employees in terms of productivity. If not, it needs to be changed”. Participant 7 added that “organisational agility is an important aspect”.

The impact of big data on leadership style was not understood by most participants in general. The comments were focussed on using data for decision making, rather than on analysing how leaders can influence stakeholders and drive the change in a data environment. This brings out the need for training on how to lead a dynamic data centric organisation. Research shows that transformational leadership impacts organisational success through effective communication, motivating people and recognising effort (Meirinhos et al., 2023). Not much past research is available relating to leadership style in big data environment and it needs to be explored further. Research also shows that the lack of collaboration leads to failure of big data strategy (Hagen, 2021), as empowering and delegating the power to use data increases its utility. Hence leaders must use a democratic style of leadership to encourage collaboration. However, as per research transformational leaders may be autocratic (Lee, 2014), although transformational leaders are inspirational (Bakker et al., 2022), and have other qualities suitable for the data environment. Hence this needs further research. Nevertheless, the lack of knowledge among participants about leadership styles, makes it evident that extensive leadership training is required to lead in the data environment.

### **Best Practices (Appendix B - Table 10)**

“Training” was considered important by participants 1 and 4. Participant 2 indicated “key business decisions backed by data”. Participant 3 enunciated the need to “establish a data driven culture – measure with metrics – and invest in technology”. Participant 5 and 6 mentioned adapting to changes in business. Participant 7 emphasised on “clear goals and strategy”, “data governance” and “continuous monitoring”. In mid-level leaders, participant 8 talked about “access to data”, “availability” and “storage”. Participant 9 proposed “trusting data - continuous learning, transparency and communication”. Participant 11 agreed with participant 9 on continuous learning and added “data centric culture” and “alignment of data strategy to business goals”. Participant 12 felt “data must be stored carefully and shared in a responsible way”.

Identifying goals and aligning data strategy to business goals, data governance, data driven culture, ongoing training, etc. are some of the best practices mentioned above. These may be classified as structural, relational, and procedural practices in research (Mikalef et al., 2019). However, the challenges of big data and lack of leadership knowledge or skill make it difficult to adopt the best practices, impacting the effective implementation of big data strategy and overall organisational success.

### **Other Findings and Analysis**

In addition to the above themes, an inductive approach to the interview responses revealed some new perceptions of leaders which are of relevance to this research. They include areas such as communication, identifying problems in the business and using data to address the problems, the need for agility to adapt to changes quickly, the application of big data analytics for sustained advantage and alignment of data

strategy to organisational goals. Alignment of data strategy to business strategy helps to maximise return on investment on data, create value and enable innovation (Yego, 2023). However, all these can be improved only if the leaders have the knowledge required to translate insights into actionable strategies and have the required skills and resources. Required skill needs to be acquired through appropriate training and development. These findings are areas suitable for advanced studies.

An analysis of the findings shows that big data impacts leadership, and the leaders broadly understand the benefits, challenges, and impact of data environment, but lack the skill to manage the change. Moreover, the study reveals that there is a difference in the level of understanding between top leadership and mid-level leaders. It can also be concluded that the extent of knowledge at senior management level is also insufficient to optimally leverage data, creating a need for training and a cultural shift for the data environment. Evidence-based decision-making creates value and benefits organisations through superior performance, innovation, growth, increased profitability, and efficiency, and there is a need to align data strategy to the organisational goals. The findings show that all levels of leaders feel that there is a need for organisation wide training and skill development, to ensure that people have the capability to deliver positive results, and create effective strategies, infrastructure, and policy framework for the big data environment.

### **Summary of the Strategic Project**

This research on ‘The relevance and challenges of big data for leadership’, brings out the level of knowledge, understanding, and the readiness of leadership to lead organisations in the big data environment. Technology is changing the business environment rapidly and the way they operate, creating a need for business leaders to adapt quickly. This research furthers prior research and highlights gaps in ability to manage change, difference in perception of leadership at different levels, leadership style, etc., through a qualitative analysis of the semi-structured interview responses of leaders at different levels, in diverse industries and organisations. The findings of the interview have been analysed and interpreted, supporting past research, and identifying new areas that may be further explored.

The findings of the research show that big data impacts leadership, and leaders face multiple challenges in leading organisations in the data and technology driven environment. Leveraging the benefits of data necessitates acquiring new skills and knowledge, a higher level of understanding of the utility of tools and technology for business, integrating data to achieve business goals and continuous learning. Past research explores organisational performance, data culture, data literacy, and other issues related to the data driven organisations. However, research on leadership in the data environment is at a nascent stage and is limited. This research highlights the lack of readiness of leadership to lead data driven organisations and the need for ongoing training and development for leaders. Leaders must learn to use big data analytics as a tool for innovation, growth, and competitive advantage. The success of disruptive changes due to big data, depend on the knowledge, attitude, and perception of people (Pugna, Duțescu and Stănilă, 2019), and this is relevant to people at all levels of leadership. The findings of the current research shows that while it is the responsibility of top-level leaders to drive the change in a data driven organisation; knowledge and awareness among leadership at all levels is essential for successful implementation, and this is lacking. It is more deficient in the lower-level leaders, necessitating knowledge management and training through all levels of leadership and requires further exploration.

### Recommendations

Though training, skill development, investing in technology, improving infrastructure, governance and appropriate leadership style may help in positive outcomes, it is important to consider more concrete means of ensuring long term results. One proposition is following a process of audit, like in the case of ESG audit or financial audit, both for an assessment of the requirements for the big data environment, and the effectiveness of its implementation. This would help ensure that appropriate skill, infrastructure, and governance are in place to achieve the outcome and enable corrective actions for improvements based on the audit report. Research shows how ESG audits help stakeholders make quality decisions (Wang, Yu and Li, 2022). Another area which the leadership could focus on, is to ensure a continuous flow of new talent with relevant skills, for which organisational leaders can tie-up with educational / training institutions to find new talent, and to teach managers leadership in the data environment, who do not require technical knowledge but must have the ability to utilise the data insights for organisational growth. Research supports the need to teach data literacy skills at university level to ensure data literate talent is available (Ghodoosi et al., 2023).

### Limitations and Research contributions

This research is not without limitations, despite the use of efficient processes for the research. Although effort was made to find participants from diverse industries and different levels, the sample size was small, and it may not be right to generalise. Another issue could be bias as some participants were known to the researcher and there may also be a bias due to prior knowledge of the researcher on the subject.

This research has both practical and academic applications. The practical application lies in the identification of the challenges and upskilling people and aligning organisation to utilise data for sustained advantage. Big data analytics is an emerging area and is growing rapidly making it difficult to completely study and analyse all dimensions. Hence further research is necessary, and it must be ongoing due to its dynamic nature. This research can be applied academically in identifying leadership styles for the big data environment, and for organisational learning and development, that would enhance data driven leadership skills.

### Future research and development

There is a need for further research on how leaders can identify problems that can be solved using big data, how leadership can ensure data driven growth and handle agility of organisations effectively in the disruptive environment, maintain a sustained advantage and identify the leadership styles appropriate for data environment. A larger sample of participants unknown to the researcher may help to overcome some of the limitations.

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## Appendix A: Primary Data Collection Methods

### Initial Note to Prepare Participants:

This research included semi-structured interviews for data collection. However, the participants were sent a note prior to the interview to prepare them for the interview.

Figure 1 - Note sent to participants to prepare them for the interview.

The Purpose of the interview is to understand the perspective of people at different leadership levels about the use of big data by organisations and its impact on leadership. The research topic is 'The relevance and challenges of big data for leadership' in organisation and the research methodology involves a qualitative analysis of answers to interview questions. The following questions have been framed to provide you with an idea of the topics that would be discussed in the interview.

- What is your understanding of big data?
- What do you think are the benefits and challenges of big data for leaders?

The other points that would be discussed include the following:

- Data quality
- Data literacy
- Data culture
- Data governance
- Best practices
- Overcoming challenges
- Leadership skills to leverage data
- Leadership styles in the big data environment

**Appendix B: Tabulation of Comments of Participants Based on Themes**

**Table 1: Understanding of Big Data and Benefits for Leadership**

Senior Level Participants	Comments
1	Large quantity - better information, better strategy, and better business.
2	Large data - real-time strategic business decisions - exploit behavioural trends - optimise revenues and profits.
3	Large volume of data - valuable insights, informed decisions, - improves performance – culture of performance by metrics.
4	Informed decision-making and effective operational planning - analysis of competitors.
5	Tactical and strategic initiatives - constantly innovate towards better, faster, cheaper, ahead of competition.
6	Processed data - becomes information - build strategies - tactical course corrections and manage based on trends.
7	Large volume – multiple sources – structure variable – data added at high speed – informed decision making, improved efficiency, competitive advantage, innovation, and growth – understanding trends, risk management and measuring performance.

Mid-Level Participants	Comments
8	Complexity & volume – helps in marketing and dissemination of information.
9	Large volume - collated from consumer - targeted marketing – trend analysis and forecast demand - consumer behaviour insights - take data driven decisions.
10	Hardly know anything - detailed complex data - informed decision-making.
11	Massive volume - insights, patterns - informed decision-making, enhanced strategic planning, and understanding market dynamics - data-driven decisions, optimize processes - gain competitive edge.
12	Large volume - understand patterns on consumption - improve and optimise things to increase profits.

**Table 2: Challenges for Leadership in Data Environment**

Senior Level Participants	Comments
1	Data quality, integrity - trained manpower.
2	Identification of source, collection, and data cleansing - understanding data for usable information or knowledge.
3	Strategy of collecting and managing - systems integration - skilled professionals
4	Communication across departments, team motivation - strategic informed decisions - identifying and collecting relevant data - accurate analysis and interpretation.
5	Maintaining a data mindset - changes for future avoidable failures - identification and communication of challenges of business and addressing them
6	Effort/cost required to collect and process data.
7	Collection, analysis and interpretation, but also with infrastructure, managing costs, data integration, creating data culture, and ethical issues - creating value for the business using big data.

Mid-Level Participants	Comments
8	Acquiring data, storage, veracity - experienced data scientist to analyse.
9	Expertise in data mining - deriving the right insight.
10	Interpretation - extrapolating to get the correct insights.
11	Collecting and analysis, interpreting data - implementing decisions, managing data, privacy, securing - cost - identifying the right talent.
12	Data collection and interpretation – in a reliable and consistent manner.

**Table 3: Overcoming Challenges**

Senior Level Participants	Comments
1	Training employees – use external consultants and technology experts.
2	Set up business processes in place - adopt an agile mindset.
3	Training employees - providing adequate tools necessary to analyse big data.
4	Training to enhance motivation skills - fostering a dynamic and adaptable organizational culture.
5	Changing the way decisions are made and documentation process requirements - consistent training on latest technical techniques – adapting latest best practices.
6	Relying on technology and tools such as AI, than on people.
7	Training and development – investment in infrastructure – ensuring data flow is streamlined – managing and controlling costs

Mid-Level Participants	Comments
8	Finding right professionals - segregating relevant data - using right tools for integrating data - securing data.
9	Use AI/ML technologies to collect, clean, index and fuse data from various sources.
10	Upskilling in big data - use case studies to highlight key role in business transformation.
11	Right talent - good people manage privacy and security concerns - help reduce costs through automation.
12	Hire data scientists/ computational experts - use AI/machine learning for data - optimize algorithms.

**Table 4: Leadership Skills to Leverage Data**

Senior Level Participants	Comments
1	Older organizations find it a challenge – training necessary – recruit new talent – use consultants
2	Need to hire new talent and train existing employees
3	Need to develop skills in organisations - Hire external professionals or upskill internal professionals - Organizations need to foster a data driven culture – use agile methodology
4	Internal training programs to enhance employees' data interpretation skills - fostering effective interdepartmental communication - ensuring seamless collaboration and sharing of insights across teams.
5	BDA for systemic insight and predictions - there is sustained advantage - skill required for sustained advantage include data-mindset, process analysis, forecasting, risk analysis, experimental design, and superior process-based decision making.
6	Leadership development programs - encourage young leaders move laterally within the organisation to gather all round experience.
7	Using data for strategic decision making – lack of skills, knowledge, and data culture – difficulty in finding resources.

Mid-Level Participants	Comments
8	Technology is growing - Upskilling to be done at all levels periodically.
9	Hire expert consultants - consultants may not have the required domain knowledge to support the business decisions - invest in leadership development by educating the leaders on Big Data.
10	Upskill and learn how to use these tools effectively
11	Not at all organisations have the necessary skills - training, industry meets, setting up small teams to do research, test and then report back to management - hire leaders who can drive change, or ensure that current leaders are up to date.
12	Leadership training to be proactive decision making, implement strategies – effective communication at different levels of leadership is needed.

**Table 5: Data Quality**

Senior Level Participants	Comments
1	Better the quality of the data and information flow - better the decision making.
2	Data inaccurate – result in faulty analytics - faulty data analytics - result in poor decision-making
3	High-quality data allows informed, accurate, and timely decisions - positive outcomes.
4	Accurate and reliable data - well-informed decisions, reducing risk of errors and enhancing overall confidence in the process.
5	For leaders, quality is one very important element any decision.
6	Garbage in, garbage out
7	Robustness of the data - consistency, reliability, accuracy, completeness and relevance - impact the decisions made – to ensure data quality invest in data management, technology and processes.

Mid-Level Participants	Comments
8	Decision making depends on quality of data
9	Quality of data enhances innovation - improved risk management.
10	Data needs to be accurate and of the highest quality - varied insights to ensure that it is indisputable
11	When data quality is assured, leaders can make more confident and precise decisions, minimizing risks and optimizing outcomes – fosters trust among stakeholders.
12	High quality of data will make the rationale behind the decisions more clear-cut and less ambiguous.

**Table 6: Data Literacy**

Senior Level Participants	Comments
1	Helps in informed decision making - efficient allocation of assets - analysing customer data.
2	All departments in the organisation adopt common data standards - employees & managers use data analytics for decision making
3	Competitive edge – informed decision making - compliance with regulations
4	Ability to understand, interpret, and leverage data effectively - informed decisions, promotes data-driven culture, and fosters innovation.
5	Better insights – faster solutions to issues – quality decision making
6	Imperative for everyone to appreciate data
7	Organisation wide ability to use data effectively - data skills such as conceptualising, visualising, interpretation, critical thinking, communication, and responsibility in the use of data - informed decisions - enables innovation - training and development - sharing and collaboration - providing knowledge, opportunities, and tools.

Mid-Level Participants	Comments
8	Awareness of source of data, use of data and how it can improve growth.
9	Better decision-making - reduced bias and proactive problem solving - drives product innovation and market success.
10	need of the hour to future-proof the skillset of workforce.
11	Empowers employees at all levels to understand, interpret, and leverage data effectively, fostering a culture of informed decision-making.
12	Enables organization to effectively implement the learnings from big data at every level.



**Table 7: Data Culture**

Senior Level Participants	Comments
1	Improved decision-making / efficiency - successful business.
2	Most benefit in terms of proper decision-making - to get the entire organisation on the same page
3	Transparency - better employee and external stakeholder engagement – efficiency - informed decision making.
4	Data-centric approach, influencing decision-making, innovation, and overall performance.
5	Team members working in coordination – each must be competent, or the chain is broken, and the initiative fails - data driven culture - highest rate of success possible over time.
6	-
7	Overall belief of people – better decision, innovation by adapting to change – training to improve data literacy – culture of trusting data – cultural shift and change in attitude.

Mid-Level Participants	Comments
8	It is the only way forward.
9	Data Driven culture enables informed decisions - reduced bias - proactive insights
10	Data, - concrete proof - often organisation culture and decision - based on opinions, not facts.
11	Don't have a data driven culture - competition will beat you.
12	Objective and quantifiable way of understanding organization performance and improvement.

**Table 8: Data Governance**

Senior Level Participants	Comments
1	Maximize the value of their data contributing to the overall success and sustainability of the organization.
2	Holistic view of guidelines, standards, compliance, security, storage, etc.
3	Better data quality, compliance, security, privacy and so on
4	Integral - strong foundation for effective data management - enhances our operational efficiency, minimizes risks, and aligns with our overarching objectives.
5	Data security, integrity, and iterability – legal compliance, security, access tracking, storage procedures, and even archiving - important strategically to avoid risk, save costs, and maintain consistent access to the data.
6	Unless data is sorted, organised, classified, and viewed in proper context, it is not going to tell us a story to learn something useful.
7	Includes framework, policies, processes, security, privacy, availability, usability, regulation, compliances - managing data efficiently - responsibility in using data for the business - improve efficiency - reduce risk and increases credibility.

Mid-Level Participants	Comments
8	Critical that it is consistent. - optimise operations and decision making.
9	Policies, processes, and technology - availability, usability, integrity, and security of data - set of rules and tools that helps manage data effectively.
10	Data protection and governance ensure that individuals data and privacy have not been compromised or exploited in any way.
11	Foundation for ensuring the quality, reliability, and security of data, thereby enhancing the overall decision-making process.
12	I'm not sure what "governance" means here. I assume it refers to how the data is being managed and used to take decisions.

**Table 9: Impact of Big Data on Leadership Style**

Senior Level Participants	Comments
1	Significant - new opportunities and challenges influence decision-making.
2	Management has to elaborate big data guidelines and policy framework to follow
3	Big data forces leaders to - have a data driven mindset - have skilled professionals to analyse - foster a data driven culture
4	Data-driven approach yielded tangible results - effective sales strategies, streamlined technical processes, and targeted marketing efforts.
5	Emphasizes need for coordination and step-in-step alignment of large teams - at strategic level, leadership must insist on quality, rigor, testing, and competent processes.
6	Leadership style relies more on data and less on emotion - EQ is not any less valuable.
7	Adaptable - organisational agility is an important aspect - visionary - transformational - foster a collaborative culture, empowering people - significant impact on strategy development and implementation.

Mid-Level Participants	Comments
8	Take decisions quickly and see that it is implemented - helps leadership focus on the core issues
9	Yes, it does impact the leadership style - decisions will be data driven and less on the gut feel.
10	Don't have enough insight into big data to say for sure, but i hope it does
11	It does - used effectively, organisations benefit from it - leaders may then use positive reinforcement to drive work.
12	Yes, it can tell you if the existing leadership style is bringing the best out of its employees in terms of productivity. If not, it needs to be changed.

**Table 10: Best Practices**

Senior Level Participants	Comments
1	Training of staff and adoption of new strategies.
2	Key business decisions backed by data.
3	Establish a data-driven culture – measure with metrics – invest in technology and tools – lead by example.
4	Promoting collaboration between technical and non-technical teams – ongoing training – recognising data as a critical asset for decision making.
5	Focus on future – leader acting as learner – in – chief – adapting to changes.
6	Well defined policies/protocols related to data collection, mining, and use - strong data governance model - adapt to changing business needs and newer data streams.
7	Clear goals and strategy – data governance - enhance technology and tools for collection, analytics and interpretation - continuous monitoring

Mid-Level Participants	Comments
8	Easy access to data and availability – secure storage
9	Trusting data – continuous learning – transparency and communication – data literacy – encourage collaboration -
10	-
11	Data centric culture – policies and framework – investment in infrastructure – continuous learning – align data strategy to business goals.
12	Data must be stored carefully and shared in a responsible way.