Critical Analysis of Innovative Leadership Through Effective Data Analytics: Exploring Trends in Business Analysis, Finance, Marketing, and Information Technology

Abstract

Globally, leaders are lighthouses that help direct followers on the right decision to make, whether in careers, entrepreneurship, personal development, education, community and social services, relationships, health, finances, and enacting purpose. In today's data-driven environment characterized by information overload, leaders and organizations seek to harness the full potential of data to improve every facet of endeavor, including leadership; thus, leaders in management and other spheres of human endeavors must rethink leadership methods in line with data analytics. This research investigates the synergistic relationship between innovative leadership and effective data analytics in organizations across different industries. The study assesses the impact of data analysis, visualization, and governance on various aspects of innovative leadership. Structured questionnaires designed using Likert scale questions and statements were used as research instruments to collect data from 490 leaders across five industries, including Accounting and Finance, Marketing, Computer and IT, Business Development, and Education. Statistical analysis, including correlation and linear regression, examined the relationships between data analytics and innovative leadership variables. The research findings support the hypotheses, demonstrating that data Analysis Influences Innovative Behavior in leadership; data Analysis is significantly *and positively related to Vision and Strategic Planning; data Visualization significantly impacts Communication Skills in leadership positively; Data Visualization significantly influences Vision and Strategic Planning in leadership positively; while a positive relationship exists between Effective Data Governance and Innovative Behavior. Data analytics is critical in achieving innovative leadership and improving organizational performance. Data analysis, visualization, and governance were essential in driving innovation and fostering clear communication. The paper recommends the promotion of a culture of collaboration and open communication, investment in employee training for data analytics skills, and encouraging innovative thinking through data-driven problem-solving strategies. The research offers a foundation for further investigations into industry-specific nuances and external factors influencing the collaboration between data analytics and innovative leadership.*

Keywords: Innovative leadership, data analytics, data analysis, data visualization, data governance, strategic planning, communication skills, innovative behavior, organizational performance, collaboration.

Introduction

n recent years, a good applaud has been awarded to the Internet of Things (IoT), Information and Communication Technology (ICT) as well as social media at large as it has taken center stage for the availability and ability to extract valued information from an unstructured data which is very effective for the growth and development and thereby serve as the propelling tool for innovation(Saarikko, Westergren, & Blomquist, 2017; Santoro, Vrontis, Thrassou, & Dezi, 2018). Several studies have asserted that data in its varieties, complexity, and volume make up big data, which turns into an asset that yields strategic, innovative ideas which aid leaders in solving problems, idea generation, time management and risk management (Buhalis & Foerste, 2015; Chen et al., 2019; Del Vecchio, Mele, Ndou, & Secundo, 2018; Troisi, D'Arco, Loia, & Maione, 2018; Gandomi & Haider 2015). Hence, data can be used to implement an effective innovation; this happens through the effective analysis of data, which starts from the data sample data collection up till data analysis. Therefore, this effectively implements and exploits innovative ideas that entail knowledge management (Trabucchi, Buganza, Dell'Era, & Pellizzoni, 2018).

The developing trend in globalization leads to a more intense need for innovative leadership, which brings about huge opportunities not only for organizations but also for individuals, and these opportunities come into existence whenever the enormous data across the globe is well used to identify problems and also used to take corrective actions (Innova, 2016). In this context, the executive must be prepared to change its leadership style and answer how ready they are to adopt the new thinking style. At the same time, they promote innovative ideas that will yield better results. Innova (2016) states that most leaders remain in the same traditional leadership cycle, depriving them of achieving greater success.

The term data analysis has gained more attention from researchers as it is a very cogent factor to be considered and addressed properly by every organization or individual who has the aim of succeeding in its field of relevance (Ciampi, Marzi, Demi, & Faraoni, 2020). Data usage to enhance decision-making cannot be over-emphasized as new data emerges daily, giving room for innovative ideas. In order to carry out an effective management service, the usage of data analysis for innovative leadership is highly recommended.

However, innovative leadership requires data analysis involving a well-structured analytical technique (Mohammad et al., 2022). Van De Ven (1986) highlighted managing attention as one of the big issues affecting innovation. Attention management is very difficult as innovative ideas are sometimes a great task to execute and can be easily overlooked if not managed properly. Innova (2016) further clarifies that organizations often forget to inquire how best they can understand data from the perspective of their customers' needs, enabling them to improve their business strategy. Globally, a great deal of interest has been geared towards innovation going through a channel where data-driven decisions are being made (Akter & Wamba, 2016; Chierici, Mazzucchelli, Garcia-Perez, & Vrontis, 2019; Ciampi, Marzi, Demi, & Faraoni, 2020).

Hence, no systematic review details the relationship between innovative leadership and data analysis. This research aims to fill the gap by pointing out how innovative leadership can be achieved through effective data analytics.
Therefore, it is crucial to note that this research aims to review some important key variables related to innovative leadership and data analytics; variables for Data analytics are data analysis vision, data visualization, and data governance. The variables for innovative leadership are innovative behavior, strategic planning, and communication skills. All these variables will be considered and used interchangeably as they relate together in this research.

Research Aim

This research aims to establish a concrete conclusion on how innovative leadership can be achieved through effective data analytics. This research will, therefore, take a good look at how an organization responds to innovative ideas, their usage of data, leadership style, and how management pays attention to data details. On the other hand, the main objective of this research is to provide organizational management with a comprehensive overview of inducing the art of innovative leadership through the effective use of data analysis.

Research Objective

1. To discover the influence of data analysis on the innovative behavior of leaders
2. To measure the relationship between data analysis and vision and strategic planning
3. To analyze how data visualization impacts the communication skills of leaders
4. To identify the role of data visualization in vision and strategic planning
5. To understand how effective data governance affects innovative behavior.

Research Question

1. What is the influence of data analysis on the innovative behavior of leaders?
2. What is the relationship between data analysis and vision and strategic planning?
3. How does data visualization impact the communication skills of leaders?
4. What is the role of data visualization in vision and strategic planning?
5. How does effective data governance affect innovative behavior?

Literature review

According to Olagbaju and Olaniyi (2023), You can't have progression without disruption. As times change and the human race positions itself for growth and continual shifting, conventional leadership has given way to the emergence of innovative leadership. Innovative leadership recognizes opportunities and growth and brings about creativity, changes, competency, and collaboration between leaders and followers, managers and employees in the workplace, organization, or educational sector, and so on (Soares et al., 2018).

Sen and Eren (2012), on innovative leadership, describe it as a catalyst due to its disruptive nature. Its existence transforms a deep-rooted problem and challenges the

existing status quo, creating a paradigm shift. Sen and Eren (2012) also opine that though innovative leadership gives room for growth and opportunities, it also acknowledges that innovative leaders require the insight and values of their followers to make that shift.With data analytics in the arsenal of innovative leaders, innovative leadership will be more effective in developing strategies, making decisions, predicting changes, and so on (Wang et al., 2018; Christensen & Raynor, 2013).

Data analytics drives various organizations, industries, and so on in this digital age, as it helps them make good informed decisions (Runkler, 2020).Data analytics examine loads of data and uncover trends that appeal to the public eye. With this discovery, data analytics affords organizations to make good decisions that scale the company's profit, thereby increasing revenue, giving organizations a competitive edge, improving operational efficiency, and improving or optimizing marketing strategy (Runkler, 2020).

Innovative leadership evolves into a formidable synergy when associated with effective data analytics. Data analytics allow leaders to transform innovative visions with proven data (Christensen & Raynor, 2013).It provides the means to assess the viability of bold ideas, predict potential outcomes, and mitigate risks. Moreover, data analytics fosters a culture of continuous growth and advancement, where leaders and their teams can adapt swiftly based on real-time insights.
They are interconnected forces that are shaping the future of organizations. As we delve deeper into this literature review, we will explore how these two pillars complement each other, driving innovation, growth, and adaptability in a rapidly evolving world.

2.1.1 Data Analysis and Innovative Behavior

Sen and Eren (2012) assert that change is paramount, which is the essence of innovation in organizations, companies, businesses, etc. Its collaboration with data analysis leaves no stone unturned for business owners to accelerate profits, improve products and services, and have a competitive edge over other companies with its ability to conceive new business models with data analysis.

Ahmad et al. (2023) affirm that with the help of machine learning, statistical analysis, and data visualization to test hypotheses, convey insights, predict data, and draw conclusions, data analysis catalyzes the improvement of innovative behavior.Innovative work behavior is the ability of workers to solve problems and improve organizations' performances, creativity, products, and services in a novel or new manner depicting creativity and innovation (Choi et al., 2021).
Amazon, Spotify, Google, and Netflix are just a few companies leveraging data analysis to foster innovative work behavior.

2.1.2 Data Analysis Vision and Strategic Planning

Through data analysis, organizations, businesses, and so on unearth tangible information that will not have been visible or noticeable if observed casually (Raj et al., 2015; Raj, 2018). Runkler (2020) affirms that organizations collect vast data regarding

the business, operations, market, and customers and use data analysis to sift through this overwhelming data to identify trends, patterns, and insights that would help their operations soar, make them a force in the marketplace, improve operational efficiency, reduce cost, and enhance customer experiences.

Christensen and Raynor (2013) assert that with data analysis, companies, businesses, and organizations can plan and strategize using valid proof, not assumptions; with the knowledge and understanding of the business, the market, and its customers, innovative leaders can envisage the future of the organization and can also make strategic decisions that would take the organization to the next level (Eppler and Platts, 2009).

During planning, Gurl (2017) explains that organizations conduct a SWOT analysis; this analysis is carried out to check the strengths, weaknesses, organization, and threats of the company. For effective outcomes, data analysis helps to determine operational inefficiencies the company's internal and external strengths and weaknesses, and it also helps notice emerging market trends and competitiveness in the marketplace (Olaniyi and Omubo 2023b).

2.1.3 Data Visualization and Communication Skills

Data visualization is the representation or explanation of facts, population data, information data, numerical figures, and so on using a visual format, such as visual maps, vision maps, graphics, charts, and diagrams (Ahmad et al., 2023). This tool makes data information more accessible and understandable.

In today's world, data visualization is adopted when analyzing large and complex data, and this is done for effective projection and communication of predictive patterns and trends, enabling stakeholders to make actionable plans (Gandhi and Pruthi, 2020). Explanation or communication through modern-day visualization instruments is more effective than traditional instrumental methods because it goes beyond the conventional demonstration of graphs, pie charts, tables, and bar graphs (Ahmad et al., 2023). It is captivating and intriguing as it converts data from its raw form into interactive and engaging visual narratives, allowing for a deeper understanding of information.

Most especially, Tomono (2023) affirms that language no longer hinders data visualization diversity, as data visualization transcends language barriers and simplifies the communication of complex ideas and concepts. It allows individuals and organizations to communicate ideas, insights, and trends more effectively to diverse audiences (Olaniyi and Omubo, 2023a).

2.1.4 Data Visualization and Vision and Strategic Planning

In the organizational world, Kinley and Ben-Hur (2020) state that clarity of vision is often the driving force of success when employees can perceive a clear goal, visualize and recognize the benefits of taking action, they are enthusiastic and energized to follow through (Ahuja, 2017). Clarity of purpose makes employees or followers proactive and

determined in their pursuits. Data visualization aids vision alignment, actualization, and strategic planning.

Interestingly, the significance of visualization in strategic planning is not a recent knowledge but rather an effective approach in times past. In the medieval age, during times of war, military generals would create representational objects or artifacts of the opposite forces; this was done to understand better the camp of the enemy and the environment and to strategize effectively because verbal analysis of the enemy camp would do nothing but overwhelm or complicate the minds of the generals. This illustration was given because, though times have evolved, visualization for strategic planning is still as important as in the medieval period.

Strategic planning is in phases: analysis, development, planning, and implementation phases (Olaniyi, Okunleye & Olabanji, 2023). In all these phases, data visualization is adopted due to its benefits; it is designed for easy understanding of the task at hand; used to create options on how to achieve milestones, activities, goals, and deployment of the necessary resources; visualize objectives, plans, timelines, allocation of resources and responsibilities, action plan, strategic initiatives, the relationship between variables and results (Eppler and Platts, 2009)

2.1.5 Data Governance and Innovative Behavior

Eryurek et al. (2021) clarify that data governance is a powerful tool for managing an organization's data value. It ensures that proper framework or measures have been put in place to ensure that data acquired by the company are protected and safeguarded with an encrypted and strong firewall against unauthorized entry, breaking, and cyber threats (Olaniyi, Olaoye, & Okunleye, 2023). This is important because when data is secure, employees are more inclined to share and collaborate on innovative ideas. After all, sensitive information is safeguarded, which promotes a culture of trust and risk-taking.

Data governance is vital for institutions that depend on data to guide their innovative operations and accomplish their strategic objectives (Alhassan et al., 2019). Businesses, organizations, and companies can build a culture of transparency and trust around their data when they enforce data governance policies (Janssen et al., 2020); this enforcement strengthens the employees to make informed and innovative decisions founded on accurate and dependable data.

Data governance policies and framework establishes clear guidelines for data accessibility and sharing. Structured and well-managed data is available to those who need it, empowering employees to explore data for insights and ideas and to envisage novel or creative products or services for audiences and end users (Abraham et al., 2019). Also, with data governance, organizations can track the accomplishments of their plans and projects and observe areas that need improvement.

This approach to innovative work behavior ensures that creating new products and services aligns with the organization's goals and customer demands (Abraham et al., 2019).

2.2 Theoretical review

Dynamic Capability

Over the years, there have been several reviews by different researchers who give their notion on the theoretical review of how dynamic capability brings about innovation. Teece et al. (1997) discovered that dynamic capability involves an organization's ability to deal with its internal and external environment, integrating, building, and reconfiguring its resources in response to the fast-changing business environment. Its basic goal is to generate great strategic results. Dynamic capability is not limited to building, incorporating, and reorganizing but is also rooted in innovative managerial and entrepreneurial expertise. It performs the job of aligning and realigning the organizations to match the opportunities and requirements of its business environment.
Huarng et al. (2015) clearly stated in their research that any organization that leverages the dynamism of its ability is set to achieve a greater result. It is saddled with re-engineering and integrating resources, competencies, and potentials to its advantage, including sensing, seizing, and transforming the business environment.In addition, Erevelles et al. (2016) and Wernerfelt (2014) affirm that organizations get more insightful information from the data gathered to determine unsatisfied consumer needs with greater dynamic capability. Al-Qudah et al. (2022) clarified that analyzed data will aid the organization in decision-making to respond to its current dynamic environmental trends effectively.

Data Analytics

Data analytics theory is a differentiated theory that helps improve strategic management. It is characterized by its relative speed, volume, and speed, which are impacted by creating, storing, and using data (LaValle et al., 2011; Vahn, 2014). Balsmeier et al. (2018) clearly state that, in traditional statistical training, things like the central limit theorem and the law of large numbers are all embedded in data analytics. He explains further that the central limit theorem or the law of large numbers certainly expresses how the world (environment) around an organization is by expressing it in models. Through this, organizations gradually pay more attention to strategic information and look for new data sources like the web, which has now become the leading information tool that assists organizations in being creative and achievingtheir set objectives (Vitolo et al., 2015). In this regard, data analytics has been viewed as a tool with a promising future incapturing signals and identifying trends.

Leadership and Innovative Behavior LMX theory

Leadership and innovative behavior theory has gained more attention from management scholars due to its neglect by many organizations. Leadership plays a cogent role in innovation,producing a creative result concerning the organization's vision (Kanter, 1983). This theory is, therefore, in collaboration with the LMX theory (Leadership-Member Exchange theory), as it expresses the duties of the management to its employees and versa (Graen & Scandura, 1987).

However, LMX expressed that innovativeness starts from the quality of the relationship between the management and its employees, which will bring about creative ideas for growth and development, which is proudly supported by (Basu, 1991). This comes into existence as each employee and the management is saddled with an innovative behavioral task, which includes idea generation, idea promotion, and idea realization (West, 2002). This is because ideas generated by any of the two parties play a big role in the innovative needs of the organization (Scott and Bruce, 1994).

Therefore, it is expedient for any organization intending to grow and develop in its sphere to implore the theory of leadership and innovative behavior as it entails the intentional creation and implementation of new ideas (West and Farr, 1989).

2.3.1 Conceptual review and hypothesis development

Inspirational leadership theory informs us of the rise of compelling leaders (Olaniyi, 2022). These leaderscan share and effectively communicate an organization's vision, objectives, and goals, thereby inspiring and empowering their employees into action. Through their efforts and influence, they enact strategic organizational reforms. Charismatic leaders are not like conventional leaders who create a distance between themselves and their followers, but rather, they actively bridge the gap and form tangible and meaningful relationships with their subordinates (Alsolami et al., 2016).

Inspirational leadership is often associated with transformational leadership; this type of leadership enacts positive changes and pushes members to accomplish exceptional results.

Transformational leadership theory focuses on the role of leaders as change agents and visionaries. Leaders who can impact, inspire, and motivate their followers to achieve elevated performance levels by encouraging them to desire greater responsibilities. Transformational leaders are associated with accomplishing remarkable feats, such as transforming followers into leaders. They envisage and embody the future, enacting positive changes and propelling team members to accomplish outstanding results (Alsolami et al., 2016).

Business intelligence is a concept and tool organizations, businesses, and companies employ to gather and extract tangible information in the business world primarily to guide and make strategic decision-making (Rouhani et al., 2012). Data mining is a concept and tool in data analytics used by organizations to analyze and extract patterns and trends from voluminous data to make informed business decisions (Agarwal, 2013)

These theories and concepts establish that innovative leaders leverage data analytics to make strategic business decisions and enhance organization processes and performance.

While a body of growing literature explores and demystifies the importance, roles, and effects of innovative leadership and data analytics individually, limited literature and

research have extensively examined data analytics's integration in effectively enhancing innovative leadership. This gap in literature informs the rationale for our research study.

2.3.2 Research Hypothesis

The exceptional capabilities of data analytics are now widely recognized. Yet, its full capabilities are only harnessed by a select few with the expertise to unlock its complete spectrum of advantages.

Data analytics positions itself as a potent and advanced technological tool that is being utilized for significant transformations in the business world (Olaniyi, Olabanji & Abalaka, 2023). Its capacity to harness and leverage data empowers organizations, leaders, and employees with the insights necessary to succeed in a competitive market. At its core, data analytics fuels innovative leadership by guiding leaders to enact viable strategic organizational changes that promote innovation and elevate operational excellence (Nji, 2021; Koohang et al., 2023; Schoemaker et al., 2018).

Nji (2021) highlights predictive analytics as an integral aspect of data analytics that propels innovation and operational performance to a higher production level. This technology amplifies employee capabilities and enables them to excel and outperform expectations (Nji, 2021).

We lay the foundation for the hypotheses of data analysis on innovative leadership and operational performance.

H1. Data Analysis influences Innovative Behavior in leadership

In today's data-driven corporate world, organizations such as Amazon, Spotify, Google, Netflix, the healthcare sector, and so on heavily leverage data analysis to inform decision-making and gain a competitive edge (Sen & Eren, 2012). One critical factor for progress in this active space is innovative behavior, which is well portrayed with versatile thinking, innovative troubleshooting abilities, and the capacity to seize opportunities.

Data analysis strengthens leaders and employees with the ability to envision novel strategies and create new products in the market (Choi et al., 2021; Sen & Eren, 2012). This hypothesis asserts that adopting and utilizing data analysis technology in leadership has a tremendous role in promoting and encouraging innovative behavior among leaders.

H2. Data Analysis is positively related to Vision and Strategic Planning

When statistical data, a facet of data analysis, is employed, corporate enterprises, governmental bodies, and so on are apt to make well-informed choices (Galli, 2021). Harnessing data analysis tools will inform policy modifications, strategy formulation, and information scrutinization and help dissect issues (Galli, 2021). The application of statistical analysis equips leaders and change makers with accurate data required for strategic planning and a backup plan to use when the initial plan falls through, thereby enhancing quality strategic decisions and vision planning (Galli, 2021; Shuajibi and Rahmani 2018; Velikikh, 2021).

Resource distribution for every department in an organization will be elevated to a higher level with the implementation of statistical analysis and optimization (Galli, 2021; Eppler and Platts, 2009).

Above all, data analysis enhances strategic planning for project management, operations management, and process improvement departments and also promotes centralized decision-making and more collaborative, decentralized decision-making (Galli, 2021).

H3. Data Visualization positively impacts Communication Skills in leadership

Properly illustrating your organization's goal and vision of an idea or plan to followers will result in apt execution. For leaders, data visualization closes the communication gap with its powerful projection skills, and with the modern-day new and improved data visualization instruments, leaders can communicate ideas and visions in an intriguing and captivating manner without stress (Kirk, 2012; Ahmad et al., 2023). This process allows for engaging discussions and planning, easy understanding, and actualizing vision and goal (Ahmad et al., 2023).

Tomono (2023), so apt in his work, stated that, above all, data visualization positively impacts leadership, as it breaks the language barrier and transcends beyond diverse languages, creating a language class of its own, where participants from various parts of the world can dialogue and rub minds by drawing meaning from visualized illustrations and images.

H4. Data Visualization positively influences Vision and Strategic Planning in leadership

This hypothesis examines the notion that data visualization positively impacts the vision and strategic planning processes in leadership.

Data visualization aids clarity anddrives organizations' success (Kinley &Ben-Hur, 2020). Data visualization didn't emerge with the advent of civilization; rather, it existed since the medieval era (Rogers, 2018). It has evolved into this powerful tool that leaders and followers use to grasp and understand complex data, the organization's performance in the market, and specifically market trends, patterns, and customer behavior (Moore, 2017)

Most especially, it is essential for representing and conveying information to stakeholders (investors, employees, and so on), making it easier to communicate a strategic vision and plan (Kirk, 2019; Moore, 2017).

H5. There is a positive relationship between Effective data Governance and Innovative Behavior

Effective data governance helps develop a proper framework that manages an organization's data value throughout its lifespan; this ensures that the company's data is well-protected, available, and precise (Eryurek et al., 2021). When properly applied, this designated framework can positively influence innovative behavior among the employees of businesses, companies, organizations, and so on (Alhassan et al., 2019).

Data governance ensures that compliance and data security measures are put in place to safeguard sensitive information; these measures minimize data-related risks (Fisher, 2009), promote a culture of trust and an environment that strengthens the confidence of employees and encourages them to experiment with new ideas and technologies and also interact with fellow employees to produce novel services and products (Abraham et al., 2019; Cheong & Chang, 2007)

In any work environment where data governance and standard security protocols are prioritized, employees are empowered to examine new concepts for innovation and optimize their innovation strategies (Janssen et al., 2020; Alhassan et al., 2019)

3. Research Methods

The research instrument used for data collection was a questionnaire. It was structured to allow the respondents to select from the options provided, and this is done using the Likert scale model, which consists of having five (5) or more options, which serves as the satisfaction scale that ranges from one extreme attitude to another. And it also enables the research team to make a reasonable and justifiable conclusion. The responses put in place are SA- Strongly Agree, A- Agree, N- Neutral, D- Disagree, SD-Strongly Disagree.

The respondents for this research questionnaire are from five different industries: Accounting and Finance, Marketing, Computer and IT, Business Development, and Education. A total of 700 questionnaires was administered online through the email; participation was voluntary, ensuring all the industry mentioned above filled out the questionnaire, and the total 490 properly completed questionnaires were achieved.These approach ensured that research method was a deliberated process of inquiry aimed at finding an answer to a new area of knowledge or existing knowledge in the universe (Jabri, 1991). Statistical Package for Social Sciences (SPSS) was used to analyze the data gathered from the respondents. The formulated research hypothesis in the study was tested using linear regressionanalysis at a 0.05 significance level.

The study uses both correlation and regression model to examine the interplay between the independent variables being data analysis, data visualization, and data governance;and the dependent variables are innovative behaviour, vision and strategic planning, and communication skills.

4. Results

List 1.Correlation result of the research variables

	DA	**DG**	**DV**	**CS**	**IB**	**VSP**
DA	1	0.993	0.992	0.991	0.993	0.993
DG	0.993	1	0.996	0.997	0.995	0.996
DV	0.992	0.996	1	0.997	0.993	0.997
CS	0.991	0.997	0.997	1	0.996	0.997
IB	0.993	0.995	0.993	0.996	1	0.994
VSP	0.993	0.996	0.997	0.997	0.994	1

DA- Data Analysis**, DG-** Data Governance, **DV-** Data Visualization, **CS-** Communication Skills, **IB-** Innovative Behavior, **VSP-** Vision and Strategic Planning.

Using correlation analysis, the independent variables (Data Analysis, Data Visualization, and Data Governance) were used interchangeably with the dependent variables (Innovative Behavior, Vision and Strategic Planning, and Communication Skills). All of its models indicate that all the variables have a significant relationship.

Additionally, linear regression coefficients were further assessed to test the hypothesis and ascertain the influence of each of the factors on the criterion variables.

Hypothesis 1

Table 1a: Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	**.993[a]**	**.985**	**.985**	**.50663**
a. Predictors: (Constant), Data Analysis				

Table 1b: ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	**8317.141**	**1**	**8317.141**	**32402.950**	**<.001[b]**
	Residual	**125.259**	**488**	**.257**		
	Total	**8442.400**	**489**			
a. Dependent Variable: Innovative behavior						
b. Predictors: Data Analysis						

Table 1c: Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	**-.040**	**.050**		**-.783**	**.004**
	Data Analysis	**1.022**	**.006**	**.993**	**180.008**	**<.001**
a. Dependent Variable: Innovative behavior						

H1 evaluates how Data Analysis Influences Innovative Behavior in leadership; the result shows how data analysis significantly influences innovative behavior (Beta value = 0.993, t = 180.008, p = <0.001), hence H1 is supported.

Hypothesis 2

Table 2a: Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.993[a]	.986	.986	.48769
a. Predictors: (Constant), Data Analysis				

Table 2b: ANOVA[a]					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**

1	**Regression**	8243.770	1	8243.770	34660.167	<.001[b]
	Residual	116.069	488	.238		
	Total	8359.839	489			
a. Dependent Variable: Vision and Strategic Planning						
b. Predictors: Data Analysis						

Table 2c: Coefficients[a]

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	.076	.049		1.561	**.002**
	Data Analysis	1.017	.005	.993	186.172	**<.001**
a. Dependent Variable: Vision and Strategic Planning						

H2 evaluates Data Analysis as positively related to Vision and Strategic Planning; the result shows that Data Analysis is significantly and positively related to Vision and Strategic Planning (Beta value = 0.993, t = 186.172, p = <0.001); H2 is supported.

Hypothesis 3

Table 3a: Model Summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.997[a]	.993	.993	.34040
a. Predictors: (Constant), Data Visualization				

Table 3b: ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	8326.392	1	8326.392	71856.352	<.001[b]
	Residual	56.547	488	.116		
	Total	8382.939	489			
a. Dependent Variable: Communication Skills						
b. Predictors: Data Visualization						

Table 3c: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.067	.034		-1.943	.003
	Data Visualization	1.006	.004	.997	268.060	<.001
a. Dependent Variable: Communication Skills						

H3 evaluates how Data Visualization positively impacts Communication Skills in leadership; the result shows how Data Visualization significantly and positively impacts Communication Skills in leadership (Beta value = 0.997, t = 268.060, t = <0.001); hence H3 is supported.

Hypothesis 4

Table 4a: Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997[a]	.997[a]	.995	.29607
a. Predictors: (Constant), Data Visualization				

Table 4b: ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8317.062	1	8317.062	94880.997	<.001[b]
	Residual	42.777	488	.088		
	Total	8359.839	489			
a. Dependent Variable: Vision and Strategic Planning						
b. Predictors: Data Visualization						

Table 4c: Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.089	.030		-2.968	.003
	Data Visualization	1.005	.003	.997	308.028	<.001
a. Dependent Variable: Vision and Strategic Planning						

H4 evaluates how Data Visualization positively influences Vision and Strategic Planning in leadership; the result shows how Data Visualization significantly and positively influences Vision and Strategic Planning in leadership (Beta value = 0.997, t= 308.028, p = <0.001), H3 is supported.

Hypothesis 5

Table 5a: Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.995[a]	.990	.990	.42057
a. Predictors: (Constant), Data Governance				

Table 5b: ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	8317.062	1	8317.062	94880.997	<.001[b]
	Residual	42.777	488	.088		
	Total	8359.839	489			
a. Dependent Variable: Innovative Behavior						
b. Predictors: Data Governance						

Table 5c: Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	-.193	.042		-4.548	<.001
	Data Visualization	1.014	.005	.995	217.353	<.001
a. Dependent Variable: Vision and Strategic Planning						

H5 seeks to evaluate the positive relationship between Effective Data Governance and Innovative Behavior; the result shows a positive relationship between Effective Data Governance and Innovative Behavior (Beta = 0.995, t = 217.353, p = <0.001); hence, H5 is supported.

5. Discussion

This research looks intently at how innovative leadership can be achieved through effective data analytics. For individuals occupying leadership positions and roles, data needs to be utilized to its optimal level, as data analytics seeks to convert raw data into actionable insights that provide them with a clue on trending issues.

This study aims to understand how leadership can be innovative in using data analytics, including the following analytics (descriptive, diagnostic, statistical, predictive, prescriptive, and cognitive). Hence, this research reviews the detailed relationship between innovative leadership and data analytics while it answers the following questions: what is the effect of data analysis on innovative behavior?What is the effect of data analysis vision on strategic planning?What is the effect of data visualization on communication skills?What is the effect of data visualization and vision on strategic planning?What is the effect of data governance on innovative behavior?
Therefore, a model consisted of six variables: Data analysis, Data visualization, Data governance, Innovative behavior, Communication skills, and Vision and strategic planning. All of the above were used interchangeably to show the effectiveness of data analytics on innovative leadership.
Every organization's growth and development is essential, as it can't stand to be kicked out of its space. Hence, organizations see the vital contribution of data analytics to strategic innovation (Olaniyi, Olabanji, & Okunleye, 2023). Brem and Voigt (2009) also extensively review how data analytics contributes effectively to an organization's sustainable growth and development of innovation. However, this research dealt extensively with how organizations can embrace innovative leadership through effective data analytics.
Hence, in this study, it is discovered that analyzing data is a tool that will assist organizations in seeing clearly and not just the current situation of the organization but also help in providing insightful answers to questions like what happened, why does this thing happen, when did it happen, how did it happen? Innovative behavior responds to these questions by applying new ideas, processes, and creative decision-making to improve the organization's performance.
Innovative leadership can only be achieved by having the proper innovative behavior, which is the organization's reaction to new developments and means of survival through quality techniques. This will not only enhance but also improve the performance of the organization. This is supported by the review of Behl et al. (2022) on the innovative role of big data analytics capabilities in improvingthe sustainable competitive advantage of SME service firms during COVID-19.
This also extends to how organizations can be tactical in their vision and planning, as this can only be known by evaluating its actions through the proper analysis of the available data. This aids organizational management in making a logical plan before executing, and this is done with valid data and not based on assumptions. This finding also relates to that of Nuno (2023) on the significance of data strategy vision, mission, and values for success. Amidst all these data operations, clear, concise, and precise communication is needed to foster effective communication among the management. This can be done through data visualization, which represents and explains information in different formats. Some of which include visual maps, graphics, diagrams, and charts. Visualization is a clear approach to communicating the organization's vision, as the ideas, insights, and trends can be well represented visually (Olagbaju, Babalola, & Olaniyi, 2023).
However, Alhassan et al. (2016), in their review of data governance activities, concluded that data governance positively affects innovation activities. This research, therefore, seeks to keep organizational management abreast of its data governance.

This ensures that data is protected and valued against unauthorized entry and cyber threats. It helps organizations manage and control data and its usage, ensuringit is accurate, consistent, and properly used. All organizations must value and manage their data properly, as it contributes greatly to their innovative operations. Any slight data leakage, cyber threats, and data breaking are not just done to the data but also a great threat to the organization.

5.1 Managerial Implications

Organizations, businesses, and viz-a-viz can leverage innovative leadership and data analytics to improve organizations' presence, competitive strength, and performance (Sen and Eren 2012).

With the fostering and enablement of collaboration and insights from teams and stakeholders, innovative, creative, effective solutions will be approached, and this encourages a culture of open communication and idea sharing (Soares et al., 2018; Abraham et al., 2019).

Strategically, leaders can improve the skill set of employees by investing in the training and development of specific data analytics skills; this equips the employees and furthers the reach of the employers (Runkler, 2020).

Also, by embracing the innovation of data, companies encourage the evolution of innovative thinking, thereby harnessing their ability to develop creative problem-solving strategies through data analytics.

Conclusion and Suggestion

Adopting innovation and data analytics revolutionize companies in the business sector tremendously. This literature adds to the limited work that demystifies and meticulously explores the correlation between innovative leadership and data analytics. Through our studies, it was observed that as companies embrace the collaboration of innovation and data and foster collaboration from every stakeholder of the business, including employees, they unlock the ability to develop creative and effective problem-solving strategies, and the collaboration encourages a culture of open communication and idea sharing (Soares et al., 2018; Abraham et al., 2019).
The theories and concepts adopted in this research study further establish that innovative leaders leverage data analytics to make strategic business decisions and enhance organizationprocessesandperformance.
This research study drew insight from selected organizations that pertain to different industries, so this study does not allow for a nuanced study into a specific industry. Also, our study focused on the role of data analytics for effective, innovative leadership in a specific industry, so further research studies can delve into other industries to provide a nuanced, unbiased, comprehensive understanding of data analytics and innovative leadership. Research could also be undertaken to capture how technological advancements, market volatility, and regulatory policies influence

the collaboration between data analytics and innovative leadership to propel revolution.

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Appendix
Questionnaire
Questionnaire on Innovative Leadership and Data Analytics

Years of Leadership Experience: years			
1-5years	**6-10years**	**10-15years**	**15 years and above**

Industry (Choose one)				
Accounting and finance	**Marketing**	**Computer and IT**	**Business development**	**Education**

Please indicate your level of agreement with the following statements on a scale of 1-5, where 1= Strongly Agree (SA), 2= Agree (A), 3= Neutral (N), 4= Disagree (D), and 5= Strongly Disagree (SD)

Data Analysis						
S/N	**ITEMS**	**SA**	**A**	**N**	**D**	**SD**
		1	**2**	**3**	**4**	**5**
1	**Data analysis is an integral part of the decision making process within my leadership role**					
2	**i consider it vital to leverage data analysis to identify opportunities and evaluate ideas within my sphere of leadership**					
3.	**Data analysis enables me to drive innovativeness within my team.**					

Data Governance						
S/N	**ITEMS**	**SA**	**A**	**N**	**D**	**SD**
		1	**2**	**3**	**4**	**5**
1	**Data governance policies and practices in my organization enhance leadership effectiveness**					
2	**Data quality, accuracy, and security is essential innovative leadership**					
3	**Engaging ethical measures while collecting and using data enhances innovative leadership.**					

Data Visualization						
S/N	**ITEMS**	**SA**	**A**	**N**	**D**	**SD**
		1	**2**	**3**	**4**	**5**
1	**using data visualization, i am able to develop insights that enhances my leadership effectiveness**					
2	**through data visualization, i am able to make innovative decisions**					
3.	**Data visualization aids me in communicating complex information effortlessly.**					

Communication skill						
S/N	**ITEMS**	**SA**	**A**	**N**	**D**	**SD**
		1	**2**	**3**	**4**	**5**
1	**I find communication effective when i engage data analytics**					
2.	**I access quality feedback that enhance my leadership through data analytics**					
3.	**my communication style is effective through data analytics**					

Innovative Behavior						
S/N	**ITEMS**	**SA**	**A**	**N**	**D**	**SD**

		1	2	3	4	5
1	Data analytics enhances my creative thinking ability.					
2.	data analytics encourages me to pursue new ideas within my leadership sphere					
3.	Data analytics fosters my level of knowledge to lead effectively.					

Vision and Strategic Planning						
S/N	ITEMS	SA	A	N	D	SD
		1	2	3	4	5
1	Data analytics enhances the development and clarity of my vision					
2.	I am able to devise more effective strategic plans to achieve my objectives through data analytics					
3.	data analytics fosters achieving of my plans and vision					