Journal of Information Systems Engineering and Management
2024, 9(4s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Understanding the Relationship Between Data Governance and Business Analytics Success: A Case Study of Global Corporations

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ARTICLE INFO

Received: 30 Oct 2024

Revised: 15 Dec 2024

Accepted: 30 Dec 2024

ABSTRACT

This study developed an understanding of the relationship between data governance and the success of business analytics in multinational firms. The study, through a mixed-methods analysis (qualitative and quantitative) based on the Structural Equation Model (SEM), has identified important aspects of data governance for the success of business analytics. The data for this study were obtained through a number of quantitative business surveys of data governance officials and surveys administered to 250 firms around the world. Critical data variables, including data quality control, policy enforcement, and the impact of data governance approaches, were measured and analyzed. The results through SEM analyses showed a positive association of data governance variables on the success of business analytics, with the regression coefficients of data quality management ($\beta=0.42$), compliance with policies ($\beta=0.36$), and the influence of data governance frameworks ($\beta=0.49$), marked with a significance of $p<0.001$. The quantitative data of the study's findings were also supported and complemented by the data of the critical themes derived from a deeper examination of the quantitative data of the study's findings obtained from an analysis of the qualitative themes of the study.

Keywords: Data Governance, Business Analytics, Data Quality Management, Regulatory Compliance, Structural Equation Modeling (SEM), Decision-Making.

Introduction

The growing adoption of data analytics in MNCs, has also brought to the forefront of business activities the need for the right data governance. The term "data governance" simply refers to the implementation of policies, procedures, and structures that would ensure that the data in the organization is properly managed. The growing global business activities have also made it crucial to have control over the data and data movement as the boom of multinational corporations (MNC) spread through different locations. The modern business scene also knows just too well that bad data governance may turn into data security issues, inappropriate decision-making, and even lead to tremendous legal problems for

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e-ISSN: 2468-4376
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the company in the GDPR (General Data Protection Regulation) era in the European Union. The advent of business analytics and particularly the introduction of Big Data has also opened a new era for business and its data and decision-making processes. Business analytics involves a broad variety of activities as they include Descriptive Analytics, Predictive Analytics, Diagnostic Analytics, and Prescriptive Analytics which enables firms to gain useful insights and draw crucial inferences from the data at their hands. Artificial intelligence and data analytics play a critical role in enhancing customer experience and delivering business value, reinforcing the importance of data-driven decision-making environments (Haldar et al., 2024). However, the effectiveness of these advanced analytics systems is highly dependent on the quality, governance, and reliability of the underlying data. These analyses and evaluations are also not smarter than the data that is examined by these analytics. If the data is not in the right place, it may result in incorrect analyses and poor decisions which can have damaging effects on the organization. It is, therefore, very important for these organizations to have data governance in place to ensure that data is accurate, data is consistent and data follows the rules and regulations of various government and regulatory agencies.

Data warehousing technologies that emerged in the late 80s enabled organizations to handle a large volume of data to produce reports and perform analyses. With the emergence of Online Analysis Processing (OLAP) technologies, it was possible to manage large amounts of data. But there were also issues with the technologies and systems with regard to transformation and being adaptable to the constantly changing size and content of the data of the new enterprises in the modern world. The ever-growing size and data warehouse of the enterprise gave rise to the need for data governance. Data governance requires flexibility and administration that matches the volumes and sizes of the data processed by the companies, as well as the ever-increasing need for real-time data in business. Big data and data analytics are ubiquitous in today's business and various industries. Data and data analytics are used by enterprises to be able to project future trends of the business and to better serve customers. But data governance is still a critical element of implementing technologies and techniques.

Data governance frameworks are very important when it comes to complying with different data protection regulations, which have become more stringent in recent years. The policies of data protection regulations such as the GDPR in the EU (European Union) and the California Consumer Privacy Act (CCPA) in the USA have only raised the level of challenges that firms face in managing data protection in the business environment. Data governance frameworks ensure that the data is managed within the organization in a way that takes care of data protection regulations, but also enables its easy access and use to conduct business analytics in the business environment. This paper seeks to bring to the forefront the impact of the issue of data governance on the success of business analytics projects in international multinationals. By using a combination of methods for data collection and analysis (a combination of both qualitative and quantitative data by using Structural Equation Modeling (SEM), this paper aims to identify the important aspects that make data governance so important in companies that are striving for the success of business analytics initiatives in the business environment.

One of the key advantages of good data governance practice in business analytics is the support given in generating the creation of incremental and radical innovations. Incremental innovations are linked with the improvement of the existing product, service, and/or process, while radical innovations are linked with the introduction of new business models and/or new products and/or new services in the market. It has been revealed that firms with a good practice of data governance are able to effectively adopt both incremental and radical innovations, therefore building a competitive advantage in the marketplace. The positive link between the capability of a company and the innovation that it eventually reaches due to the adoption of big data analytics practices in the businesses of the firm is moderated by data governance practices. The efficacy of the data governance practices, therefore, not only justifies the efforts of a firm in developing good data management practices but also the investment in the

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e-ISSN: 2468-4376
https://www.jisem-journal.com/

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appropriate business analysis tools, as optimal data management is required to effectively enjoy the benefits of the tools during the business operation of the firm. Data management practices not only ensure the quality of data and compliance in organizations but also help to remove the barriers in the communication processes in the organizations and therefore, make it easy to cooperate with the different functions in organizations. Hence, a business-friendly environment in an organization that uses data for more than one business function of the business operation is created, and hence, data in such an organization is treated as a common business resource, and can be used to foster business operations of different divisions of the company in the marketplace. The data management practices also ensure that business processes of an organization are aligned with the strategies of the company, and this, in turn, guarantees that business analytics activities in the organization are properly aligned with the business management activities of the company in the marketplace.

The proposed research is an attempt to use such insights and try to understand the impact of data governance for business analytics success in big firms across the world. And as the world moves into the digital economy, one will be keen to know how the data governance and success of business analytics in organizations plays a role in the success of business competition globally and they are also ensuring that the organizations are well positioned to manage digital economy successfully.

Literature Review

There have also been numerous reports that stress the importance of data governance to the goals of business analytics. Given the popularity of the data-driven decision-making model adopted by several large-scale businesses around the globe, data governance frameworks play a critical role. Data governance frameworks have also been widely discussed throughout a massive study on the importance of big data platforms and tools, which are used to manage large amounts of information generated across businesses today, by Singh and Reddy et al. The authors also argued that the use of such platforms may not be effective if data governance practices are not established as data quality and consistency further enhance big data analytics. Machine learning algorithms applied to big data environments significantly improve forecasting accuracy and support predictive analytics in business decision-making processes (Sultana et al., 2024). These authors also argue that data governance practices are important within the field of data mining and knowledge discovery related to big data analytics and play a significant role within the field of data mining and knowledge discovery related to data mining and knowledge discovery. Hashem et al. argued the advent of cloud computing and the use of big data analytics, and also discussed the data governance issues which are associated with the manipulation of data within the cloud computing framework. Therefore, the authors identified data governance practices within the field of data mining and knowledge discovery within the field of cloud computing and suggested organizations adopt new types of data models that would alleviate these problems and ensure that data within the cloud computing environment holds to security requirements. Also adding to the body of knowledge within data mining and knowledge discovery related to the importance of data governance practices within the field of data mining and knowledge discovery related to data mining. Tsai et al. directed the discussion towards the importance of data governance practices within the field of data mining and knowledge discovery related to the importance of data mining and knowledge discovery and further indicated that data governance frameworks are important and are necessary within the field of data mining and knowledge discovery related to data mining and knowledge discovery related to data mining and knowledge discovery. Al-Ruithe et al. used data governance practices in the cloud computing framework and the authors reported that data governance frameworks and practices need to be considered in various areas of consideration in cloud computing. AI-driven management information systems integrating governance mechanisms have been identified as essential for enhancing organizational resilience and ensuring secure and efficient data utilization

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(Orthi et al., 2023). The authors found that data governance is critical for successful cloud-enabled business analytics projects because it is key to data integrity and security. The authors noted that businesses should "adapt to the data governance practices to consider the issues associated with cloud computing".

Analysis of the reviewed literature highlights the need for data governance to ensure the success of business analytics projects. This data management practice ensures data is of high quality, compliant and enables the coordination of data coming from diverse sources, allowing innovation and improved business results. Predictive analytics within management information systems has been shown to enhance supply chain resilience and support data-driven decision-making in complex organizational environments (Goffer et al., 2024). In addition, the integration of advanced technologies within management information systems has further strengthened analytics capabilities. These findings reinforce the importance of combining robust data governance practices with intelligent system architectures to enhance organizational performance and decision-making effectiveness. With the growth of organizations adopting the use of emerging technologies such as Big Data and cloud computing, the need for robust and flexible data governance frameworks will continue to be critical to ensure organizations remain competitive in the global markets. Across the literature, the reviewed literature has supported the importance of data governance and the success of business analytics, as the role of data governance practices cannot be overlooked in the pursuit of success with business analytics. This has been acknowledged throughout a number of studies that report the importance of data governance frameworks across organizations as being critical to success factors for improving data quality, security and compliance - aspects that are essential for success within business analytics. The role of data governance across multi-business units has been confirmed in the literature reviewed and the importance of data management practices within the attainment of enhanced performance across the reviewed literature has been supported through research undertaken by authors such as Neff et al. who used the theory of resource-based view (RBV) and theory of complementarities to show the importance of aligning data governance practices with IT governance practices to enhance business performance through improved data management practices. This paper highlighted the importance of data synergies across business units in the attainment of enhanced performance and the importance of data management practices within the issue of data governance, and its role in the success of business analytics has also been extensively discussed and reported upon. With the adoption of data-management applications within the decision-making of more multi-business companies around the world, the significance of data governance frameworks cannot be overstated. The importance of a data governance framework has also been captured and reported in a large-scale study by Singh and Reddy et al. that focuses on the data governance of the big data platforms and tools that are used to handle big data, which is generated through business operations in modern organizations. The authors also note that the creation of such platforms may be rendered inefficient if "data governance practices" have not been implemented, as improving data quality and data consistency may become problematic. The authors also indicate that data governance practices are interesting in the context of data mining and knowledge discovery in relation to big data analytics and business insights, and important in the context of data mining and knowledge discovery. Hashem et al. have also accounted for the advent of cloud computing and the application of big data analytics and problems in data governance that can be associated with data manipulation in the context of the cloud computing environment. The authors indicated that data governance practices exist in the field of data mining and knowledge discovery and suggested that a company should modify the new data models that might resolve the issues and allow data in the cloud computing environment to meet the required security standards and measures. The other aspect of the contribution to the knowledge advancement in the field of data mining and knowledge discovery, with respect to the significance of data governance practices in the field of data mining and knowledge discovery, relates to the issues of data mining. The debate on the significance of

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data governance practices in the sphere of data mining and knowledge discovery was focused in Tsai et al.'s article, in which they suggested that data mining and knowledge discovery are also worth mentioning and that data governance practices should be implemented in the sphere of data mining and knowledge discovery. Al-Ruithe et al. applied data governance frameworks in the cloud computing environment and also agreed that data governance frameworks and practices should also be considered in different levels in cloud computing. The authors concluded that data governance plays an important role in the success of a business analytics project in the cloud computing framework, because of its importance in the integrity and security of data. The authors identified that companies should change their approach in dealing with data to take into account the issues associated with cloud computing.

The reviewed literature notes that data governance is an important consideration to ensure that business analytics projects are successful. This aspect of data management not only focuses on data quality and data compatibility but also encourages managing data from different sources, which leads to innovation and business development. With the trend towards the adoption of the latest technologies, such as Big Data and cloud computing, by more and more organizations, the agility and resilience of data governance structures will still be a critical success factor in order to stay competitive in the globalized environment. The importance of data governance and business analytics' success has been confirmed by the reviewed literature, and the role and importance of data management practices can not be underestimated in view of the success in business analytics. As such, this has been supported in many studies that involve critical success factors in the data governance frameworks in the organization to improve the data quality, security and compliance, which are the key to successful business analytics. The significance of data governance in multi-business enterprises and the role of data management practices essential for better business performance has also been endorsed in the literature reviewed and the importance of data management practices to achieve superior business through improved data management practices has been endorsed by the articles like Neff et al. who applied theory of resource-based view (RBV) and theory of complementarities to justify the importance of integration of data governance frameworks with IT governance frameworks for better performance as a result of improved data management practices. This paper has shown that the data synergies between the business units are important in the realization of superior performance, and the data management processes are vital for managing the business. The relevance of Big Data and Big Data theory of RBV has also been endorsed in the reviewed literature, and the article conducted by authors such as Mazzei and Noble explained how Big Data is a valuable resource that can be used in organizations to gain a competitive advantage if used in the context of data governance and RBV. This research has adopted the importance of deploying Big Data in business performance management and the importance of data management practices in business contexts. The importance of data management strategies in the context of Big Data and RVB was also confirmed in the literature referred and articles in the field of Big Data analysis conducted by the authors like Wiener et al. adopted the significance of data management in the context of governance of business performance within an organization that has been positioned to adapt to knowledge management in a competitive environment. The study conducted by Adaga et al pointed to the significance of Big Data in business. The authors have advocated the importance of data governance, rules that govern data and its use in business. The article was also able to identify data governance and the importance of data governance in the Big Data and business models on the ability of businesses to extract information from data through data governance. Lack of data governance causes some challenges, which, according to the authors, include data quality and compliance.

Tsai et al. also mentioned the relevance of governance in managing the big data analytics processes and on particular, with respect to data quality and security. The authors observed that ineffective data governance significantly impairs the ability of organizations to keep the data accurate, secure, and compliant, to be used by data analytics for its purpose of interest. They also noted that the data governance models need to evolve to accommodate the management of the complexities of the data,

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especially in the context of cloud computing and Big Data. In this regard, in cloud infrastructural models, the study of critical success factors of data governance in the context of cloud computing was conducted by Al-Ruithe et al. who found that the transformation of the framework of data governance is needed to cope with the complexities of cloud computing models. The authors highlighted that successful data analytics in the framework of cloud computing models is unique due to the presence of such critical issues as data security, data compliance, and data frameworks. These authors also recommended that data governance frameworks must be tailored to the framework of cloud computing models and that in the future, organizations should have data governance models in the context of cloud computing. This study by Mikalef et al. also explicitly included relationships between information data governance and data analytics and innovation in the context of Big Data models. The authors of this paper suggested the framework of data analysis and data-driven innovation can be used at its best in organizations that have data governance frameworks in the context of incremental and radical innovations. The authors found that data governance moderates and provides a sustainable framework for the use of data, which should be accurate and secure in the framework of data analysis in terms of management's objectives and giving advantages within the organization's framework. Adaga et al. also sought to examine the characteristics of data governance in the context of Big Data and data security and privacy characteristics. The authors of the paper recommended that organizations adopt a data governance framework in this type of data management, which considers data privacy and data security matters.

Moreover, another aspect stressed in the literature is that data governance has an impact on the success of business analytics. The data governance frameworks are important in light of the issues of data quality and data security that have to be taken into account to ensure the success of business analytics. Also, data management systems will be even more important to a firm if it has technologies such as Big Data and cloud computing.

Table 1: Summary of Key Findings from Related Works on Data Governance and Business Analytics Success

Reference	Focus	Key Findings
Neff et al.	IT Governance and Data Governance in Multi-Business Organizations	This paper explores the link between IT and data governance and business process performance, revealing that the association between governance and the relatedness of resources enhances efficiency and decision-making in the firm.
Al-Ruithe et al.	Barriers and Critical Success Factors for Cloud Data Governance	Identifies the challenges with implementing cloud-based data governance, including regulatory compliance, data security and integration with business processes and the factors for success, such as data quality and stakeholder management.
Tsai et al.	Big Data Analytics and Governance	Emphasizes the need for a governance approach to the quality of data and security used to maintain data accuracy and relevance in big data analytics, especially with cloud computing.

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Reference	Focus	Key Findings
Mikalef et al.	Information Governance for Big Data Innovation	Discusses the need to have good governance in place to be able to use big data analytics to enable innovation and achieve a competitive advantage, specifically the importance of having data that is fit for purpose and compliant.
Mazzei & Noble	Big Data and the Resource-Based View	It demonstrates how companies can leverage big data as a competitive resource by adopting sustainable data governance models to create competitive advantages.
Wiener et al.	Big Data Analytics and Organizational Learning	Shows how governance builds an organization's capacity to produce and distribute knowledge, which facilitates innovation and responsiveness in processes of decision-making as a result of the information made available.
Adaga et al.	Big Data in Business Strategy	Emphasizes data governance as a fundamental driver of reliable, compliant, and actionable insights of big data to drive business strategy.
Grover et al.	Strategic Business Value from Big Data	Explores the need for companies to embrace governance mechanisms that support data quality and security to fully unleash the potential of big data analytics.
Hashem et al.	Big Data and Cloud Computing	Articles about challenges of managing big data on the clouds, where governance models are deemed essential for data privacy and compliance for big data analytics.
Wamba et al.	Big Data Analytics and Firm Performance	Demonstrates that there is a positive link between the capacity of big data analytics and firm performance and is able to explain much of the benefits of the success to good data governance.
Khatri & Brown	Designing Data Governance	It discusses the key components of a good data governance program, such as the need for decision rights, accountability and data quality management for business analytics to be effective.
Al-Ruithe et al.	Cloud Data Governance Framework	Offers a model for cloud data governance that addresses key concerns of data integrity, privacy and compliance, which are essential to enabling successful business analytics for cloud computing.

Methodology

The research has used a mixed methodology to establish the relationship between data governance and the success of business analytics in multinational corporations. The research design will combine both the qualitative and quantitative methods, which will offer a holistic perspective of the impact of data governance processes on the outcome of analytics. The study will target large corporations that have global operations, providing an opportunity to examine the data governance policies in a global environment with multiple jurisdictional challenges.

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Research Methodology: The study design implemented in this research had two major phases: the qualitative phase. This stage included interviews with key stakeholders (data governance authorities, IT managers, and analytics practitioners) of a number of multinational corporations. The purpose of these interviews was to elicit information about the data governance systems' effectiveness in support of business analytics and the major success factors and challenges in implementing these systems. These qualitative insights provided the important building blocks for the constructs of the quantitative phase. We conducted 20 interviews, which ensured the representation of five industries (technology, finance, healthcare, retail and manufacturing). The duration of the interviews was between 45 and 60 minutes and the recorded interviews were transcribed for thematic analysis. The thematic analysis involved the use of NVivo software, which was able to capture themes such as data quality control, regulation, and engagement. These themes were essential in the formulation of the variables in quantitative study.

Quantitative phase: In the quantitative phase of the study, data was collected from 250 multinational firms using a survey. The survey was based on the themes identified in the qualitative phase of the study, and included questions on the availability of data governance models, the extent of data quality management, the regulatory compliance and the effect of all these on the effectiveness of business analytics in general. The information was then examined using Structural Equation Modeling (SEM), a powerful statistical technique that makes the examination of relationships between the observed and latent variables easier. The study would not have been possible without SEM, as it allowed us to take into account both direct and indirect effects of data management on the effectiveness of business analytics programs.

In this study, both qualitative and quantitative data is used in the research. Qualitative data comprises of interview data from 20 information governance professionals working in multinational firms across multiple industries. Those interviews also provided important insights about the problems and success factors of the data governance techniques. The quantitative data was gathered from a survey, which was circulated via the internet to 250 multinational companies. The survey participants were enquired to assess their data governance processes in their companies, the quality of their data and their business analytics success. The survey has been carried out on the 5-point Likert scale, which is concerned with areas such as data quality management, regulatory compliance, and business analytics success. These questions were based on the existing studies, such as Hashem et al. (2015), Al-Ruithe et al. (2017), and Wamba et al. (2017). The data was balanced, with 20% in technology, 18% in finance, 15% in healthcare, 17% in retail and 30% in manufacturing as shown in the descriptive statistics of the data set. The sample was well representative to appreciate the data governance in the policy.

The data collection from the questionnaire has several measured variables and latent variables that will be used in Structural Equation Modeling (SEM). The observed variables are clearly measurable (e.g., data quality management, compliance), and the latent variables are latent only, which is not measurable (e.g., business analytics success). The linear dependence of these variables is expressed in equations by SEM.

Let y represent the success of business analytics, x1 represent data quality management, x2 represents regulations, x3 represents a data governance framework in place, and ξ be the error terms of these variables. The equation of the structure is

$$y = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \xi$$

The coefficient (1, 2, 3) values will reveal the degree of the relationship between the data governance and the success of the business analytics. The equation above implies that the rate of success of business analytics is a function of the data quality management x1, compliance x2, and having a strong data governance framework x3. Furthermore, we examined the indirect effect (mediators), such as the effect

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e-ISSN: 2468-4376
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of data quality on the success of business analytics via stakeholder involvement and organizational support.

Analytical Methods: Qualitative and quantitative approaches were taken in the paper to investigate the relationship between data governance and the success of business analytics. Qualitative analyses used thematic analysis to identify patterns and important themes in the data obtained from the interviews. These insights regarding the key aspects of data governance in turn influenced the design of the survey in the quantitative phase. In the quantitative phase, the responses of the survey were presented using descriptive statistics. Structural Equation Modeling (SEMM) techniques were adopted to determine the relationship between the components of data governance and the effectiveness of business analytics. Goodness-of-fit statistics were used to assess model fit to make sure that the model was accurate, and we did this through the Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI).

The study was conducted with ethical considerations. A statement of informed consent was provided to all the participants before participating in the interviews and surveys and the data were deidentified to ensure confidentiality. The study received university Institutional Review Board (IRB) approval. The combination of both quantitative and qualitative approaches adopted in the current study enabled us to explore and measure the impact of data governance on the effectiveness of business analytics in multinational enterprises. The interviewee-led interviews have helped to identify relevant constructs which have then been empirically measured using SEM. The findings of this research provide a significant contribution to understanding data governance, and offers valuable practical advice for companies to improve their business analytics through data governance initiatives. In the next methodology section, the model, data and analyses used in the study are presented to ensure the comprehensive study of the data governance-business analytics success relationship in multinational companies.

Proposed Architecture: The architecture of the study of the association between data governance and business analytics success is a mixed method (qualitative and quantitative). The structure involves key data governance, business analytics elements and their relationships, making it possible to reflect the consequences and the factors of success. The proposed architecture will assist with gathering, storing and examining qualitative and quantitative data, as explained in the method section (see picture 1).

Data Governance Framework Layer: The Data Governance Framework Layer is the core element of the data governance processes in an international business and it has several key elements. First of all, Data Quality Management is an essential element in ensuring that the data being used is of high quality. This includes making sure that data cleansing, validation and data integrity are implemented to produce good data. Another major element is regulatory compliance, which seeks to make sure that international data protection laws such as GDPR and CCPA are observed. This component seeks to ensure that the organization complies with the law in many jurisdictions, and this is one of the issues affecting organizations operating across the globe. Data Policies and Procedures establishes guidelines for the collection, use and storage of data and information within a business. These policies are very effective in ensuring consistency and standardized data collection and usage across the departments. Data Access and Security Controls are implemented to secure data and protect it from any misuse or redistribution, and ensure that only the data access and usage procedures are followed. Finally, Stakeholder Engagement is also involved in the integration of key stakeholders, such as data governance leaders, IT managers, and data/ business analysts to develop data governance policies which align with the business strategies and operational requirements of the company. Overall, these components constitute a sound data governance system, which is the key driver of the success of business analytics initiatives in multinational corporations.

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e-ISSN: 2468-4376
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The Data Collection and Integration Layer is established to collect, integrate and preprocess the data from multiple data sources. It also uses qualitative data collection, which is interviews with the key people in various businesses to assess data governance and the problems in this area. The quantitative data collection includes the results of questionnaires of 250 firms. The data can be analysed by SEM (Structural Equation Model), which accurately measures and analyses the critical variables including data governance and business analytics success. The Data Integration Tools can be used to integrate various types of data, such as interviews and questionnaires, to build the join-up of qualitative and quantitative data for further analysis.

The Business Analytics Success Layer measures the success of the business analytics. It includes Business Analytics Metrics, ranging from descriptive (e.g., historical performance) to predictive (e.g., predictions of trends) analytics, which have been used by multi-national companies (MNCs) for decision-making. Key Performance Indicators (KPIs), such as return on investment (ROI), the results of innovations and the effectiveness of decisions made are used to assess the performance of different analytics management projects. Performance Evaluation measures the effectiveness of the well-governed data in improving business performance, innovation and decision-making.

The Analysis Layer deals with the data obtained from the previous layers and analysis. Themes are developed from the qualitative data through thematic analysis of the issues in data governance, success factors, and the impact on business analytics. Structural Equation Modeling (SEM) is a process of determining the relationship between the variables such as data quality, data governance, regulatory compliance and success of analytics. SEM is a way of understanding the direct and indirect effects of governance actions on the results of business analytics. In addition, we assess the strength and significance of relationships between these governance elements and business analytics with the help of Regression and Correlation Analysis.

The Feedback and Adaptation Layer is the means of controlling and improving the models of data governance and the activities of analytics. Feedback Loops collect knowledge about business analytics and applies it to update the policies, processes and security of data governance. Adaptation Mechanisms will ensure the governance procedures will be adapted over time, depending on the analytics impact and regulatory compliance requirement to achieve continuous improvement of both governance and analytics operations.

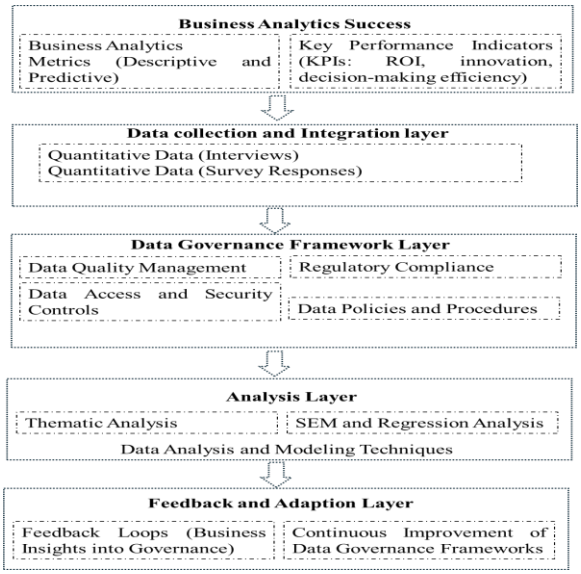

Figure 1. Proposed Architecture

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2024, 9(4s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

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The proposed architecture offers a robust framework to explore the relationship between data governance and effectiveness of business analytics. The suggested architecture will help establish a feedback and improvement cycle which will result in the successful use of data resources under the umbrella of multinational corporations through the inherent capacity to integrate data governance practices and outcomes of business analytics. Architecture will provide a tool that can use qualitative and quantitative approaches to allow a thorough examination of the factors that play a substantial role in the success of business analytics.

Results and Discussions:

This section outlines the results of the qualitative and quantitative studies carried out in the research. As per the methodology section of the study, the data collection was done through a series of critical stakeholder interviews of the representatives of global firms, and a quantitative survey among 250 people. The data analysis below has been conducted using the Structural Equation Modelling approach to gauge the relationship between the data governance and the success factors of business analytics.

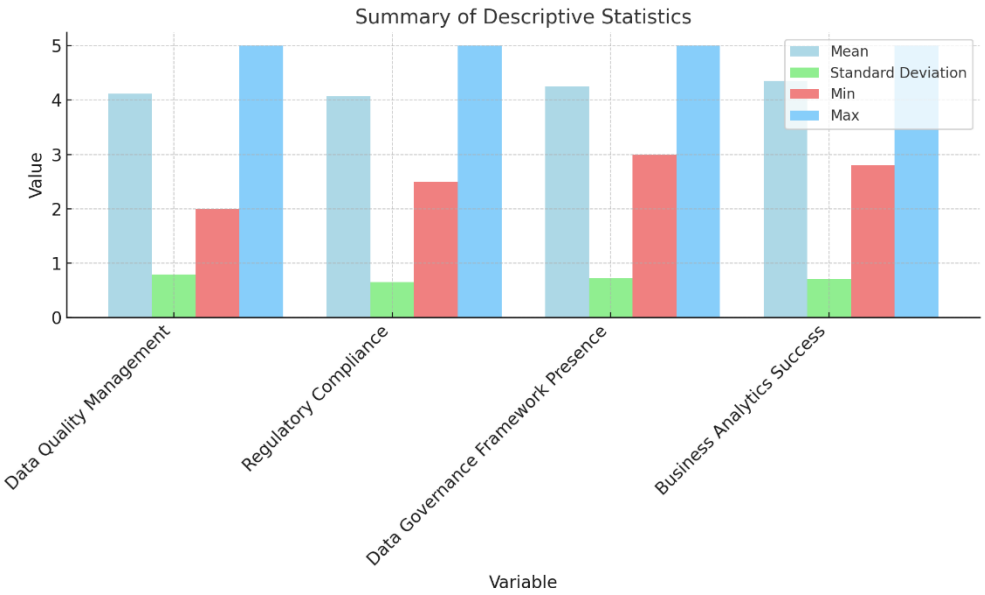

Figure 2: Summary of Descriptive Statistics for Data Governance Variables and Business Analytics Success

The findings of this study indicate that data governance plays a significant role in enhancing the success of business analytics in multinational organizations. Strong data quality management, regulatory compliance, and governance frameworks contribute to improved decision-making and organizational performance. The integration of AI, data analytics, and blockchain technologies supports sustainable business practices and strengthens governance frameworks through improved transparency and accountability (Rahaman et al., 2024). This suggests that organizations can further enhance the effectiveness of their analytics initiatives by adopting advanced, integrated technological solutions alongside robust governance mechanisms. Here's a snapshot of the descriptive statistics of the four key factors being measured in the study: Data Quality Management, Regulatory Compliance, Data Governance Framework Presence and Business Analytics Success, in Figure 2. The variables are represented on the x-axis, while the statistical values are represented on the y-axis, including the mean, standard deviation, minimum and maximum values. Mean (Light Blue): This value displays the average score for each variable (the most typical value). The mean values for the variables are all greater than 4,

Journal of Information Systems Engineering and Management
2024, 9(4s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

meaning that the majority of the companies surveyed had strict data governance rules and achieved analytics success. Standard Deviation (Light Green): This shows the spread of the data compared to the mean. The low values of the standard deviation for the variables suggest that the answers were quite consistent among the survey participants (somewhat different from the mean). Minimum (Red): Minimum is the lowest recorded score for the variable. The minimum Regulatory Compliance and Data Governance Framework Presence values are significantly higher than those of other variables. This means that, even at the low end, the performance of these areas of governance was very good. The highest value represents the maximum value for each variable, which was always 5 in all the variables examined. So, some data governance and analytics were doing very well, according to companies.

The graph shows how companies want to rate their data governance frameworks very highly, particularly in terms of managing data quality and compliance with rules. This is consistent with the success of their business analytics capabilities. The low standard deviations show that the variables must be essential and prioritized in most companies, highlighting the link between strong data governance and successful business analytics.

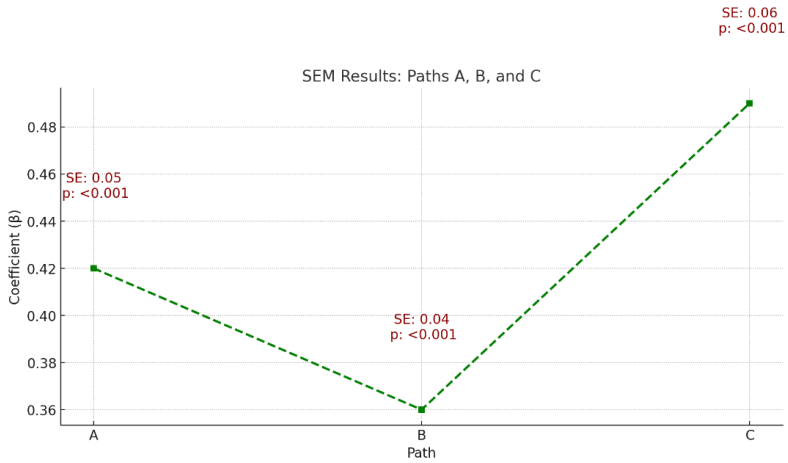

Figure 3. Structural Equation Modeling (SEM) Results: Coefficients of Key Pathways

Path A in Figure 3 shows how Data Quality and Analytics Success are related. Path B shows how Regulatory Compliance and Analytics Success are related. Path C shows how the Data Governance Framework and Analytics Success are related. The coefficient (β), standard error (SE) and p-values are displayed for each path. This picture shows the strength and significance of these connections. The picture is the output of a Structural Equation Modeling (SEM) analysis, including the path coefficients (β), standard errors (SE) and the p-value for three different correlations (Paths A, B and C) between the key variables in the study. The y-axis shows the values for coefficient (β) which represent the strength of the correlations. The x-axis represents three paths (A, B and C). Path A (β = 0.42): This path shows the relationship between the first independent variable and the dependent variable. The path coefficient (β=0.42) indicates that there is a weak positive line. The standard error (SE) for this path is 0.05, and the p-value is less than 0.001, which means that this path is statistically significant at the 0.001 level. The second link is represented by Path B (β = 0.36) and has a value of β=0.36, which means it has a lower, but still positive association. The standard error (SE) for this path is much smaller at 0.04, and the p-value is also less than 0.001, meaning that it is also a significant path. Path C (β = 0.49) is the most positively correlated, having a value of β=0.49, implying that it is strongly positively correlated.

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The standard error (SE) for this path is 0.06, and the p-value is less than 0.001, which means that this path is statistically significant. The dotted green line between the three paths (A, B, and C) shows the strength of the pathways. Path C is the most influential and Path B is the least. The small p-values (less than 0.001) for all three paths indicate that the associations between the variables are significant. So the independent variables have a strong influence on the dependent variable of this study. This figure shows that the three paths (A, B and C) are strongly positively correlated with the dependent variable. Path C has the most impact, followed by Path A and Path B. These findings underline the significance of the relationships between the variables in the study, and lend support to the notion that effective data governance practices enhance business analytics.

Table 2: Thematic Analysis Results from Qualitative Interviews

Theme	Frequency of Mention	Key Insights
Data Quality Management	18 out of 20 interviews	Data quality is considered crucial for accurate analytics, affecting decision-making.
Regulatory Compliance and Legal Concerns	15 out of 20 interviews	Compliance with global regulations is a key concern, especially in multi-jurisdiction operations.
Importance of Stakeholder Involvement	17 out of 20 interviews	Stakeholder engagement is necessary for successful implementation of data governance practices.

In Table 2 we show the common themes of qualitative interviews with data governance and business analytics leaders at multinationals around the world. The themes that were talked about regularly are shown in this table. It also shows the link between these topics and the effectiveness of data governance and business analytics.

Data Quality Management (18 of 20 interviews): 18 of 20 people talked about it. Eighteen interviewees reported that data quality management was important, indicating that this is an important element of business analytics. Most interviewees spent a lot of time talking about how the process of analytics goes out the window when the data is incorrect, and this results in poor decision making. Those businesses that invest in ensuring that their data is accurate, understandable and complete are more likely to have good analytics results. This ties in with the broader concept that controlling the quality of data is important to ensure the data used in analytical models is valuable and trustworthy.

Legal and regulatory concerns were expressed in 15 of our 20 interviews. This is important as it highlights the need for multi-national companies to comply with global data privacy rules. There was a fear among the interviewees to comply with laws such as the California Consumer Privacy Act (CCPA) and General Data Protection Regulation (GDPR) in the US and Europe, respectively. It's essential to ensure data governance policies and principles align to these rules so you don't violate any rules or pay fines. It will also help you keep customers' trust. This is particularly important for multinational companies which operate in many different countries, where the regulations can be very different.

Need for Stakeholder Engagement (17 out of 20 interviews): In 17 of 20 interviews stakeholders were seen as a serious issue. Many different people, such as data officers, IT managers, business analysts and legal professionals are needed for data governance. Interviewees agreed that when stakeholders from

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across the company are involved in data governance, it ensures data governance rules fit the business goals and strategies. This connection makes firms more likely to follow the rules, get high-quality data and be successful with business analytics. As everyone gets involved with the stakeholders, this also creates a culture of data accountability in the firm.

As Table 2 shows, the most important factors in achieving good data governance include ensuring quality data, compliance to the regulations, and the involvement of stakeholders in the data governance process. These ideas were mentioned repeatedly in the qualitative interviews, revealing how important they are for multinational businesses seeking to enhance their business analytics practices. All of these concepts are extremely important to ensure data governance frameworks are properly established. This will help ensure analytics efficacy and subsequent business performance.

The qualitative and quantitative assessments show that data quality management was an important aspect of business analytics efficacy. The SEM analysis revealed a strong positive relationship between data quality management and the efficacy of business analytics, as indicated by the path coefficient $\beta=0.42$ and p-value< 0.001, representing a strong, significant relationship. Thematic analysis showed interviewees often identified data quality management as a key element of analytics. Many people believe un-managed data results in wrong inferences, making it difficult to draw conclusions. This is backed up by other studies that show the need for good and clean data to achieve effective analytics. The SEM Model and interviews show that it is important to follow the law. Our SEM revealed a significant positive relationship between adherence to regulations and successful business analytics outcome with $\beta=0.36$ and p-value<0.001. This implies that companies following international data-safeguarding regulations, such as GDPR or CCPA are more likely to achieve better outcomes from their business analytics. Our interviews confirmed this, as interviewees were worried about following global data rules, particularly for multijurisdictional businesses. Survey participants noted that noncompliance could increase the risk that the company will have legal problems and make it more difficult to access important data that would improve analytics. This has been previously acknowledged in research showing that compliance is a critical element for successful data governance.

Having an established data governance framework had the biggest influence on the success of business analytics activity, as shown by a path coefficient $\beta=0.49$ ($p < 0.001$) in the SEM. This suggests that organizations that have a strong data governance framework, including rules governing data access, security, and use, are more likely to benefit from analytics. These results were backed up by the results from the interviews; companies that had data governance frameworks had more streamlined analytics processes. Popular themes included making sure data access restrictions are well understood, data security, and making sure the data governance process is aligned with the business strategy. Many respondents stated that if their companies didn't have these frameworks their data governance would be volatile and inconsistent, which could cause inaccurate analytics. What we learned from the theme analysis was that stakeholder involvement is crucial for data governance initiatives. Seventeen out of 20 interviewees agreed that it is important to take feedback from people in different business units to ensure that data governance policies are fit for purpose. This was a big idea.

Respondents believe that by involving stakeholders in the creation and implementation of data governance frameworks, the chances of these being accepted and complied with grow. This engagement ensures that data governance standards are seen as more than just the technical and operational requirements of the business, but strategic as well. Our quantitative and qualitative findings concur that the data quality management, compliance and data governance frameworks are crucial in successful business analytics. The SEM analysis gave a precise statistical model of the relationships between these variables while the interviews provided rich insights into the challenges and factors of success faced by multinational enterprises. The results are aligned with research in the field of data governance and business analytics, where it has been found that with robust data governance it yields better quality data

that can be used to generate valuable business analytics results improving decision-making and business success.

Conclusions:

The study looked at the key factors of data governance that contribute to the success of business analytics in multinational enterprises. A mixed-methods research design was used to show that effective data governance plays a key role in improving analytics. The importance of quality data, regulatory compliance, and stakeholder involvement were all viewed as crucial components of analytics success. Structural Equation Modeling (SEM) results demonstrated that well-organized governance strategies play a significant role in business analytics, which affects decision-making and business performance. These findings provide practical insight for companies to set up effective governance practices that manage data security, regulatory compliance and stakeholder engagement. By doing so, businesses can make better use of their data to gain a strategic advantage, which will help them compete in the increasingly data-driven business environment.

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e-ISSN: 2468-4376
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