

# Corporate Data Governance, an evolutionary framework, and its influence on financial performance

*Research Paper*

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## **Abstract**

*Data is considered one of the assets that organizations have to protect through a good corporate governance framework. Organizations must ensure that procedures and practices are in place to assess, direct, monitor and protect data and related infrastructure, for the value data provides to a corporation and thereby its stakeholders. The objective of a good data governance framework has to be in-line with the corporate governance objectives of maintaining and strengthening its contribution to market integrity and firm's economic performance. Moreover, data governance influences firms' performance by influencing the quality of data used for financial reporting and corporate takeover markets as internal governance mechanisms.*

*This paper is part of the doctoral thesis on "Data Governance Influence on Corporate Governance and Firms' performance", from Swiss School of Business and Management Geneva.*

*Keywords: Data Governance, Corporate Governance, Data Quality, Financial Performance, Evolutionary theory, Contingency theory*

## **1 Introduction**

Since decades, "governance" has been one of the most important research themes. Scholars have researched and debated on the theories and practical approaches by which corporations can be governed to protect shareholder's value and resolve agency problems.

We have known since 1970's, opportunities to purchase information and data at some cost can induce optimal scale of economies (Wilson, 1975). The data thus acquired can be directly monetizable or indirectly providing value to companies. By 2024, 75% of organizations in the world will have established centralized data and analytics centre of excellence to support federated Data and Analytics initiatives and prevent enterprise failure (Duncan, 2021).

Data is considered one of the assets that organizations have to protect through a good corporate governance framework (Tang, 2018). Organizations must ensure that procedures and practices are in

place to assess, direct, monitor and protect data and related infrastructure, for its value to enterprise and thereby its stakeholders. The guidance in European countries from regulators, especially around data privacy and Governance, has been fast influential since the General Data Protection Legislation (European Parliament and European Council, 2016) came into effect (Marelli et al., 2020).

The objective of a good data governance framework has to be in-line with the corporate governance objectives of maintaining and strengthening its contribution to market integrity and economic performance. Further, corporate governance is influenced positively by effective risk management (Şenol et al., 2018) and (Swain and Samantray, 2019) states this interrelation of influence, in Indian banking sector in particular.

Also, data governance can be more effective if the risk associated with data can be included in the overarching risk management framework. It has been argued that corporate governance and risk management are interdependent in the banking industry (Rehman et al., 2021). While value continues to dominate the Data Governance priorities in organizations, imbibing the principles of risk management can be essential to identify the effectiveness of the internal data control environment (Addagada, 2021).

## **2 Background**

### **2.1 Technology advancements, Digitization, and Data as a corporate asset**

As new technologies that manage data at scale like big-data platforms and cloud platforms evolve to digitize data, and, process data at scale in firms, it is an opportunity as well as a challenge for corporate governance (Tang, 2018). If data can be collected and consumed in perspective, a corporation can transform itself to profitability by understanding the markets better, as well as the internal environment to transform with data driven business models. This is particularly possible as data governance enables a firm's sensing capabilities (Mikalef and Krogstie, 2018). Also, a wave of digital transformation triggered by the pandemic has intensified the need for digitization of data and accountability in firms. Thereby, data availability in firms started to increase, which has progressively become a strategic asset to drive the firm's valuation (Taylor, 2012). Furthermore, data in firms, has to be managed as any other corporate asset, such as technology and people (Liakh, 2021). A corporate governance strategy should include the governance of data as an equally important sub-discipline as the governance of IT (Traulsen and Tröbs Marco, 2011).

### **2.2 A view into the history of corporate governance landscape**

In the 1980s that the term 'corporate governance' first appeared in use, and it quickly spread around the world (Tricker, 2009). Since 1930s, the theory of corporate governance has been developed as Berle

and Means ((Berle and Means, 1932)) studied the implications of 'modern corporations' for separation of ownership from control. Debates around corporate governance intensified since 1990s as corporate scandals in the U.S. and U.K. have resulted in an increasing lack of investor confidence in the honesty and accountability of listed companies and resulted in a market response to strengthen corporate governance code.

Following the corporate scandals of Pollypeck and BCCI in early 1990s, in the UK, the Cadbury Code (1992) has incorporated concerns regarding executive remuneration in 1995, strengthened requirements for director independence following the Higgs Review in 2003 as per Nordberg and McNulty (Nordberg and McNulty, 2013), and also strengthened the board's oversight of executives, as well as shareholders' oversight of boards following the Walker Review in the aftermath of the global financial crisis and most recently culminating specifically in the revised UK Code of Corporate Governance (Barker and Chiu, 2018).

Similarly in the U.S., corporate governance issues have been increasingly addressed with the Sarbanes-Oxley Act of 2002 (Rahman et al., 2013), passed after the Enron scandal in 2000, to the Dodd-Frank Act of 2010. The future research trends will be around environmental and economic sustainability, climate change

It has even been a defence of corporate chieftains at companies such as Enron, Worldcom, Merrill Lynch, Bank of Credit and Commerce International (BCCI) who claimed that they were not responsible for fraud because they did not have intelligibility on the accounting data (Robert L Laud and Schepers, 2009). The emergence of changes in investors apart from individuals, including institutional investors, such as insurance companies and pension funds, as well as the arrival of non-traditional investors, such as hedge funds, have also altered the character of the corporate governance codes. In terms of corporate governance mechanisms, internal mechanisms include incentives and monitoring, whereas external mechanisms include monitoring and disciplinary measures (Kostyuk et al., 2018). According to World bank, corporate governance majorly can be associated with two dimensions - control mechanism and direction (Zuva and Zuva, 2018). In their summary of corporate governance, the OECD emphasizes that it is a matter of "responsibility, transparency, accountability, and power distribution" within the organization. Core(1997) suggests that risk, in terms of information and operating environment, is an important determinant of the level of firms' performance (Hutchinson, n.d.).

### **3 A Brief Literature Review**

#### **3.1 Data Governance as a Board room agenda**

Fama and Jensen (Fama and Jensen, 1983) state the board of directors to be the central governance mechanism in corporations. The board of directors is therefore entrusted with exercising critical judgement in determining the company's goals, strategy, setting policies for achieving those goals, as well as monitoring progress (Mallin, 2019).

Since years ago, large corporations have struggled with growing amounts of data combined with insignificant and poor information quality. With corporate governance and regulatory compliance, managing data as information and intelligibility is now a board room agenda (Dittmar, 2008). It is imperative for executives to assess the relevance and reliability of new and vast volumes of data including performance reporting from the perspective of various stakeholders, as they continue to expand and become more complex (Robert L. Laud and Schepers, 2009).

Data governance as a formal function makes increasing volumes of data manageable with pace and is a predictor for sustainable knowledge creation. And sustainable knowledge creation is also a predictor for corporate information transparency and innovative, financial, and market performance that directly related to corporate governance (Abueed and Aga, 2019). By conducting a survey of 200 organizations across the globe, Pierce, Dismute, & Yonke (2008) state that 58% recognised data as a strategic asset. Alhassan, Sammon and Daly (2016) argue that the decision science of data governance equates to governing any corporate assets that have value or potential value.

In general, researchers refer to data governance as the allocation of roles, decision-making rights, and accountabilities around data assets (Khatri and Brown, 2010). Data governance is an oversight on data management activities to ensure that policy and ownership of data is enforced in the organization. The emphasis is on formalizing the data operations along with the associated data-based roles, responsibilities and accountabilities (Addagada, 2017).

Further, data governance provides professionalism to better manage data which often lacks to required extent. Governing data can happen through a set of change management activities that influences the continuous organizational development (Bollweg, 2022). Enterprise Data Management Council (EDM Council) often states that data governance is operationalized as a function that defines and implements standards, controls and best practices in managing data, in alignment with organization strategy (EDM Council, 2020). Data Governance Institute (DGI) defines data governance as a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods (Data Governance: The Basic Information - The Data Governance Institute, 2022).

### 3.2 Data governance frameworks and their evolution

In order to provide directions for further research on data governance, a collection of research areas and potential research questions has been compiled (Abraham et al., 2019).

Research Area	Topics of Interest	Research Question
Governance mechanisms	<ul style="list-style-type: none"> <li>Data governance evolution</li> <li>Allocation of decision-making authority</li> </ul>	RQ 3.3.1 How do data governance mechanisms evolve over time?

*Table-1: Topics of Interest from previous research*

Like Gong and Janssen (2019) and Senyo (2019) and, we take a structured, topic-centric approach to literature reviews. In this study, we summarized the relevant information from peer-reviewed scientific literature as well as selected practitioner publications in order to better describe the domain of data governance. Data Governance frameworks have evolved significantly over the past fifteen years in practice within organization with significant contributions to literature from professional bodies like DAMA and EDM Council.

The basic data framework, developed by Cheong and Chang (2007), focuses on defining roles, responsibilities, and accountability as well as organizational bodies and policies, standards and processes, and data governance technology, but is more of a people-based framework. The further evolution of data governance takes into account four specific roles: sponsor, data quality board, chief steward, business data steward, technical data steward, as well as the assignment of responsibilities. Using the RACI matrix to align roles and activities illustrates the strength of the framework (Wende, 2007). Weber and Otto (2007) provide insight into configuring data governance for companies based on contingency factors based on value pairs centralized or decentralized and hierarchical or cooperative models.

The next significant standardization of data governance was by Khatri and Brown (2010) as they defined decision domains (i.e., principles, data quality, metadata, data access, data lifecycle). Following this milestone in data governance research, other researchers including Spillane (2012) have extended data governance frameworks with scalability as a core theme thus defining core mechanisms (i.e., structural, procedural, relational). These frameworks then extend to specialized capabilities for cloud data storage derived from NIST principles Al-Ruithe (2016). Al-Ruithe, Benkhelifa and Hameed (2019) emphasized the importance of collaboration over data, by exploring options, exchanging offers, and reaching an agreement.

Then, the data governance frameworks were adapted to fit other industry standard frameworks in IT or risk management. Alhassan, Sammon and Daly (2016) analysed existing data governance literature to determine whether it aligned with either of the standard governance patterns (i.e., define, implement and monitor). Then, emerging models for data governance were defined using different theories (such as the contingency approach) and the decision domain model (Alhassan et al., 2016).

Another significant milestone in research is the OECD publishing a public data governance framework. It provides direction around securing leadership vision, implementation of data governance, publishing policy and laws, as well as the importance of governing data with architecture across its lifecycle. Further extension of the data governance framework includes specific focus domains (i.e., stakeholders, governance goals, value from data, governance mechanisms, reciprocity) (Micheli et al., 2020). There is also an emerging framework dealing with external social factors that structure data governance arrangements. The model from Liu (2022) is still nascent in maturity however data governance is expanding to increasingly align with corporate governance, sustainability and ESG for extended benefits to the economy and shareholders.

# Corporate Data Governance in Firms and their influence on financial performance

Paper	Framework Comp	Principles	Author	Relevant Information (Additional)	Review																																																
The Need for Data Governance: A Case Study,	People based framework, on responsibilities and accountabilities 1. Organisational Bodies and Policies 2. Standards and Processes 3. Data Governance Technology	Emphasizes the importance of a Data Governance structure together with policies and procedures for managing data effectively. Provides a structured framework for mitigating the risks of data management.	Cheong & Chang, 2007	<p>Figure 1. Data Governance Structure</p>	The strength is in the definition of stakeholders and stakeholder groups while giving them responsibilities through policy. The role of Data Steward role has core IT skills, however, they need not be cross-skilled across business and IT as stated. In order to be successful, data quality management must be closely integrated with the operations unit that acquires and processes data. This framework is stated to be managing data risks, however, there is no link to the Risk function. The process associated with data quality is not viewed holistically.																																																
A Model for Data Governance – Organising Accountabilities for Data Quality Management	1. Strategy – Develop a Data Quality Strategy 2. Organisation – Design the Data Quality Organisation 3. Information Systems – Design the Data Quality IS Architecture	Data governance model for the purpose of Data Quality Management, identifies four specific roles Sponsor, Data Quality Board, Chief steward, Business data steward, Technical data steward along with assignment of responsibilities.	Kristin Wende, 2007	<table border="1"> <thead> <tr> <th>Roles</th> <th>Executive Sponsor</th> <th>Data Governance Council</th> <th>Chief Steward</th> <th>Business Data Steward</th> <th>Technical Data Steward</th> </tr> </thead> <tbody> <tr> <td>Plan Data quality activities</td> <td>A</td> <td>R</td> <td>C</td> <td>I</td> <td>I</td> </tr> <tr> <td>Establish data quality review process</td> <td>I</td> <td>A</td> <td>R</td> <td>C</td> <td>C</td> </tr> <tr> <td>Define data producing processes</td> <td></td> <td>A</td> <td>R</td> <td>C</td> <td>C</td> </tr> <tr> <td>Define roles and responsibilities</td> <td>A</td> <td>R</td> <td>C</td> <td>I</td> <td>I</td> </tr> <tr> <td>Establish policies, procedures and standards for data quality</td> <td>A</td> <td>R</td> <td>R</td> <td>C</td> <td>C</td> </tr> <tr> <td>Create a business data strategy</td> <td></td> <td>A</td> <td>C</td> <td>C</td> <td>R</td> </tr> <tr> <td>Provide information systems support</td> <td></td> <td>I</td> <td>A</td> <td>C</td> <td>R</td> </tr> </tbody> </table> <p>Legend: R - Responsible, A - Accountable, C - Consulted, I - Informed</p>	Roles	Executive Sponsor	Data Governance Council	Chief Steward	Business Data Steward	Technical Data Steward	Plan Data quality activities	A	R	C	I	I	Establish data quality review process	I	A	R	C	C	Define data producing processes		A	R	C	C	Define roles and responsibilities	A	R	C	I	I	Establish policies, procedures and standards for data quality	A	R	R	C	C	Create a business data strategy		A	C	C	R	Provide information systems support		I	A	C	R	<p>The purpose of this data governance model is to identify roles and organizational alignment with a brief description. Placing the roles against the activities showcases the strength of the framework through the RACI matrix. Even though draft decision areas or processes have been provided, they are not comprehensive. Certain decision areas that need to be considered are:</p> <p>"Defining an operating model" that states how roles interact, in alignment with the skillsets of the stakeholders involved.</p> <p>Plan, and prioritize critical data to assess.</p>
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A contingency model for data governance	1. Centralized data governance 2. De-centralized data governance 3. Hierarchical data governance 4. Cooperative data governance	An elaborate analysis of the interaction of roles and responsibilities and the design of decision-making.	Weber & Otto, 2007	<p>Figure 3. A contingency model for data governance</p>	Provides insight into configuring data governance for companies based on contingency factors based on value pairs centralized/decentralized and hierarchical/cooperative models. While the roles of business data stewards have been stressed, there is less guidance on whether they are part-time business representatives in a distributed model or full-time in a centralized model. The contingency factors are narrow in scope and do not take into account internal policy, regulations, technology adoption, etc into account.																																																
Designing Data Governance	Five data decision domains 1. Principles 2. Data Quality 3. Metadata 4. Data access 5. Data Lifecycle	IT Governance as the context for data Governance.	Khatri & Brown, 2010		The framework is aligned with IT Governance and provides basic tenets for data governance that did not exist in the literature. As an example of leveraging lessons from IT Governance, the emphasis on data architecture decisions similar to establishing the IT infrastructure is missing. Data Architecture as a formal decision domain is lacking that drives decisions around the choice of platforms, tools, and approaches to managing data that shape costs and benefits. Moreover, Data access as a domain can be myopic, but, can use Data Processing as a sub-dimension, as the recent policies in data protection are around the processing of data.																																																

Table-2: Evolution of data governance and it's frameworks

# Corporate Data Governance in Firms and their influence on financial performance

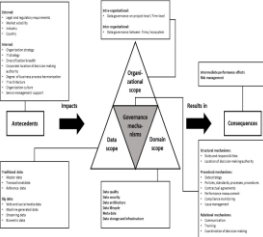
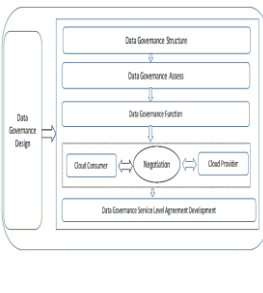
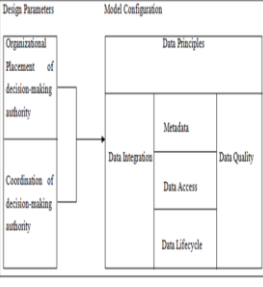
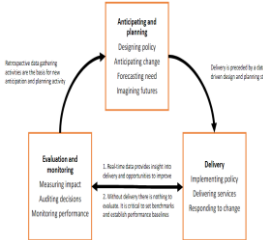
<p>Data Governance: A conceptual framework, structured review, and research agenda</p>	<ol style="list-style-type: none"> <li>1. Structural</li> <li>2. Procedural</li> <li>3. Relational</li> </ol>	<p>Governance mechanisms comprise formal structures connecting business, IT, and data management functions, formal processes and procedures for decision-making and monitoring, and practices supporting the active participation</p>	<p>Spillane, 2012</p>		<p>The framework is scalable to include contingency factors such as regulation, public policy while including all aspects of data lifecycle management. The dimensions can be extended to Data Modeling, Data Integration, Content management, Business Intelligence to make Data Governance more structured and formalized across the lifecycle of data.</p>																									
<p>A Conceptual Framework for Designing Data Governance for Cloud Computing</p>	<ol style="list-style-type: none"> <li>1. Data Governance Structure.</li> <li>2. Data Governance Assessment.</li> <li>3. Data Governance Function.</li> <li>4. Negotiation.</li> <li>5. Data governance Level Agreement</li> </ol>	<p>Derived from principles of NIST</p>	<p>Al-Ruithie, Benkhelifa &amp; Hameed, 2016</p>		<p>The strength of the framework is its thoughtful collaboration of data between parties. Negotiation has been defined as "a process where two parties with differences which they need to resolve are trying to reach an agreement through exploring options and exchanging offers and an agreement. The contract negotiation mentioned is more concerned with a legal framework than data capabilities. In terms of data, contracts may include negotiating for local data storage, protection controls, observability of data infrastructure, non-functional specifications, data quality thresholds, and audit controls.</p>																									
<p>Data governance activities: an analysis of the literature</p>	<ol style="list-style-type: none"> <li>1. Define</li> <li>2. Implement</li> <li>3. Monitor</li> </ol>	<p>frequency analysis of the data governance activities mentioned in the selected papers. The analysis points to a low frequency for 'implement' and 'monitor' actions this could indicate a lack of maturity around data governance</p>	<p>Alhassan, Sammon &amp; Daly, 2016</p>	<table border="1" data-bbox="805 801 1069 1043"> <thead> <tr> <th></th> <th>Concept</th> <th>Action</th> <th>Area of governance</th> <th>Decision domain</th> </tr> </thead> <tbody> <tr> <td>Defines roles</td> <td>Define</td> <td>Define</td> <td>Data roles and responsibilities</td> <td>For all decision domains</td> </tr> <tr> <td>Assigns responsibilities for decision</td> <td>Implement</td> <td>Implement</td> <td>Data roles and responsibilities</td> <td>For all decision domains</td> </tr> <tr> <td>Establishes guidelines for data quality management</td> <td>Define</td> <td>Define</td> <td>Data guidelines</td> <td>For data quality</td> </tr> <tr> <td>Establishes standards for data quality management</td> <td>Define</td> <td>Define</td> <td>Data standards</td> <td>For data quality</td> </tr> </tbody> </table>		Concept	Action	Area of governance	Decision domain	Defines roles	Define	Define	Data roles and responsibilities	For all decision domains	Assigns responsibilities for decision	Implement	Implement	Data roles and responsibilities	For all decision domains	Establishes guidelines for data quality management	Define	Define	Data guidelines	For data quality	Establishes standards for data quality management	Define	Define	Data standards	For data quality	<p>This analysis of literature resonates with the practical conditions around governing data. Data Governance is associated with activities Assess, Direct, Monitor, if a risk or IT governance framework like COBIT is taken as a standard. There can be a better classification of "Areas of Governance" in Monitor "Actions". Monitoring in data governance is a continuous set-of activities which usually must be accompanied by an initial Assessment to reach consensus on what aspect of data operations have to be monitored for better benefits.</p>
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<p>Data Governance: A Challenge for Merged and Collaborating Institutions in Developing Countries</p>	<ol style="list-style-type: none"> <li>1. Contingency model</li> <li>2. Decision domains</li> </ol>	<p>The emergent model for data governance using contingency approach &amp; ata governance decision domains model</p>	<p>Ruhode, 2017</p>		<p>The strength of the framework, is its derivation from contingency model and the data governance decision domain model. The emergent model suggested could have used some enriched dimensions such as data processing and data architecture, and design parameters including contingency factors such as mergers, internal policy, regulations, technology adoption etc. The approaches suggested like the hybrid approach where decisions are mixed between individual departments and IT department would have been supported by the analysis of choosing such approaches.</p>																									
<p>The path to becoming a data-driven public sector, OECD Digital Government Studies</p>	<ol style="list-style-type: none"> <li>1. Strategic</li> <li>2. Tactical</li> <li>3. Delivery (Day to Day)</li> </ol>	<ol style="list-style-type: none"> <li>1. Securing leadership and vision for strategic vision</li> <li>2. Encourage implementation across government</li> <li>3. Placing policy, laws, guidelines and standards associated with data</li> <li>4. Ensuring existence of data architecture</li> </ol>	<p>Rene Abraham, Jan vom Brocke, Johannes Schneider, 2019</p>		<p>The framework is well rounded around establishing a control framework that can derive value from data as it moves through its lifecycle. The inclusion of leadership on data based decisions is well articulated, and importance of data architecture is well emphasized. Planning for data and it's infrastructure is critical, and this phase is well emphasized in the literature. For the social perspective of impact on citizens, the ethics associated with data access, processing an protection have been stressed on with a focus on risks associated with them.</p>																									

Table-2: Evolution of data governance and it's frameworks



<p>Emerging models of data governance in the age of datafication</p>	<p>Analytical dimensions of data governance 1. Stakeholders 2. Governance goals 3. Value from data 4. Governance mechanisms 5. Reciprocity</p>	<p>1. Analytical dimensions, drawing in particular from. 2. Adopts a social science-informed perspective of data governance that complements other framings, such as those of platform governance or privacy and data protection law</p>	<p>Micheli &amp; Suman, 2020</p>	<p>Table 1. Analytical dimensions</p> <table border="1"> <thead> <tr> <th>Dimension</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>Stakeholders</td> <td>The individuals, institutions, organizations or groups who are affected by or have an effect on the way data is generated and the value created.</td> </tr> <tr> <td>Governance goals</td> <td>The objectives held by actors who influence how data is generated.</td> </tr> <tr> <td>Value from the data</td> <td>The resources expected to be generated from the use of data and how these are distributed among actors and across society.</td> </tr> <tr> <td>Governance mechanisms</td> <td>The different instruments adopted to achieve specific governance goals, including the underlying principles.</td> </tr> <tr> <td>Reciprocity</td> <td>The power relation between stakeholders for data access and use.</td> </tr> </tbody> </table>	Dimension	Definition	Stakeholders	The individuals, institutions, organizations or groups who are affected by or have an effect on the way data is generated and the value created.	Governance goals	The objectives held by actors who influence how data is generated.	Value from the data	The resources expected to be generated from the use of data and how these are distributed among actors and across society.	Governance mechanisms	The different instruments adopted to achieve specific governance goals, including the underlying principles.	Reciprocity	The power relation between stakeholders for data access and use.	<p>The framework suggests a focus domain, "Reciprocity" that refers to the power dimensions between stakeholders in accessing, controlling, and using data. This is a scenario often found in small companies and corporations with mergers or global operations. The derived synthesis of power dynamics associated with data could have been explained in-depth with aspects like data democratization on the heels of data protection, which can help govern data better. Additionally, Public &amp; Private Data Ownership is an aspect that could have been expanded to include the dynamics of ownership of data generated by citizens and by internal functions. The four models defined can lead to well-articulated public policies.</p>
Dimension	Definition																
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<p>Social data governance: Towards a definition and model</p>	<p>Social data governance spans four dimensions 1. Individualism 2. Libertarianism 3. Authoritarianism 4. Communitarianism</p>	<p>This preliminary model, consisting of a two-dimensional continuum, state intervention and societal autonomy for the one, and national cultures for the other. Uses a socio-technical perspective to describe four emerging models of</p>	<p>Jun Liu, 2022</p>		<p>The framework considers external social factors that structure data governance arrangement. The model is still nascent in maturity, while it is yet to be made clear, on how corporations or governments can leverage on a specific quadrant into which they fall into, basis societal dimensions. The paper considers the long-term interest in state intervention and societal autonomy in governance as well as cultural aspects to derive this theory of marginal data governance.</p>												

Table-2: Evolution of data governance and its frameworks

### 3.3 Proposed Data Governance Framework

The general theories chosen for the proposed data governance framework are contingency theory (Lawrence and Lorsch, 1967) and evolutionary theories (Nelson and Winter, 1982). Along with explanations of how actors are responding to various kinds of pressures and influencing forces, trust and emotions of internal and external stakeholders should be included while providing for a framework on data governance (Huse, 2005). Scholarly and practitioner literature on data governance focuses on organizational structure and decision-making authority placement.

#### 3.3.1 Contingency Model for Data Governance

Compared to the even more recent concept of data governance, IT governance has evolved from the initial concept of corporate governance. Organizational management, IT Governance and data governance research are critiqued for their assumptions of relation with fit and performance along with rational actors, and design parameters like organization structure (Negandhi and Reimann, 1972; Weber and Otto, 2007; Weill and Olson, n.d.). Contingency theory emerged during the 1950s in response to previous management theories which only emphasized a single method of organizing management and control. There might not be one management and governance model that works for every organization, and a model needs to be customized according to contextual factors, such as the environment, technology and market in which they operate (Negandhi and Reimann, 1972). Contingency theory of organization, is focused on two types of variables (e.g., the effect of

environment variables on organizational structure, and the effect of sub-unit structure on organizational performance) (Weill and Olson<sup>^</sup>, n.d.).

There is a relationship between organizational characteristics and organizational effectiveness that is determined by contingencies. In most studies of corporate governance, analysis of contingency factors has been addressed in several literatures including corporations (Aguilera and Jackson, 2003), small and medium-sized companies (Anheier and Theodor Baums, 2020) and firms in various life-cycle phases, including young firms (Lynall and Golden, 2003). The contextual factors used in corporate governance research that can be cascaded to data governance are

1. National, geographical and cultural differences
2. Industry and the industrial environment of the corporation
3. Ownership dispersion and types
4. Firm size
5. Life-cycle variations including the importance of crises and the configuration of corporate resources
6. CEO tenure, attributes and background

Contingency theory traditionally addresses the fit between organizational structure and the environment (Elgharbawy, 2021). Scholars later enhanced contingency theory from the environment fit to internal conditions within the organization, such as structural formalization and specialization, as contingencies (Miller, 1992). As organizational contingencies change, the contingency model configures corporate data governance accordingly (Weber and Otto, 2007). Weber and Otto named certain factors as contingent on data governance, but did not specify how these factors influence the organization performance or governance archetypes. In conclusion, data governance researchers have considered two domains: the organizational structure of data quality management activities and the placement of decision-making authorities. They suggest that contingencies affect data governance and that a data governance configuration is specific to a given company (Weber and Otto, 2007). Further, the contingency factors that have been researched earlier to have an impact on data governance are –

1. Firm size
2. Structure
3. Competitive strategy
4. Corporate governance
5. Decision-making style

We have proposed a Contingency based research model for data governance that includes a combination of contingency factors, design parameters and outcome parameters. The contingency factors influence the design of the data governance operating model as well as its outcomes in the form of benefits to the shareholders.

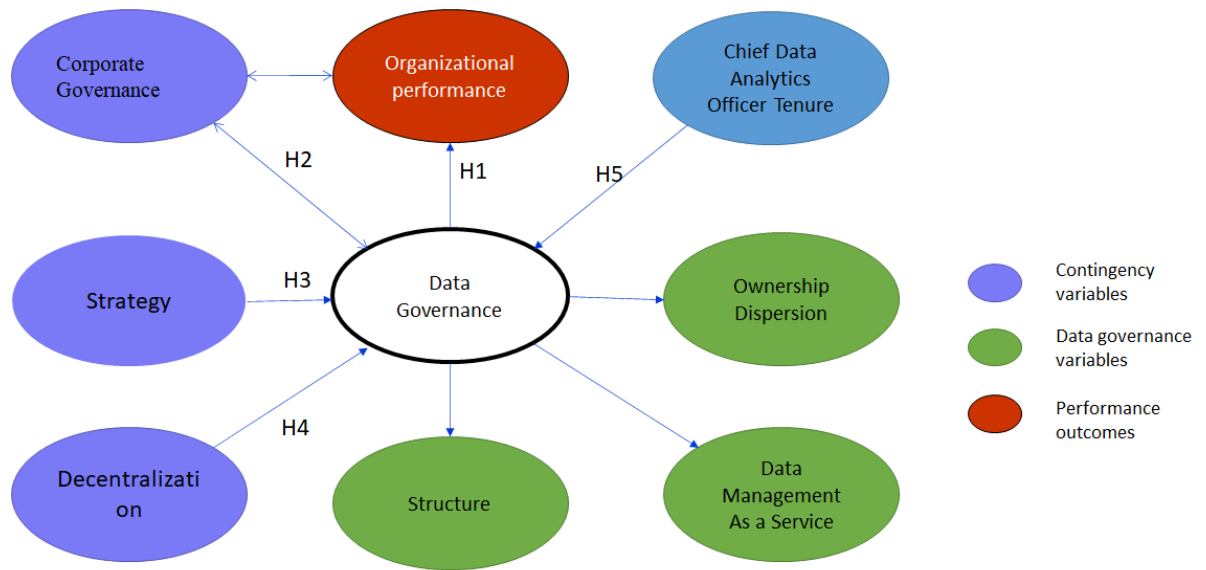


Figure 1. Contingency based research model for data governance

The impact of inadequate data governance and data breaches of customer data are in terms of direct costs, brand damage and missed opportunity in corporations (Gregory, 2011). There is another school of thought that states if organizations use too bureaucratic, complex, and restrictive data governance mechanisms, this ‘over-governance’ could lead to a performance decrease by limiting data-led innovations and motivating users to bypass policies and take unnecessary risks with their data (Abraham et al., 2019). Data governance provides the framework for addressing complex issues such as improving data quality or developing a single view of the customer at an enterprise level (Panian, 2010). Bigdata along with data governance is a strategic factor and has significant impact on organizational performance (Pfahlsberger and Mendling, 2021). According to Kamioka (2016), data governance has a positive impact on data utilization, resulting in an increase in sales and customer spending. According to Mikalef (2018), data governance improves a firm's dynamic and operational capabilities by improving the existing mode of operations. Therefore, the first inference can be made: data governance and an organization's effectiveness under a variety of contexts are positively correlated.

***H1: Data Governance is positively associated with organizational effectiveness based on context***

A corporate governance structure should include the governance of data as an equally important governance area as the governance of IT (Traulsen and Tröbs Marco, 2011). Formalization of data

management through data governance can increase transparency, accountability, responsibility, independence and fairness in implementing corporate governance (Lestari, 2020). In sections 3.4, the relationship between corporate governance and data governance has been well studied, and the following hypothesis has been proposed (Hsu and Yang, 2022)

***H2: The efficiency of data governance is positively related to corporate governance in an organization***

The first step to managing data with formality is to determine a data governance structure that fits the organization. There are certain characteristics that can affect the determination of data governance structure, such as adopting an offensive strategy to monetize data insights or improving sales, versus adopting a defensive strategy to ensure data compliance or accurate disclosures (Lancaster et al., 2019).

As (Wolf, 2002) puts it, the governance phenomenon takes place within horizontally organised structures where both state and non-state actors (including citizens) interact. However, in this governance phenomena, power disparities among actors continue to exist, which is easier in theory than in practice (Micheli et al., 2020). Such a conflict of power between IT, business divisions or board of directors can be managed through the right structure of data management. So, data governance is a framework, which provides structure and formalization for the management of data (Abraham et al., 2019). Further, structural governance mechanisms determine reporting structures, governance bodies, and accountabilities (Borgman et al., 2016; Peterson, 2004).

Ownership dispersion is a crucial design parameter in data governance. As per existing literature, there are three archetypes for the distribution of accountability in the structure of the organization: centralization, federation, or decentralization (Otto, 2011a). Furthermore, highly regulated markets require a more centralized organizational structure than markets with less or no regulations (Weber and Otto, 2007). Further external factors encompass market volatility (Otto, 2011b, 2011a), the industry the company operates in (Milman et al., 2008; Otto 2011b; Tallon 2013), and the country the company is located in (Nguyen et al., 2021). To summarize, it's inferred that the formality of the effective data governance structure is related to the degree of certainty and stability of its market and environment. Contingency theory assumes that better the "fit" among contingency variables (e.g., between context factors and data governance structure), the better the performance of the organization. Thus, the following hypothesis can be arrived at:

***H3: The structure of data governance model is positively associated with operating environment and Strategy***

Business divisions can, for example, create data products or management information systems (MIS) for local needs, within their priority, if decision-making is decentralized. A high degree of centralization, in contrast, is likely to impede such responses (Palmié et al., 2016). Coordinating decision-making refers to aligning divisions for an organizational objective like ensuring financial data is managed for quality. Such alignment can be referred to as interdependencies and can result in a substantial need for coordination among units (Ambos and Schlegelmilch, 2007). This requires planning for extensive co-ordination through formality in reacting to events that need exchange of information to solve for a problem like managing quality and meaning of regulatory disclosures. Such scenarios influence the way that data management can be published as a service across sub-units within data management and governance. Such services from sub-units will require coordination and collaboration of decision making, within the autonomous bounds of these units and the organization as a whole (Castañer and Oliveira, 2020).

Firms operating in relatively dynamic environments tend to be decentralized, while those facing more stable environments tend to be centralized (Lawrence and Lorsch, 1967). According to this theory, the "optimal" data governance structure varies with the environment in which the organization operates. These authors further proposed that decentralization under stable environmental conditions and centralization under dynamic conditions may actually be dysfunctional. In other words, they argued that an organization must establish a "fit" between its internal structural arrangements and its external environmental demands.

***H4: Decentralization under stable environmental conditions and centralization under dynamic conditions may impact outcomes of data governance***

Managing the data governance program on a day-to-day basis is the responsibility of the data governance leader (Loshin, 2009). The leader provides guidance concerning the design, delivery, and maintenance of data and provides an oversight on compliance with data policies (Dyché & Levy 2006). With the current state of organization structures, data leader positions were not senior enough to drive change, or engage directly with senior leadership (Giordano and Onions, 2021). To combat this engagement problem, increasingly, firms that are bullish on using bigdata are establishing Chief Data Officer (CDO) positions to maximize the value of data. As a new member in the executive management, CDOs contribute positively to firm performance (Nie et al., 2019). Under certain conditions, the stock market as well does react positively to announcements of newly created CDO positions (Zhan et al., 2022). Once the organization goals for data are agreed upon, the CDO can help to build data assets, management approaches, and management skills to ensure that the unit can

achieve the goals. To conclude, a long tenure CDO with a C-level presence can realize the strategy in the long run, that spans beyond three years. Hence, the below hypothesis can be made:

***H5: Tenure of the CDO positively influences outcomes from data governance***

As we make five hypothetical statements supported by literature, the next aspect highlighted in figure-1 is the importance of using design parameters that are also related to the contingency factors, in the design of optimal data governance in an organization.

- ***Ownership dispersion:*** placement of owners and decision makers related to data activities (Weber and Otto, 2007)
- ***Data governance structure*** – centralized, de-centralized or hybrid models along with definition of roles, accountabilities(Wende, 2007)
- ***Data management as a service*** – Innovating, and publishing sub-units within data management along with assessment, direction and monitoring from data governance, for greater control and faster reaction to independent data events like breaches or policy overlaps (Addagada, 2021).

### **3.3.2 Evolutionary Model for Data Governance**

The resource-based and knowledge-based theories focus on business strategy and achieving competitive advantage within companies with a common approach to transactions and organizational management analysis. Organizations, like organisms in Darwin's biology, require two conditions for survival: a heritable variation in form and a variation in survival and replication that explains the variation. Hence, adaptation confers survival advantages through variations, selections, and retentions (VSR) (Levinthal, 2007). The data governance model in its broadest sense, then represents the organizational embodiment of a firm's characteristics and capabilities to control VSR. Organizational success is driven by a set of routines throughout the organization that is constantly adapting through the VSR process (Downs and Velamuri, 2018a).

According to the evolutionary approach, companies are organized as "enterprises", being characterized by three main attributes:

- they act strategically, i.e., they choose their own segment on which to compete
- they strategize in an offensive approach and just not to minimize costs through consistency and long production series, but to constantly innovate their products, processes, and organizations.
- they maintain people deployment flexibility at all levels, maintaining the competitive advantage through continuous improvement.

The evolutionary perspective is indicated through various learning loops. These may be at individual, group, organizational, and societal levels (Huse, 2005). Evolutionist theories, in their diversity, are focused on issues such as long-term impact of changes within the firms, in terms of processes, products, decisions, analysis of the determinants of success. The theory is based on the essential characteristics of the company, including its strategy, structure and organizational capabilities (Anca, 2012). If the first two are widely known and discussed in literature, organizational capabilities are a relatively new category that is mildly researched. An organization's capabilities are not limited to its managerial capacity, but can also include its processes and technology capabilities, which need constant innovation and improvement and can be incur costs.

### **3.3.3 Data Management as a Service, and Data Governance framework**

Combining evolutionary theory's view of organizational capabilities for successful value creation in data management along with views of researchers like Barnett (2021), it is vital for organizations to adopt and innovate into enhanced organizational capabilities in data management, such as Data Management as a Service (DMaaS). This helps organizations to focus on the benefits and value rather than cost-reduction when the service is handled centrally by experts or outsourced.

Data as a service (DaaS) is another service that provides firms with data in the format they require. For data to be governed and made useful for business, management, people, and processes must be in place (Barnett, 2021).

DMaaS involves a strategic partner taking over the technical services provided by DaaS, as well as the data management routines, people, and processes related to the CDO role. With DMaaS, offensive strategies can be launched that generate value while still being flexible enough to satisfy defensive strategies. Furthermore, data governance as a function can ensure that DMaaS is sustainable, enabling active data management.

As part of data management, the Data Quality Management (DQM) sub-function defines the goals, approaches, and plans of action that ensure data content is sufficiently accurate and complete to support defined business and strategic objectives. DQM should be developed in alignment with business objectives, measured against defined data quality (DQ) dimensions and based on an analysis of the current state of DQ. DQM is a series of processes across the full data supply chain to ensure that the data provisioned meets the needs of its intended consumers (EDM Council, 2020) .

Most challenges in managing data can be overcome by re-discovering and standardizing the current data quality management processes into regular routines of data operations combined with managerial resource availability. Often organizations will have to define a Target Operating Model (TOM) that

consists of discrete functional modules that encapsulate people with required skills, routines and technology collaborate through service calls (Addagada, 2017).

Each data management function like the data quality sub-unit can be considered a Data Governance Area (DGA). A DGA groups together business processes, people in the form of roles, and technology capabilities to achieve an end goal. This could be something as simple as ensuring that financial disclosures or regulatory reports are 100% accurate. Each Service Domain (SD) like service setup, defines a unique, discrete, and logical set of business, process, and technology capabilities. A Service Operation (SO) is a coherent instantiation of activities within a Service Domain (SD). An example of a SO is “Develop Data Quality Strategy”. A SO further describes a high-level dependency in one Service Domain (SD) or between two Service Domains.

- 3.3.3.1 *Data Governance Area (DGA)*: Defines the highest-level classification of the governance domain that covers sub-functions within data management. The DGA groups a set of business processes and technology capabilities to achieve an end goal for data management. Data Quality for example is a governance area within the data management function that will require policy, operating model, people, data quality assessment as well as issue management processes, and required tools like profiling or scorecards.
- 3.3.3.2 *Service Domain (SD)*: Defines the finest logical level of partitioning, each defining unique, discrete business, process, and technology capabilities. The service domains are the elemental building blocks of a data management service landscape. Examples of service domains are Service Usage and Service protection.



*Service Operation (SO):* Describes what business, process or technology functionality should be contained in an effective collaborative function, as well as the functionality it needs to access through delegated service operation calls to other service areas and service domains. In general, a service operation is a routine, which is a combination of a functional pattern and an asset that is being maintained. A data quality service can be well defined by a set of service domains, including service setup, service promotion, service usage, service protection, service monitoring and improvement. A service operation in addition to driving and reinforcing organizational routines, involves an interplay between signalling, messaging, and the search will expose mutagenic innovation opportunities between these routines. Overall, this interplay has a significant impact on a company's success. As this interplay of reciprocal dependency becomes more efficient, the better (Downs and Velamuri, 2018b).

3.3.3.3 *Functional Pattern:* Data management behaviour patterns are the regular and predictable patterns that govern all of its activities. These routines transmit variation, including not only decision and choice-related activities but also how and how efficiently activities are performed. In essence, routines are the source of the competitively differential set of organizational traits that determine a firm's sustainable success.



Figure 2: Evolutionary theory-based illustration of Data Quality Management Service, A Data Governance Area

There are specific domains that can be used to define a data quality management service, such as service setup, service promotion, service usage, service protection, and service monitoring and improvement, as illustrated in Figure-2.

A firm's competitive survival is said to depend on a set of routines and the resulting traits. Nevertheless, these routines can change (mutate) both as a result of serendipitous events (i.e., natural selection) and purposeful efforts (i.e., directed selection). The mutation is an effective and important dynamic that can increase the chances of a firm's survival. Mutation can happen through continuous learning loops which has been formalized through a specific service domain (i.e., data quality service monitoring and improvement).

In Table-3, the service domain "Data Quality Service Set-Up" describes the service operations, including the functional pattern and asset.

Service Domain	Service ID	Functional Pattern	Asset	Service Operation
Data Quality Service set-up	SD1.1	Plan	Strategy	Develop Data Quality Strategy and design approach
Data Quality Service set-up	SD1.2	Communicate	Strategy	Communicate strategy to relevant stakeholders and council
Data Quality Service set-up	SD1.3	Plan	Operating Model	Plan operational processes and develop an operating model
Data Quality Service set-up	SD1.4	Communicate	Operating Model	Communicate operating model to people with specific roles assigned to people, and council
Data Quality Service set-up	SD1.5	Administer	Feedback Solicitation	Solicit and incorporate feedback into strategy and operating model
Data Quality Service set-up	SD1.6	Endorse	Strategy and Operating Model	Sponsor, chief data officer, council and representatives will sign-off and provide acceptance on the Data Quality Strategy and Operating Model

Table-3: Data Quality Governance Area, illustrated Data Quality Set-up Service Domain with combination of Functional patterns and Assets

### 3.4 Extending data governance in alignment to corporate governance and Financial Performance

The parallel evolution of concepts and frameworks on data governance and corporate governance has been discussed in previous literature. In addition to being governed by accountability, data as a corporate asset (Perna, 1995) must be protected by procedures and practices, as well as reviewed in the context of the data control environment. Most data governance frameworks are generic in describing

how to define activities that govern data. However, literature reflects the lack of research in the 'implement' and 'monitor' decision-domains like data policy (Alhassan et al., 2016).

There also has to be an emphasis on the central role of business executives in the governance of data (Naciti et al., 2021). Formalization of management through data governance can increase transparency, accountability, responsibility, independence and fairness in implementing corporate governance (Lestari, 2020). The four constructs of structure, process, participants, and success of an inter-organizational data governance domain align to corporate governance principles and help in creating a data ecosystem that is well governed (Jagals and Karger, 2021). Apart from the four theoretical constructs above, in the present day, there is also a need to identify the relationships in view of validation in implementation environments, between activities in decision domains of data governance that extend to corporate governance principles like risk management, responsibility and accountability as well as inter-organizational co-ordination to achieve goals, while suggesting areas of future research.

From previous literature, the focus of governing data, is mostly on topics including data protection and security but less on how organizations handle data issues in inter-organizational environments (Eisenhardt, 1989). However, this has to be expanded to holistic aspects of data risk and data management not just limiting to data privacy and security. One such aspect to quote is governing data to ensure that reported financial information is qualitative that impacts decision-making of investors and other stakeholders (Hsu and Yang, 2022). Further, several researchers have discussed the influence on quality of data used for financial reporting on manager compensation as an internal governance mechanism and corporate takeover market as an external governance mechanism which makes data governance to be influencing firms' performance (Hsu and Yang, 2022; Li et al., 2018; Perna, 1995; Pucheta-Martínez et al., 2016; Ur Rahman et al., 2019).

## **4 Conclusion**

The objective of a good data governance framework has to be in-line with the corporate governance objectives of maintaining and strengthening a corporation's contribution to market integrity and adding value as a corporate asset (Otto, 2011a, 2011b). In addition to being governed by accountability, data as a corporate asset (Perna, 1995) has to be protected by procedures and policy to create an internal control environment. With growing volumes and implications of big data, data governance mechanisms improve the value protection of business attained through data driven capabilities. Formalization of management through data governance can increase transparency, accountability, responsibility, independence and fairness in implementing corporate governance.

Moreover, the paper further provides a brief literature review on influence of data governance on corporate governance to be a positive influence.

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