Designing Data Governance Structure:
An Organizational Perspective

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Abstract—**High quality data is a key source of business value, but data quality issues in organizations are often addressed inadequately and pertinent Data Governance (DG) is called for. This paper focuses on the accountability aspect of data governance: the assignment of decision rights and responsibilities pertaining to data management. We follow the design science approach and examine how Agile Governance Model (AGM) can be used as the basis of designing a pertinent governance structure for the organizational arrangement of data governance accountabilities. We distinguish common data management roles based on the literature, analyze the organizational coverage of these data governance roles, and demonstrate how AGM can be used to ensure that requisite accountabilities will be addressed throughout the enterprise at the right organizational levels and aspectual loci.**

Index Terms—**accountability, data governance, design science, governance structure**

I. INTRODUCTION

FOR decades, the focus of information technology has been on efficiency: automating business tasks and streamlining operations. Point solutions and individual automation projects have resulted in a complex information landscape characterized by redundancy, inconsistency and variance. Lack of trusted information adds risks and costs, impedes business change and leads to poor or even wrong managerial decisions. Organizations seek to break down the silos of information and unlock trusted information to flow freely to where it is required. At the same time, appropriate safeguards and measures need to be put in place to protect sensitive information, provide transparency and minimize risk, while fulfilling compliance requirements [1].

The need for better responsiveness and increased demand for high quality information at all levels of an organization has necessitated greater scrutiny of data management and protection practices. While data quality has been associated with data governance [2], [3], research has not focused on the accountability aspect thereof. We view that new attitudes, management practices and accountabilities for data management and governance are required to ensure quality information for decision-making.

Data governance can be defined as an organizational approach to data and information management that formalizes a set of policies and procedures to encompass the full life cycle of data, from acquisition to use and to disposal. Marco [4] argues that perhaps the greatest benefit of a data governance initiative is to make organizations realize that data is a valuable enterprise asset. In many organizations this can be overlooked, while the focus is more on managing financial and human assets. Also, many corporate and IT governance approaches do not adequately portray the business value of data, as they equate data with IT assets such as computer and database technologies [5].

A data governance program must address accountability: to appoint people in data management roles and give them the authority to implement, consolidate and manage all enterprise-wide data governance efforts, while tying their performance to incentives or compensation [6]. Wende [7] points out that such accountabilities are typically assigned to IT departments that try to solve problems by simply implementing technically oriented data management or data warehouse systems. However, organizational rather than technical issues are more critical to the success of data governance.

Several governance roles have been identified in the literature. Wende [7] analyzed a number of studies, case studies and reports from analysts and consultants and deduced five data governance roles: Executive Sponsor, Data Governance Council (or, Data Quality Board), Chief Steward, Business Data Steward, and Technical Steward. Marco [8], Griffin [6] and Otto [9] have also identified data governance roles along the same lines.

This paper focuses on the accountability part of data governance: the assignment of decision rights and responsibilities pertaining to data management. As pointed out by Otto [9] data governance is an organizational design task. However, many data governance efforts begin within a functional domain and do not address the full cross-enterprise complexity across business and IT environments [10] Data Governance efforts are also often led several levels below the

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most senior leader [11].

The paper is structured as follows. In Section II, we present the research approach and the theoretical background. In Section III, we then analyze the key data management roles as commonly identified in the literature (e.g. [7]–[9], [12]). Finally, in Section IV we provide conclusions and summarize the issues presented in the paper.

II. RESEARCH APPROACH AND THEORETICAL BACKGROUND

A. Research Approach

This paper examines data governance roles and accountabilities from an organizational design perspective. In order to outline a data governance structure that is both actionable and open to validation, we subscribe to the design science approach [13]. As field-tested and grounded design exemplars, we employ the models of Requisite Organization [14] and sociocracy [15] that provide theoretical foundations for prescriptive organizational layering and circular organizing, respectively. The methodology we used emphasizes a problem solving approach that consists broadly of the following steps: finding and formulating a relevant research problem, designing a design artifact as a solution for the problem and finally evaluating the solution.

To establish awareness and relevance of the research problem, a literature search was conducted. The search was based on a keyword search in the following academic databases: ISI web of knowledge, DBLP, EBCOHost Academic Search Elite, EBCOHost Business Source Premier, ScienceDirect, IEEExplore and ProQuest. Google Scholar search engine was additionally used to find relevant academic articles related to data governance. The primary keyword used in all searches was "data governance". Additional keywords were used as deemed appropriate. For some of the most relevant articles, a citation analysis was conducted.

Our research problem can be expressed as follows:

What are the requisite data governance roles and accountabilities in a full-system organization-wide data governance initiative?

As a design artifact to address the research problem, we designed a data governance structure for the organizational arrangement of data governance accountabilities. In identifying possible governance roles, we relied on secondary sources provided by the literature. To determine the organizational coverage of these roles, we mapped them to Agile Governance Model (AGM) [16]–[18], a normative meta-structure that specifies pertinent organizational levels and aspectual dimensions. Finally, we evaluated how this design artifact helped address the research problem.

B. Agile Governance Model

Agile Governance Model (AGM) [16]–[18], illustrated in Fig. 1., specifies an abstract and highly generic meta-level governance structure that can be instantiated for any type of governance [17], in this case data governance. It comprises a number of levels and horizontal aspects, fixed separately for

any idiosyncratic purpose. These levels and aspects differentiate a number of meta-categories, denoted by spheres, that can be instantiated with pertinent governance roles and bodies that are linked to each other with vertical and horizontal control and coordination mechanisms.

Agile Governance Model is in line with the principles of sociocracy [15]: circle organization, circle meetings and double-linking. A circle is a policy-making unit of people that formulates and updates its objectives, performs the three functions of operating, measuring, and directing, and maintains the quality of its resources [19]. The circles form a circle organization, wherein neighboring circles are double-linked to each other via at least two people who belong to and take part in the decision making of both circles [20].

Endenburg [15] suggests that sociocracy is relevant to every organization, regardless of its object or size, "because the way in which the agreements are made and the rules are established and the way in which they can be amended and compliance with them supervised is the same for every organization."

In constructing our design artifact, we instantiated AGM for just two aspects, following the simple models of [16] and [17]:

Effectiveness aspect, which is about "doing the rights things": the capability of accomplishing desired goals. Organizational activities of this type, such as design and planning, promote flexibility, adaptability and innovation. Coordinative and supporting activities serving multiple constituents are also representative of the aspect. It allows the organization to share resources and capabilities and to devise new ones in anticipation of future contingencies.

Efficiency aspect, which is about "doing the things right": the capability of optimizing the utilization of resources. Organizational activities of this type, such as development and business-as-usual operational work, promote predictability and accountability. It is about "doing the most with what we've got": leveraging the available resources and capabilities to the maximum extent.
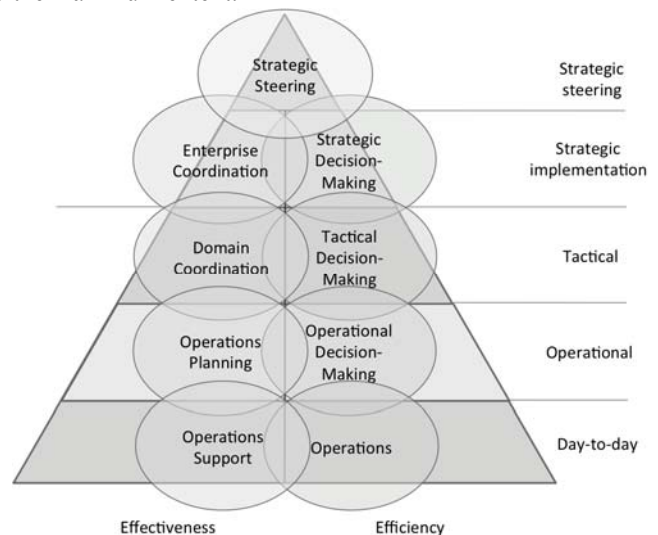

Fig. 1. Agile Governance Model (AGM).

Vertically, we stratified the governance structure to five

normative levels. In line with the strata I–V of Requisite Organization [14] this number of levels is typically requisite (i.e. not too few, not too many) in a self-governing organization such as a middle-size business or an independent business unit of a large corporation [14] that we view is a natural scope for data governance. In descending order, the five levels are:

V – Strategic steering, with a planning horizon of more than five years (cf. [14]). Decisions at this level are usually made in the face of external influences and pertain to the organization's business models, long-term objectives, future directions as well as formulation of corporate objectives and policies. Governance relies on relational capabilities (cf. [21]): informal collaborative relationships, value-based practices and normative controls.

IV – Strategic implementation, with a planning horizon of two to five years (cf. [14]). Decisions are far-reaching and their implementation requires substantial time and effort: breakthrough innovation of new products and services and discovery of new markets [22]. The strategic intent is translated into more tangible objectives and concrete plans for operating units to realize. Strategy is optimized through integrating multiple functions and multiple cross-functional processes [23]. This is attained through organization-wide programs and strategic systems (e.g. balanced scorecard, critical success factor analysis, service-level agreements, performance management, profit sharing schemes, etc.) (cf. [21]).

III – Tactical level, with a planning horizon of one to two years (cf. [14]). Decisions are limited to the existing asset base. Decision-making authority is limited to short-term core business process efficiencies to maximize the return on investment [22]. Multiple teams are connected across functions to rethink work systems and processes within an operational domain [23]. Key mechanisms include structural means such as formal roles, committees and councils (cf. [21]).

II – Operational level, with a planning horizon of three months to a year (cf. [14]). Operational decision-making is related to concerns of the immediate future, has a direct impact on the conduct of business, and typically does not require laborious development efforts. This level is about continuous improvement and quality [22]. Governance at this level relies on vertical lines of command and standardization for coordination (cf. [21]).

I – Day-to-day level, with an operational time perspective of one day to three months (cf. [14]). Work at this level is concrete work towards completely specified goals. It is usually done by first-line manual workers and clerical staff. Direct actions at this level do not call for much discretion or planning ahead, but the tasks are carried out following scripted instructions. When things go wrong and the obstacles cannot be overcome based on previously learned methods, outside help is needed from the next higher level. [14].

In the outlined governance model, each level comprises of two "meta-categories" – one for the effectiveness aspect; and one for the efficiency aspect, These meta-categories can be instantiated with circles empowered to make independent decisions in their respective areas of influence and responsible for setting up their own circle policies. An exception is the strategic steering level, at which the planning and execution aspects conjoin and there is only one meta-category.

By having both the vertical control structure and horizontal collaboration structure in place, the organization can flexibly adjust its behavior to varying business priorities and find an appropriate balance between efficiency and effectiveness. Such governance arrangements can compensate for the rigidity of organizational structure and help organizations to achieve seemingly conflicting objectives [24].

III. DESIGN ARTIFACT: DATA GOVERNANCE STRUCTURE

We devised our design artifact, a data governance structure, by mapping the data governance roles, as commonly identified in the literature, to corresponding AGM meta-categories, as described in Section II.

The scope of the five roles as commonly identified in the literature (i.e. Executive Sponsor, Data Governance Council, Chief Steward, Business Data Steward, and Technical Steward [7]–[9], [12]) does not cover both the effectiveness aspect and the efficiency aspect at all levels of the organization. Most notably, the roles do not cover efficiency at the strategic implementation level nor effectiveness at the tactical and operational levels. The identified governance roles also do not cover day-to-day level activities.

Furthermore, the data governance council is the only collective governance body identified and thus the only one that can be conceived as a circle. Corresponding bodies would be required elsewhere in the organization to enable a true circle organization that could be used to re-engineer and re-organize work processes [25].

To "fill in the blanks", we utilize the DAMA Guide to The Data Management Body of Knowledge (DMBOK) [26] a comprehensive practitioner guide for implementing data management, to identify additional roles and governance bodies that we think complete a balanced data governance structure. Table I exhibits both the aforementioned roles as identified in the literature (in **bold** typeface) and additional roles and bodies from DMBOK (in normal typeface).

TABLE I. OUR DESIGN ARTIFACT: DATA GOVERNANCE INSTANTIATION OF AGM.

Level	Governance Roles	
	Effectiveness	*Efficiency*
Strategic Steering	**Executive Sponsor**	
Strategic Implementation	**Data Governance Council, Chief Steward**	Data Stewardship Steering Committee(s), Coordinating Data Steward(s)
Tactical	Data Governance Office (DGO), Data Stewardship Facilitators	Data Stewardship Team(s), **Business Data Stewards**
Operational	E.g. Architects (Data, Data Integration,	**Technical Data Stewards**

Level	Governance Roles	
	Effectiveness	*Efficiency*
	Application, Technology)	
Day-to-Day	E.g. Data Model Administrators, Database Administrators, Data Integration Specialists	E.g. Data Analysts, Data Modelers, Analytics Developers, Report Developers

The collective governance bodies, as identified in [26], such as data stewardship steering committees, data governance office and data stewardship teams, can be seen and run as circles. They can also readily constitute a double-linked circle organization. For instance, a coordinating data steward is a member of the data stewardship steering committee, but also a lead link in a data stewardship team. Reciprocally, a business data steward can be an elected member in the higher-level circle, the data stewardship steering committee. However, [26] does not explicitly identify governance bodies that we would view being at the operational or the day-to-day level.

The following sub-sections describe in detail the mapping for each AGM meta-category.

A. Strategic Steering

At the highest level of data governance, the executive sponsor provides the necessary involvement from top management and thus enables the data governance program to be established throughout the organization [7]. The sponsor provides funding for data governance and is responsible for defining, communicating and overseeing mission, data strategy and policies. These high-level steering means guide the establishment of more tangible governance rules at the next level down.

The executive sponsor should be a person with high credibility in the organization, be knowledgeable about the problems within the company and also be able and willing to challenge the status quo [8]. The sponsor must have enough authority to engage in strategic management and long-term decision-making concerning the entire organization. In the case of a large corporation, the executive sponsor has a dual role as a member of the corporate collegium and as a representative of the constituent organization(s).

B. Enterprise Coordination

Whereas the executive sponsor handles the more political aspects of enabling the existence of data governance, the data governance council (DGC) has enterprise-wide authority over data management and its objectives and responsibilities are closer related to the actual implementation. It is responsible for translating the strategic intent of top management, represented by the executive sponsor, into more tangible rules and objectives.

The data governance council is a committee consisting of business unit and IT leaders, along with the data stewards [7]. The chief steward chairs the committee and additional temporary participants may include the executive sponsor and process owners or business unit managers.

The DGC defines the strategic framework for data governance and controls its implementation. The council's work consists of formulating data governance mechanisms and strategies, and to ensure that these are aligned with the organization's overall mission and strategy [27]. The DGC assigns roles, responsibilities and authority at different organizational levels, provides mechanisms for coordination, communications, information sharing, prioritization and conflict resolution, and provides accountability for the successful implementation of all governance efforts at enterprise, division, group and project levels [27]. The council also coordinates, manages and monitors the development of enterprise-wide audit and control procedures and data standards and policies.

The chief steward is the chair of the data governance council with the responsibility to put the council's decisions into practice [7]. The role of the chief steward is to act as a project manager responsible for enforcing standards, establishing data quality metrics and targets along with ensuring that regulatory, privacy and information sharing policies are followed. The chief steward should be a highly credible person, preferably a senior manager with background in data management [8].

Villar [12] identifies the main attributes for a successful chief steward to be strong leadership, communication and team building skills. The chief steward needs to make sure that the data stewards are working and implementing the agreed data governance decisions and to aid in any conflicts should they emerge [7]. Without being able to communicate both with business and technology leaders and to bridge the gap between business and IT, data governance issues and conflicts cannot be efficiently resolved. In order to be successful, it is important that the chief steward has respect throughout the enterprise and that he or she acts as a consensus builder.

C. Strategic Decision-Making

Under the cross-functional coordination by the data governance council and the chief steward, enterprise-wide data management initiatives focus on one particular data management function. DMBOK suggests that these initiatives are supported and overseen by one or more data stewardship steering committees launched by the data governance council.

Data stewardship steering committees are participated by coordinating data stewards, who provide business leadership for their respective data stewardship teams and identify business data steward candidates for those teams [26]. Whereas the governance council sets the standards, policies and procedures for data and metadata management, data stewards execute the developed standards and policies and are responsible for ensuring that the data and its metadata are accurate, accessible, usable and current [8].

As additional responsibilities of coordinating data stewards, DMBOK mentions reviewing and approving changes to reference data values and meanings; reviewing and approving logical data models; ensuring that application data requirements are met; and reviewing data quality analysis and

audits [26].

D. Domain Coordination

DMBOK suggests that in larger enterprises a staff organization called the data governance office (DGO) supports the efforts of the data governance council, data stewardship steering committees, and data stewardship teams.

The DGO staff includes data stewardship facilitators who help business data stewards and coordinate data governance and stewardship activities such as scheduling, announcing and supporting meetings, managing and coordinating resolution of data issues, assisting in definition and framing of data issues and solution alternatives, and assisting in definition of data management policies and standards [26].

E. Tactical Decision-Making

According to Villar [12] the business data stewards are the business leaders accountable for the definition, accuracy, consistency and timeliness of critical information within their business scope. She stresses that the stewards are not owners of the data. The enterprise is the owner, whereas the stewards' role is to provide a service for the data users throughout the organization. Unlike business processes, data cannot be managed for one specific use [28].

Villar further stresses the motivation and need for implementing the business steward role. She points out that because data is a business enabler, critical data should be assigned to those who can apply business judgments [12]. The business data steward is a leadership role that requires understanding of the importance of data to the business and must be able to translate business strategy into data tactics that achieve the business objectives. This requires collaborating with, and influencing, both business and technology teams across business units.

Key activities and responsibilities for the business data steward are defining data elements and values according to business requirements [7]. The targets are to simplify the technology landscape and to ensure that data meets the required quality standards set by the data governance council. In this way the business processes can operate with high quality data that is accessible from the right place at the right time.

The business data steward is a tactical level role, whose responsibility is to translate the strategic targets of the data governance council and the chief steward into policies that ensure systematic work and regulate open-ended, discretionary decision-making at the operational level.

DMBOK prescribes that (business) data stewards collaborate in data stewardship teams led by the coordinating data steward, typically within an assigned subject area [26].

F. Operations Planning

This meta-category is concerned with designing and coordinating that appropriate data management aspects are integrated into information systems in line with respective policies, standards and guidelines. This is the responsibility of operational level architect roles such as data architect, data

integration architect, and application architect.

G. Operational Decision-Making

As noted in [26], data management is a shared responsibility between business data stewards (trustees) and data management professionals (expert custodians), e.g. technical data stewards.

The technical data stewards can be seen as the counterparts to the business data stewards [7]. They are professionals from the IT departments that focus on the technical data element definitions and assessing optimal data formats for achieving the data requirements and objectives put forward by the data governance council.

Technical data stewards provide insight into the technical details and possibilities of the supporting IT systems along with information about the data flows between the different systems. They have the important role of bringing the IT perspective to the data governance council and to the data governance work. By cooperating with the business data stewards, the business objectives can be efficiently and effectively realized and supported by well working IT systems and technical data quality standards.

Whereas the role of business data stewards is tactical, the role of technical data stewards is operational. They bring the IT perspective to data management: technical data element definitions, data formats, metadata standards. Representing Stratum II work [14] they aim at optimizing work practices and quality standards and managing deviations from the acceptable limits of performance.

H. Operations Support

Of the DMBOK roles, roles such as data model administrator, database administrator or data integration specialist fall herein.

I. Operations

At this level, real governance does not exist, but idiosyncratic activities are guided by fixed target standards for performance. Exemplary roles would include such DMBOK roles as data analyst, data modeler, analytics developer or report developer.

IV. DISCUSSION AND CONCLUSIONS

In this paper, we focused on the accountability aspect of data governance. Following the design science approach, we addressed the following research problem: *What are the requisite data governance roles and accountabilities in a full-system organization-wide data governance initiative?*

Drawing upon prior theory and existing literature, we 1) analyzed the organizational coverage of common data governance roles, and 2) suggested how Agile Governance Model (AGM) [16]–[18] can be used as the basis of designing a governance structure to ensure that requisite roles and accountabilities are addressed throughout the enterprise at the right organizational levels and aspectual loci.

The design of the data governance structure resulted in a

few findings. Firstly, it helped to illustrate the relative positions of different data governance roles. For instance, the executive sponsor is clearly a strategic steering role representing an external viewpoint, whereas the data governance council is subordinate to it and focuses on the implementation of strategy in a design, planning and support capacity at the enterprise level. Business and technical data stewards are operational roles that work at the next two lower work levels, respectively.

Secondly, we found out that the five most common roles as identified in the literature [7] may not be adequate to form a complete, well-balanced data governance model. The mapping of the common roles to AGM showed a lack of 1) roles pertaining to the efficiency aspect at the strategic implementation level, 2) roles pertaining to the effectiveness aspect at the tactical and operational levels, as well as 3) roles concerned with day-to-day level activities.

Thirdly, the identified roles alone do not enable a true circle organization [15] that could be used to re-engineer and re-organize work processes [25]. We argued that additional collective data governance bodies are needed to instantiate remaining meta-categories to achieve this.

We posit that in a well-balanced governance structure each meta-category of AGM should be populated by at least one circle headed by a role vested with requisite accountability and authority. Any gaps in the structure guide to think what additional circles and roles are required to make the structure more balanced and more complete. To instantiate the data governance structure accordingly, we utilized the DAMA Guide to The Data Management Body of Knowledge (DMBOK) [26] to identify additional roles and governance bodies not typically present in the data management literature. In our view, this made the data governance structure more balanced and more conducive to circular organizing.

As our analysis of data governance roles and accountabilities is based only on secondary sources, i.e. existing literature, it should be extended with empirical data on how organizations actually organize their data governance. Whereas this paper addresses the engineering of the design artifact – the AGM-based data governance model – further work is required to empirically validate it in an actual context.

In our experience, the systemic design approach employed promotes clarity in the role definition related to data governance. For the sake of a simple demonstration, we chose to instantiate AGM only for two horizontal aspects. As exemplified in [18], it is possible to identify more aspects, when using AGM for governance design. A more pertinent data governance structure with well-founded aspects and even more comprehensive set of roles remains a subject for further research. Another interesting further research avenue would be to analyze the coverage of data management functions of the Data Management Body of Knowledge (DMBOK) using Agile Governance Model as the analysis framework.

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