

## Design Dimensions for Enterprise-Wide Data Management: A Chief Data Officer's Journey

Raphael Schilling  
University of St. Gallen  
raphael.schilling@unisg.ch

Stephan Aier  
University of St. Gallen  
stephan.aier@unisg.ch

Robert Winter  
University of St. Gallen  
robert.winter@unisg.ch

Kazem Haki  
University of St. Gallen  
kazem.haki@unisg.ch

### Abstract

*To unlock additional business value, most enterprises are intensifying their enterprise-wide data management. In the case of the globally operating bank, we base this article on, a Chief Data Officer (CDO) organization is established for providing data governance and, in a second step, pushing data driven innovation forward. As many employees of the bank were not yet familiar with (or did not acknowledge) the need for enterprise-wide data management, this evolution exhibits characteristics of an organizational learning process. CDOs may want to actively steer this learning process by purposefully designing and adjusting their data management approach over time. Based on the major controversies the CDO has been confronted with, we propose four design dimensions for enterprise-wide data management and discuss the considerations for their configuration: (I) objective, (II) governance, (III) organization of data analytics, and (IV) expertise.*

### 1. Introduction

In a time where data is the “new oil”, publications on innovative data use cases, technological advancements, and significant investments in data related business models are omnipresent [1]. For established, large enterprises, such publications offer valuable opportunities for ideation and strategic planning, but they also create considerable pressure for business innovation. In most cases, these traditional enterprises possess more valuable data and dispense a larger amount of resources to potentially outperform the reported cases.

In large enterprises, however, the respective data repositories have often grown locally and thus are difficult to utilize and to manage on an enterprise-wide level. For example, the data structure and data quality of individual business entities oftentimes differ strongly, as they are heavily dependent on the

respective business needs. Accordingly, there is a high risk of obtaining incorrect data points, extensive data exploration efforts, and potentially misleading conclusions.

While the challenges of heterogeneous data architectures are not new, the pain of not having a holistic view on data on an enterprise level is becoming more severe. A growing number of data related regulations, such as European legislations GDPR [2] and BCBS239 [3], oblige enterprises to enhance their data governance significantly. Having a holistic view on data is also a prerequisite for big data analytics endeavors, which are often based on a broad variety of data sources from within and beyond the organization. In this light, it appears to be logical that most organizations have started to pay more attention to coherent data management on an enterprise level [4].

Enterprise-wide data management comprises all activities required to unlock the value of data along the entire data lifecycle. This includes the design and enforcement of rules, standards, and principles of data governance as well as the identification and leveraging of data-related business opportunities [5]. Traditionally, such endeavors were driven by data governance councils or teams of enterprise and data architects [6]. Lately, organizations have started to anchor enterprise-wide data management on the senior management level, prominently manifested by the remarkable increase of Chief Data Officer (CDO) appointments in recent years [7].

The CDO and related roles face the challenge of balancing autonomy of local data producers and consumers while enforcing sufficient alignment on an enterprise level. Finding this balance is highly dependent on the specific circumstances. Therefore, successful practices, once they are identified in a particular organization, cannot easily be transferred and/or adopted. Establishing enterprise-wide data management is rather an organizational learning process than a regular innovation project.

In this article, we reflect on this learning process and ask **(RQ)**: how can senior executives design and establish enterprise-wide data management in their

organization? By doing so, we aim at facilitating the organizational learning process and at providing senior management with a source of orientation and inspiration.

To this end, we present the case of a large, globally operating universal bank that has gone through this learning process and successively strengthened enterprise-wide data management after appointing a CDO in 2015. It is the wide range of design decisions the bank was confronted with, which caught our attention: We aim to better understand the reasons why the bank took certain design decisions and how they were adjusted over time. Analyzing and conceptualizing such learning processes and their contingencies promises to be better transferrable to other cases than merely adopting the outcomes (such as governance structures or established processes).

We opt for a single case study research approach, as this allows us to present a rich description. Thanks to our long-lasting collaboration with the bank even before taking up this research project, we were already familiar with its organizational structure and its data management track record. For this study, we additionally conducted seven semi-structured interviews with informants holding senior management positions, and who were heavily involved in the process of establishing enterprise-wide data management (e.g., CDO, senior IT architect, business strategist). The interviews took place in summer 2017 (i.e., two years after the CDO's appointment).

In the following, we discuss related studies describing the responsibilities of senior executives concerned about enterprise-wide data management. We then introduce the case organization and discuss the controversies the organization was confronted with. Based on these controversies, we propose four design dimensions that help structuring the design decisions senior executives should take into consideration when developing enterprise-wide data management.

## 2. Related research

While the Chief Information Officer (CIO), was long the sole senior executive role responsible for technological aspects including data management, several additional senior management roles (CxO), have been proposed and introduced over the last few years to master digital transformation. One of the core arguments for introducing additional roles was, that the task to mobilize the entire organization to collaborate across functional and hierarchical boarders in the digital space is highly complex [8].

Executives roles such as Chief Digital Officers [8], Chief Innovation Officer, and Chief Data Officers [9] are responsible to—on the one hand—define

and establish strategic guidelines with regards to digital transformation and—on the other hand—prepare and maintain the therefore required technological platform and related capabilities.

The CDO role is foreseen to take care of all data related issues on an enterprise-wide level, from both the strategic and operational perspectives. As nicely described by Lee et al. [9], a CDO is supposed to cater for internal and external data exchange and usage, the management of structured and unstructured data as well as the identification of opportunities for the exploitation and exploration of data. To achieve these goals, Dai and Wu [10] highlight the importance of having knowledge in business analysis, data management and business strategy.

Yet, most organizations are not used to have a dedicated senior executive role for enterprise-wide data management. Hence, CDOs and comparable executive roles are confronted with rapidly changing expectations concerning their contribution, priorities and managerial activities [11]. To support them in addressing this challenge, we aim at deriving a better understanding on the design decisions that need to be taken in enterprise-wide data management. We do so by analyzing the evolution of enterprise-wide data management at a case organization.

## 3. The case organization

Our case organization is a large, globally operating universal bank<sup>1</sup>. The bank has a long history and is operating in 50 countries. It is structured by multiple geographical and functional divisions and headed by a rather small headquarter.

To make better use of data on a global level, the bank appointed a CDO in 2015 and divisional CDOs in 2016. The size of the CDO organization, comprised of data scientists and data strategists, varies across divisions. Our case analysis focuses on the activities of the CDO in the division with the largest data set and most complex data architecture.

The new executive role of the CDO was tasked with implementing enterprise-wide data management by providing data governance to create a foundation for pushing data-driven innovation forward. By mastering data management and building big data capabilities the bank envisions outperforming competitors through its data-driven business innovation and cost reduction achieved through artificial intelligence. In this sense, this bank is an exemplary and early case of the 90% of large organizations that will appoint a CDO in the near future [12].

---

<sup>1</sup> In compliance with corporate communications policies, all case data are strongly anonymized.

## 4. Case analysis

Having dedicated data management roles marks a turning point in the bank's established approach to data management. For decades, the bank optimized its data management from a technical perspective but paid little attention to the cross-divisional alignment of data from a business perspective. With the creation of a CDO organization, the bank began to emphasize the business perspective on data management. Throughout this change process, the design of enterprise-wide data management was adjusted several times.

In the following, we discuss these adjustments by spotlighting the controversies caused by the introduction of enterprise-wide data management. These controversies took place in parallel between 2015 (appointment of the CDO) and summer 2017 (the time when the interviews were conducted).

### Controversy 1: Negotiating and calibrating data management objectives

The appointment of the CDO triggered critical discussions on the objective of enterprise-wide data management and the expected value contribution of the CDO organization. The bank's senior management urgently needed to address regulatory obligations to make progress in terms of data quality and data management, hence a key motivation to appoint a CDO was to assign regulatory responsibility concerning data management to one central entity:

*"We decided that we cannot afford to have 15 different owners to solve these problems, but we need one."*  
Business Strategist

Thus, the initial core objective of the CDO organization was to ensure regulatory compliance (**objective I**). The general agreement was that a CDO was successful if there were no data incidents (i.e., no data that was lost, incorrect, or misused). Accordingly, the active management of issues, ownership, and measurement of data quality became a mandate of the CDO. In line with this intention, the CDO described the role as:

*"The CDO takes care of data matters that are of concern to the regulator."*  
CDO

While earlier initiatives to introduce enterprise-wide data management were implied by IT architecture designs, these attempts to actively manage data from the IT side failed. The new CDO organization,

therefore, became part of the business side, addressing one of the core reasons for earlier failures:

*"We tried to do it from the IT side without much involvement of the business side."*  
Senior IT Architect

Accordingly, the initial CDO organization was built around regulatory initiatives and also funded by respective budgets. A dedicated team was formed to structure and define data for various risk reports, while another team was created to unify client data. Most efforts were put into the creation of a data catalog across business units, a requirement of one of the regulations. For most local departments and projects, the creation of this data catalog was the first moment they met the CDO:

*"The first real contact was when someone in our department was required to support the CDO in standardizing—or in some cases even initially creating—a data catalog."*  
Senior Manager in Management Reporting

The data catalogue was instrumental for making the discrepancy among departments more transparent and in addressing the core concerns of the regulators:

*"It is now clear that we do not have commonly agreed upon guiding principles and standards on how data models and data catalogs should be defined."*  
Senior Manager in Management Reporting

Arguably, this new awareness facilitated the establishment of enterprise-wide data management because a broader range of employees became aware of data related issues and the corresponding impacts on the organization. Within a short time, the CDO could satisfy significant concerns of the regulators but not yet create business value beyond the regulatory value for the local departments and projects, which had, so far, been confronted with additional efforts:

*"This alignment requires additional efforts for the projects like data mapping, creating entries in the data catalog, etc. but does not create any additional benefits."*  
Senior Manager in Management Reporting

In short, the organization expected the CDO organization to create value beyond regulatory compliance:

*"If we had to draw a pyramid of a CDO's tasks, regulatory compliance would probably build the basis."*  
Business Strategist

Therefore, the expectation grew that the CDO organization would also provide data insights. Such insights would create a business contribution like more revenues or faster data processing in projects (**objective II**). Hence, the CDO started to adjust focus and the intended objective of enterprise-wide data management:

*“Now, after 15 months of operation, I am starting to address new perspectives by aiming at aligning and supporting the use of data for business purposes.”*  
CDO

Numerous other teams were long working on data insight projects by using diverse data sources, tools, and platforms. So far, there was relatively low alignment among these teams. As an initial step to improve this alignment—and to further convince senior management of the importance of the approach—the CDO started to create a data strategy. This document envisions the data capabilities of the bank, including data governance and data usage opportunities. Going forward, the CDO intends to provide input for the business strategy. To underline the strategic relevance of enterprise-wide data management, the first use cases are being implemented. Here, the focus lies on efficiency gains, for example, by using advanced analytical capabilities to identify the “best” data repositories in the bank and making them broadly available.

## **Controversy 2: Harmonizing data management practices**

The bank was traditionally organized in a federated manner. Due to the heterogeneous nature of their businesses, the various departments and projects were given lots of freedom concerning data management practices (**practice I**). There was no standardized approach to source, enrich, and provide data across the organization:

*“Data is only reflecting what the organization is living.”*  
Senior Manager in Management Reporting

Accordingly, the CDO was confronted with diverse forms and levels of implementing data management. On the one hand, the bank was long considered industry-leading in the analysis and reporting of structured data:

*“Our data warehouse platform allows us to transform data in a very structured way and in high quality from operational systems to reporting systems.”*  
CDO

On the other hand, the technical infrastructure was not designed for an integrated approach to data management and the analysis of unstructured data. In addition, the bank was confronted with a growing number of data islands and redundancies.

The heterogeneous data management approaches had to be addressed by the CDO, who envisioned a harmonized approach to data management (**practice II**). Not only did the regulatory requirements demand a unified view across the bank (e.g., on client data), but the company also wanted to make use of advanced big data analytics. A comparison with the cost structure of one of the competitors revealed the bank could improve the cost basis by streamlining the data management approach, reducing the efforts spent on merging and aligning data. This competitor was perceived to be successful because it managed to automate most of its processes, which required a full end-to-end integration of data, something that was not present in the bank.

Based on this observation, the CDO was expected to create a framework for enabling the bank’s evolution towards harmonized data management with regards to customer and product data. A significant challenge was that some local departments were active in data management for a long time so that the CDO had to find his position among the existing players. Introducing one central approach to data management, at first glance, was not an option because it would not have been accepted by the local departments and projects where data management had either a long tradition or was not common practice. Furthermore, the size of the application landscape (with several thousand applications, many of which had a custom data architecture) made it unfeasible to define unified data structures even on a high level of abstraction.

The CDO addressed these circumstances by creating an overview on who is doing what based on which data. He grouped these activities into categories, such as sales, compliance, and opportunities, then defined 20 high-level business object models to enable data classification. In close collaboration with the IT architecture team, a common tool for the documentation of the data architecture on a global level was introduced. The CDO wanted to avoid:

*“A setup where people are trying do the same thing but on several platforms with several tools and different data sources.”*  
CDO

The degree of formal control was limited given that most data related functions were not directly reporting to the CDO. Nevertheless, he managed to establish his interests in the organization by focusing

on senior management attention. Regular discussions and the creation of the data strategy were used to create awareness and interest in the approach. The harmonization should be driven by a desire to make use of data. To resolve governance issues, the “data governance council” was supportive in implementing policies under the umbrella of regulatory initiatives.

The CDO learned that to ensure data quality, the establishment of governance represented by roles, processes, and control mechanisms was more important than having formal control over the people working with the data. To further progress in the alignment of data management across the organization, the CDO assigned more responsibility to the data owners. The new data classification on a global level could be used to assign data ownership.

However, several issues remained unresolved. One of the most pressing was that data owners were not aware of their role or did not have the required resources:

*“Data owners often are not taking over their responsibility. They also often do not have the required financial resources to implement the things (e.g., data quality processes) they should implement based on their job description.”*

*Senior Manager in Management Reporting*

Therefore, the bank began to measure data quality across data flows and to link the measure to the data owner. This endeavor turned out to be challenging at the border between the operational and the management reporting systems. Given the significant amount of systems and data, the bank decided to apply the approach only to prioritized data domains.

### **Controversy 3: Adjusting centrality of data analytics**

Before the creation of the CDO organization, the employee roles working with data were distributed across the entire bank. The creation of the CDO role with the ambition to provide business value raised the question whether data analytics should be offered as a centralized shared service or remain in the responsibility of the local departments and projects.

With the intention to showcase initial use cases of advanced data analytics within a short period, a small team of data scientists became part of the CDO organization as a “kick-start” team who focused on client data profiling (**structure I**). The main argument for having such a centralized team was that the technological enhancements would require advanced technical knowledge that could only be efficiently acquired by dedicated teams. It also turned out to be

difficult for local departments and projects to get sufficient access rights within a reasonable time to run new forms of data analytics. In addition, the CDO had to address the issue that newly created platforms were not sufficiently managed and only used by a few units. At that time, it was a common understanding at the bank that businesspeople would require support with regards to the technological capabilities:

*“The way how data can be analyzed today is something completely different than it was five or ten years ago. Therefore, I believe it’s a too high expectation towards business to know exactly what kind of data they need.”*

*Business Strategist*

However, the experience showed that new ideas were project driven because the interpretation of data required specific business knowledge, which was difficult to appreciate by the central team of data scientists. The organization realized that it would require many data scientists close to the respective business, which suggested a decentralization approach (**structure II**). It also was argued by one of the data consumers that if the CDO organization had its data scientist, then it becomes biased when setting up the platform:

*“Either the CDO is someone who defines the framework conditions and provides a platform, including the required governance processes, or he is the only provider for any data analytics activities. To do both at the same time without being the only provider for data analytics is difficult.”*

*Manager Digitalization Initiative*

Therefore, the CDO organization was expected to provide capabilities rather than running the analysis:

*“I personally do not believe that it makes sense to assign everything related to data to the CDO. The role should rather provide capabilities.”*

*Business Strategist*

The core idea is that the CDO organization would specialize in topics covering questions like “How to use client data?”, “How to use trading data?”, or “How to use risk data?” and offer expertise to other teams. Accordingly, the CDO foresees a set-up where the CDO organization provides technical and methodological support for the local departments and projects that are less experienced in data analytics or have challenging questions. In fact, the CDO organization envisions performing the sourcing, cleansing, and ingestion of data centrally, while leaving the actual analysis of the data to the local projects and departments.

#### **Controversy 4: Developing method expertise and business domain knowledge in the central data management team**

Given that the CDO organization was newly formed, it had to build up sufficient internal knowledge to ensure that the data analytics of the bank was in line with its business and operational model. It also needed to ensure that data analytics were performed in an appropriate methodical manner (**expertise I**). Thus, the CDO acted to balance data management expertise and business domain knowledge.

As previously mentioned, regulatory compliance initially was the core objective of the CDO organization. It was clear that the CDO could only define the most critical data domains and areas that needed to be better managed once he had a good understanding of the business and operational model of the firm. The creation of the data catalog allowed to accumulate the respective business knowledge. However, the initial version of the data catalog was criticized by the local departments and projects as having a gap between the structure defined by the CDO organization (e.g., generalized attributes of all credits) and the requirements of the implementation projects (e.g., different forms/conceptualization of credits in each international location). The CDO organization needed to support the local departments and projects actively. For example, the often vaguely formulated regulations had to be translated into actionable directives for local departments and projects:

*“A CDO organization should be involved in the definition of policies and then develop them further so that the projects get precise action items. Questions could be: What governance processes need to be implemented? Which technological support is required/mandatory?”*

*Senior Manager in Management Reporting*

With the increasing demand for business innovation, the CDO organization was required to have a profound understanding on the data architecture while being a pool of method experts. The CDO or-

ganization was expected to know what could be done with a set of data to better support local departments and projects (**expertise II**). In fact, the bank identified one of the leading factors hindering the creation of enterprise-wide data analytics use cases was a lack of senior business and data scientists in the context of the complex data architecture. The CDO organization was therefore expected to train employees accordingly and then delegate them to the local department and project teams:

*“Like the architects help in defining the application architecture, representatives from the CDO office could support defining the data models/frameworks and data governance guidelines.”*

*Senior Manager in Management Reporting*

#### **5. Results: Four design dimensions for enterprise-wide data management**

Essentially, the controversies outlined above are centered around the design and implementation of enterprise-wide data management. We use these controversies, to derive design dimensions that can be used by senior executives when establishing enterprise-wide data management. They may help to structure discussions, define priorities and manage expectations.

In total, we differentiate four design dimensions. In Figure 1, these dimensions and their corresponding design features are visualized. While for some design dimensions (Objective, Expertise) the design features may be realized in combination, the design features of other design dimensions (Governance, Organization of Data Analytics) are mutually exclusive.

The design decision taken by the case organization are also represented in Figure 1. As visualized by the red arrows, the case organization (purposefully) adjusted their approach to enterprise-wide data management over time.

In the following, we discuss each of the four design dimensions, the evolution of respective practice at the case company, and the corresponding implications for enterprise-wide data management in detail.

## Design Dimensions for Enterprise-Wide Data Management

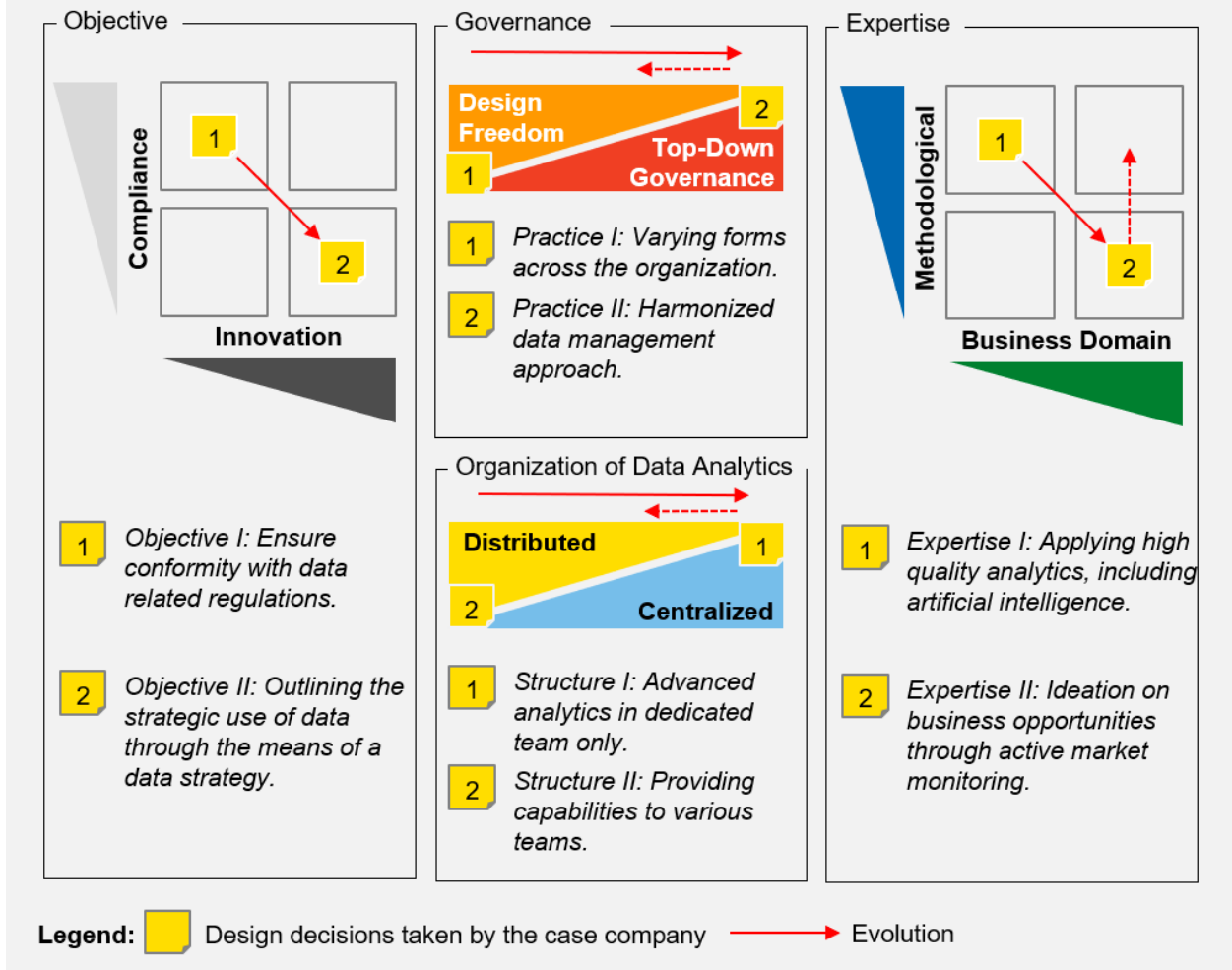


Figure 1. Design dimensions for enterprise-wide data management

### Dimension 1: Objective

We propose the objective of enterprise-wide data management as the first design dimension in enterprise-wide data management. The definition of a clear objective is required to set priorities and define the mandate of enterprise-wide data management.

**Design features.** Based on the case analysis, we propose two complementary objectives: compliance and innovation. While compliance refers to the mandate to cater about data-related regulations (“defensive” strategy), innovation refers to the identification

and exploitation of data-related business opportunities (“offensive” strategy). Arguably, the two objectives may be addressed at the same time, as they are not necessarily contractionary. In the framework of Lee et al. [9], these two objectives are reflected in the value impact dimension. There, a difference is made between improving existing services and exploring new strategic opportunities.

**Evolution at the case company.** The objective of the CDO organization at the bank gradually evolved from a strong focus on regulatory compliance toward business innovation. In retrospect, the focus on regulatory compliance laid the foundation for business

innovation such that the regulatory pressure allowed for follow-through of data alignment activities, a prerequisite for big data analytics.

**Implications for enterprise-wide data management.** Those who head enterprise-wide data management initiatives may consider adjusting the objective of their initiatives at certain times. In our case, the initial focus on regulatory requirements did not result in sufficient support by local departments and project teams. The CDO role was perceived as a “must have” instead of a facilitator of data-based value creation. Having met the regulatory requirements, the CDO intentionally started to seek opportunities for business innovation by working on the bank’s data strategy. By doing so, enterprise-wide data management could differentiate itself from traditional data governance roles and emphasize its business-oriented view on data. However, we should note that this evolution does not necessarily reflect a path of maturity. Upcoming regulations may again require a shift of objectives towards regulatory compliance. The learning in the case is that both objectives, although being perceived differently in the organization, share the common basis of logical data integration and data quality requirements.

## Dimension 2: Governance

The term enterprise-wide data management implies harmonization of how data is managed across the organization. The design dimension “Governance” refers to the way how this goal is achieved.

**Design features.** The governance approach may vary between the two extremes of providing full local design freedom and enforcing rigid governance mechanisms in a top-down fashion.

**Evolution at the case company.** In this case, we observed a development path from a high amount of local design freedom to rigid governance and back to a situation where data management is mostly delegated to local decision-makers such as data owners.

**Implications for enterprise-wide data management.** We find this journey to be a necessary learning process, which first creates a shared understanding of data management and later allows for local adoption. This is required to account for local contingencies and empower organizational units. The intentional shift between low and rigid control appears to be an ongoing process. Times of rigid control ensure alignment and awareness of various stakeholders, whereas phases of design freedom drive innovation forward. The design of process control mechanisms forms the bridge between these two states that ensure data quality without having formal control over the people working with the data.

## Dimension 3: Organization of Data Analytics

The third design dimension refers to the degree of centralization of data analytics.

**Design features.** Large organizations may opt to perform data analytics in one central entity or delegate this task towards local entities.

**Evolution at the case company.** In the case presented in this paper, we find an evolution from growing a critical mass of centralized data scientists towards a distribution of data scientists across the bank.

**Implications for enterprise-wide data management.** Arguably, centralization of data scientists is supportive in developing capabilities. However, is not ideal when it comes to effective operations and the creation of new ideas, as these typically emerge at the project level.

A CDO may use a central team of data scientists to develop competencies and deliver initial projects to showcase the value of advanced data analytics in the organization.

This dimension appears to follow a maturity path such that the more experience an organization has with data analysis, the more the task can be decentralized and assigned to local departments and projects. While the first centralized attempts remove barriers and create awareness in the organization, the allocation of data analysts to local departments and projects helps bringing method expertise and business domains closer.

## Dimension 4: Expertise

The fourth identified design dimension of enterprise-wide data management is the expertise of the central data management team.

**Design features.** As enterprise-wide data management covers a wide range of technological and strategic topics, we differentiate between expertise / knowledge in terms of methodology (e.g., techniques for data analysis) and business domain knowledge (e.g., market trends). Similarly, Dai and Wu [9] differentiate between skills in the “data space” and as well as the “value impact”.

**Evolution at the case company.** At the bank, we find the expertise of the central data management team to evolve toward the two directions of methodological expertise and business domain knowledge.

**Implications for enterprise-wide data management.** After having gained a profound understanding of the business and operational models of the organization, the CDO is required to address the interests of local projects and departments as best as possible. Therefore, business domain knowledge needs to be built up by ideating on business opportu-



nities through active market monitoring. However, this knowledge will only allow the CDO organization to speak the same language as their partners on the local department or project levels. To bring data-driven innovation forward, advanced methods of data analytics as well as data stewardship topics, such as data quality, prioritization, and monitoring, are required, all leading to the knowledge we describe here as methodological expertise.

## 6. Concluding Remarks

This case demonstrates that the establishment of enterprise-wide data management is a highly complex and multifaceted endeavor. The appointment of a CDO marks the beginning of a journey, exemplified by various controversies around enterprise-wide data management. To address these controversies, those responsible for enterprise-wide data management, (i.e., CDOs and related executive roles), need to purposefully adjust the organization's approach to enterprise-wide data management along the journey. Our four design dimensions may support this adjustment process by providing a common conceptual reference frame for analysis, for sharing lessons learned, for identifying patterns, and for inspiration.

The CDO and the bank we study in this article were actively striving to unlock business value from data on local and global levels. To do so, the data management objective, the governance, the centrality of data analytics, and the expertise of a central data management team was controversially discussed and adjusted multiple times. These discussions and adjustments reflect a learning process, which will be experienced by any organization aiming at establishing enterprise-wide data management. Those learning faster and adapting better to their specific context will gain a competitive advantage because they can make better use of their data.

The focus and arrangement of this learning process are likely to differ between organizations. In the case of the bank described here, the organization had a long tradition of decentralized design freedom, making it challenging to align data management practices across local departments and projects while simultaneously facilitating local data related innovations. Organizations with a more hierarchical tradition may find it, in contrast, more difficult to assign responsibility to local entities.

The findings of this article are relevant for large, mature organizations of other industries facing complex data architectures with a need to implement regulatory obligations. Similar industries in this regard include healthcare, insurance, transportation, and pharmaceuticals. Data managers can make use of this

case description to critically reflect on their own data management approach and reference the managerial implications when establishing their own data management enhancements.

With this work, we aim at contributing to a better understanding on the design decision space for enterprise-wide data management. As such, the design dimensions proposed in this paper may complement existing frameworks on the design of enterprise-wide data management. So could the CDO framework proposed by Lee et al. [9] potentially be extended by complementary layers which cover aspects like experience or governance.

## Appendix: Research Method

To better understand the process of establishing enterprise-wide data management, we opted for a single-case study approach. The selection of a particular case allows us to present a rich and consistent description and to sound our observations with the respective organization. We consider the selected bank to be appropriate for our research purpose because it introduced the CDO role early and could already gain enough experiences to critically reflect on its lessons learned.

Data collection took place during Summer 2017 and included primary and secondary sources. Primary sources refer to the interviews conducted in the organization. We conducted seven semi-structured interviews, carried out openly and focused on the reasons for establishing a CDO organization, the respective lessons learned, and adjustments. The interviewees held senior management positions, either as CDO or directly involved peer functions, such as IT architecture or business strategy. The interviews were conducted by one or two researchers and lasted between 60 and 90 minutes. All interviews were recorded, transcribed, summarized, and returned to the interviewees for review. Secondary sources included presentations and reports created by the CDO as well as other written documentation (e.g., descriptions of departments).

The data were analyzed in two phases. First, we grouped similar arguments and formed clusters of arguments (e.g., statements describing the objective of enterprise-wide data management). We next analyzed the data based on these clusters and gave particular attention to temporal adjustments and the respective reasons (e.g., how and why did the objective of enterprise-wide data management change over time). Before writing this article, we discussed our findings with representatives of the bank (to verify correctness).

## Acknowledgements

This work has been supported by the Swiss National Science Foundation (SNSF).

## References

[1] R. H. L. Chiang, V. Grover, T.-P. Liang, and D. Zhang, "Special Issue: Strategic Value of Big Data and Business Analytics," *Journal of Management Information Systems*, vol. 35, no. 2, pp. 383-387, 2018.

[2] European Commission. (2016). What Does the General Data Protection Regulation (GDPR) Govern? Available: [https://ec.europa.eu/info/law/law-topic/data-protection/reform/what-does-general-data-protection-regulation-gdpr-govern\\_en](https://ec.europa.eu/info/law/law-topic/data-protection/reform/what-does-general-data-protection-regulation-gdpr-govern_en)

[3] Basel Committee On Banking Supervision. (2013). Principles for Effective Risk Data Aggregation and Risk Reporting Available: <https://www.bis.org/publ/bcb239.pdf>

[4] E. Alfaro, J. Murillo, F. Girardin, B. H. Wixom, and I. A. Someh "BBVA Fuels Digital Transformation Progress with a Data Science Center of Excellence," *CISR Working Paper*, vol. 430, pp. 1-16, 2018.

[5] L. Dallemule and T. H. Davenport, "What's Your Data Strategy?," *Harvard Business Review*, Article vol. 95, no. 3, pp. 112-121, 2017.

[6] K. Weber, B. Otto, H. Oesterle, "One Size Does Not Fit All - A Contingency Approach to Data Governance," *ACM Journal of Data and Information Quality*, vol. 1, no. 1, pp. 1-27, 2009.

[7] J. Belissent and G. Leganza, "Top Performers Appoint Chief Data Officers," *Forrester Research Report*, 2015.

[8] A. Singh and T. Hess, "How Chief Digital Officers Promote the Digital Transformation of their Companies," *MIS Quarterly Executive*, Article vol. 16, no. 1, pp. 1-17, 2017.

[9] Y. Lee, S. Madnick, R. Wand, and F. Z. Wand, Hongyun, "A Cubic Framework for the Chief Data Officer: Succeeding in a World of Big Data," *MIS Quarterly Executive*, vol. 13, no. 1, pp. 1-13, 2014.

[10] W. Dai and N. Wu, "Profiling Essential Professional Skills of Chief Data Officers Through Topical Modeling Algorithms," presented at the Twenty-third Americas Conference on Information Systems, Boston, 2017.

[11] J. Steele, *Understanding the Chief Data Officer - How Leading Businesses Are Transforming Themselves with Data*. Sebastopol CA, USA: O'Reilly, 2015.

[12] A. Forni. (2017). Keys to Success for Chief Data Officers. Available: <https://www.gartner.com/smarterwithgartner/keys-to-success-for-chief-data-officers/>