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Boris Otto
Institute of Information Management, University of St. Gallen, Switzerland, boris.otto@tu-dortmund.de

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Organizing Data Governance: Findings from the Telecommunications Industry and Consequences for Large Service Providers

Boris Otto

Institute of Information Management, University of St. Gallen, Switzerland

Boris.Otto@unisg.ch

Abstract:

Many companies see Data Governance as a promising approach to ensuring data quality and maintaining its value as a company asset. While the practitioners' community has been vigorously discussing the topic for quite some time, Data Governance as a field of scientific study is still in its infancy. This article reports on the findings of a case study on the organization of Data Governance in two large telecommunications companies, namely BT and Deutsche Telekom. The article proposes that large, service-providing companies in general have a number of options when designing Data Governance and that the individual organizational design is context-contingent. Despite their many similarities, BT and Deutsche Telekom differ with regard to their Data Governance organization. BT has followed a more project-driven, bottom-up philosophy; Deutsche Telekom, on the other hand, favors a rather constitutive, top-down approach. The article also proposes a research agenda for further studies in the field of Data Governance organization.

Keywords: Data Governance, data quality, case study, organizational design, contingency factors, research agenda

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I. INTRODUCTION

Motivation

Data Governance is a topic that is attracting growing attention, both within the practitioners' community and among Information Systems (IS) researchers. Consulting companies, software vendors, and analysts have emerged, giving recommendations on the establishment of Data Governance in organizations [Bitterer and Newman, 2007; IBM, 2007; Newman and Logan, 2006]. Researchers have proposed initial frameworks for Data Governance [Khatri and Brown, 2010; Otto et al., 2007] and have analyzed influencing factors [Weber et al., 2009] as well as the current status of implementation [Pierce et al., 2008].

The fact that Data Governance is currently being discussed so vividly is due to a growing number of business requirements which a company's data is expected to meet [Kagermann et al., 2010]. In the telecommunications industry, working with high-quality data is widely seen as a competitive advantage. A company aiming at the provision of Internet Protocol Television (IPTV) on a broad scale, for example, needs to have available both customer data (address data, for example) and network infrastructure data (regarding the bandwidth available in specific regions, for example) in a complete and accurate form. False-negative responses during availability checks (i.e., when customers are told that the product is not available for them, although the bandwidth would be sufficient) due to incorrect or inaccurate data result in lost revenues and reduced market share. What data quality means to telecommunications companies can be seen from a statement from consulting company Deloitte: "Data ascends from the basement to the boardroom" [Deloitte, 2009].

The issue of data quality and data quality management has been under scientific investigation since the 1990s. The respective studies deal with the definition of data quality [Lee et al., 2006; Wang and Strong, 1996], the identification and description of tasks to be addressed by data quality management [English, 2001; Wang, 1998], or the description and analysis of data quality management in concrete, real-world cases. Interestingly, only very few studies deal with the organization of Data Governance on a companywide level. This omission is all the more surprising as companies clearly express their need for effective support in their efforts to establish Data Governance. Despite the fact that the first attempts have been made to formulate recommendations regarding the organization of data quality management (Wang [1998] proposing to view information as a product and to appoint information product managers, or Weber et al. [2009] applying the principles of contingency theory, for example), there has so far been no research into what companies should actually do when trying to organize Data Governance.

Research Problem and Approach

The article at hand picks up on this gap and sets out to investigate the organization of Data Governance. The aim is to shed light on the organizational dimensions of Data Governance and the design options companies have when organizing Data Governance. For this purpose, the article uses case study research which is a qualitative research method particularly suited to researching contemporary phenomena that cannot be separated from the environment they are embedded in (unlike laboratory experiments, for example) and that have not been scientifically studied to a large extent so far [Benbasat et al., 1987; Stake, 1995; Yin, 2002].

The case study comprises two organizations that have similar key company data and similar goals (to reduce confounding effects in the study). Thus the article follows Blanton et al. [1992] and their analysis of IT organization in the banking industry. The two cases presented in this article are taken from the telecommunications industry, namely BT Group—the successor to the former public organization British Telecommunications—and Deutsche Telekom. The telecommunications industry was chosen because of the relatively dominant role—compared to other industries such as manufacturing—that information technology (IT) in general [Potter et al., 2010] and data in particular play for business success [Deloitte, 2009].

This article contributes both to the advancement of the scientific knowledge base and to the practitioners' community. The scientific contribution results mainly from the article's ambition to increase the theoretical understanding of Data Governance organization. It follows the suggestion of previous research to analyze "more complex organizational" [Weber et al., 2009, p. 23] models for Data Governance. Epistemologically, the result of the article represents "theory for explaining," hence a typical outcome of case study research [Gregor, 2006, p. 624].

Practitioners will benefit from the study because they can transfer the results to their own business context, thus fostering the organization of Data Governance.

Section II of the article analyzes the theoretical background. The result of the analysis lays the foundation for Section III which formulates the research question and introduces the research process. The two cases of BT and Deutsche Telekom are presented in Section IV before they are analyzed and interpreted in Sections V and VI. The article concludes with Section VII, giving a summary of the article and an outlook for future research.

II. THEORETICAL BACKGROUND

Data Governance and Related Concepts

Data is sometimes referred to as the "raw material" of information, while information is defined as data in context [Boisot and Canals, 2004] or processed data [van den Hoven, 1999]. In the practitioners' community, however, both terms are often used synonymously. Thus, for the purposes of this article, *information* and *data* are used interchangeably, following the example of Wang [1998].

A common definition of the term *Data Governance* has yet to be established. Some studies point out that several definitions exist, but they do not come up with any clarification in this regard [Pierce et al., 2008]. Other studies take up Weill's [2004] definition of IT Governance as a "framework for decision rights and accountabilities to encourage desirable behavior in the use of IT." Consequently, Weber et al. [2009], for example, see Data Governance as a framework for decision rights and accountabilities to encourage desirable behavior in the use of data. Khatri and Brown [2010] provide a similar description: "Data governance refers to who holds the decision rights and is held accountable for an organization's decision-making about its data assets."

In the practitioners' community, the issue of Data Governance has been taken up in recent years by analysts, software vendors, and consulting companies. Gartner sees Data Governance as establishing "disciplined processes for managing information assets" [Bitterer and Newman, 2007]. Forrester shares the process view and defines Data Governance as the "process by which an organization formalizes the fiduciary duty for the management of data assets critical to its success" [Karel, 2007]. On the contrary, IBM sees Data Governance not as a process but as a "quality control discipline for adding new rigor and discipline to the process of managing, using, improving and protecting organizational information" [IBM, 2007]. And Hewlett-Packard considers Data Governance to be the enterprise function focused on ensuring the quality of an organization's data [Hewlett-Packard, 2007].

The scientific state of the art and the state of the art in the practitioners' community converge with regard to the following aspects of Data Governance:

- Data Governance is based on the notion of data as a company asset, the value of which organizations need to maintain and/or increase.
- Data Governance specifies who in a company is allowed to make what decisions regarding the handling of data (rights), and what the tasks related to this decision-making are (duties).
- Data Governance demands binding guidelines and rules for data quality management.

The article defines Data Governance as a companywide framework for assigning decision-related rights and duties in order to be able to adequately handle data as a company asset.

Both researchers and practitioners frequently use the term Data Governance in the context of data quality and data quality management. Pierce et al. [2008] have shown that in many organizations activities targeted at Data Governance as well as those targeted at data quality management are initiated by the same individuals or groups of individuals. And almost all publications state that—among other things—Data Governance is about making decisions with regard to data quality guidelines and data quality management [Cheong and Chang, 2007; Khatri and Brown, 2010; Otto et al., 2007].

Data quality is typically determined by the data's "fitness for use," i.e., the capability of data to meet certain requirements defined by the user in order to accomplish a certain goal in a given context [Olson, 2003; Redman, 2001]. Thus, data quality seems to be in the eye of the beholder. However, despite the absence of a definition, a number of variables (so-called data quality dimensions) are commonly used to determine data quality. Examples of such dimensions are completeness, consistency, accurateness, relevance, and timeliness [Wang and Strong, 1996].

Data quality management comprises activities for the improvement of data quality [Batini and Scannapieco, 2006]. Going beyond mere reactive action (e.g. identification and correction of data defects), data quality management

works as a proactive and preventive concept, characterized by a continuous cycle consisting of activities to define, measure, analyze, and improve data quality including the design of appropriate framework conditions [English, 2001; Eppler and Helfert, 2004; Wang et al., 1998].

The close connection between Data Governance and data quality management results from the perspective on data as a company asset. This notion of data goes back to the Hawley Report, in which practitioners in the 1990s defined a number of basic principles for handling "information assets" [Horne, 1995]. Data assets are considered to have a certain value for an organization, which is why they need to be managed in the same way that physical goods are managed. Data only has a value if being used. The fitness of data for use is what Wang [1998] considers data quality. Poor data quality, i.e., data "unfit" for use and of low utility, reduces the value of data assets in an enterprise [Even and Shankaranarayanan, 2007, p. 80]. Thus, the value of data depends on its quality. Data Governance provides guidelines and rules regarding data quality and data quality management. Figure 1 illustrates the relationships of these basic concepts.

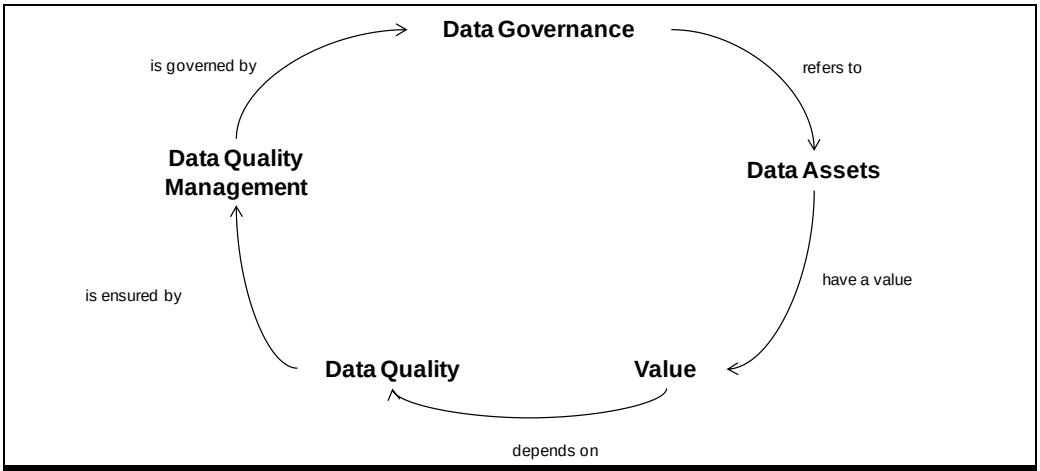

Figure 1. Data Governance and Related Concepts

Organizing Data Governance

Practitioners and researchers agree upon the fact that the establishment of Data Governance is an organizational design task [Lee et al., 2006; Pierce et al., 2008; Thomas, 2006]. However, a holistic conceptualization of Data Governance organization is missing. Existing work discusses either particular organizational aspects such as data stewardship [Friedman, 2007; Laurent, 2005] or remains too generic and does not consider the specific characteristics of different industries, for example [Khatri and Brown, 2010; Weber et al., 2009].

Therefore, this article looks at existing research on organizational design in general and on the organization of the IS/IT Governance in particular in order to lay the theoretical ground for the case study. The transfer of findings from IS/IT Governance to Data Governance follows the lines of argumentation adopted by Khatri and Brown [2010] and Weber et al. [2009].

In general, organizational design comprises three dimensions. The first organizational dimension relates to an organization's goals which can be further divided into formal goals and functional goals [Grochla, 1982; Gross, 1969; Mohr, 1973]. Whereas the former measure an organization's performance, the latter refer to the tasks an organization has to fulfill. Transferred to the research area of data governance, the formal goals relate to maintaining or raising the value of a company's data assets [Fisher, 2009, p. 63ff.], whereas the functional goals are represented by the decision rights defined. Typical decision rights organized by Data Governance refer to the definition of data quality metrics, the specification of metadata, or the design of a data architecture and a data lifecycle [Weber et al., 2009].

The second organizational dimension is the organizational form. This materializes in its organizational structure and its process organization [Galbraith, 2002]. Whereas the former defines the specification and assignment of responsibilities, the latter focuses on the activities required to meet the organization's business objectives. Very few studies address these dimensions from a Data Governance perspective: Wang et al. [1998], suggesting that information be viewed as a product, propose the appointment of an information product manager and the specification and control of the information production process, but give no recommendations as to how this should be done. Weber et al. [2009] propose a reference model for Data Governance, enabling the identification of basic decision areas and roles, but do not explain how companies might design the individual model elements according

to their needs. Furthermore, one can distinguish between primary and secondary organization [Galbraith, 1977, Vahs, 1999]. Primary organization refers to the hierarchical structure of a company. The main characteristic of a hierarchical relation is the unilateral assignment of decision-making power to a higher hierarchy level. In contrast, secondary organization is the result of an effort to mitigate dysfunctional aspects produced by the primary organization, typically by introducing hierarchy-overarching and hierarchy-adding measures [Galbraith, 1977; Galbraith, 2002; Lawrence and Lorsch, 1967]. Examples are coordinating departments and committees. It is widely agreed that Data Governance should comprise the specification of roles and decision rights as well as the assignment of decision rights to roles. Typical roles are data steward, data owner, or Data Governance council [Bitterer and Newman, 2007; Weber et al., 2009].

The third organizational dimension is the organizational transformation which consists of a transformation process on the one hand and organizational change measures on the other. Recommendations on what to do when introducing a continuous improvement process for data quality can be found in the work of Loshin [2001] and that of Batini and Scannapieco [2006]. However, neither is specific when it comes to the question of how such a process could be permanently established in companies. Some authors from the practitioners' community propose maturity models for Data Governance which are supposed to guide the transformation [Dember, 2006; IBM, 2007]. These models, however, often remain at the level of "check lists" with no application support in concrete business settings.

Figure 2 shows the conceptual framework for the case study outlined in this article based on an analysis of the theoretical background. The framework shows Data Governance as an organizational design task which comprises the design of organizational goals, the design of the organizational form, and organizational transformation. Its use in the research process is described in further detail in Section III.

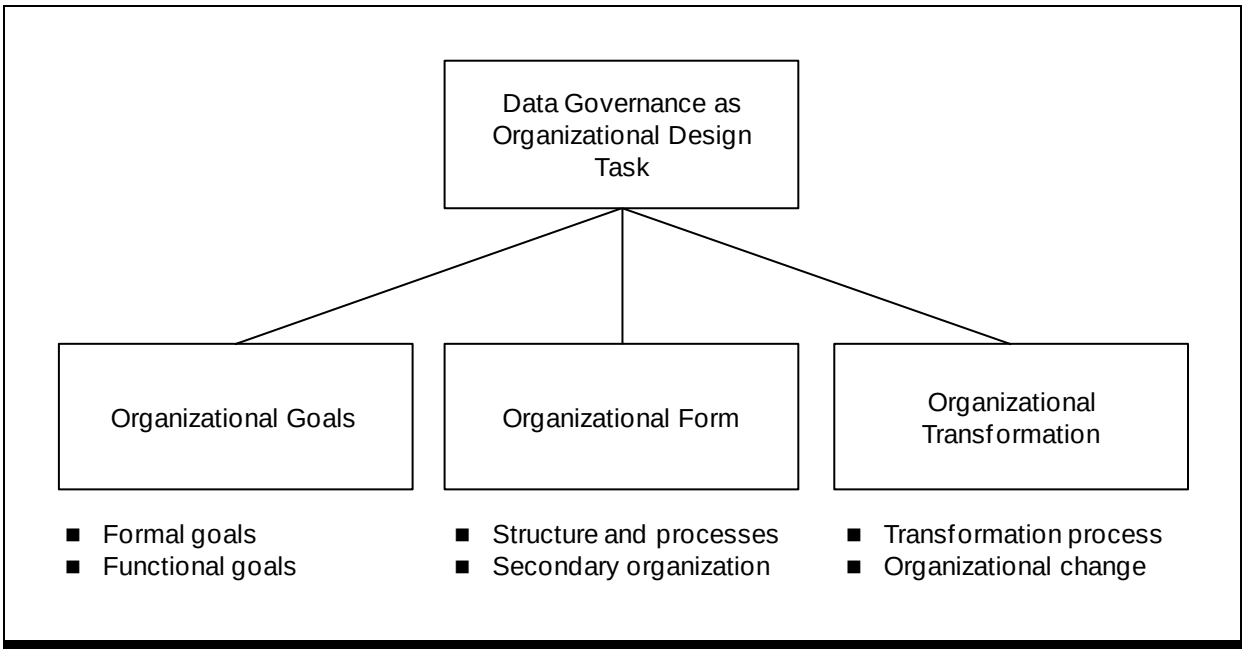

Figure 2. Conceptual Framework of Data Governance Organization

Research on the instantiation of the framework in practice, i.e., the actual organization of Data Governance in a company, is still in its infancy—in contrast to IS/IT Governance which is a highly researched area in this regard. One example is the question of where to locate IS/IT-related decision-making power in the organization. Boynton et al. [1992] propose an approach for supporting companies that want to find a solution for splitting IS/IT-related decision rights between functional departments and IT department. In the context of Data Governance there have been some basic reflections about this issue both in the scientific [Khatri and Brown, 2010; Weber et al., 2009] and in the practitioners' community [Laurent, 2005]. A second example relates to the organizational form of the IS/IT function. Numerous studies have examined alternatives in the continuum between centralized and decentralized organization [Brown, 1997; Ein-Dor and Segev, 1978]. On this basis, various researchers have determined contingency factors by transferring the principles of contingency theory to the organization of the IS/IT function [Brown and Magill, 1998; Sambamurthy and Zmud, 1999]. The "IT Governance archetypes" (business monarchy, IT monarchy, federal governance, IT duopoly, and feudal governance) described by Weill and Ross [2005] are also built on these studies. Comparable studies relating to Data Governance have not been conducted so far. Instead, Weber et al. [2009] showed the general applicability of contingency theory to Data Governance. They identified the performance strategy of a company, the organizational structure and also the degree of market regulation and business process

harmonization as contingency factors, but did not elaborate further on resulting "organizational design patterns," for example. In addition, a number of organizational "prototypes" exist in certain individual cases. Cheong and Chang [2007], for example, describe a Data Governance structure which consists of five roles (Data Governance council, data custodian, user group, IT council, and IT technical staff). And Friedman [2007] proposes a sample organization chart with data stewards per business department, a data quality sponsor, and a data quality operations team.

Data Governance in the Telecommunications Industry

Few available case studies deal with the management of data quality in the telecommunications industry. Reid and Catterall [2005] examine the significance of data quality in the process of introducing Customer Relationship Management (CRM) in a telecommunications company. They show that a data management strategy and a "data governor" are required prior to implementing a CRM system in order to avoid poor customer data quality. Umar et al. [1999] propose a methodology for integrating data quality and data architecture management, based on findings from the telecommunications industry. A similar study was conducted at AT&T, resulting in a three-step methodology for ensuring data quality [Redman, 1995]. Another case study collects and analyzes experiences gained in the process of data integration and developing of a companywide conceptual data model in the course of a Data Warehousing project at Telecom Italia [Trisolini et al., 1999]. Heinrich et al. [2009] illustrate their procedure for developing data currency metrics at a German mobile phone provider. They provide a means for estimating the economic impact of measures to improve data currency. However, each of these case studies deals with a single aspect of data quality management (specification of data quality metrics, for example). None of them addresses Data Governance as a companywide organizational framework.

III. RESEARCH METHODOLOGY

Research Design

This article aims at investigating the organization of Data Governance. For this purpose, case study research was chosen as the underlying research method because it allows the examination of contemporary phenomena in the early state of research in their real-world context [Benbasat et al., 1987; Yin, 2002].

The design of case study research comprises five components [Yin, 2002, pp. 20–27], namely

- the research questions
- propositions for the research
- the unit of analysis
- the logic which links the data to the propositions
- the criteria for interpreting the findings

The central research question of this article is motivated by the lack of research on Data Governance organization and asks what options companies have in practice with regard to organizing Data Governance and whether an individual Data Governance organization is contingent on its context.

The case study is of an exploratory nature, i.e., it aims at laying the foundation for pertinent hypotheses or propositions for further inquiry. In such exploratory cases, Yin [2002, p. 21] concedes that no elaborated propositions can be specified beforehand (in contrast to descriptive and explanatory case studies). Nevertheless, he stipulates that case studies be purpose-oriented, i.e., that there has to be a preliminary conceptual framework guiding the exploration. This article uses the conceptual framework of Data Governance organization (see Figure 2) as preliminary proposition, assuming that Data Governance comprises three different dimensions and that companies have options when designing the dimensions. Moreover, previous research on Data Governance suggests the assumption that individual instantiation of the design options is contingent on context [Khatri and Brown, 2010; Weber et al., 2009].

The unit of analysis of the study at hand is the organization of Data Governance in the telecommunications industry. From a Data Governance standpoint, the telecommunications industry is characterized by high IT spending [Potter et al., 2010], big data volumes, many legal and regulatory requirements (e.g., related to security and privacy of customer data) and intensive consumer interaction, as well as complex application system architectures (all compared to other industries such as discrete manufacturing, for example).

The above mentioned conceptual framework for Data Governance organization is also used as the logic which links the data to the propositions in the case analysis (see Section V). Moreover, the framework—together with the proposition that its individual instantiation is context-contingent—serves as guidance for the interpretation of findings

in Section VI. In doing so, the article results in a theory for explaining because "explanations are given for how and why things happened in some particular real-world situation" [Gregor, 2006, p. 624].

Case Selection

Along with a clear understanding of the unit of analysis, case selection is crucial for building theory from case studies because it is case selection that determines the external validity of the case study [Yin, 2002, pp. 35–36], hence the limits for generalizing the findings [Eisenhardt, 1989, pp. 536–537]. The companies to be investigated in the case study were selected on the basis of key company data [Benbasat et al., 1987, p. 373]. Key company data comprises aspects such as company size, geographic coverage, organizational structure, or customer base structure. To avoid confounding effects, the study was limited to the examination of companies with comparable environments.

The two companies that were chosen are BT and Deutsche Telekom. Both companies rank among the world's leading providers of communications solutions. BT's activities include networked IT services, local, national, and international telecommunications services, and higher-value broadband products and services. BT Group plc is the holding company for an integrated group encompassing the four lines of business. Deutsche Telekom offers telecommunications and IT services. Deutsche Telekom's business strategy is oriented toward socioeconomic developments, such as digitalization of central areas of life, personalization of products and services, and the increasing mobility of individuals. The two companies show similarities regarding their key company data (see Table 1). Previous case studies followed similar principles for the selection of companies, as did Blanton et al. [1992] with their analysis of IT organization in the banking industry.

The main contacts for the case study were two employees in charge of data quality management introduction at BT and the head of the organizational unit "Data Governance" at Deutsche Telekom. Case A was analyzed first, in the second quarter of 2008. In a second step, case B was selected for replication purposes [Yin, 2002, pp. 45–46]. Thus, the Deutsche Telekom case was chosen because it allowed for investigation of the same phenomenon.

Table 1: Case Overview

	Case A	Case B
Company	BT	Deutsche Telekom
Headquarter	London, United Kingdom	Bonn, Germany
Revenue in 2009	GBP 21.4bn	EUR 64.6bn
Staff 2009	96,000	260,000
Lines of business	• BT Retail • BT Wholesale • Openreach • BT Global Services	• Broadband/Fixed Network • Mobile Communication • Business Customers
Markets served	Operations in 70 countries	Operations in more than 50 countries
bn = billion.		

Data Sources, Collection, and Exposition

In order to prepare the companies for the case study research project, they were both provided with information material outlining the objectives of the project and a structured interview guide. The interview guide reflected the fact that Data Governance is considered a design activity [Khatri and Brown, 2010] which follows a process of reshaping an initial organizational state toward a desired state [Galbraith, 2002]. Therefore, the questions in the interview guide were structured into three groups: first, the initial situation (including "pain points" and the "need for action"); second, the process of Data Governance organization covering the three organizational dimensions of the conceptual framework; and third, the new situation.

In accordance with accepted recommendations on case study research [Stake, 1995; Yin, 2002], multiple sources were used for data collection. However, interviews provided the main data source at both BT and Deutsche Telekom. Table 2 summarizes the data sources used.

All interviews were documented in writing by two researchers working in parallel. The documents were then analyzed and transferred into an integrated case document (one for each company). The first versions of this document were then sent to the interview participants for feedback and clarification of open points. Once all the additional information feedback had been incorporated, the final version was reviewed and discussed several times on the phone with the main contacts at BT and Deutsche Telekom. The final versions, which are available as working reports [Otto and Weber, 2009; Schmidt et al., 2010], were also reviewed by the companies' communication departments.

The presentation of the cases follows a chronological structure and intentionally deviates from the analytical structure provided by the conceptual framework. This enables the case presentation to take into account the fact that the case study covers an event over time [Yin, 2002, p. 139]. Subsequently, the conceptual framework of Data Governance organization is used as the underlying structure to analyze and compare the cases in Section V, before the results are interpreted in Section VI. This approach follows the recommendations given by Benbasat et al. as a path which readers can readily follow [1987, p. 374].

Table 2: Data Sources

	Case A	Case B
Company	BT	Deutsche Telekom
Interviews	2008-04-14, 13:30–17:00, London (UK) • Head of Information Management Practice, BT Design • IM Manager, Business Revenue Management, BT Wholesale • IT Manager, BT Wholesale • Lead Data Management Consultant, BT Design	2009-11-06, 09.00–10:30, Darmstadt (DE): • Head of Data Governance, Central IT
	2008-04-14, 19:30–21:00, London (UK): • Head of Unit Customer Management ICT Transformation, BT Design • IT Manager, BT Retail • Lead Data Management Consultant, BT Design	2009-11-06, 11:00–12:30, Darmstadt (DE): • External consultant to Central IT
	2008-05-15, 12:30–13:45, Cardiff (UK): • 2 DM Consultants, BT Design • Lead Data Management Consultant, BT Design	2009-11-06, 13:00–14:30, Darmstadt (DE): • Data Architect, Central IT
	2008-04-15, 14:45–15:30, telephone: • Enterprise Data Architect, BT Design • Lead Data Management Consultant, BT Design	
Documents	External presentations: • Presentation by [Hill, 2003] on the IM Program • Presentation by Turner and Evans [2007] at ICIQ 2007	Official publications: • Presentation by [Grewe, 2009] at the Data Management Congress 2009 in Cologne • TM Forum, Information Framework (SID), as per 04.02.2010 [TM-Forum, 2010]
Archival records	Internal documents: • Information Management Forum Terms of Reference, BT Group plc, London, UK 2002 • BT Group Information Policy, BT Group plc, London, UK, 2001	Company communications: • DTAG, Connected life and work, annual report 2008 • DTAG, Deutsche Telekom AG, company presentation, Bonn 2009

DM: Data Management
IM: Information Management
IT: Information Technology
TM Forum: Tele Management Forum
SID: Shared Information and Data

IV. CASE PRESENTATION

BT

Initial Situation

In the mid-1990s, BT introduced a strategy to increase the speed of service deliveries to customers, as a response to the effects of market deregulation and increasing competition. At that time, BT's business processes were very complex, and in many cases processes were supported by more than one application system. Business processes were mainly designed to fit the functional orientation of BT's organization. Hence, end-to-end processes were split across many different organizational units. Also, as BT was undergoing continuous organizational change, business processes were permanently being designed "behind reality." The gap between business process design and the demands of reality was typically closed by increased manual activities and workarounds.

The central problem at BT with regard to data was that no standards existed for the creation, use, and maintenance of data. These activities tended to be spread across the entire organization. For example, each line of business had its own customer data, a diverse set of products, and different contractual agreements. Another problem was meeting the need for high-quality customer address data as an essential precondition for business processes such as billing, delivery, repair, and marketing.

BT's Operational Support Systems supported all business processes. However, the systems landscape was very complex and heterogeneous. Over time, the proliferation of systems had led to complicated interfaces and data flows. Moreover, acceptance of IT services was limited because business often failed to yield the expected business benefits from systems. In this context, BT's IT strategy aimed at improving existing systems and increasing their use, rather than developing a new application architecture design.

Other factors causing BT to deal with the issue of data quality resulted from its functional organization, which did not support integrated business processes. Business units did not know where the data they were using came from, and which other units in subsequent process steps were using the same data for what purpose. As a consequence, employees did not focus on entering seemingly unnecessary data correctly, which resulted in poor data quality in subsequent process steps. For example, repair personnel were sent to the wrong locations because of incorrect customer address data, which was costly for BT and resulted in a poor experience for the customer.

The Information Management Program

BT's data quality efforts started in 1997 with an initial project and over time evolved into the Information Management (IM) Program. The IM Program was sponsored by the Group Chief Information Officer (CIO), which was a business function at that time. The initial project had a budget of GBP 20,000 and aimed at identifying opportunities to better leverage investments in information systems in BT Wholesales. The study covered various topics and their impact on business. It emerged that data quality was rated as number one priority.

A team of two people was formed in response to this finding. The first area which was selected dealt with the data quality of customer names and addresses used by BT Retail. The project team analyzed and evaluated appropriate software tools to improve data quality in this domain. The one-year software license fees incurred by the purchase of the software were recovered within three months through postage savings after the cleansing of address data. With this success as the starting point, more projects followed. The largest project aimed at replacing two marketing systems by one new system called SWIFT. It was based on the introduction of standards for customer names and addresses. The increasing number of data quality projects led to the establishment of the IM Steering Group in 1998, whose main objective was to oversee projects and make sure they were in time and budget.

In 1999, BT Wholesale joined the initiative, driven by a lack of transparency with regard to its assets. The Steering Group then gave rise to the IM Forum. Among the major tasks of the IM Forum were portfolio management for data quality projects, planning and budgeting processes for data quality activities, coordinated identification of opportunities for data quality projects, and alignment with BT's overall business goals. Also in 1999, the IM Forum issued the first version of the BT Group Information Policy, which aimed at maximizing exploitation of "information assets" across the organization.

In 2000, the IM Forum initiated a one-day information event called "Shaping the Future BT Conference." The event was chaired by BT's CEO, who gave a keynote speech emphasizing the importance of information in BT's strategic goals. Both BT Retail and BT Wholesale presented selected data quality projects demonstrating that increased data quality results in improved business performance. As a result of the conference, the request for data quality projects increased.

Also in 2000, the team developed a methodology for data quality projects (see below). The approach was characterized by a focus on cost-benefit analyses. Project proposals that could not prove a reasonable cost-benefit ratio were not accepted. While the Data Quality Methodology was an answer to the need for a structured approach to efficiently managing the growing number of projects, it was also a means for fostering adoption of the Information Policy. The team learned that a simple directive regarding the use of information and data was not enough to achieve sufficient support from the business. Instead, the team had to speak a "language the business understood," i.e., be able to quantify the monetary benefits of improved data quality in a business process or function. By 2003, the number of data quality projects managed under the IM Program had grown to more than fifty.

The IM Forum

Members of the IM Forum were the Group CIO, the CIOs of the different lines of business, and a representative from central Information and Knowledge Management (IKM) practice. The projects coordinated by the IM Forum were

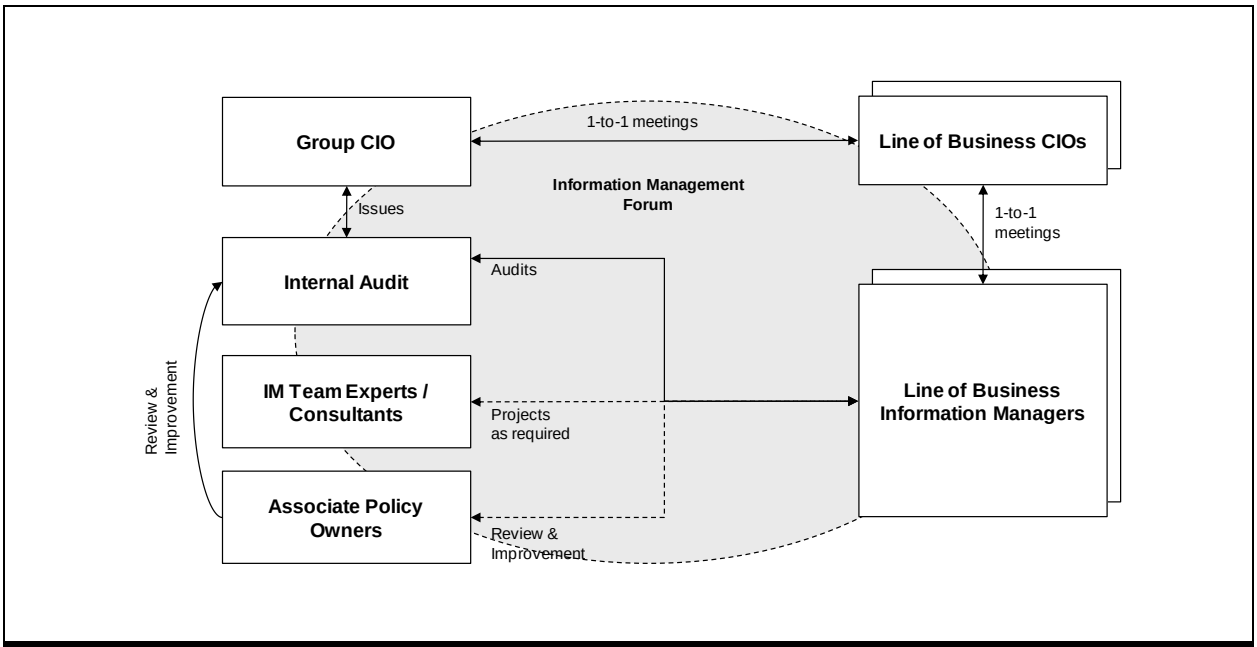

Figure 3. BT's Information Governance

funded by a central budget provided by the Group CIO. However, the benefiting lines of business were to contribute from the savings they made as a result of the projects so that the IM Forum would be self-funding.

In the course of the IM Program, specific roles in both business and IS/IT departments were established. As the data held by each line of business needed to reflect the different market and organizational needs, one senior manager from every line of business was appointed "Information Manager." Information Managers were responsible for data quality communications, organizational change and improvement activities, and data cleansing. Business owned the definitions of data quality and the metrics that define success across data quality projects. An Internal Audit group carried out audits to ensure compliance of the lines of business with the Information Policy. Figure 3 shows an overview of BT's information governance roles and responsibilities.

As a corporate-wide instrument, the Information Policy set out directives for the different lines of business, such as conducting data quality assessments, developing measures and targets for data quality, and developing communication plans. Implementation of the Information Policy was one of the IM Forum's main areas of responsibility.

However, BT realized that the Information Policy in itself was just a first step and not sufficient to create sustained awareness of the importance of data quality in the business. It was not that business managers were per se reluctant to implement the Information Policy, but certain business requirements (such as "do more with less," organizational changes, etc.) conflicted with data quality objectives. The IM Forum reacted by changing its approach and introducing the Data Quality Methodology, which allowed managers to focus on the business impact of data quality. Speaking the "language business understood," i.e., quantifying the monetary benefit of each data quality project, facilitated the deployment of sustainable, reusable solutions and hence sustainable data quality improvements.

Data Quality Methodology

BT's Data Quality Methodology consists of five phases (see Figure 4). The first phase, Problem & Opportunity Identification, aims at identifying pain holders and "champions" and at relating complaints and suggestions regarding data quality to business objectives. Within the second phase, Diagnosis, the project team carries out a quick data analysis which is comprised of data discovery and data profiling techniques in order to identify the current data quality level as a baseline (also called "data quality health check"). The health check is followed by a workshop with stakeholders to identify problem sources and potential business benefits. Proposals with no indication of business benefit are rejected. For approved proposals, stakeholders and the project team create a commercial proposition document within the Proposal phase. The document has to be agreed by the business sponsor and then forms the project agreement. The commercial proposition ensures that business owns the project. In the fourth phase, Re-engineering, the project team designs and implements the solution. Business leads and IT supports the solution,

which includes changing culture, systems, processes, and technology. With the fifth phase, Consolidation, the project team aims at ensuring a sustainable solution.

In addition to the Data Quality Methodology, the Architectural Forum—which was formed as a subgroup of the IM Forum—developed data quality principles for system development as part of the design procedures called Joined-Up Design (JUD). New system development projects had to pass the JUD test, which ensured that the prerequisites for data quality were taken into consideration in the design of new systems. For example, only existing data sources were to be used. The Architectural Forum was empowered to stop system development projects until they passed the test.

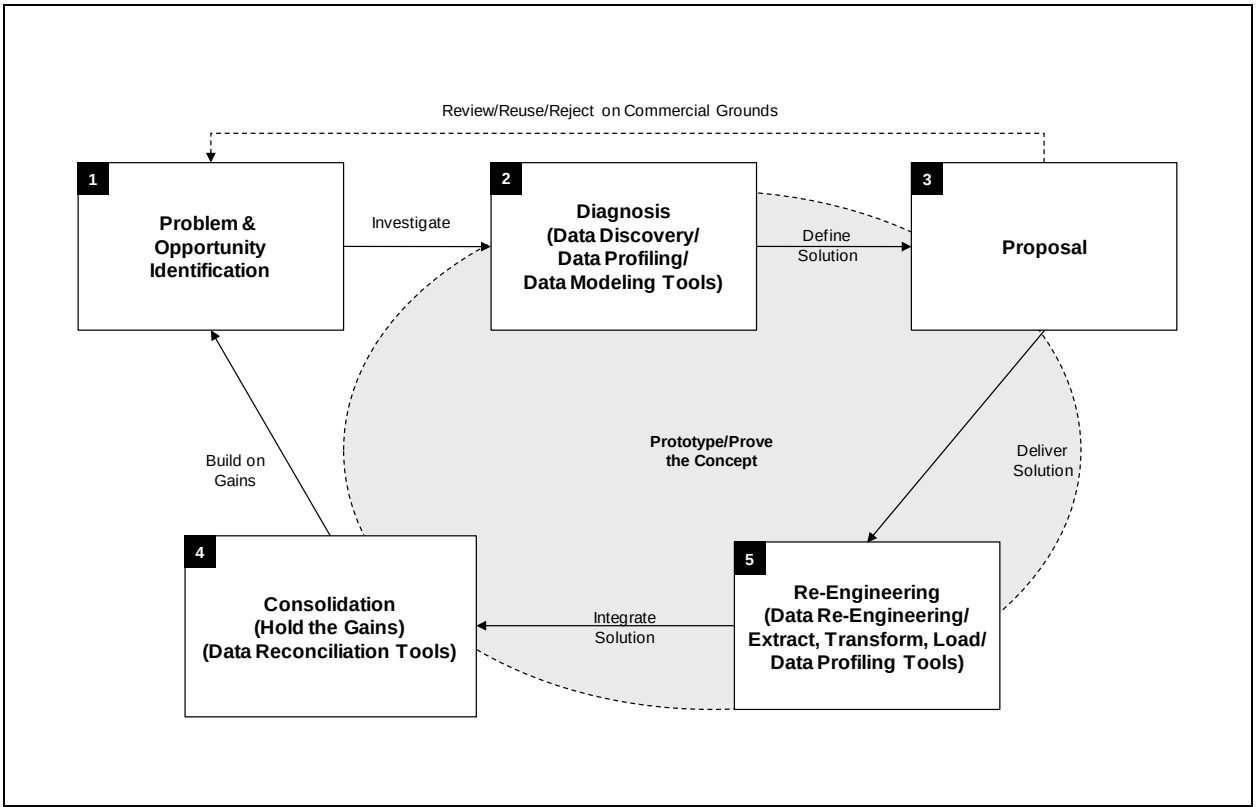

Figure 4. BT's Data Quality Methodology, adapted from [Turner and Evans, 2007]

New Situation

BT achieved a cumulative GBP 700 million in business benefits during the seven-year IM Program. The overall benefit is a result of the benefit contributions of the numerous individual data quality projects which were coordinated under the IM Program (in 2003, for example, the program included more than fifty projects). Sources of benefits were mainly process improvements, i.e., reduced costs of failure, less scrap and rework, enhanced productivity, and better morale. Reduced lifecycle costs and faster deployment of enhancements led to an increased return on investment in Information Technology, which was one of the main goals of the IM Program.

Within BT Wholesale, the business signed off over GBP 600 million in benefits, which amounts to 85 percent of all of BT's data quality benefits. Benefits resulted from decreased inventory costs, avoidance of capital expenditure, revenue recovery and creation, and improved asset utilization. Furthermore, lost assets could be found, asset status was corrected, correct bills for products and features were issued, electronic business was enabled, and customer satisfaction and process efficiency was improved.

Every year, the team was given targets for savings in the asset investment budget, and the team succeeded in meeting these targets. When it came to defining business benefits, there were no generic measures—these were specific for every project.

An example is the "lost asset" project which improved accuracy and availability of network asset data. This was achieved through harmonizing asset data records, improving business processes between BT and external network suppliers, and supporting "asset recovery." In 2003, approximately 15 percent of all network assets were not recorded in the inventory systems (i.e., they were considered "lost") [Hill, 2003]. And in the same year, BT reported

on GBP 1.8 billion in new network capital expenditure [BT Group plc, 2003]. Avoidance of just 10 percent (as a conservative estimate) of the monetary value of the average 15 percent losses equals savings of GBP 27 million.

The IM Program is seen as a successful initiative within BT. However, with growing maturity and stability, the program became self-contained and developed into "business as usual," which is why it now no longer exists as a strategic goal in its own right. At BT Wholesale, there is a relatively small team that has continued to run internal data quality projects using the Data Quality Methodology. Part of the core IM Team now works at BT Client Services, providing data quality services to BT's customers using the Data Quality Methodology. The Architectural Forum turned into a group dealing with Enterprise Master Data Management.

Deutsche Telekom

Initial Situation

To validate whether the company's strategic business goals are met on a short-term basis, Deutsche Telekom defined six priorities (the BIG 6) containing measurable objectives for each business year. In 2008, for example, the BIG 6 referred to the company's expansion of its leading position in the broadband sector, entrance into the entertainment market, and the fulfillment of customer expectations with regard to products and services.

Before 2006, Deutsche Telekom pursued neither systematic data quality management nor any form of Data Governance. Activities related to data quality management were limited to casual consistency and completeness checks of data inventories for single applications or ad hoc data cleansing initiatives when new software components or products were implemented. All these measures were demand-driven and did not take into account business requirements to be met by data. Moreover, the question of how to improve data quality on a companywide level and in a preventive manner was not addressed.

When the two business divisions—T-Com and T-Online—merged in June 2006, Deutsche Telekom faced a growing need to ensure data quality on a companywide level. For example, it became necessary to consolidate data inventories from both divisions in order to ensure consistency of customer master data, as customers were increasingly being offered a combination of products from both divisions (i.e., telephone and Internet products and services). The following problems occurred with the merger of T-Com and T-Online:

- Alignment of data quality management with the overall company strategy and the BIG 6 was missing.
- Companywide guidelines and processes for maintenance and modification of business objects and data objects were not defined and/or implemented.
- Clearly defined responsibilities for maintenance and modification of business objects and data objects were not defined.
- The origin and the distribution of data objects across the entire IT landscape were not transparent.
- Data defects, although identified (inconsistency of customer data, for example), could not be quantified.
- There was no companywide transparency as to which data had to be available in which quality, or as to what methods and techniques could be used for effective data quality management.
- There was no common understanding of business objects and data objects (i.e., no common understanding of the elements to be addressed by data quality management).

Data Governance Organization

In the course of integrating T-Com and T-Online to form the new business unit T-Home, Deutsche Telekom decided to set up organizational units solely addressing the issue of data quality management. These organizational units were supposed to act as a line function in order to bundle and control existing data quality management activities, which until then had been conducted independently of one another and in a decentralized fashion.

In April 2007 a project was started in the board area IT, aiming at preparing the regular operations of a business function for data quality management. The project resulted in the establishment of two departments for data quality management, one within a business function and the other within the central IT department. The business department is called MQM27 and deals with the consolidation of business requirements to be met by data (particularly customer data). It is the central unit for data quality management on the business side. Within the central IT department, known as ZIT (*Zentrum für Informationstechnik*—Center for Information Technology), there was established a department called MDM (Master Data Management, ZIT72), which is responsible for putting forward concepts for data quality management and translating business requirements to the IT level. ZIT also encompasses another unit, Data Management (ZIT73/74), which deals exclusively with data cleansing activities. For

the purpose of planning and executing data quality measures, the departments ZIT72 and MQM27 cooperate closely with a unit named IT2 (Enterprise IT Architecture). ZIT72, on the other hand, consists of two teams. One of these (ZIT722) deals with short- and mid-term tasks such as data quality measurements. The other, Data Governance (ZIT721), is responsible for long-term measures, such as defining standards for Data Governance, developing guidelines and rules to ensure high data quality, specifying data object ownership, or designing and implementing companywide data models and data architectures. Figure 5 shows how data quality management is embedded in the organizational structure of Deutsche Telekom. Grayed out organizational units are the ones dealing with the functional goals of Data Governance.

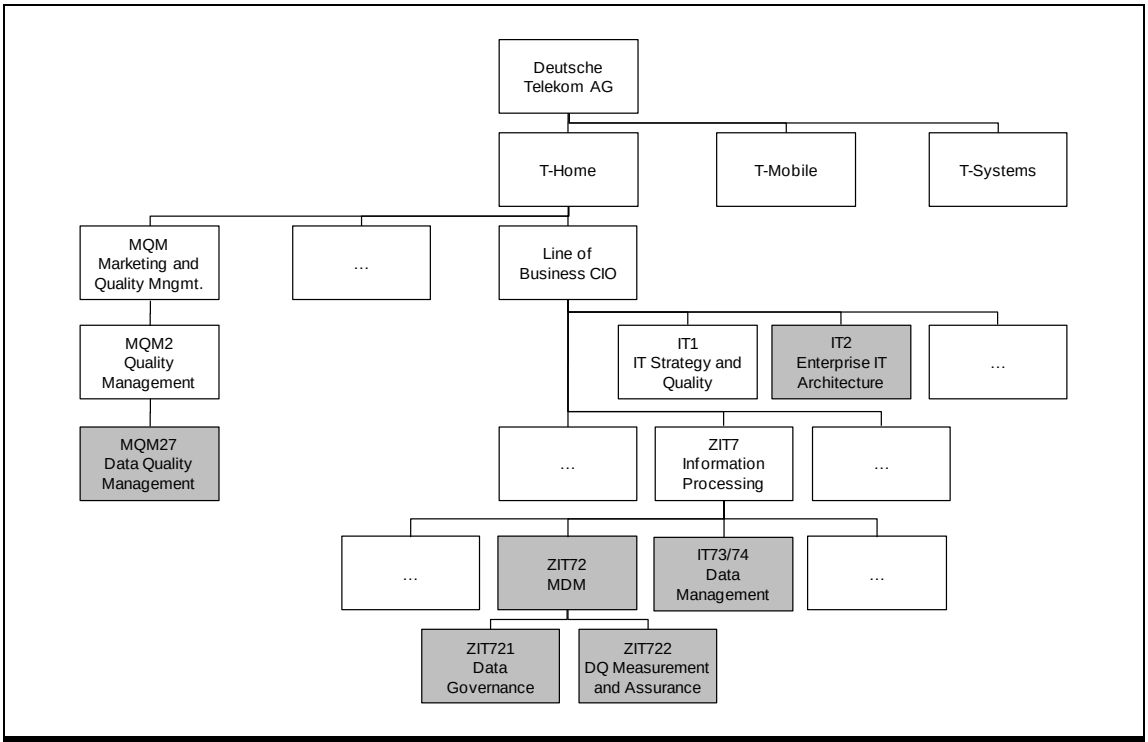

Figure 5. Data Governance Organization at Deutsche Telekom

In parallel with the design of the organizational structure, the NDQ2010 project was initiated (NDQ stands for "*Nachhaltige Datenqualität"*—Sustainable Data Quality). One of its goals was the identification and assignment of data-related responsibilities:

- Data owners are responsible for the data class or attribute assigned to them. They make the final decisions with regard to maintenance or modification of their data classes and attributes. The role of data owner is typically assumed by the head of the functional department/division.
- Besides the data owners, two data architects, one from the business side and one from the central IT department, are assigned to each data class. Data architects are responsible for the management of metadata and data structures of the respective data class (i.e., the data modeling processes).
- Data managers (again one from the business side and one from the central IT department) are responsible for data maintenance and for the related processes, tools, and resources on behalf of the data owner.
- Business and IT data quality managers are responsible for controlling data quality processes.

New Situation

At Deutsche Telekom, guidelines and rules exist for data quality management. While guidelines (such as "clear and unambiguous definition of and ownership for metadata") tend to constitute a framework aimed at directing employees' actions and "way of thinking," rules (such as "the central model of reference data for all T-Home applications is the current version of the business object model") are more concrete and binding.

For the purpose of aligning data quality management with the overall company strategy, the BIG 6 are used as an orientation pattern when performance indicators for data quality management and target values for data quality are defined. This ensures that data quality management activities always support strategic company goals. Moreover,

clear data-related responsibilities are assigned per business object. And a standard data model was introduced on a companywide basis.

The Data Governance team (as part of the MDM department) has evaluated the benefits of a consistent data modeling approach and a standardized, companywide data model:

- The standardized data model provides a common and consistent terminology facilitating communication between functional departments and the central IT department as well as across domain boundaries.
- The definition of business objects across projects and domains fosters business object reuse so that repeated redefinition can be avoided and costs and additional effort can be reduced.
- A standardized data model is a prerequisite for the consolidation of distributed system landscapes and the migration of systems.
- The comprehensive definition of business objects fosters a common understanding of data elements and reduces errors due to inadequate usage.
- A standardized data model is a prerequisite for efficient integration of internal and external partners, as all data elements have the same semantics.

Apart from that, Deutsche Telekom quantified the overall savings through those benefits by estimating the cost reduction potential for new system development activities, maintenance activities, and system operations activities. For the budget for new system developments, for example, Deutsche Telekom estimated a portion of 20 percent being "generally influenceable," of which between 12.5 and 22.5 percent might be positively affected by data quality measures. Deutsche Telekom expected to reduce the overall IT budget by 0.2 percent in the first year after introducing a standardized data model, by 0.67 percent in the second year, and (leveraging learning curve effects) by 1.46 percent in the third year, resulting in an average annual saving potential of approx. 0.8 percent of the IT budget [see Schmidt et al., 2010]. With an estimated average proportion of the IT budget amounting to 5.3 percent of a telecommunications company's turnover [Smith and Potter, 2008], Deutsche Telekom's cost-saving potential in 2009 equaled EUR 27 million.

V. CASE ANALYSIS

Organizational Goals

With regard to the organizational goals related to Data Governance, the cases are similar insofar as the motivation to organize Data Governance was derived from the companies' overall strategic goals (more implicitly in the case of BT, very explicitly in the case of Deutsche Telekom with its BIG 6).

Also, the economic benefit was quantified in both cases. However, BT did so only for individual projects, whereas at Deutsche Telekom the benefit (of a standardized data model, for example) was not calculated until data quality management had been organized as a line function. At BT, formal goals were set as targets for cost savings (in particular, for the asset investment budget), whereas they were not specified at Deutsche Telekom.

A comparison of the quantified benefits in the two cases shows that BT realized cost savings of approximately GBP 100 million per year while Deutsche Telekom's annual saving potential equals EUR 27 million. However, the conclusion that BT's approach for Data Governance was more effective is not valid because benefit quantification approaches applied in the two cases are different. For example, BT assigned the business benefits of all data quality projects to the IM Program whereas Deutsche Telekom only quantified the effects of the introduction of a standardized data model. And BT was able to consider the full amount of realized benefits whereas Deutsche Telekom calculated with an attenuation factor (12.5 to 22.5 percent in the example given above).

Similar functional goals exist with regard to support for data quality projects. However, whereas all of BT's actions were project-driven, at Deutsche Telekom companywide design tasks also played an important role (for the data architecture, for example).

Organizational Form

The organizational structure of Data Governance differs in the two cases. During the time of the IM Program there was no line function at BT, whereas at Deutsche Telekom the two departments MQM27 and ZIT72 were set up right from the start. At the same time, differences also exist with regard to the process organization. At BT, the Data Quality Methodology was developed and introduced as a new process for guiding data quality projects in a business-oriented manner. In contrast, Deutsche Telekom uses existing processes such as the change request management for IS/IT services.

And while at BT the IM Forum was a central element in the secondary organization of Data Governance, at Deutsche Telekom interaction of the different departments and projects took place via existing project management structures. The translation of activities into a line function was not performed at BT until Data Governance—in the form of the IM Program—had proven to be successful.

Organizational Transformation

When it came to the organizational transformation, BT decided in favor of a "start small, grow big" approach (i.e., the initial budget for the project was quite small). Deutsche Telekom, on the other hand, decided to implement new line functions first, and set up projects to elaborate on detailed aspects of data quality management afterwards (e.g., the NDQ project).

As for organizational change management, Deutsche Telekom only executed measures in the course of the merger process for the two divisions. Apart from this, no explicit change management took place. BT, however, was always anxious to maintain the commitment of both top management and functional departments on a continuous basis.

Table 3 summarizes the result of the case analysis as a case-ordered meta-matrix [Miles and Huberman, 1994].

VI. INTERPRETATION OF FINDINGS

Propositions

The case analysis shows that companies have options when designing the three organizational dimensions described in the framework of Data Governance organization. The results of the case analysis in Table 3 show a number of similarities in the way the two studied companies organize Data Governance. Similarities can be found mainly with regard to the formal goals (e.g., derivation from the companies' strategic business goals, limited degree of formalization) and to functional goals (e.g., setting companywide policies and standards, companywide Data Governance roles). Also, the case analysis reveals many differences which lie mainly in the organizational structure (project organization at BT vs. line functions at Deutsche Telekom) and the transformation process ("think big, start small" at BT vs. "top down" from the outset at Deutsche Telekom).

> *Proposition 1: There is no "off-the-shelf" approach for organizing Data Governance. The organizational design of Data Governance rather depends on how companies "configure" the variety of organizational dimensions related to Data Governance.*

The fact that even companies with many similarities (with regard to key company data, for example) have numerous design options in organizing Data Governance confirms the assumption of existing research regarding Data Governance as being context-contingent [Khatri and Brown, 2010; Weber et al., 2009].

> *Proposition 2: The effective design of Data Governance organization is contingent on external and internal factors because these factors determine the configuration of organizational dimensions related to Data Governance.*

Proposition 2 leads to the question of exactly which factors are contingencies. As an appropriate tactic for further case investigation, Eisenhardt recommends the juxtaposition of seemingly similar cases [1989, p. 541]. As mentioned before, the two companies show many similarities: They are almost the same in terms of key company data (revenue, number of employees, markets served, product portfolio, etc.), are former state-owned companies, have undergone significant organizational changes, and operate in the same industry (one which is characterized by intensive customer interaction, high infrastructure investments, and high IT spending). However, they display significant differences in two other aspects.

First, the "mandate for action" was given by different units in the two companies. At BT, both the initial project in 1997 and the IM Program were sponsored by a business function (in fact by the CIO who was then organizationally positioned on the business side). In contrast, at Deutsche Telekom the project which prepared the setting up of the organizational structure for Data Governance was IT-driven. This might explain why Data Governance was for a long time organized as a program with no formal allocation to a line function. Business units were interested in solving data quality issues on a project-wise basis. The "constitutive" approach which Deutsche Telekom chose might have been "harder to sell" to the business units at BT.

Second, there was a difference in the awareness of Data Governance as an important topic. When BT started the IM Program, Data Governance was a relatively new concept with an extremely limited knowledge base. The initial project at BT was not even considered a data quality project, and data quality did not turn out to be an issue until the results had been analyzed. As a consequence, there were no references BT could learn from and all Data Governance-related design options had to be learned "from scratch." At Deutsche Telekom, the situation was very

Table 3: Case Analysis				
		Case A	Case B	
Variables (cf. Figure 2)		BT	Deutsche Telekom	Congruence
Organizational Goals	Formal Goals	• Driven by strategic business requirements • Implicitly related to strategic business goals • Annual targets for IM Program	• Driven by strategic business requirements • Explicitly related to the BIG 6, but not formalized	High
	Functional Goals	• Initially defined in the IM Policy • Goal definition on a case-wise basis (e.g., data quality targets) • Central portfolio management (including budgeting)	• Job descriptions for units MQM27 and ZIT72 • "Constitutive" goals (e.g. standard data model, guidelines and rules)	Medium
Organizational Structure	Structure and Process Organization	• Organizational unit not introduced until IM Program turned out to be successful • Establishment of IM Managers in business units	• Organizational units MQM27 and ZIT72 • Integration into existing processes (e.g., change request management)	Low
	Secondary Organization	• IM Forum as a means of secondary organization • Data Quality Methodology to facilitate project organization	• Identification and assignment of Data Governance roles across organization • Projects such as NDQ (dedicated DQ projects) • No formal board structure	Medium
Organizational Transformation	Transformation Process	• Evolution over time, starting with a small project and growing to the IM Forum (no "master plan" existed upfront) • Continuous management of a project portfolio	• Small preparatory project in 2006 • NDQ project to elaborate tasks and define roles	Low
	Organizational Change	• "Shaping the Future BT Conference" including CEO speech • Task of Information Managers • Focus on benefits to obtain support from business	• Part of larger initiative (integration of two lines of business) • Benefits exemplarily analyzed to show impact on the business	Low

different. At the start of their Data Governance activities, the topic was still in its infancy within the scientific community, but was intensively discussed within the practitioners' community. For example, IBM founded a Data Governance Council which consisted of a number of large US-based firms as far back as 2004 [IBM, 2006]. Thus, Data Governance was considered an accepted approach which, for decision-makers, in return reduces the perceived risk related to organizing Data Governance as a line function.

> *Proposition 3: The positioning of the mandate for action and the awareness of Data Governance within the company are two contingency factors for Data Governance organization. They determine the configuration of organizational dimensions related to Data Governance and, thus, the effectiveness of Data Governance.*

At BT, the mandate for action was allocated to a business function from the early stages of the Data Governance activities. This approach to mandate allocation can be interpreted as a reason why Data Governance was always

required to demonstrate its business benefit (what also led to a mandatory cost-benefit-analysis in the data quality methodology). Moreover, it might also be an explanation for why BT (in contrast to Deutsche Telekom) did not use a rather "conservative" approach to quantifying the business benefits. BT's Data Quality Methodology ensured that business functions were continuously "engaged" in the justification of Data Governance.

> *Proposition 4: In companies with the mandate for action allocated to a business function, the business benefits related to or caused by Data Governance are eventually attributed to Data Governance to a larger extent (compared to companies with a mandate for action in IT, for example).*

The propositions also raise the question about the validity of findings, in particular external validity. External validity concerns the domain to which the findings can be generalized [Yin, 2002, 35ff]. The comparison of the companies studied suggests that the findings hold true for other large, multinational service providers with intensive use of complex IT and a large customer base. Similar companies can be found, for example, in the retail banking and utility industries. Cheong and Chang [2007] present the case study of a large utility service provider in which Data Governance activities were driven by data quality issues in asset management (similar to BT) and in which a Data Governance council was established (similar to the IM Forum at BT).

In contrast, the findings are not expected to be transferrable to companies with fundamentally different characteristics to those of BT and Deutsche Telekom. Such firms might be found in manufacturing industries, among others. Wijnhoven et al. [2007] discuss Total Data Quality Management (TDQM) at gas valve producer Honeywell Emmen in The Netherlands. This case differs in many ways from the cases presented in this article. The focus of activities was on product data (not on customer or asset data), the company (typically for manufacturing firms) operates a central product database (in contrast to the complex and heterogeneous system landscape in telecommunication firms), and it comprises only one location. Organizational activities associated with TDQM at Honeywell Emmen mainly relate to the setting up of a project team. In contrast to BT and Deutsche Telekom, neither a primary organization (in the form of a line function as at Deutsche Telekom), nor a secondary organization (like the IM Forum and IM Program at BT) were set up.

Research Agenda Outline

The propositions mentioned above form a first step in the development of a theory on the organization of Data Governance. In order to prepare the ground for further investigation and allow for operationalizing such theory, the article suggests empirical indicators for the organizational dimensions of Data Governance and a set of contingency factors. Following the line of argumentation used by Wheeler [2002] in his work on net-enablement, these suggestions are not exhaustive, but rather form a foundation which can be examined for evidence in future research. Table 4 shows sample empirical indicators.

An initial set of contingency factors for Data Governance is proposed by Weber et al. [2009]. Combined with the factors which emerge from the evidence of the case study, the article proposes a number of external and internal contingencies. External contingencies comprise the company size, the industry, the volatility of the markets served, and the extent of business-to-consumer activities (in contrast to business-to-business activities). Among the internal factors are the allocation of the mandate for Data Governance, the awareness in the organization of the topic, the organizational structure in general, the degree of business process harmonization, and the heterogeneity of the application system landscape.

Future research on the organization of Data Governance should include both positivist and interpretivist approaches. Positivist research approaches would transform the propositions into testable hypothesis which could then be used in quantitative research designs. They would also allow for substantiating the applicability of contingency theory to the field of Data Governance. Interpretivist research approaches would include further case studies which allow for gaining a deeper understanding of feasible Data Governance "configurations" and prevailing "organizational patterns."

VII. CONCLUSION AND OUTLOOK

Companies organize Data Governance in order to be able to ensure data quality and maintain the value of data as a company asset. This article presents a case study on the organization of Data Governance based on two of the largest companies from the telecommunications industry, namely BT and Deutsche Telekom.

The findings from the case study lead to four propositions regarding the organization of Data Governance in telecommunication firms in particular and in large service-providing companies in general. The case study findings propose, for example, that the "configuration" of Data Governance is contingent to external and internal factors.

Table 4: Empirical Indicators Related to Organizational Dimensions		
Organizational Goals	Formal Goals	• Data Governance goals derived from business goals • Existence of metrics for data quality • Integration of data quality metrics in performance management system (e.g., key performance indicators of business processes, balanced scorecard)
	Functional Goals	• Existence and maintenance of a data strategy • Existence of preventive data quality management • Existence of and compliance to data standards • Data architecture and data lifecycle management defined
Organizational Structure	Structure and Process Organization	• Mandate for action allocated in the organization • Data Governance roles reflect organizational structure of company (central and decentral departments, business and IT departments, different business units) • Existence of standard operating procedures • Integration of Data Governance processes in existing processes and practices (e.g., IT service management)
	Secondary Organization	• Existence of a companywide Data Governance body • Clear responsibilities for portfolio management, budgeting and resource allocation related to Data Governance
Organizational Transformation	Transformation Process	• Existence of a project and time plan for Data Governance organization • Existence of a “roll-out” plan
	Organizational Change	• Involvement and engagement of all hierarchical levels • Existence of communication measures • Existence of training and support activities

These factors determine the individual design of organizational dimensions of Data Governance and, thus, its effectiveness. Moreover, both companies studied in the case are able to quantify the business benefits related to Data Governance. The organizational design of Data Governance at BT, however, seems to be favorable in terms of attributed the benefits eventually to Data Governance activities.

The article also risks the attempt of proposing a research agenda for further investigation of Data Governance. Further studies should combine both positivist and interpretivst approaches. On the one hand, they should aim at validating the organizational design options through an investigation of companies on a larger scale. On the other hand, a focus of future work should be placed on the further investigation of contingency factors and the confirmation of “organizational patterns” for Data Governance. From the perspective of the practitioners’ community, the results of the work presented can be considered valuable as different options to be taken into consideration when establishing Data Governance are specified. Reflecting on these options will help to avoid approaching the topic prematurely and in too simplified a manner.

Moreover, the article indicates some more general implications to the IS community. It shows that two of the worldwide leading telecommunications companies have undertaken a significant endeavor to improve the way data are managed and to sustainably assure quality of their data. While the discussion within the IS community over the last years emphasized topics such as IS strategies, architectures, and software design (which are undoubtedly of high relevance for both practitioners and researchers), data as a research topic was often underrepresented. With the increasing prominence of Data Governance, though, the entire study of data management in general might experience a “renaissance” in the community. In the 1990s Wang [1998] proposed the idea of managing data in the same way as physical goods. He compared data with raw material and software systems with manufacturing systems. Keeping his analogy in mind, one could get the impression from the past discussions in the IS community that companies should focus on factory planning, manufacturing machinery design, shop-floor production systems, etc. only, and might lose sight of managing raw materials, semi-finished, finished goods, etc. As this is certainly not an appropriate approach, the future discussion around data in the IS community should be more balanced than in the past.

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ABOUT THE AUTHOR

Dr. Boris Otto is Assistant Professor at the University of St. Gallen, Switzerland, and Research Fellow at the Center for Digital Strategies at the Tuck School of Business at Dartmouth College in Hanover, NH, USA. His main areas of research include Data Governance, data quality management, and master data management. His work is published in numerous international journals and proceedings of international conferences. Prior to his current positions he worked for the Fraunhofer Institute for Industrial Engineering in Stuttgart, Germany, PricewaterhouseCoopers in Hamburg, Germany, and SAP in Walldorf, Germany.

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