A Model for Data Governance – Organising Accountabilities for Data Quality Management

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Abstract

Enterprises need data quality management (DQM) that combines business-driven and technical perspectives to respond to strategic and operational challenges that demand high-quality corporate data. Hitherto, companies have assigned accountabilities for DQM mostly to IT departments. They have thereby ignored the organisational issues that are critical to the success of DQM. With data governance, however, companies implement corporate-wide accountabilities for DQM that encompass professionals from business and IT. This paper outlines a data governance model comprised of three components. Data quality roles, decision areas and responsibilities build a matrix, comparable to a RACI chart. The data governance model documents the data quality roles and their type of interaction with DQM activities. Companies can structure their company-specific data governance model based on these findings.

Keywords

Data governance, corporate data quality, data quality management, data governance model

Introduction

Companies are forced to continuously adapt their business models. Global presence requires harmonised business processes across different continents, customers ask for individualised products, and service offerings must be industrialised (cf. Borzo 2005). These factors certainly impact the business process architecture and the IT strategy of organisations. Ultimately, however, data of high quality are a prerequisite for fulfilling these changing business requirements and for achieving enterprise agility objectives (Newman & Logan 2006b). In addition to such strategic factors, some operational domains directly rely on high-quality corporate data, such as business networking (Vermeer 2000; Madnick et al. 2004; Tellkamp et al. 2004), customer management, (Zahay & Griffin 2003; Reid & Catterall 2005; Crié & Micheaux 2006), decision-making and business intelligence (Shankaranarayan, Ziad & Wang 2003; Price & Shanks 2005), and regulatory compliance (Friedman 2006).

Data quality management (DQM) focuses on the collection, organisation, storage, processing, and presentation of high-quality data. In addition, there are organisational issues that must be addressed, such as maintaining sponsorship, managing expectation, avoiding scope creep, and handling political issues (Wang et al. 1998; English 1999; Nohr 2001; Eppler 2006). However, responsibility for improving data quality and managing corporate data is often assigned to IT departments (Friedman 2006). Also, many companies try to cope with data quality (DQ) issues by simply implementing data management or data warehouse systems. Surveys on data warehousing failures reveal that organisational rather than technical issues are more critical to their success (Watson, Fuller & Ariyachandra 2004).

Integrated DQM is required in order to address both organisational and IT perspectives. Successful DQ programs identify the organisational processes behind DQ (Bitterer & Newman 2007). With data governance, companies implement corporate-wide accountabilities for DQM that encompass professionals from both business and IT. Data governance defines roles and assigns accountabilities for decision areas and activities to these roles. It establishes organisation-wide guidelines and standards for DQM and assures compliance with corporate strategy and laws governing data.

There is only limited research on data governance. Apart from a few DQM approaches dealing with accountabilities (Redman 1996; English 1999), an elaborate analysis of the interaction of roles and responsibilities, and the design of decision-making structures is missing. For our research, we therefore incorporate data governance sources from consultants, analysts and practitioners (e.g., Swanton 2005; Dember 2006a; Dyché & Levy 2006a; Marco & Smith 2006; Newman & Logan 2006a; Russom 2006; Bitterer & Newman 2007).

Both academic and practical sources presume data governance as a universal approach – one that fits all enterprises alike. Research on IT governance indicates that the distribution of accountabilities for IT management differs between companies and that several IT governance models exist, such as centralised and decentralised IT governance (Brown, C.V. 1997; Sambamurthy & Zmud 1999; Weill 2004). Previous research falls short of providing a comparable analysis for data governance and the accountabilities for DQM. We suggest that – similar to IT governance – a data governance configuration is specific to a given company. Our main contribution is to propose a flexible data governance model composed of roles, decision areas and responsibilities, which documents and illustrates the company-specific data governance configuration. Whereas we focus on this accountability aspect of data governance in this paper, we do not examine its guidelines and compliance facet.

We contribute to DQM research by advancing the state of the art regarding data governance. In contrast to prior research, we propose a model to document the company-specific decision-making framework of DQM. The data governance model outlines the three components of such a framework, namely roles, decision areas and responsibilities. For the components, we identify typical data quality roles and decision areas, and propose a method to assign responsibilities. Our approach respects the fact that each company needs a specific data governance configuration. A data governance model helps companies to structure and document their DQ accountabilities.

The remainder of the paper is structured as follows: The following section introduces related work on data quality management and data governance. The next section outlines the idea and the structure of the data governance model. It proposes a set of data quality roles, decision areas, and responsibilities. The last section summarises this paper and discusses its contribution.

Data Quality Management and Data Governance

We refer to data quality management as quality-oriented data management, i.e., data management focusing on collecting, organising, storing, processing, and presenting high-quality data[1]. The organisational issues that must be addressed, such as maintaining sponsorship, managing expectation and compliance, defining accountabilities, avoiding scope creep, and handling political issues, push DQM into an area of conflict between business and IT. On the one hand, DQM has to provide many stakeholders (e.g., CxOs, sales, controlling, procurement, IT, business units, customers, public authorities) with high-quality corporate data. On the other hand, these stakeholders have different interests (e.g., local/regional/company-wide differences), which do not necessarily accumulate to the best achievable result for the company as a whole. Because of these particularities of DQM, large multi-business companies are likely to have difficulties with institutionalising DQM, i.e., defining accountabilities, assigning people accountable for DQM within the organisational structure, and enforcing DQM mandates throughout the company.

Data governance – as part of DQM – addresses these particular issues within corporate structures. Data governance specifies the framework for decision rights and accountabilities to encourage desirable behaviour in the use of data[2]. Academic research on data governance is still in its infancy. DQM approaches, such as Total Data Quality Management (TDQM) (Wang 1998; Wang et al. 1998; Huang, Lee & Wang 1999), mainly address DQM activities and decision areas. The only role accountable in TDQM is the information product manager, which ensures that relevant, high-quality information products are delivered to information consumers. Few DQM approaches (Redman 1996; English 1999) deal with more than one role, roles related to several organisational levels, and their tasks and responsibilities. Due to the limited research on data governance, we also analysed data governance sources from consultants, analysts and practitioners (Swanton 2005; Dember 2006a; Dyché & Levy 2006a; Marco & Smith 2006; Newman & Logan 2006a; Russom 2006; Bitterer & Newman 2007). However, all available sources postulate a universal data governance approach – one that should fit all companies alike. An elaborate analysis of the interaction of roles and responsibilities, and the design of decision-making structures is missing.

Hence, companies might find it difficult to establish and maintain organisational structures designed to assure and sustain high-quality data throughout the enterprise. Findings of a recent survey among data management professionals indicate that data governance is rarely adopted (Russom 2006). Only 8% of respondents had deployed a data governance initiative, 17% were in the design or implementation phase.

[1] The term data is often distinguished from information by referring to data as "raw" or simple facts and to information as data put in a context or data that has been processed (Huang, Lee & Wang 1999; Price & Shanks 2005). In line with most data or information quality publications, we use the terms data and information interchangeably throughout the paper.
[2] In the absence of academic definitions of data governance, this definition was adapted from the IT governance definition of (Weill 2004).

Research into IT governance is more advanced than research into data governance, with the first publications released 25 years ago (cf. Brown, C.V. 1997). IT governance follows a more flexible approach for the assignment of accountabilities. Early research distinguished two IT governance models: in centralised models corporate IT performs all IT functions, whereas in decentralised models business units' IT performs these tasks (e.g., Ein-Dor & Segev 1982). Subsequent research specified more precise IT governance models, acknowledging several IT functions (e.g., Sambamurthy & Zmud 1999) and more than one organisational level involved (Brown, C.V. 1997). Finally, Weill (2004) proposed five IT functions, three organisational units, and a distinction between decision and input rights. The combination of these three dimensions resulted in six feasible IT governance models.

In conclusion, IT governance research proposes three elements that compose an IT governance model: roles, major decisions areas and assignment of accountabilities. We assume that such flexible models – instead of the universal data governance approaches postulated by prior research – would help companies to structure and document their specific decision-making framework for DQM. Therefore, we adopt the idea of IT governance models to build a model for data governance.

However, it is important to emphasise that data governance is not a full subset of IT governance. As outlined above, accomplishing corporate data quality requires close collaboration among IT and business professionals who understand the data and its business purpose. Hence, we argue that data governance and IT governance are coequal and both have to follow corporate governance principles. Furthermore, data governance should be clearly distinguished from DQM (Dyché & Levy 2006a; Russom 2006; Bitterer & Newman 2007): data governance provides a framework for management decisions; actual "day-to-day" decision-making is DQM. Figure 1 illustrates the relationships between the terms explained.

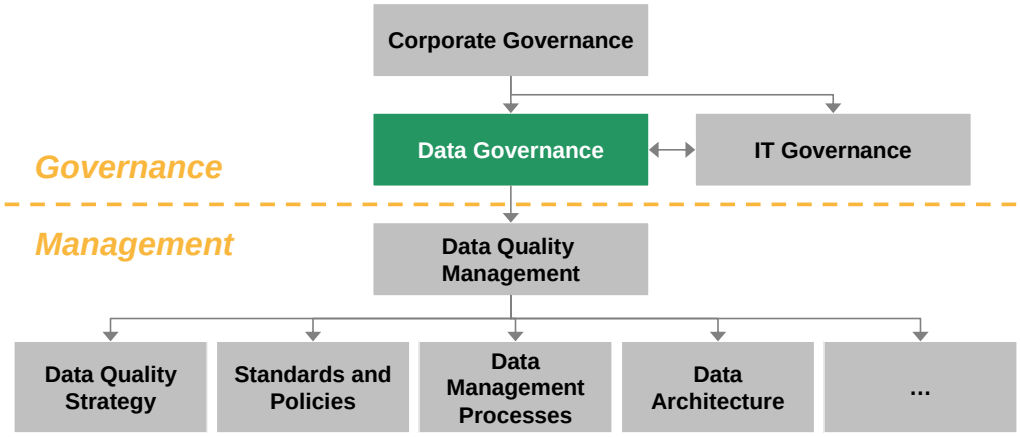

Figure 1: Terms in Governance and Management

A Model for Data Governance

Structure of the Data Governance Model

The data governance model is comprised of DQM roles, decision areas and main activities, and responsibilities, i.e., the assignment of roles to decision areas and main activities. The three components are arranged in a matrix (cf. Figure 2). The columns of the matrix indicate the roles in DQM. The rows of the matrix identify the key decision areas and main activities. The cells of the matrix are filled with the responsibilities, i.e., they specify degrees of authority between roles and decision areas. A company outlines its individual data governance configuration by defining data quality roles, decision areas and responsibilities, and by subsequently arranging the components into the model. This configuration is unique for each company. Indications for useful and necessary roles, possible decision areas, and a method for assigning responsibilities are given in the subsequent sections.

Data Quality Management Roles

To improve data quality and maintain high-quality corporate data a company requires specific DQM roles and committees. (Redman 1996; English 1999) provide the only data quality management approaches that consider this aspect in detail. Therefore, to deduce a useful set of data quality roles, we also analysed studies (Russom 2006), case studies (Dember 2006b; Dyché & Levy 2006b) and reports from analysts and consultants (Swanton 2005; Dyché & Levy 2006a; Marco & Smith 2006; Newman & Logan 2006a). These sources usually distinguish between three and five roles. Dyché and Levy (2006a) and English (1999) describe roles that are more specialised – they distinguish twelve and nineteen roles respectively.

Roles / Decision Areas	Executive Sponsor	Data Governance Council	Chief Steward	Business Data Steward	Technical Data Steward	...
Plan data quality initiatives	A	R	C	I	I	
Establish a data quality review process	I	A	R	C	C	
Define data producing processes		A	R	C	C	
Define roles and responsibilities	A	R	C	I	I	
Establish policies, procedures and standards for data quality	A	R	R	C	C	
Create a business data dictionary		A	C	C	R	
Define information systems support		I	A	C	R	
...						

R – Responsible; A – Accountable; C – Consulted; I – Informed

Figure 2: Draft of a Data Governance Model

The analysis of these sources results in a set of four roles and one committee – the data quality board. Table 1 compares the roles and the committee. It provides a short description, the level and part of the organisation to which the roles typically belong, and the alternative names found in the sources. Names in brackets only partly match with either the description or organisational assignment. A more detailed description of roles and committee is given below.

Business-driven and technical perspectives on DQM are, on the one hand, reflected in the distinction between business data steward and technical (or information systems) data steward (English 1999). On the other hand, the superior committee and the chief steward consolidate these two views. The actual number of roles may vary from company to company. However, we think that the roles presented build a balanced and useful set when focusing on the strategic notion of data quality management.

Table 1: Set of Data Quality Roles

Role	Description	Organisational Assignment	Sources
Executive Sponsor	Provides sponsorship, strategic direction, funding, advocacy and oversight for DQM	Executive or senior manager (e.g., CEO, CFO, CIO)	Strategic information steward (English 1999), executive level (Newman & Logan 2006a), executive sponsor (Marco & Smith 2006), (executive council) (Dember 2006b)
Data Quality Board	Defines the data governance framework for the whole enterprise and controls its implementation	Committee, chaired by chief steward, members are business unit and IT leaders as well as data stewards	Business information stewardship team (English 1999), data governance council (Dyché & Levy 2006a; Marco & Smith 2006), data governance committee (Russom 2006), GRCS board (Dember 2006b), trustee council (Dyché & Levy 2006b), (legislative level) (Newman & Logan 2006a)
Chief Steward	Puts the board's decisions into practice, enforces the adoption of standards, helps establish DQ metrics and targets	Senior manager with data management background	Master data coordinator (Swanton 2005), director of data management (Dyché & Levy 2006a), chief steward (Marco & Smith 2006), corporate steward (Russom 2006), lead stewards (Dember 2006b), (data czar) (Dyché & Levy 2006a)

Role	Description	Organisational Assignment	Sources
Business Data Steward	Details the corporate-wide DQ standards and policies for his or her area of responsibility from a business perspective	Professional from business unit or functional department	Information professionals (Redman 1996), business information steward (English 1999), business data steward (Dyché & Levy 2006a), subject area steward (Newman & Logan 2006a), master data lead (Swanton), domain steward (Russom 2006), business steward (Marco & Smith 2006), subject matter expert (Dyché & Levy 2006b)
Technical Data Steward	Provides standardised data element definitions and formats, profiles and explains source system details and data flows between systems	Professional from IT department	Database steward & information architecture steward (English 1999), technical steward (Marco & Smith 2006), source system data steward (Dyché & Levy 2006a)

Executive Sponsor

Support from top management, which is crucial for corporate DQ initiatives, results from the executive sponsor. The executive sponsor is a member of the top management, such as the CEO, CFO or CIO. Besides supporting DQ initiatives and data governance, he or she provides sponsorship, strategic direction, funding, advocacy and oversight for data quality management.

Data Quality Board

The DQ board defines the data governance framework for the whole enterprise. It sets top-down strategic goals and ensures that they are in line with the organisation's mission and objectives. More particularly, it develops and directs corporate-wide standards, rules, policies, processes, and guidelines to ensure the ongoing improvement of DQ. Furthermore, the board provides mechanisms for coordination, communication, information sharing, prioritisation, and conflict resolution. The DQ board is usually chaired by the chief steward. Depending on the number of data stewards, they all participate in board meetings. They may also represent the board in business or IT projects affecting their area of responsibility. Temporary participants may include the executive sponsor or business representatives, such as process owners or business unit managers.

Following the company's structure and objectives, the DQ board has to decide how data stewards are assigned. For example, a business steward may be responsible for a main data type, such as customer or material. Similarly, he or she could be assigned to a process, such as the order or production process. Finally, assignment to a business unit or geographical region is possible. The number of data stewards is defined automatically on the basis of their assignment to areas of responsibility.

Chief Steward

The main task of the chief steward is to put the board's decisions into practice. He or she enforces the adoption of standards, helps establish DQ metrics and targets, and ensures that regulatory, privacy and information sharing policies are followed. In addition, the chief steward staffs and supervises all data stewards, but also helps them to enforce their mandates. He or she is an expert in business and IT-related DQ issues across the enterprise.

Business Data Steward

Business data stewards work directly with representatives from business. They document business requirements and assess the impact of new business requirements on DQ and vice versa. Usually, one business data steward is assigned either per business unit, per main business process or per main data type. For their area of responsibility, the business data stewards detail the corporate-wide DQ standards and policies brought up by the board. This may involve creating business rules for data, developing data vocabularies, and maintaining and publishing DQ metrics. Business data stewards know how business terminology is defined in their area and how business processes use data. They communicate their knowledge to the DQ board and recommend standards and policies based on business requirements.

Technical Data Steward

The counterparts of business data stewards are technical data stewards, who focus on data representation in IT systems. Here again, one technical data steward can be assigned per business unit or department or per IT system. They provide standardised data element definitions and formats for their area of responsibility and focus on technical metadata. In addition, technical stewards profile source system details and data flows between systems. They communicate IT-related requirements to the DQ board.

Decision Areas in Data Quality Management

Data governance refrains from day-to-day decision-making, which is part of data quality management. Therefore, the data governance model comprises only the fundamental decision areas and main activities in improving and maintaining corporate data quality. The following decision areas are a consensus from existing approaches to DQM (Redman 1996; Wang et al. 1998; English 1999; Nohr 2001; Eppler 2006; Lee et al. 2006). Engineering approaches dealing with the design of businesses commonly distinguish between different layers regarding strategic, organisational and technical aspects (e.g., Davenport 1993; Hammer & Champy 1993). For the design of DQM, we structure the DQ decision areas according to the layers strategy, organisation and information systems. The following lists the main activities at every layer. (For a more complete overview of these decision areas please refer to (Otto et al. 2007).)

Strategy – Develop a Data Quality Strategy

A DQ strategy is required to manage and direct all DQ activities in line with the overall business strategy. The strategy includes the strategic objectives which are pursued by DQM, how it is aligned with the company's strategic business goals and its overall functional scope. The main tasks for setting up a DQ strategy include:

- Analyse and comprehend the role of data within the company.
- Plan concrete data quality initiatives.
- Execute a status quo assessment of data quality to identify most critical areas for improvement.
- Establish a data quality review process to ensure compliance with laws and regulations.

Organisation – Design the Data Quality Organisation

Designing the DQ organisation includes defining roles and responsibilities, determining information needs, defining metrics and standards, and designing data processes. More particularly, decision areas include:

- Determine information needs of external and internal data consumers.
- Define processes that produce data including adequate controls.
- Define roles and responsibilities for data quality that ensures accountability, authority, and supervision as well as the involvement of senior executives and business management.
- Specify data quality metrics, performance indicators and standards.
- Establish policies and procedures to enforce control, quality assurance, risk management and security.

Information Systems – Design the Data Quality IS Architecture

The DQ architecture is aligned with and supports the overall enterprise architecture. Designing the DQ architecture encompasses creating a business data repository and defining the information systems in line with data quality requirements. Data quality tools may support the information quality improvement process. The main activities on the information systems layer are:

- Define the DQ architecture design and architecture guidelines.
- Create a business data dictionary to ensure consistent understanding of data across the enterprise.
- Define information systems support to increase the accountability for data integrity and security.
- Evaluate and implement tools supporting data quality improvement, such as analysis tools, cleansing and transformation tools or defect prevention tools.

Assigning Responsibilities

For the assignment of responsibilities to roles we build on knowledge from project management (Heerkens 2001; Kerzner 2003), change management (Cohen & Roussel 2004; Thomas 2005), and team building (Payne 2001). A Responsibility Assignment Matrix (RAM) identifies participants and to what degree they interact with defined activities or how they make a decision. The columns of the matrix identify positions, roles or the individuals themselves. The rows indicate activities, decision areas or functions. The cells of the matrix specify degrees of authority or interaction types between columns and rows.

The most popular type of RAM is the RACI chart. For example, the IT governance reference framework COBIT uses the RACI chart to define responsibilities (IT Governance Institute 2005). RACI is an acronym for the four types of interaction: Responsible, Accountable, Consulted and Informed. When we map them to the domain of DQM, they denote:

- Responsible: role that is responsible for executing a particular DQM activity. The role accountable determines the degree of responsibility.
- Accountable: role that is ultimately accountable for completing a DQM activity or authorises a decision.
- Consulted: role that may or must be asked to provide input and support for a DQM activity or decision before it is finished.
- Informed: role that may or must be notified of the completion or output of a decision or activity.

Depicting the assignment of responsibilities in a RACI chart proves to be valuable for DQM when taking into account DQM's particularities of residing in an area of conflict between business and IT issues, and having to satisfy multiple stakeholders' interests within and outside the organisation. The RACI chart not only clarifies roles and their responsibilities, it fosters more supportive sharing of duties (cf. Payne 2001). It is also valuable as a company-wide communication device for DQM roles and their implied relationships to one another as well as their type of interaction with specific activities and decisions (cf. Heerkens 2001).

Discussion

Companies need data quality management that combines business-driven and technical perspectives to respond to strategic and operational challenges demanding high-quality corporate data. Data governance specifies the framework for decision rights and accountabilities as part of corporate-wide data quality management. With this paper we contribute to the accountabilities aspect of data governance which has not been well elaborated by DQM research so far. Instead of following the universal approach of prior research, we respect the fact that each company requires a specific data governance configuration. We define a data governance model comprised of data quality roles, decision areas and responsibilities. We identified a set of four data quality roles and one committee that present a balanced and useful set when focusing on the strategic notion of DQM. The fundamental decision areas and main activities of DQM can be structured according to strategic, organisational and technical aspects. We propose the RACI chart to document and structure DQ roles, their type of interaction with the DQM activities, and how they make a decision.

A data governance model helps companies in structuring their data quality accountabilities. Based on our proposed roles and decision areas, they can structure their individual data governance configuration as a RACI chart. They can use the data governance model as a company-wide communication device for DQM roles and their type of interaction to specific activities and decisions. Depending on the level of granularity, a company might define more than one data governance model. For example, several models might document every decision area in detail, or one model might describe the corporate level of DQM and additional models document DQM on business unit level.

Finally, a number of limitations need to be considered. This paper transfers knowledge from IT governance research to data governance. DQM is not fully comparable to IT management because of the business perspective involved in DQM; and neither are data governance and IT governance. Nonetheless, IT governance research pursues similar objectives; moreover, it has a longer and more profound track record. To mitigate the influence of IT governance and for a more elaborate investigation of the allocation of decision rights, organisational studies such as corporate governance, organisational theory and organisational psychology need to be considered.

This research has thrown up many questions in need of further investigation. IT governance research points to the importance of aligning IT governance arrangements with the overall enterprise context. Scholars investigated the relationship between a firm's IT governance solution and its organisational context factors, such as corporate governance mode or firm size (Brown, C.V. 1997; Sambamurthy & Zmud 1999; Brown, A.E. & Grant 2005; Weill & Ross 2005). The underlying assumption is that the context factors affect the contribution of IT governance in enhancing corporate performance. A contingency approach to data governance would help to understand the impact of context factors on the configuration of the data governance model. It would provide companies with guidance on how to configure data governance in a way that fits their situation. A first attempt has been made by (Wende & Otto 2007), who propose a data governance approach based on five contingencies. Furthermore, an analysis of the guidelines and policy aspect of data governance is recommended in order to enforce mandates as defined in the data governance model. Finally, the design of a method for defining and implementing the data governance model would help companies to improve and maintain data quality on a sustained basis.

Currently, a research group at the University of St. Gallen is testing the data governance model in three projects with partners from different industries and requirements. First results show that the model is considered a very

useful tool for organising, communicating and coordinating accountabilities for DQM in an organisation-wide context.

References

Bitterer, A. & Newman, D. 2007, *Organizing for Data Quality*, Gartner Research, Stamford, CT.

Borzo, J. 2005, *Business 2010 - Embracing the challenge of change*, Report from the Economist Intelligence Unit sponsored by SAP, London.

Brown, A.E. & Grant, G.G. 2005, 'Framing the Frameworks: A Review of IT Governance Research', *Communications of the Association for Information Systems*, vol. 15, no. May, pp. 696-712.

Brown, C.V. 1997, 'Examining the Emergence of Hybrid IS Governance Solutions: Evidence from a Single Case Site', *Information Systems Research*, vol. 8, no. 1, pp. 69-94.

Cohen, S. & Roussel, J. 2004, *Strategic Supply Chain Management: The Five Disciplines for Top Performance*, McGraw-Hill Professional.

Crié, D. & Micheaux, A. 2006, 'From customer data to value: What is lacking in the information chain?' *Database Marketing & Customer Strategy Management*, vol. 13, no. 4, pp. 282-99.

Davenport, T.H. 1993, *Process Innovation: Reengineering Work through Information Technology*, Harvard Business School Press, Boston.

Dember, M. 2006a, '7 Stages for Effective Data Governance', *Architecture & Governance Magazine*, vol. 2, no. 4.

---- 2006b, *Case Study: Gaining Efficiencies as a Result of Implementing a Data Governance Program*.

Dyché, J. & Levy, E. 2006a, *Customer Data Integration*, John Wiley & Sons.

---- 2006b, *Checkfree*, John Wiley & Sons, Hoboken, New Jersey.

Ein-Dor, P. & Segev, E. 1982, 'Organizational Context and MIS Structure: Some Emprirical Evidence', *MIS Quarterly*, vol. 6, no. 3, pp. 55-68.

English, L.P. 1999, *Improving Data Warehouse and Business Information Quality*, 1 edn, John Wiley & Sons, Inc., New York, NY.

Eppler, M.J. 2006, *Managing Information Quality*, 2nd Edition edn, Springer, Berlin, Heidelberg.

Friedman, T. 2006, 'Gartner Study on Data Quality Shows That IT Still Bears the Burden'.

Hammer, M. & Champy, J. 1993, *Reengineering the Corporation: A Manifesto for Business Revolution*, Nicholas Brealey Publishing, London.

Heerkens, G.R. 2001, *Project Management*, McGraw-Hill Professional.

Huang, K.-T., Lee, Y.W. & Wang, R.Y. 1999, *Quality Information and Knowledge*, Prentice Hall, New Jersey.

IT Governance Institute 2005, *CobiT 4.0: Control Objectives, Management Guidelines, Maturity Models*, IT Governance Institut, Rolling Meadows/IL.

Kerzner, H. 2003, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, 8th Ed. edn, John Wiley and Sons.

Lee, Y.W., Pipino, L.L., Funk, J.D. & Wang, R.Y. 2006, *Journey to Data Quality*, MIT Press, Boston.

Madnick, S., Wang, R., Chettayar, K., Dravis, F., Funk, J., Katz-Haas, R., Lee, C., Lee, Y., Xian, X. & Bhansali, S. 2004, *Exemplifying Business Opportunities for Improving Data Quality through Corporate Household Research*, MIT Sloan School of Management, Cambridge, MA.

Marco, D. & Smith, A.M. 2006, 'Metadata Management & Enterprise Architecture: Understanding Data Governance and Stewardship', *DM Review*, no. Sep/Okt/Nov.

Newman, D. & Logan, D. 2006a, *Governance Is an Essential Building Block for Enterprise Information Management*, Gartner Research, Stamford, CT.

---- 2006b, *Achieving Agility: How Enterprise Information Management Overcomes Information Silos*, Gartner Research, Stamford, CT.

Nohr, H. 2001, *Management der Informationsqualität*, Nr. 3/2001, Fachhochschule Stuttgart, Stuttgart.

Otto, B., Wende, K., Schmidt, A. & Osl, P. 2007, 'Towards a Framework for Corporate Data Quality Management', paper presented to 18th Australasian Conference on Information Systems, Toowoomba, Australia, 06.12.2007.

Payne, V. 2001, *The Team-Building Workshop: A Trainer's Guide*, AMACOM American Management Association, New York.

Price, R. & Shanks, G. 2005, 'A semiotic information quality framework: development and comparative analysis', *Journal of Information Technology*, vol. 2005, no. 20, pp. 88-102.

Redman, T.C. 1996, *Data Quality for the Information Age*, Artech House, Boston, London.

Reid, A. & Catterall, M. 2005, 'Invisible data quality issues in a CRM implementation', *Journal of Database Marketing & Customer Strategy Management*, vol. 12, no. 4, pp. 305-14.

Russom, P. 2006, 'Taking Data Quality to the Enterprise through Data Governance'.

Sambamurthy, V. & Zmud, R.W. 1999, 'Arrangements for Information Technology Governance: A Theory of Multiple Contingencies', *MIS Quaterly*, vol. 23, no. 2, pp. 261-90.

Shankaranarayan, G., Ziad, M. & Wang, R.Y. 2003, 'Managing Data Quality in Dynamic Decision Environments: An Information Product Approach', *Journal of Database Management*, vol. 14, no. 4, pp. 14-32.

Swanton, B. 2005, 'Master Data Management Organizations: A Balance of Control and Responsibility'.

Tellkamp, C., Angerer, A., Fleisch, E. & Corsten, D. 2004, 'From Pallet to Shelf: Improving Data Quality in Retail Supply Chains Using RFID', *Cutter IT Journal*, vol. 17, no. 9, pp. 19-24.

Thomas, S.J. 2005, *Improving Maintenance and Reliability Through Cultural Change*, Industrial Press Inc.

Vermeer, B.H.P.J. 2000, 'How Important is Data Quality for Evaluating the Impact of EDI on Global Supply Chains?' paper presented to Proceedings of the 33rd Annual Hawaii International Conference on System Sciences (HICSS-33).

Wang, R.Y. 1998, 'A Product Perspective on Total Data Quality Management', *Communications of the ACM*, vol. 41, no. 2, pp. 58-65.

Wang, R.Y., Lee, Y.W., Pipino, L.L. & Strong, D.M. 1998, 'Manage Your Information as a Product', *Sloan Management Review*, vol. 39, no. 4, pp. 95-105.

Watson, H.J., Fuller, C. & Ariyachandra, T. 2004, 'Data warehouse governance: best practices at Blue Cross and Blue Shield of North Carolina', *Decision Support Systems*, vol. 38, no. 3, pp. 435-50.

Weill, P. 2004, 'Don't just lead, govern: How top-performing firms govern IT', *MIS Quarterly Executive*, vol. 3, no. 1, pp. 1-17.

Weill, P. & Ross, J. 2005, 'A Matrixed Approach to Designing IT Governance', *MIT Sloan Management Review*, vol. 46, no. 2, pp. 25-34.

Wende, K. & Otto, B. 2007, 'A Contingency Approach to Data Governance', paper presented to 12th International Conference on Information Quality (ICIQ-07), Cambridge, USA, 10.11.2007.

Zahay, D. & Griffin, A. 2003, 'Information antecedents of personalisation and customisation in business-to-business service markets', *Journal of Database Marketing*, vol. 10, no. 3, pp. 255-71.

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