Business Analysis for Business Intelligence

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Mastering Data Management

Note that I do not use the term “master data management.” Not that I don’t like the concept but I am afraid it will go the same route as the corporate data warehouse in the pre-Kimball era: a nice idea but extremely hard to realize in everyday business practice. Again the tension between providing the business with rapid response to their demands and maintaining a well-architected master data management may push the choice to an imperfect but useful environment instead of the perfect solution, which is never going to come out of the planning room. The true value of Ralph Kimball’s work to the development of working corporate data warehouses, emerging from hands-on data marts, is rapidly delivering business value, but using conformed dimensions to facilitate large integrated warehouses addressing all the subject areas cannot be underestimated. Yet, data management in any of the projects approached (whether the old top-down from Bill Inmon or the bottom-up approach from Kimball) is often an orphan in the process. Just like documenting the project and its deliverables, it is regarded a tedious and superfluous extra on which neither the technicians nor the analysts like to spend their time.

Data management in a Business Intelligence (BI) project is like the blood circulation in an organism: it is needed everywhere but appears in various doses and throughput levels through various blood vessels from the aorta of the extract, transform, load (ETL) process to the capillaries of everyday atomic data capture on the shop floor. The following sections intend to create awareness for clarity and understanding of uniform master data such as “product” or “party” (internal and external, such as supplier and customer) during the business analysis process.
MAJOR COMPONENTS OF DATA MANAGEMENT

Overview

Data management with regard to BI and your role as a business analyst reflects on the following aspects:

- Managing master data and the system of record
- Source analysis
- Data profiling
- Source-to-target mapping
- Metadata
- Data management architecture
- Business analysis issues

Master Data

Data management for Business Intelligence requires time and effort to gather and unite every department in the organization around the major entities:

- **Party** which is a generalization of:
  - Internal party, which in its turn can be a:
    - Person, that is, DIM_EMPLOYEE or DIM_PARTNER
    - Organization, that is, DIM_ORGANIZATION or DIM_BUSINESS_UNIT
  - External party, which can also be a:
    - Person, that is, DIM_CUSTOMER
    - Organization, that is, DIM_CUSTOMER or DIM_CHANNEL
- **Product** describes the physical or service delivery to internal and external customers. It can comprise purchase items, saleables, or consumables but not gross plant addition (GPA).
- **Geography** is the territory or region that can be strongly determined by the type of operation or the department looking at it.
- **Time** can be trickier than one may think at first sight: business hours may vary in full continuous operations like the process industry or logistics and in a global or multicultural environment an eight-hour workday may be distributed over eight, ten, or even twelve hours. “Siesta” ring a bell?
• Time can be registered from three viewpoints:
  • The happening time: which represents when the event actually happened or “will happen” as in budgeted events.
  • The valid time: this can be both a point in time and a period when an event or a status was valid. It is a derived value from a slowly changing dimension type 2 or type 3.
  • The system time: also known as “SYSDATE,” or the time when the event was recorded.

• Calendar where the business days vary over time and per country or even per region may also require a little bit more attention than expected.

More on these concepts in the section on generic definitions.

In complex IT architectures, it can be useful to construct an extended CRUD matrix, superseding the level of one system or database. This high-level matrix shows the relationships between (master) data needed for BI and the applications where the data are created (C), read (R), updated (U), or deleted (D). Potential inconsistencies are easier to trace in a CRUD matrix. Don’t expect to do this in a one-off process.

Table 14.1 tells us immediately where the master data’s system of record resides: for customer, order, and territory it is the customer relationship management (CRM) system, for product it is the inventory system, and for the Human Resources (HR) member, the Human Resources Management (HRM) system. But the U’s here and there point to applications that add data to the master data such as accounts receivable adding a customer contact responsible for the accounts payable at the customer site or the territory specification for staff members other than sales and marketing people in the HRM application.

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* Application x target data element.
Extended CRUD matrices can be constructed in various flavors depending on the viewpoint:

- [Application x target data element] as in the example above
- [Application x source data element], which produces a much more refined view as each source record’s life cycle is mapped in the matrix
- [User x source data element], which is only relevant in the case where one user has CRUD access to many applications. In that case a drill-down of “applications per user” will be necessary.

**Source Analysis**

The source analysis should yield the following information per entity and its attributes:

- Entity name, definition, source application, table with the master file, and the data definition owner.
- Attribute name, definitions, datatypes, domain (i.e., list of values for discrete values and the data range for continuous values).
- Physical data model.
- Access and security methods (rules, passwords, etc.).
- Check how the data are used by business processes and complete the extended CRUD matrix in complex environments.
- Check how the data are used by applications and complete the extended CRUD matrix.
- Check for gaps in data domains such as: insufficient data currency, availability, or relationship gaps.
- Assess a rough approach to the necessary transformations for BI purposes.

**Data Profiling**

Some practitioners exclude this exercise from the business analyst’s responsibilities. I tend to disagree as data profiling can provide the acid test for the assumptions made during the analysis. Sometimes the business user (or even the source IT specialist) has spent less time with the company than the specific tables he is talking about. It wouldn’t be the first time the client tells you he has 78,000 clients, which a simple count rejects with the proof of the existence of half a million customer records!
Table 14.2 teaches us that a large proportion of values is missing and the source system does not support data consistency.

Data profiling comes in two flavors: business or contextual data profiling and technical or out of context profiling. The first checks the assumptions from the business community: that is, “Every employee has a manager,” or, “Every active customer has received at least one invoice in the last three years,” and so on. The technical profiling checks the feasibility for ETL and answers all the necessary questions to scope the complexity and workload of the ETL.

Before you start the business profiling, you should ask yourself (and your customer) about her expectations about the quality of this job. The higher the quality requirement, the more thorough work is needed and the larger the sample size is required, up to profiling large tables entirely. Don’t underestimate the time and resources needed for this job. The sample may be random using SQL functionality to pick every nth record for profiling or it may be a stratified sample using an important decision variable to spread the sampling in a meaningful way. Common strata are “Product,” “Customer,” “Employee,” and “Time.”

Unless you are asked to estimate the end-to-end project workload you needn’t be involved in the technical data-profiling exercise. Nevertheless, don’t take on this job without the involvement of the technician(s) who will actually do the ETL design and build the data warehouse. Ignore this rule and you may find yourself in big trouble as soon as the builders come in.

Source-to-Target Mapping

Some practitioners also exclude this exercise from the business analyst’s responsibilities and here I tend to agree. Nevertheless, one should be aware of this exercise and consult the results as this may prove to be a reality
check for the assumptions made during the analysis. Make sure you and the ETL designer have an exchange of ideas and information about this stage. In Table 14.3 the transformation column at least will certainly be of interest to the analyst.

**Metadata Management for Business Analysts**

I couldn’t agree more with Kimball (2004) who says the following about metadata tools in his book, *The Data Warehouse ETL Toolkit*:

Metadata is an interesting topic because every tool space in the data warehouse arena including business intelligence (BI) tools, ETL tools, databases, and dedicated repositories claims to have a metadata solution, and many books are available to advise you on the best metadata strategies. Yet, after years of implementing and reviewing data warehouses, we’ve yet to encounter a true end-to-end metadata solution. Instead, most data warehouses have manually maintained pieces of metadata that separately exist across their components.

Kimball’s description of metadata structures is complete and serves a basis for any business analyst who wants to get deeper into the subject. Let me pick out the metadata questions about metadata the business analyst should ask before, during, and after the project.

**Before the Project**

These questions are mainly about the front room metadata that describe the source data from a business point of view as well as the dimensions and their attributes and the measures in the fact tables. These are to be found in the report requirements or in the business requirements. In complex environments, an application landscape can provide a high-level lineage view on crucial data such as customers and employees. For example, an organization may have different input possibilities like a checkout and a call center, and external customer data sources that need to be reconciled in a customer master data repository.

In this phase, a first estimate of data volumes may be useful to determine the technical scope of the project. In the case of heavy security demands (e.g., HRM analytics or BI for legal or policing purposes) the metadata should also include which profiles (or even persons) have access rights to
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</tr>
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<tr>
<td></td>
<td>NORM_HIERARCHY</td>
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Example of a Mapping Table
which data. Finally, a conceptual or logical data model of the data warehouse or the data mart is both the result and the documentation of the business analysis process. This should provide enough input for the project definition and the project charter.

During the Project

As the business analyst delves deeper into the analysis levels and the metadata are well documented from a business context perspective, the source metadata are described in technical terms: for example, datatypes, record lengths, source to target lineage, results from data profiling, default values, null values, and missing data handling, mandatory flags, slowly changing dimension attribute handling, data quality policies and strategies, business rules on the source systems, and so on. During the project, the physical data model serves as a guide and is also used for technical documentation purposes.

After the Project

I advise the business analyst to play more of a documentalist role as this third layer of metadata is mostly about the BI/BI process, a further refining of data lineage and a description of the business translations of technical row and column headers. This is the realm of the developers.

A FRAMEWORK FOR DATA MANAGEMENT

The following recommendations are not the gospel. Whatever classification and representation framework you choose, as long as they are consistent, practical, and first and foremost manageable, you are avoiding the two major pitfalls of data management: getting bogged down in unworkable procedures on the one hand or creating data chaos leading to new stovepipes of “Never-mind-I’ll-do-it-myself” solutions. I combine the elegance of the Dublin Core’s metadata catalog with the complexity-reducing Zachman framework and deliver this blend with the usability of the structured writing approach. Before you get too mixed up by all this, let us describe the three building blocks.
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Preface

Running a business from a Business Intelligence (BI) point of view is like setting up research strategies to accept or reject hypotheses, prejudice, or generally accepted theories, refining and improving models, illustrating and reinforcing these with actions and stories to build the foundation upon which your organization’s strategies are built.

LINEAR SHORTCUTS

But for lack of time, budget, or other reasons, we tend to create “linear shortcuts” and restrict ourselves to empiric, rule-based business intelligence. And even on that level, things can go seriously wrong. Maybe the drawing in Figure P.1 says it better than words. The shaded ellipse is the linear shortcut, ignoring or, worse, denying the existence of other possible causes and only grasping part of the problem and the solution. Management is satisfied with an explanatory power expressed by the 0.65 of the correlation coefficient and does not have the level of sophistication to push the envelope farther. One direction is to get more root causes in the model, increasing R, and the other—equally important if not more so—is to monitor the root causes on a continuous basis because nothing is more ephemeral than analysis results based on transactions that are dimensionalized, aggregated, and ranked according to the organization’s paradigms.

These linear shortcuts are cause and effect chains that are easy to communicate to the organization. Thus, management deprives itself of thorough and methodical Business Intelligence methods and systems that take the “horizontal” approach to its success or failure drivers. As the decision maker is seeking a satisfactory outcome rather than the best possible, he is paying an opportunity cost that is not seen in the books but might lead to the organization’s premature demise. The history of the rise and fall of many great companies shows a constant in their behavior: the strategic patterns, ploys, and posture that led to their success also lead to their downfall as they keep clinging to their linear shortcuts. These linear
shortcuts undermine the potential of business intelligence and, as a consequence, the organization’s strategic potential.

Linear shortcuts lead to oversimplification in decision making.

THERE IS NO SILVER BULLET IN BI

I am not claiming to have found the silver bullet that will produce the ultimate Business Intelligence model. The only promise I can make to the reader is that he or she will discover the complexity of aligning the organization’s information management with its strategy process. My hope is that the organization’s information management will develop a broader view of Business Intelligence, broader than the Information Technology (IT) aspects, broader than the business aspects, and broader than the interaction between the two and that this will lead to better performance of the strategy execution, which is essential for the organization’s survival.
As Business Intelligence becomes more and more pervasive, the competitive edge will go to those organizations that implement and develop Business Intelligence in close harmony with their specific culture and their strategy process. When I read Tom Davenport’s article (2006) I did a double-take. Davenport described what I was doing 20 years ago in a large German mail-order company. Long before the Internet, we touted that “One day all marketing would become direct marketing,” meaning we would be able to individualize our customer relationship management on all aspects: product, price, promotion, cost, and profit. Because of our more scientific and analytic approach, we had information of which our brick-and-mortar competitors, the general stores, could only dream. Now, our creed is becoming true for even the smaller organizations, and analytical power and skills are becoming the new competitive frontier. Let me take you on a tour to inspire you to turn your organization into an analytical competitor.