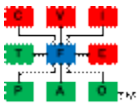

A Conceptual Data Model

For the Business Enterprise

1. INTRODUCTION

At the beginning of the data modeling process, we have the descriptions of business data structures (data capture forms, data capture screens, data inquiry screens, data reports, etc.) and their components. This is the business data vocabulary or metadata. The unorganized metadata represents the Universe of Discourse (UoD) according to Simsion, a Relational Data Model according to Codd or the description of an implemented data lake.

The goal is to organize these metadata descriptions into a minimum cover set of the Relational Data Model (database). Unfortunately, reducing the Relational Data Model to a minimum cover set is an NP complete problem with no algorithmic solution.

To provide a framework of organizing the business metadata, we will attempt to create a conceptual data model (Chen). A conceptual data model shows how the business organizes itself and sees its representation of the world.

The conceptual data model as described by Chen uses only the data structures and not the data structure components. The problem of identifying which data structures are the entities in the metadata is described by Kent and this problem is also an NP complete problem.

To produce a conceptual data model, the set of data structures should be classified into non-overlapping subsets of entities. As Jevons describes the process, a classification depends on the person doing the classifying unless there is an agreed on external domain model that shows an organization for the metadata, for example, the Federal Accounting Standards Advisory Board Handbook for the business record keeping domain.

2. METADATA CLASSIFICATION

Modern accounting practice provides us with the first level of classification. It separates the measurements on business processes (journals) from the master data (accounts) in business record keeping. Such a business model is described by the American Productivity and Quality Center.

Journals record the data of the business process. An example of this is buying groceries (sales process). The cash register receipt is a copy of the sales journal entries, one entry of each grocery item sold. The payment card/loyalty card is the key to the customer account. There can be many journals for a process. A journal for each cash register in the grocery store. And there can be a journal for each business process used to run the grocery store.

Now, we need to identify the journals and the accounts that are components of the enterprise conceptual data model.

2.1 Classifying the Business Journals

The business journal entries are the data recorded while the business is executing its processes. The entries describe the facts that the company records as it creates, sells and delivers its products (goods, services and/or services).

The journal entries (facts) record either the time spent executing a process step or the money used in a process step. These facts are the company's view of its transactions that happened during the business process.

These business processes are realized as four separate journals which are:

1. Money tracking
    a. The sales journals record the events that bring money into the business (Marketing to Sales to Revenue process).
    b. The purchasing journals record the events that remove money from the business (Supply Chain process).
2. Time tracking
    a. The labor capture journals record the events that measure the time spent by workers (Time Card Capture process).
    b. The product creation capture journals record the events that measures the time spent creating inventory items (Inventory Creation process).

For each of these processes, the business measures the completion of a process task (events) and records the data. When describing a business process measurement, the questions that need to be answered are who, what, when, where, why and how has the business event arrived at this point in the process. The answers to these questions identify the accounts (master data) of the business process

2.2 Classifying the Business Accounts

To identify the accounts (master data) involved with each of the business processes, we need to answer the six questions (Zachman) posed for each completed process event (task):

1. Who – the classes of people involved in the event
2. What – what was used/delivered/created by the event
3. How – what was the task completed in the event
4. Where – was the location at which the event completed,
5. When –was the time on which day was the event completed
6. Why – was the event completed – the answer to this question is "to get and make inventory items in order to sell them and make money" and is not part of the conceptual data model

Each of these concepts is independent of the others, i.e., the description of who does not contain any elements of where, what, when, etc.

Each account is related to every journal entry.

The answers to the questions are shown in the table below:

Zachman Question	Accounts	Description	Business Process
WHO	Worker	provides labor to the business	time card capture process
	Customer	sends money to the business for inventory items	sales process
	Supplier	receives money from the business for goods, services or information	purchasing process
WHAT	Inventory Item	inventory item delivered by the business to the customer	item creation process
	Product	product ordered by the customer	product specification
HOW	Task	the step in the sales process that the event measures	business process specification
WHERE	Position	location of business unit within the business	business organization
WHEN	Financial Calendar	the date of the sales process event	calendar organization

Table 1. Identifying the Accounts (Master Data)

There are two things to note. The first thing is that a question can identify more than one account. For example, who covers the classes of people that interact with the business and exist whether the business is operating or not.

Second, the answers are in two groups. The first group (top four rows in the table) are the operational accounts. The business' representation of real-world entities organized as the business views them. The second group are the organizational accounts. The accounts are created by the business to organize the business record keeping.

The operational accounts are:

1. Worker that completed the task that resulted in the event
2. Customer that bought the goods, services or information
3. Supplier that provided the inventory item or its parts
4. The Inventory item that fulfilled the customer's purchase

The organizational accounts are:

1. Product is the list of goods, services, or information that the business offers for sale
2. Task is the event completed in the business process
3. Position with in the business unit that is responsible for the event
4. Financial Calendar is the Date of that event

2.3 Classification Diagram

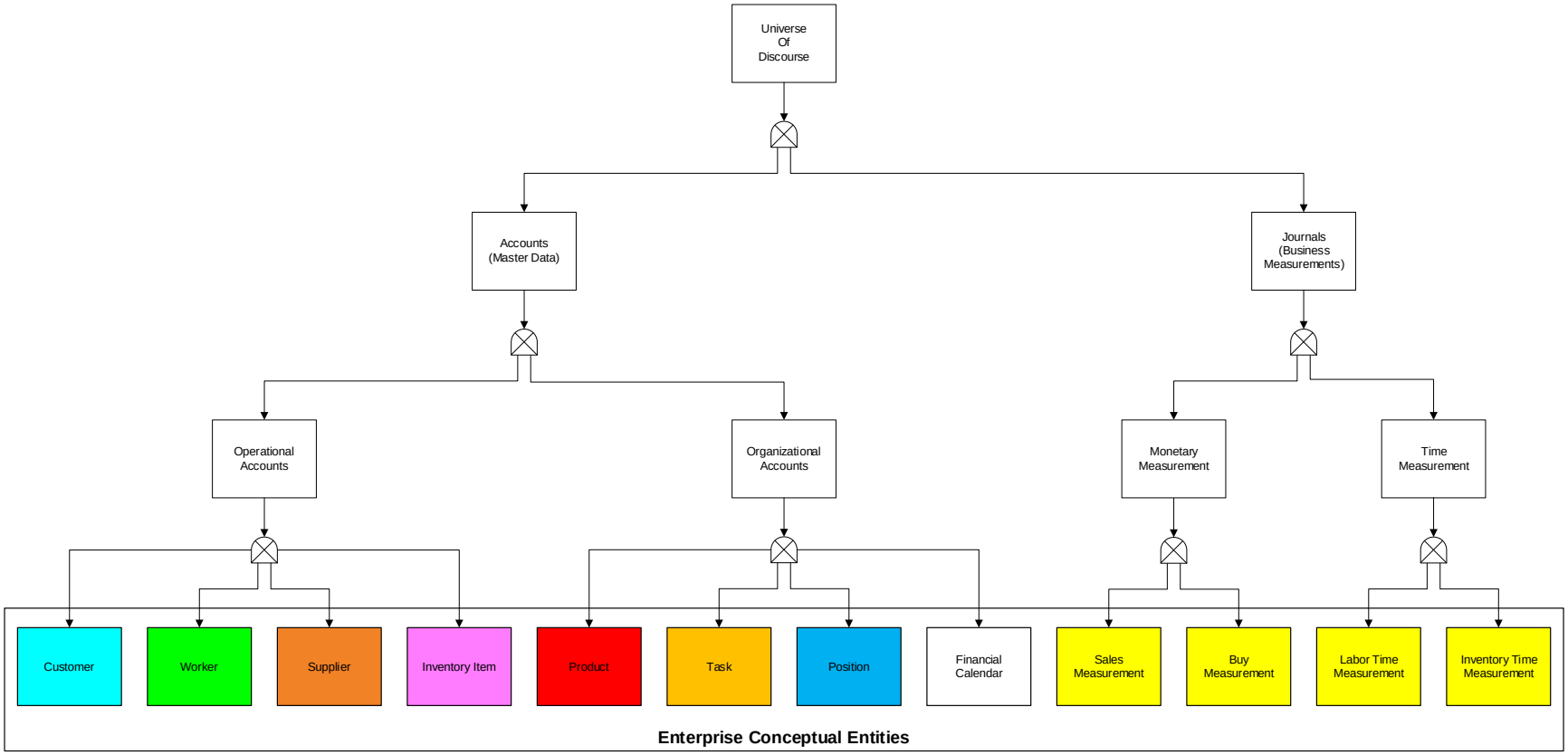

Figure 1. Classification of the UoD Metadata

3. AN ENTERPRISE CONCEPTUAL DATA MODEL

A conceptual data model consists of a data model diagram and metadata that describes the entities and relationships in the data model diagram.

3.1 Conceptual Model Diagram

The data model diagram shows boxes and lines. The boxes represent the business measurements and master data entities, and the lines show the relationships between the measurements and master data.

Each line represents a relationship between two entities. One arrowhead represents one row and two arrowheads represent many rows.

Each measurement entity is related to each of the master data entities.

The data model diagram is organized into three columns:

- The operational business accounts (master data) are in the left column
- The business process measurements (facts) are in the center column
- The organizational business accounts (master data0 are in the right column.

If this conceptual model is agreed to during the database development life cycle, then data capture applications, data processing applications, data marts and subject areas are all subsets of the conceptual model and can be expressed as views on the data model.

For example, the data model in Figure 2 shows four boxes enclosing the entities of the four major business processes. Each of the boxes represents a major business application.

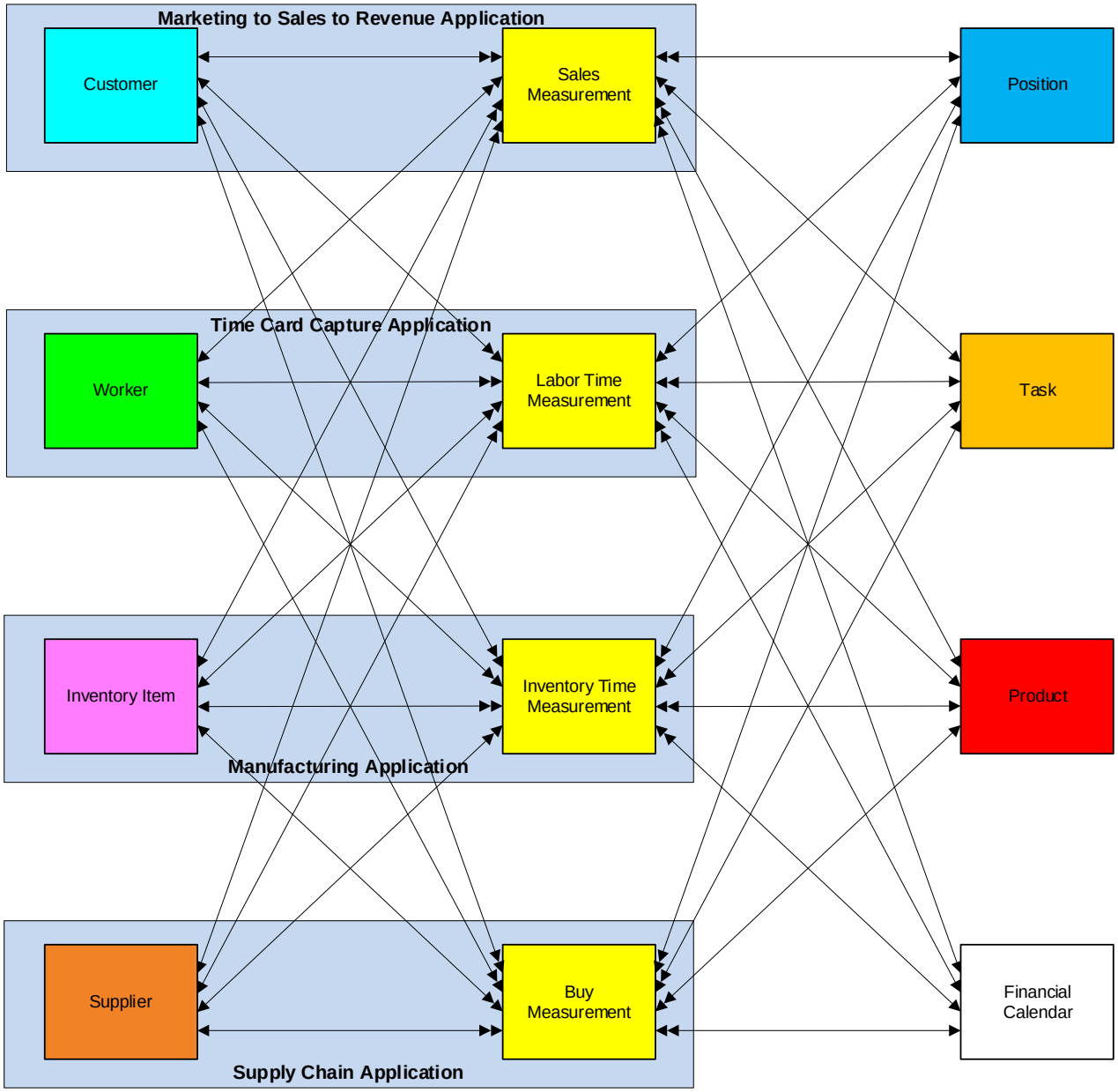

Figure 2. Conceptual Data Model at the Enterprise Level

3.2 Operational Accounts

The operational accounts are the entities that the company uses in its day to day operations that create, market, sell and deliver its products and services. These entities are the company's view of its customers, suppliers, labor, and inventory.

3.2.1 Customer

Customer is the account that contains the data that identifies and describes of all those entities that pay for or are expected to pay for our products. Customers are our view of the entities that send us money for goods, services, or information. Or they sent us money in the past. Or we expect them to send money in the future. These Customers can be individuals, other businesses, governments, the business itself, its subsidiaries, etc., In fact, anyone that pays for our products. If you don't expect to get money from them, they are not customers. In healthcare, the insurance companies and the government are the customers.

3.2.2 Worker

Worker is the account that contains the data that identifies and describes of all the people who provide labor during the business processes. They can be full time employees, part time employees, contractors, temporaries, company directors, etc.

3.2.3 Inventory Item

Inventory Item is the account that contains the data that identifies and describes of all the goods and information purchased, used, or created by the business during the product creation process. Inventory items are things that we have spent money to acquire and may be offered for sale during the lifetime of our company. In healthcare, inventory consists of the people that receive the services.

3.2.4 Supplier

Supplier is the account that contains the data that identifies and describes of all the suppliers that interact with us at the start of the product creation process. Suppliers are the entities that we send money to for goods, services or information. Or we sent them money in the past. Or we expect to send them money in the future. These suppliers can be individuals, other businesses, governments, the business itself, subsidiaries, etc. In banking, the suppliers are the deposit accounts.

3.3 Business Journals

The journals record the business process measurements that describe the facts that the company records as it creates, sells and delivers its products and services. These facts are the company's view of its interactions with its customers, workers, inventory and suppliers.

3.3.1 Sales

The Sales journal records the measurements of money and quantity that the business makes during the sales order process. The sales order process is a sequence of events (documents, states, etc.) that records the quantity and price of a product, from the initial sales opportunity until the product is paid for and available to the customer. The business chooses the points in the sales order process at which the measurements are made.

3.3.2 Labor Time

The Labor Time journal records the measurements of the time a worker spends doing a task during the course of buying, creating and selling products. A set of time measurement events is a time card that records the tasks (state changes) as the worker navigates the business processes.

3.3.3 Inventory Time

The Inventory Time journal records the measurements of the time an inventory item spends in a task during the course of creating an item. A set of time events is a time card that records the tasks (state changes) as the inventory item navigates the product creation (manufacturing) processes.

3.3.4 Buy

The Buy Measurement items are process measurements that the business makes during the purchase process. The purchase process is a sequence of events (documents, states, etc.) that records the quantity and price of an inventory item, from the initial purchase request until the inventory item is paid for and used by the business. The business chooses the locations in the purchasing process at which the measurements are made.

3.4 Organizational Accounts

The organizational accounts are the entities that the company creates and organizes to facilitate the business processes. These areas are the business organization chart, the list of products, the business process tasks and the financial calendar.

3.4.1 Position

Position is the account that contains the identification and description of all the functional divisions of the company. The fundamental or indivisible level of a business unit is position within the company (e.g., Chief Operating Officer, Knowledge Manager, etc.).

3.4.2 Task

Task is the account that contains the identification and description of all the processes and process steps (activities or tasks) that have been used by the business in the past, are currently used by the business or are planned to be used by the business. These processes can be processes, functions, tasks, activities, etc. An example of business tasks is the documentation provided for the ISO 9000 certification.

3.4.3 Product

Product is the account that contains the identification, description, specification and prices of all the products that we have sold in the past, are currently selling, or plan to sell in the future. There is always a price for a product even if the price is zero. These products can be goods, services, or information. The products include shipping services, handling services, and third-party services such as taxes that are resold for government suppliers.

3.4.4 Financial Calendar

The Date is the account that contains the identification and description of all the days on which the business plans to perform product. These days are the list of all the dates in the calendar.

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