Assortment Analysis

DEFININIG A KPI MAP

Matteo Golfarelli

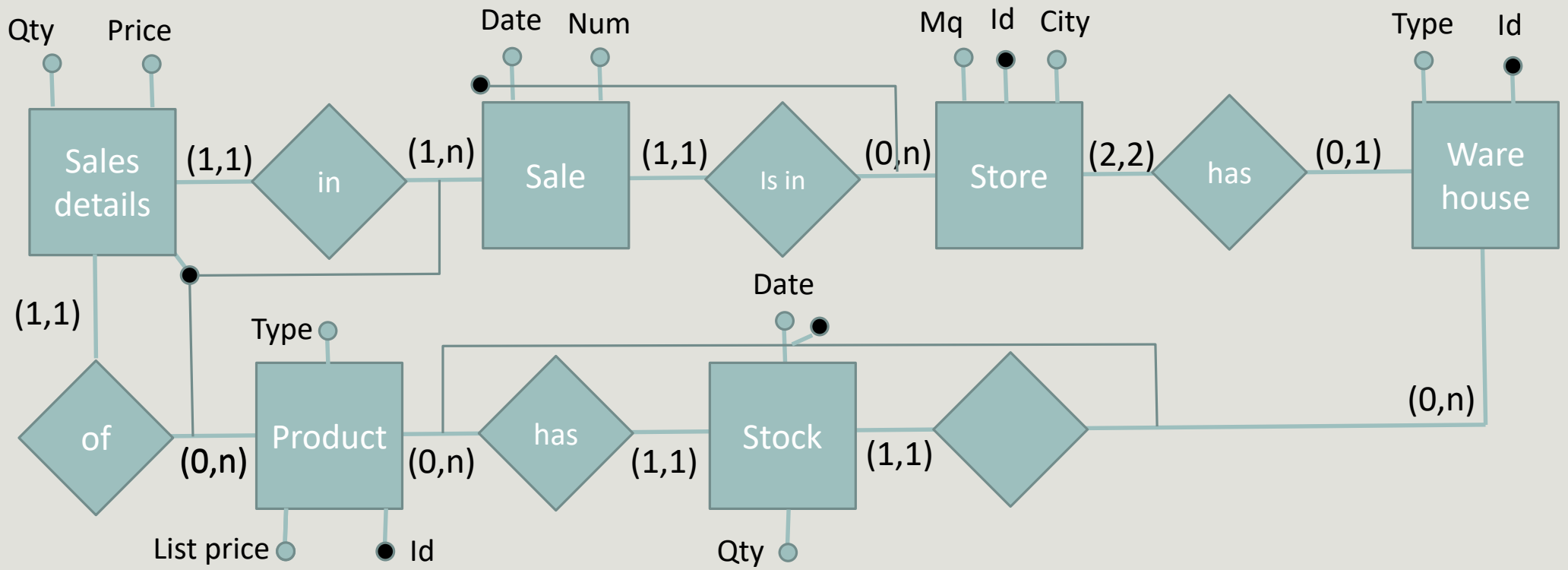
Case study

A company sells a large set of articles in a large number of department stores and is interested in monitoring how store managers handles display of products along a 6 month season. The domain experts tell us that:

- *Undisplayed articles cannot be sold*
- *Articles displayed in a low quantity are difficult to be sold. An optimal quantity is 5 units per article*
- *Keeping the same articles for the whole season does not attract customers to visit the store again*

The data source

Each department store is connected to the company information system and store data about sales and stocks.



The data source

Each department store is connected to the company information system and stores data about sales and stocks.

- Each store has 2 warehouses: the real store warehouse and the showroom itself. The product quantities stocked in the showroom are, actually, the exposed ones.
- Apart from the store warehouses, it exists a central warehouse that supplies all the stores
  - *Wharehouse.store={central,showroom,back shop}*
- After the store closure, each product stocks are update, that is for each product, store and warehouse, two tuples are added in the stock table. Stocks are historicized
  - ***Store1**, **Warehouse 2**, **09/03/2019**, **Product2**, 120*

From Goals to Measures

The company is interested in monitoring how store managers handle display of products along a 6 month season (i.e. a commercial campaign). More in details:

- How far are the shops from the perfect display? Why?
  - Too many articles in the assortment compared to the showroom size?
  - Not enough available quantities?
- Does display policies change in different stores?
- Can we identify good and bad shop managers?
- Which is the innovation level of display? Articles rotate?
- Is the assortment compatible with the showroom size?
- How does display change along season? For example during seasonal sales
- How does display impact on selling?

Stakeholder

Category manager: manager of a specific type of products, decide the articles and the quantity to be bought

- Interested to layout of product of its category. Data can be analyzed either at the maximum detail or aggregated by month, and area

Supervisor: manager of a specific geographical area, decide the discount policies for her area

- Interested to single shops in its area

Layout manager: the one who suggests the number and quantity of items to be displayed

- Interested to layout of each single shop as well as at groups of shops or categories

Measuring Display Policies from Different Points of View

- Display policies in a department store can be analyzed according to the following points of view:

Measuring Display Policies from Different Points of View

- Display policies in a department store can be analyzed according to the following points of view:
  - **Fragmentation:** are single article exposed in the right quantities?
  - **Non-exhibited articles:** are articles exhibited at least one day?
  - **Display Refresh:** how much the exposure is renewed?
  - **Density:** how many articles are displayed per square meter?

From Measures to KPI: Fragmentation

Let us assume to use the day granularity for time. A **spatio-temporal slot** is the unit of space occupied by an instance of an article for one day.

- Slot are abstract unit of space and time. The actual size is not considered

From Measures to KPI: Fragmentation

Let us assume to use the day granularity for time. A **spatio-temporal slot** is the unit of space occupied by an instance of an article for one day.

- Slot are abstract unit of space and time. The actual size is not considered

Given a season (e.g. [march18-sept18] – 215 days), an article and a store, we define the **exhibition index** [0;*n*] as the number of slots used to exhibit the article instances

$$ExhIndx(art, store) = \sum_{i=0}^{maxPcs} days(art, store, i) \times i$$

Article	0 pc.	1 pc.	2 pcs.	3 pcs.	4 pcs.	5 pcs.	….
XYZ	50 days	80 days	60 days	25 days	0 days	0 days	0 days

$$ExhIndx = 275$$

Exhibition index can be aggregated on store and articles classifications

From Measures to KPI: Fragmentation

- Having an **optimal exhibistion quantity (OptExhInd)** (e.g. 5 pcs) we can compute:
  - The number of necessary exhibition slots for a given period
    - For the whole season it is: 215 x 5 =1,075 slots
  - A **fragmentation index** [0;1] as:

$$\frac{ExhIndx(art, store)}{OptExhIndx(art)}$$

  - In our case 275/1,075 = 0.256
  - The fragmentation index can be averaged on time, articles and stores

From Measures to KPI: Display Refresh

- Given a store, a temporal binning (e.g. weeks), let's *bin1*, *bin2* two consecutive time bins , **Display Refresh Index (DRIndx)** [0;1] for a store can be computed as

From Measures to KPI: Display Refresh

- Given a store, a temporal binning (e.g. weeks), let's *bin1*, *bin2* two consecutive time bins , **Display Refresh Index (DRIndx)** [0;1] for a store can be computed as the percentage of articles exhibited in *bin2* that are not present in *bin1*.

$$DRIndx(store, Bin1, Bin2) = 1 - \frac{|Bin1\ aricles\ \cap Bin2\ articles|}{|Bin2\ articles|}$$

  - Computing *DRIndx* at the day granularity is hardly meaningful in most of cases due stability of Exhpositions.

From Measures to KPI: Density

Exhposition Density Index (Density) for a store requires the real space occupation of an article to be kept into account. Given:

- The number of spatio-temporal slots taken by article *art* - *ExpIndx(art,store)*
- The space taken by each slot for *art, Space(art)*
- The store exhisibition size *Mq(store)*

$$Density(store) = \sum_{i=1}^{\#art} \frac{ExpIndx(i, store) \times Space(i)}{Mq(store)}$$