Assortment Analysis

Defining a KPI MAP

Case study

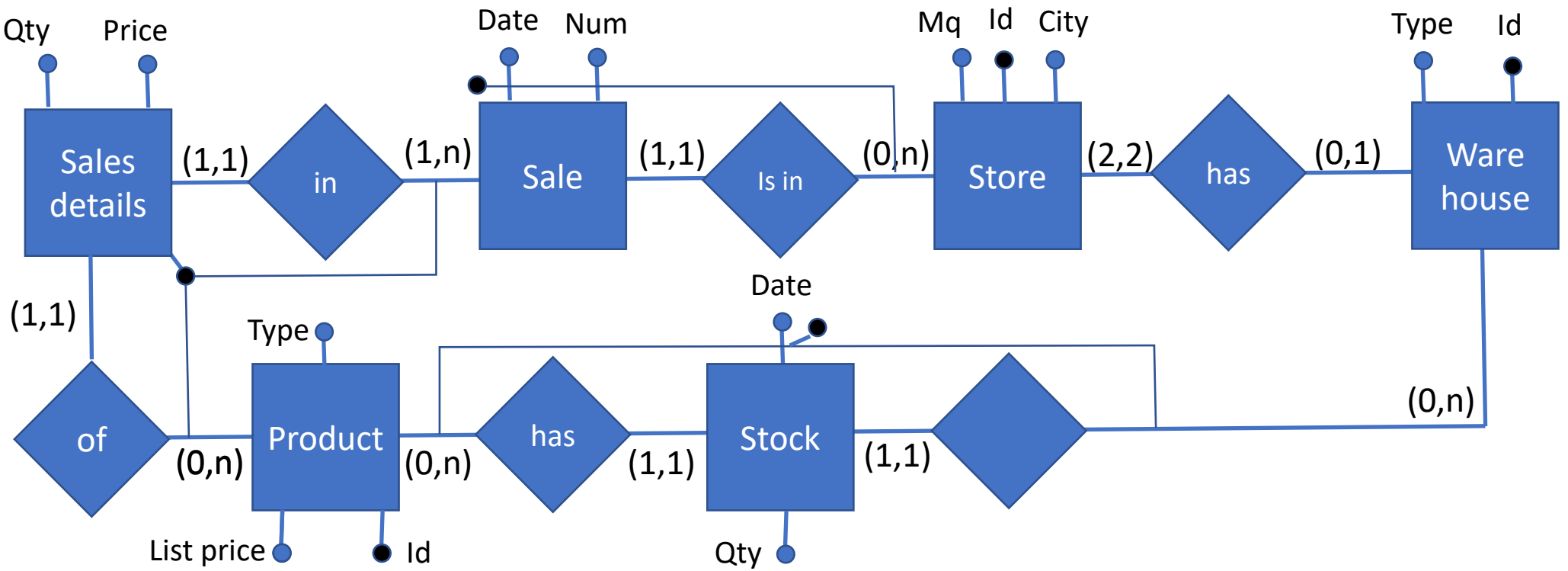
A company sells a large set of articles in many department stores and is interested in monitoring how store managers handles display of products along a 6-month season.

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 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, product stocks are updated
  - 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? Do articles rotate?
- Is the assortment compatible with the showroom size?
- How does display change along season?
  - For instance, during seasonal sales
- How does display impact on selling?

Stakeholders

Category manager:

- Manager of a specific type of products
- She decides the articles and the quantity to be bought
- Interested in the layout of products of her category
- Data can be analyzed either at the maximum detail or aggregated by month, and area

Supervisor:

- Manager of a specific geographical area, she decides the discount policies for her area
- Interested to single shops in her area

Layout manager:

- She suggests the number and quantity of items to be displayed
- Interested in the layout of each single shop as well as groups of shops or categories

Different stakeholders, different goals of analysis!

Measuring the facets of display policies

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

Measuring the facets of display policies

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

- Fragmentation: is each article exposed in the right quantities?
- Non-exhibited articles: are articles exhibited at least one day?
- Display Refresh: how frequently is the exposure renewed?
- Density: how many articles are displayed per square meter?

Measuring the facets of display policies

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

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

From Measures to KPIs: Fragmentation

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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 KPIs: Fragmentation

Having an optimal exhibition 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 KPIs: Display Refresh

Given a store, a temporal binning (e.g., weeks), let's bin_1, bin_2 two consecutive time bins; the Display Refresh Index (DRIndx) [0;1] for a store can be computed as:

From Measures to KPIs: Display Refresh

Given a store, a temporal binning (e.g., weeks), let's bin_1, bin_2 two consecutive time bins

Display Refresh Index (DRIndx) [0;1] for a store can be computed as the percentage of articles exhibited in bin_2 that are not present in bin_1

$$DRIndx(store, Bin_1, Bin_2) = 1 - \frac{|Bin_1\ aricles\ \cap Bin_2\ articles|}{|Bin_2\ articles|}$$

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

From Measures to KPIs: Density

Exhibition 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* (i.e., *ExhIndx(art, store)*)
- The space taken by each slot for the given article (i.e., *Space(art))*
- The store exhibition size (i.e., *Mq(store)*)

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