

## Exercise 08: Conceptual design

### Task 1: Create an entity-relationship model (ER model) for the following facts.

The company RamschCO wants to sell its products to customers via the Internet. Customers of the company have typical characteristics, such as first and last name, telephone number, e-mail address and postal address, which consists of street, city, state and postcode. The customers identify themselves to the system through a unique login name, which also has an associated password. Every customer has one or more virtual shopping baskets when shopping. There are customers (that are visitors) who do not have a shopping basket. Every shopping basket is identified by a unique ID number. Other attributes of a shopping basket are the date of purchase, the type of purchase and the total price (of all purchased items), which is calculated by multiplying unit prices and the quantity purchased for each item. The customers buy from the online store in different item categories (books, CDs, DVDs, etc.). Every item category has a unique ID and an associated description. Every category has multiple items (every item only belongs to one category, and every category has at least one item). Every item is identified by a unique item number (e.g. "BA2320"), a name, image and price. Because items can be in different sizes and colours, the customer does not place items in general, but specific stock keeping units (SKUs) in their shopping basket. An item can have one or more SKUs, and every SKU has an SKU number (e.g. "YELLOW38"). The order number is derived from the item number, a minus sign and the SKU number (e.g. "BA2320-YELLOW38"). For every SKU, we also know the storage location, quantity in stock, colour and size. The customer can put SKUs in their shopping baskets, and of course an SKU can be placed in several different shopping baskets (because only when the transaction is completed will an SKU be declared sold and the "quantity in stock" will be reduced accordingly).

### Task 2: Create an entity-relationship model (ER model) for the following facts.

You are working on a reservation system of a railway operator. A train consists of multiple carriages. For trains, the operator, e.g. Meridian, and a unique train number are stored. Every carriage has a 4-digit carriage number which uniquely identifies that carriage. A carriage is always assigned to a train. In addition, a manufacturing date is stored for every carriage. This enables the age of the carriage to be determined. A carriage is equipped with various features. A carriage feature has a unique identifier, such as 1st class, 2nd class or dining car. A carriage may have multiple carriage features, such as dining car and 2nd class. There are seats in every carriage. Every seat has a seat number that identifies it within a carriage. However, seats in different carriages can have the same seat number. Every seat has the property "IsWindow". We store true for a window seat and false for an aisle seat.

---

**Task 3          Create an entity-relationship model (ER model) for the following facts.**

You are working on the online shop for a plant nursery. Create an ER diagram for the following statements by the manager of the nursery.

- Only model the most important information as entities.
- Don't forget keys and cardinalities in [min/max] notation.
- Specify the calculation as a comment for calculated attributes.

"Of course, we mainly sell plants, safely packed in special shipping boxes. This is by far our most important trading unit. In addition to the plants, we also sell flower bulbs and various gardening supplies, likewise safely packed, these are our other two trading units.

Every trading unit has its price, a unique order number and a name.

As I mentioned, our strong plants are the most important. For every plant, it is relevant how much space it needs, i.e. how close to other plants it is planted, the so-called planting distance.

We have young trees in our product range, where customers are particularly interested in how high they can possibly grow. We also have shrubs, and here it is important that the customer knows whether a shrub is suitable for a sunny, partially shady or shady location. All trees and shrubs in our product range are hardy, but this is not the case with small plants, where some are non-hardy. Some are only annuals (lasting one year), whereas others are perennials (lasting several years). We also have pot plants, which are likewise available for the three different locations. Hydroculture is becoming more and more widespread, especially for office plants, but not all kinds are suitable for this.

With the flower bulbs, it's all much easier, there are only those for the two planting periods of spring and autumn, and of course the variety the flower belongs to (such as tulips, daffodils, etc.). It's even easier when it comes to gardening supplies, which are only shown by type in the shop, so things like plant pots, climbing aids, gardening tools and so on.

That's about all. Oh yes, what we also do in the shop is sell sets of trading units. We keep coming up with new, well-matched combinations, for example a set consisting of a flower box, a red rose and two white roses. So there are multiple trading units in the set, and we give the customer a discount of say 10%, so that the set might only cost EUR 18, whereas the trading units contained in it would normally cost EUR 20 altogether. We actively promote the sets in the shop and display both the discount and the set price prominently, they sell very well."