

FUNCTIONAL _ DESIGN / TECHNICAL DESIGN

ISE-DMDD “Happy Travel”

FUNCTIONAL DESIGN AND TECHNICAL DESIGN

- **Introduction**
- **Functional Design**
- **Technical Design**

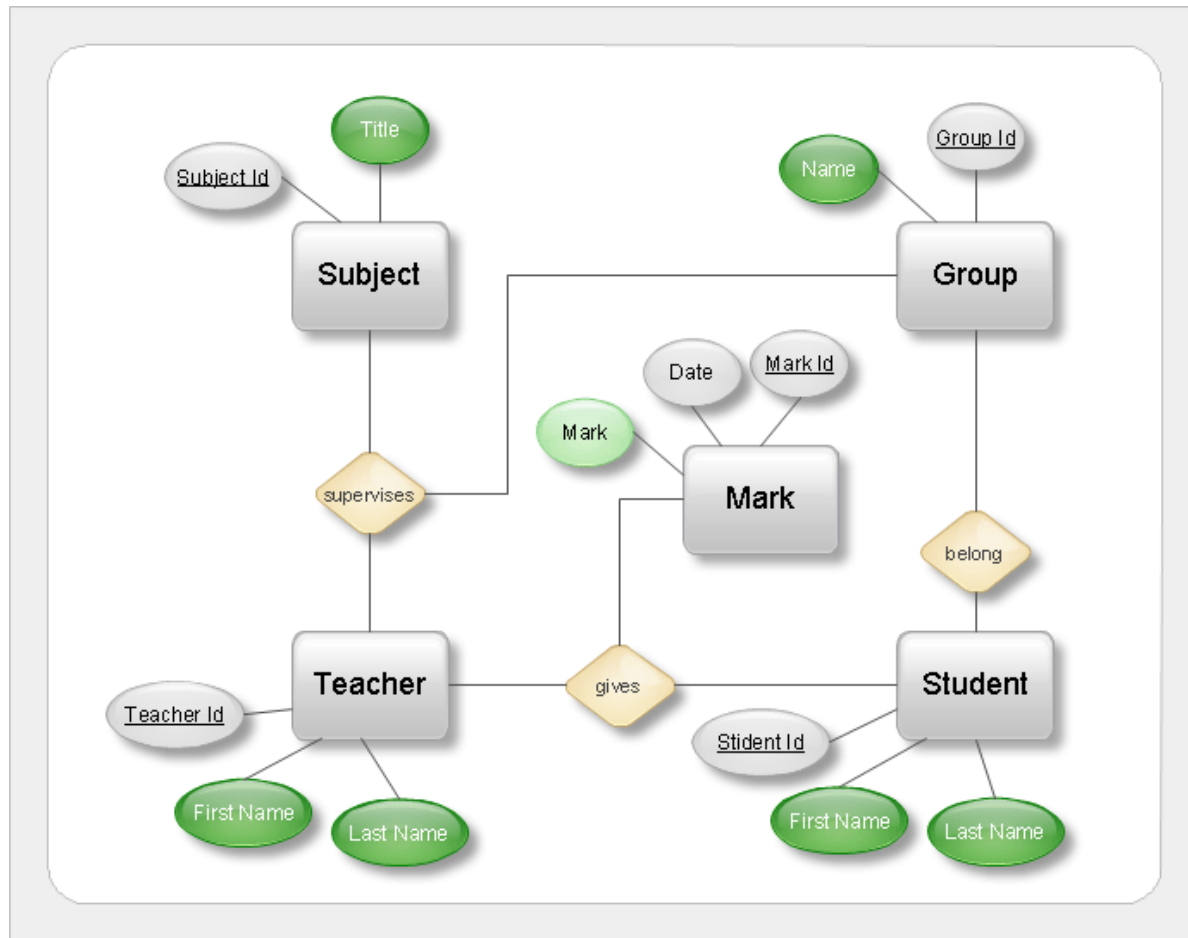
ERM IN RETROSPECTIVE

Many database designers suffer from 'tableitis', i.e. they tend to think in terms of tables instead of entity types (domain concepts).

This might be 'encouraged' by the ERM notation we use, because it looks like a database diagram.

The original ERM notation by Peter Chen (1976) is probably more suitable for conceptual modeling. See example on next slide.

ERD, CHEN NOTATION



ANALYSIS AND DESIGN DOCUMENTATION

- Functional Design (FD, Dutch: FO)
also called: Requirements Specification
- Technical Design (TD, Dutch: TO)
also called: Software Design

CONTENTS FD AND TD

FD: describes WHAT the system will do

- Processes: BPM, Use Case Model
- Data: Conceptual Data Model
- Interaction: Relation between processes/tasks and data

TD: outlines HOW the system will work

- Architecture: Hardware, software
- Data: PDM, Script, changes in DB schema
- GUI: Detailed UI design + related functions

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GOAL FUNCTIONAL DESIGN

- Specification of functional requirements of information system
- Description of the functionality and the related data of the future information system
- Agreement between customer and development team
- Target audience: customer and development team

CONTENTS FUNCTIONAL DESIGN

Dynamic model (processes, tasks)

- Description of what the system does and the processes it supports
- Candidate techniques: Business Process Model, Use Case Model

Static model (data)

- Abstract representation of the domain (Universe of Discourse)
- Describes the data the system will use (entity types, relationship types, business rules / constraints)
- Candidate techniques: CDM (ERM), FCO-IM information model

Interaction model

- CRUD
For each function which entity types are modified (Create, Update, Delete) or read (Read).
- User privileges
Which functions/tasks may be performed by which users / user groups?
- Storyboards
Screen design and navigation

EXAMPLE ARTIFACTS IN FD

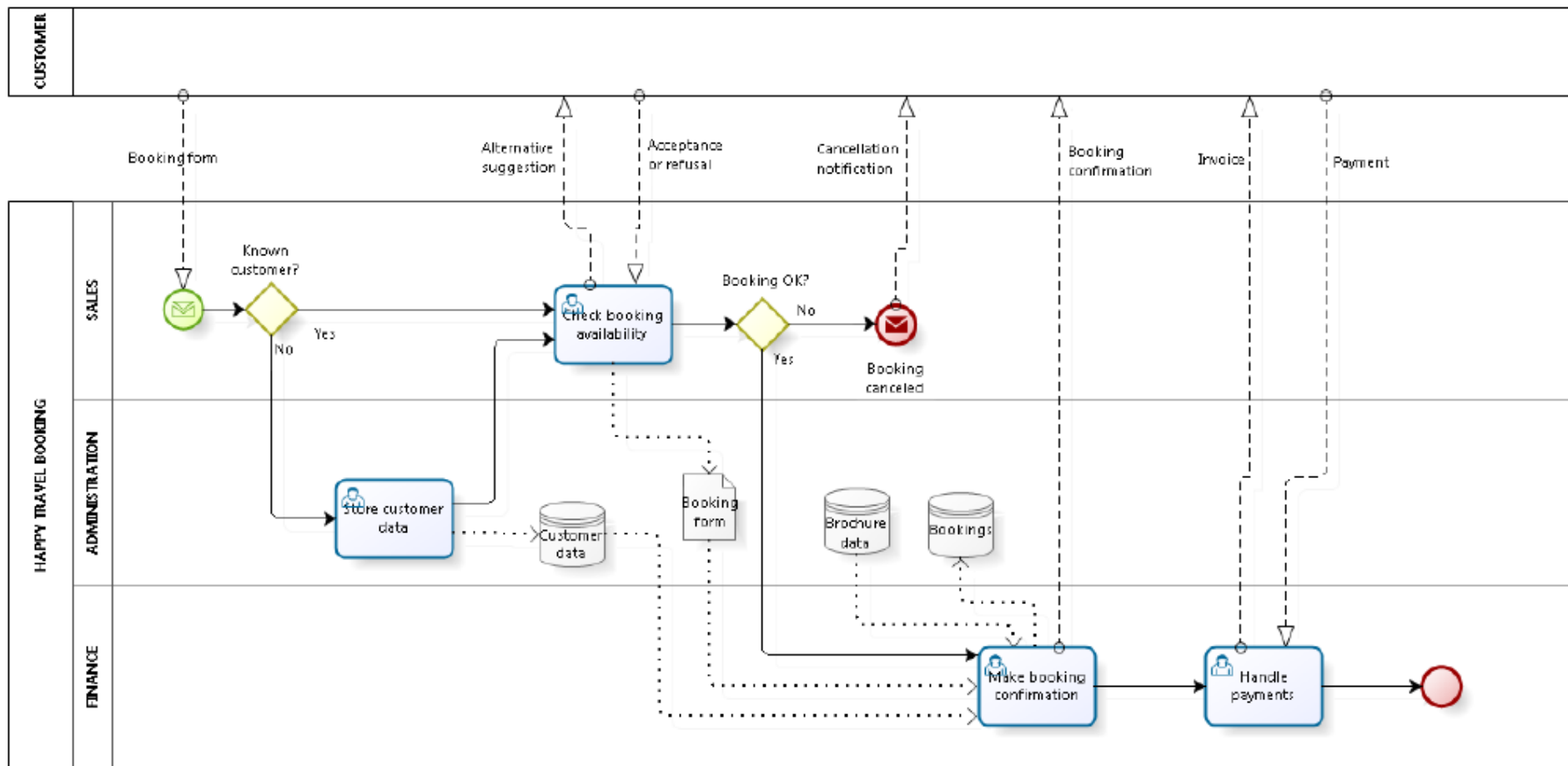
From Case: Happy Travel

CASE HAPPY TAVEL

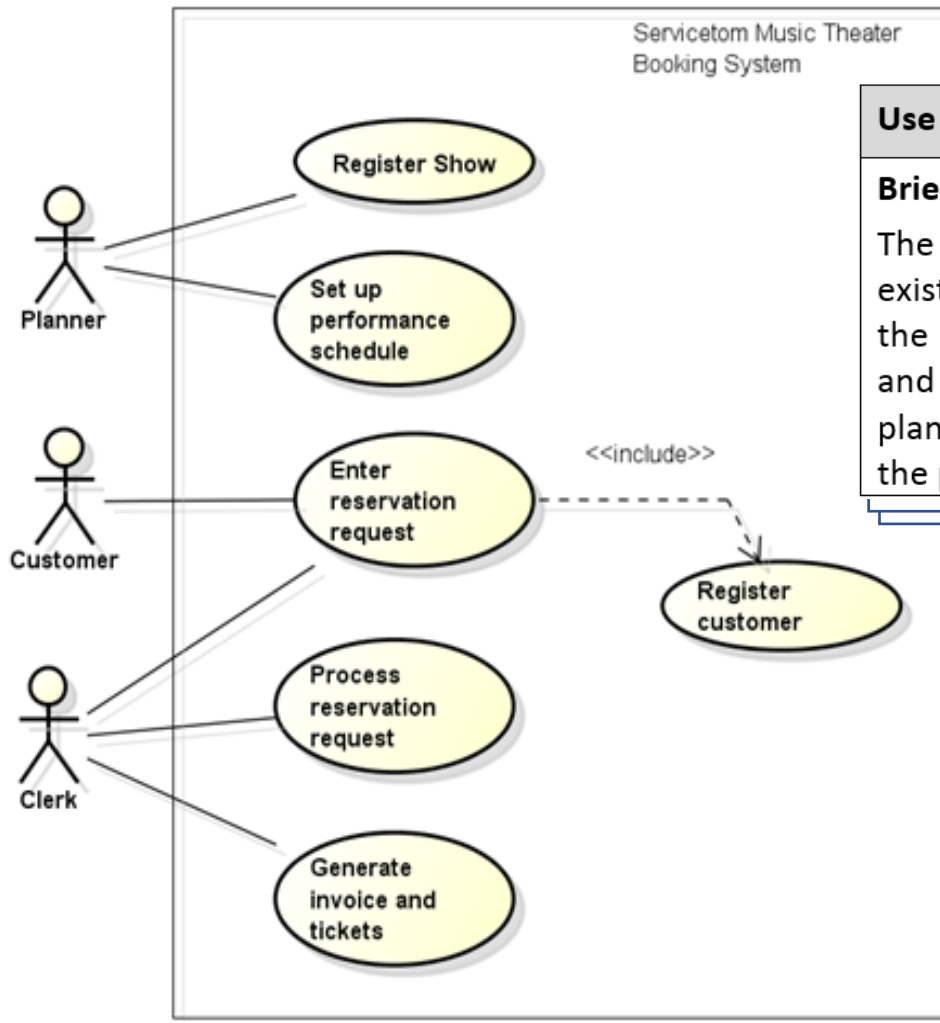
Travel agency and tour operator Happy Travel organizes trips to European cities. The management of Happy Travel wants to enable customers to book trips online.

All information in the Happy Travel Brochure must be made available on Internet and a system must be developed to support the online booking process.

BUSINESS PROCESS MODEL



USE CASE MODEL



Use case: Register Show

Brief description

The planner creates a show or edits an already existing show. The planner enters the show name, the name of the performer, a show description and at least one genre. After confirmation by the planner the system stores the show. Optionally the planner can remove an existing show.

CONCRETE EXAMPLES OF INFORMATION

Happy Travel – Town information

Town: *Paris*

Happy Travel – Booking Form

| | | | | | |
|-----------------------|---|----------------------|----------------|-----------------|----------|
| Customer | Name: | <i>R.G.Zwarten</i> | | | |
| | Address: | <i>Zuidkade 15</i> | | | |
| | Postal code: | <i>6176 CK</i> | | | |
| | Town: | <i>Spaubeek</i> | | | |
| | Telephone: | <i>0285 - 123456</i> | | | |
| Accommodation | Accommodation code: | <i>PAR002</i> | | | |
| | Town: | <i>Paris</i> | | | |
| | Name: | <i>Ambassador</i> | | | |
| | Number single rooms: | <i>2</i> | | | |
| | Number double rooms: | <i>1</i> | | | |
| Period of Stay | week / midweek / long weekend* | | | | |
| | From: | <i>25/6/2016</i> | until: | <i>2/7/2016</i> | |
| Participants | | Initials | Surname | Birth Date | M / F |
| | 1 | <i>R.G.</i> | <i>Zwarten</i> | <i>23/09/74</i> | <i>M</i> |
| | 2 | <i>J.L.M.</i> | <i>Zwarten</i> | <i>25/03/73</i> | <i>F</i> |

* Cross out if not applicable

CRUD MATRIX

| | Accommodation | City | Travel Option | Booking | ... |
|--------------------------------|---------------|------|---------------|---------|-----|
| Register accommodation | CRUD | CR | | R | ... |
| Register Travel Options | | R | CRUD | | ... |
| | ... | ... | ... | ... | ... |



CONCEPTUAL DATA MODEL

- **Entity Relationship Diagram**

- Fact types describe the semantics, concrete examples clarify further
- For consensus and transferability you should describe important domain concepts in natural language (Data Dictionary)

- **Domains**

- **Constraints**

For business rules that are not visible in the ERD give:

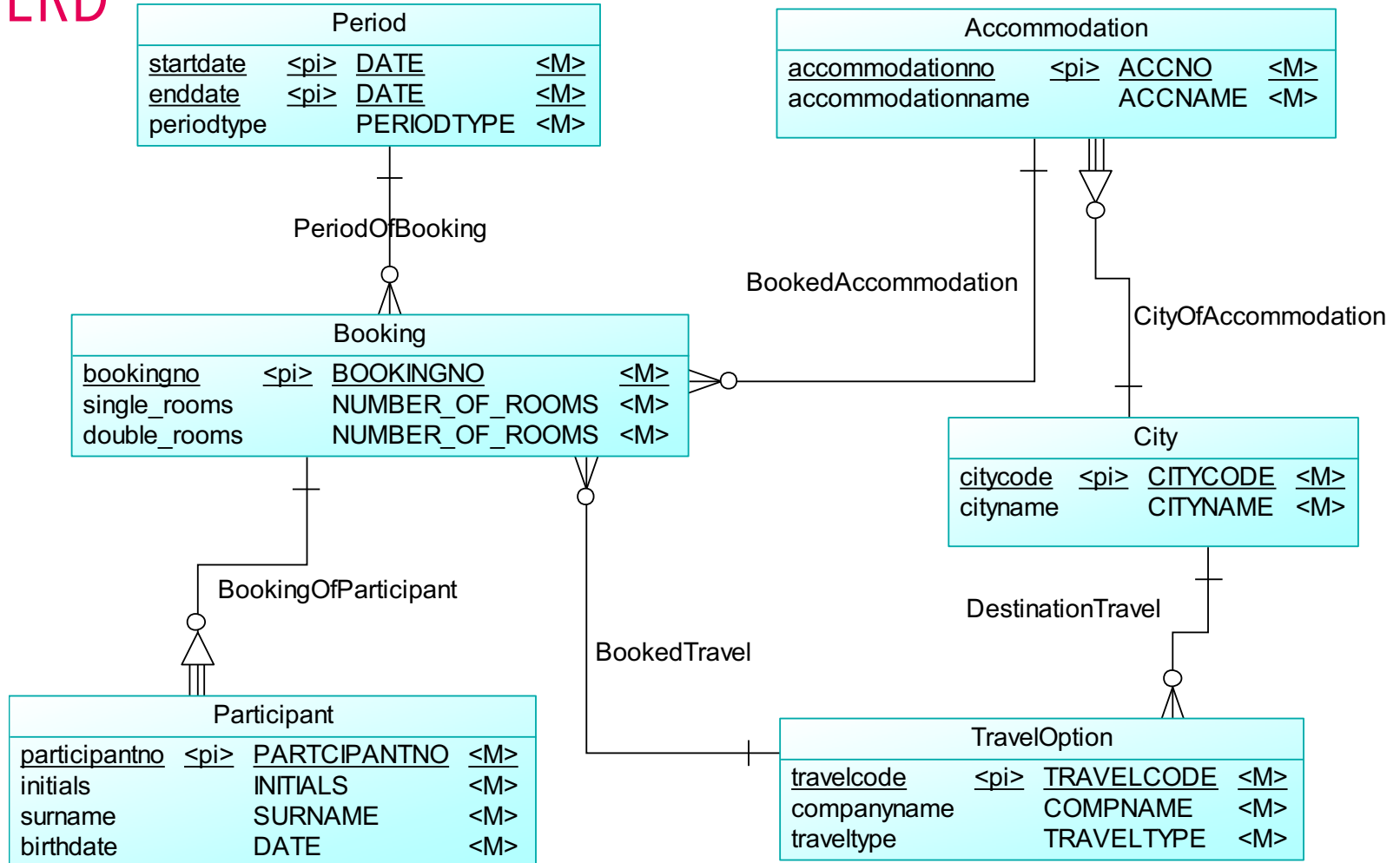
- i. Name of the corresponding business rule
- ii. Related parts of the model (ETs, RTs and attributes)
- iii. Specification of the constraint (in natural language)

- **Modeling decisions**

Usually, there are several data modeling possibilities.

If several options were considered,
state them and account for the choice made

ERD



DOMAINS

| Domain | Datatype | Domain value constraint |
|-----------------------|---------------|---------------------------------------|
| ACCNAME | character(25) | |
| ACCNO | numeric(3) | values>0 |
| BOOKINGNO | number(8) | |
| CITYCODE | character(3) | |
| CITYNAME | character(30) | |
| COMPNAME | character(20) | |
| DATE | date | |
| INITIALS | character(6) | |
| NUMBER_OF_ROOMS | number(2) | values>0 |
| PARTICIPANTNO | number(1) | values>0 |
| PERIODTYPE 'week') | character(12) | values in ('long weekend', 'midweek', |
| SURNAME | character(25) | |
| TRAVELCODE | number(4) | |
| TRAVELTYPE | character(10) | |

DESCRIPTION OF DOMAIN CONCEPTS

Accommodation

A hotel or guest house where the participants of a city trip pass the night. Each accommodation has a unique code, for example PAR002. The three letters refer to the city and the three digits form the sequence number of the accommodation within the town.

Booking

A customer of a city trip books an accommodation in the destination city for a period (week, midweek or long weekend). He might also book the travel to the city or travels on its own. Furthermore the participants and the booked rooms are registered.

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EXPLANATION OF CHOICES

Currently Happy Travel offers only single and double rooms in the accommodations.

It is expected this will not change in the near future.

Therefore it was decided to model the fact types about the number of single and double rooms in an accommodation as two attributes in the ET ACCOMMODATION,

Instead of using separate entity types ROOM_TYPE and ACCOMMODATION_ROOM_TYPE,

although this last option is more flexible because it allows easy addition of other room types in future.

CONSTRAINTS

C1 corresponds with BR1 RulePeriodDates

- Concerns: ET Period, attributes startdate and enddate
- Specification: For each period the startdate must be before the enddate

C2 corresponds with BR2 RuleTravelDestination

- Concerns: ETs and RTs Booking, BookedAccommodation, Accommodation, CityOfAccommodation, City, BookedTravel, TravelOption, TravelDestination
- Specification: If a booking contains a travel, then the destination of the travel should equal the city of the booked accommodation.

C3 corresponds with BR3 RuleParticipant

- Concerns: ETs and RTs Booking, BookingOfParticipant, Participant, attributes initials, surname and birthdate
- Specification: There are no participants of a booking with the same combination of initials, surname and birth date.

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GOAL TECHNICAL DESIGN

- In the TD is described how functions of the information system will be built
- Document design choices (should be consistent with requirements in FD)
- Target audience: development team and maintenance team

CONTENTS TECHNICAL DESIGN

- **System and software architecture**
 - client/server, 3-tier, etc.
 - overview of modules, forms, reports, databases, interfaces with other systems
 - relations between these components
- **Physical database schema**
- **GUI design**
- **Design choices**

PHYSICAL DATABASE SCHEMA

Physical database schema, derived from CDM

For each table

- Description (for example: related fact types)
- Columns (attributes)
- Domains: which data type (user defined domain)?
- Primary key
- Foreign key(s) and FK-references
- Declarative constraints: check, not null, unique

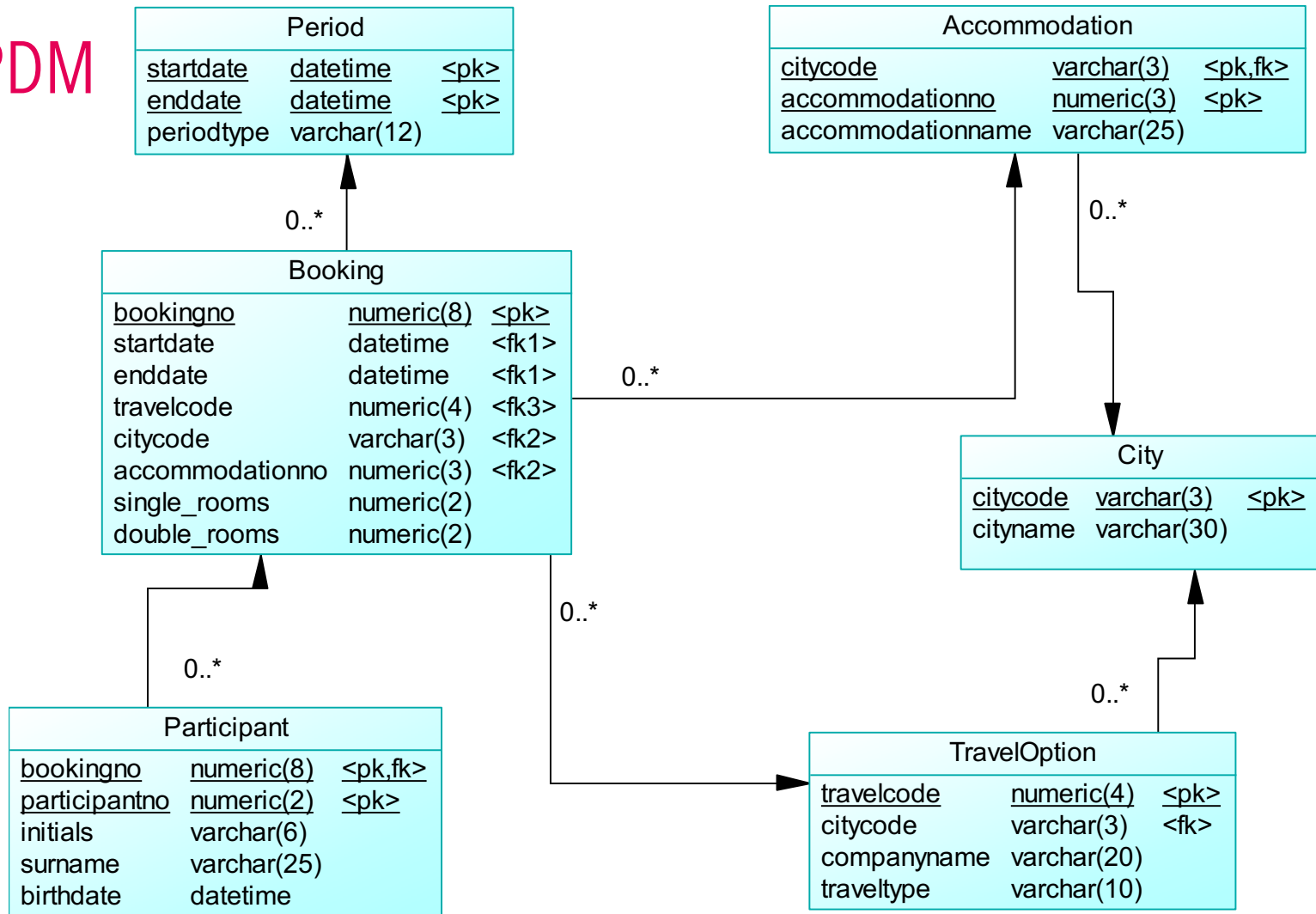
Integrity rules

- Description and implementation (triggers/stored procedures)

Implementation choices

- introduction surrogate (dummy) ID's
- indexes (where, why, clustered/nonclustered, ...)
-

PDM



DESCRIPTION OF TABLES AND COLUMNS

| | |
|-----------------------|--|
| <i>Table: Booking</i> | <i>This table contains data about bookings made by customers</i> |
| column | description |
| bookingno | unique number of a booking |
| citycode | citycode of the town where the booked accommodation is located |
| accommodationno | Sequence number of the booked accommodation within this city |
| travelcode | code of the booked travel option |
| startdate | startdate of the stay period of this booking |
| single_rooms | number of single rooms of this booking |
| double_rooms | number of double rooms of this booking |

INTEGRITY RULES

IR1 corresponds with C1 and BR1 RulePeriodDates

- Specification: For each period the startdate is before the enddate
- Implementation: check-constraint CHECK_PERIODDATES on table Period

IR2 corresponds with C2 and BR2 RuleTravelDestination

- Specification: If a booking contains a travel, then the destination of the travel should equal the city of the booked accommodation.
- Implementation: trigger TRAVELDESTINATION on table Booking

IR3 corresponds with C3 and BR3 RuleParticipant

- Specification: There are no participants of a booking with the same combination of initials, surname and birth date.
- Implementation: Unique on columns (initials, surname, birthdate) in table Participant