Appendix C: Common Errors in ER-Diagrams

Warning: The ER-Diagrams in this appendix are all wrong. Do not imitate them!

I have used the following sources:

- Rauh/Stickel: Konzeptuelle Datenmodellierung (in German), Teubner, 1997.
- Experience from correcting many homeworks and exams.

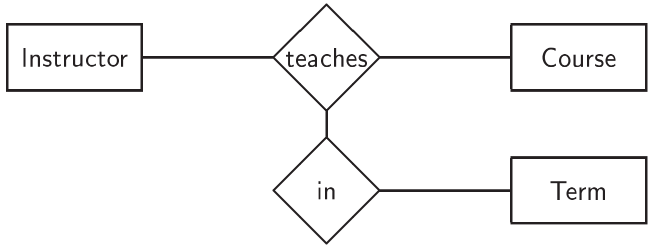
Overview

1. Syntax Errors
2. Logical Errors

Connections (1)

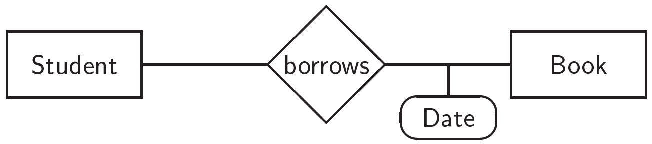
- You cannot connect two entity types directly:

- There can be no connections between relationships:



Connections (2)

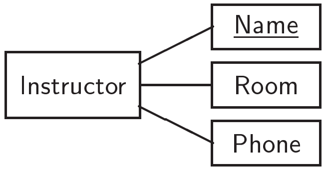
- You can attach attributes to entities and relationships, but not to connecting lines:



- An attribute must be linked to an entity or a relationship (maybe via a structured attribute). It cannot stand on its own.

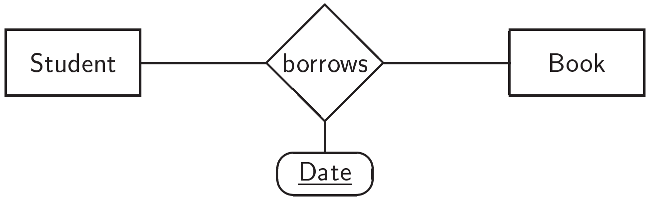
Attributes

- You must mark attributes with ovals, ellipses, or boxes with round edges. Using normal boxes for entity types and attributes is an error:



Keys

- You cannot specify a key for a relationship:

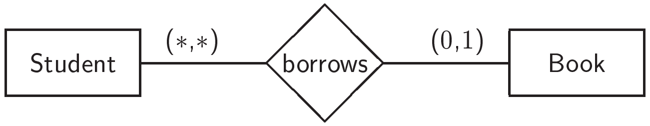


- Every entity type must have a key (at least before it can be translated into the relational model).

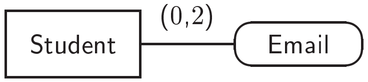
  Especially, an entity type without any attributes is only allowed as a subclass.

Cardinalities

- The “$*$” can only be used as maximum cardinality.
  The minimum cardinality must be a number (0,1,2,...):

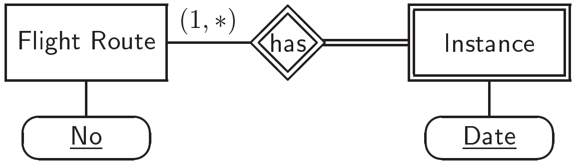


- The minimum cardinality must be smaller than the maximum cardinality, e.g. $(2{,}1)$ is invalid.
- You cannot specify cardinalities for attributes:

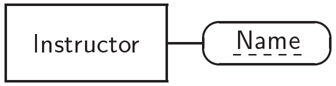


Weak Entities (1)

- You cannot specify a normal key for a weak entity.

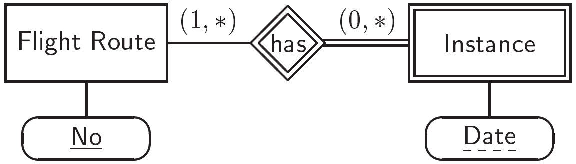


- You cannot specify a partial key for a regular entity.



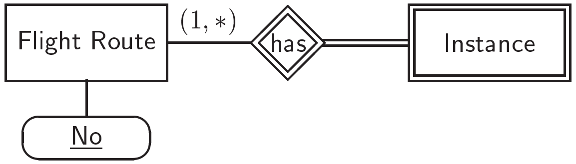
Weak Entities (2)

- You cannot have cycles in weak entity relationships, e.g. A is a weak entity with owner B, and B is a weak entity with owner A.
- A weak entity must always participate in the relationship to its owner with the cardinality $(1,1)$. You do not have to specify this explicitly, but you cannot specify anything else.



Weak Entities (3)

- If the inherited key is not extended (i.e. no partial key is specified for the weak entity), then specialization must be used instead.

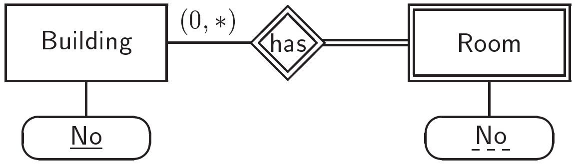


- It is especially illogical to specify a cardinality of $(1,*)$ at the owner entity and then not to extend the key.

  If the weak entity has the same key as its owner, there can be at most one weak entity for every owner.

Weak Entities (4)

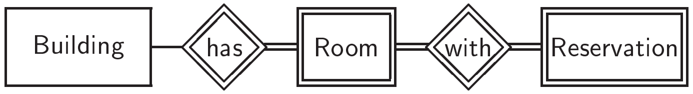
- You cannot introduce attributes in weak entities which have the same name as the inherited key attributes:



- A weak entity must be connected by a double line to exactly one relationship:

Weak Entities (5)

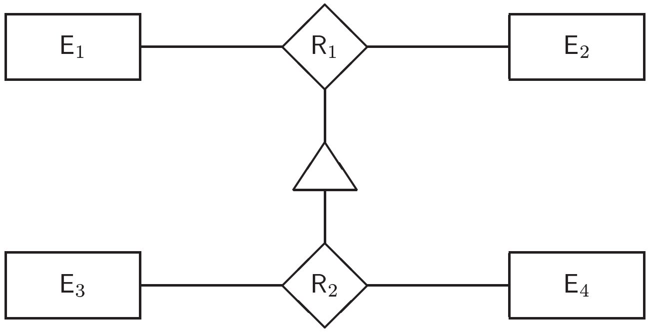
- A weak entity can itself be parent entity for another weak entity. But the line connecting the parent-child relationship to the parent entity must be a single line:



I.e. the connection of “with” to “Room” is wrong.

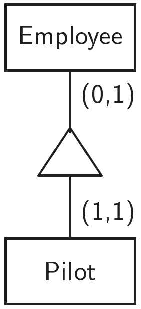
Specialization (1)

- The specialization symbol (ISA) must be connected to entity types:



Specialization (2)

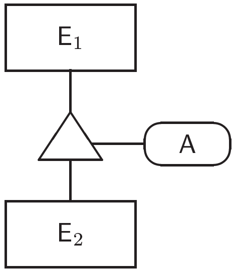
- You cannot attach cardinalities to specializations:



- Especially, cardinalities other than these do not make sense.

Specialization (3)

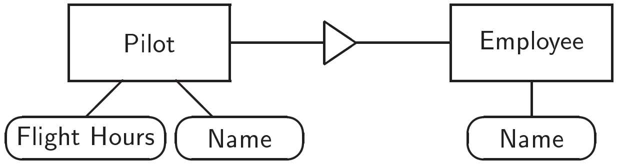
- You also cannot attach attributes to the specialization symbol:



- There can be no cycles in specializations: It cannot happen that A is a subtype of B and B is a subtype of A.

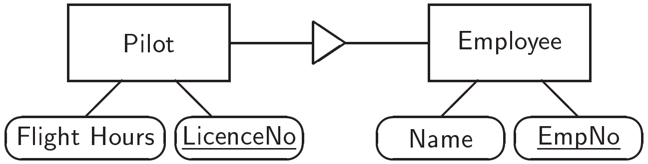
Specialization (3)

- You cannot introduce attributes in the subtype which have the same name as an attribute from the supertype (attributes from the supertype are automatically inherited):



Specialization (4)

- You cannot define a primary key on the subtype:

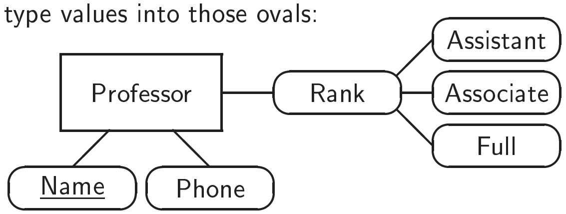


- Then the primary key for the subtype would not be clear.
- However, you can specify alternate keys on the subtypes (at the moment, only as a natural language constraint).

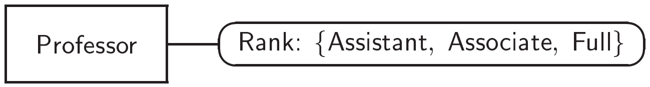
  E.g. Oracle Designer supports several keys for the same entity type.

Structured Attributes

- When ovals are linked to other ovals, this means a record type (structured attribute). It is not correct to put possible data type values into those ovals:



- If you want to indicate a data type, do it in this way:



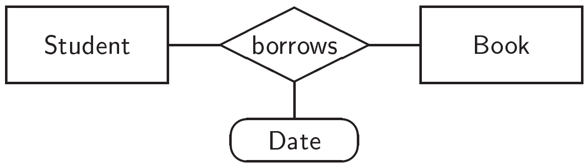
- Also consider subclasses, especially for yes/no attributes.

Overview

1. Syntax Errors
2. Logical Errors

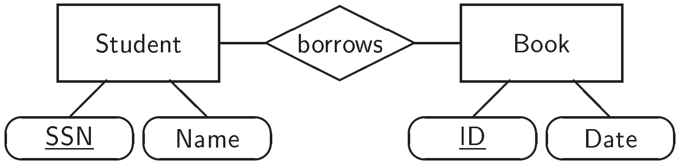
Too Restricted Schemas (1)

- Cardinality (1,1) specified, but (0,*) in reality.
- The following schema allows to store only one date per combination of student and book. If the application requires to store historical information, including whether a student borrowed a book multiple times, then this is incorrect:



Too Restricted Schemas (2)

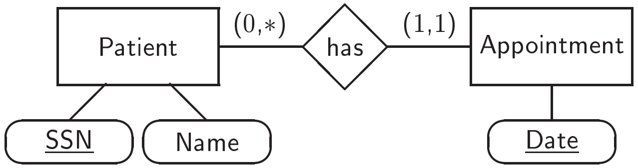
- In the following schema, you can store only one date per book. This might be ok. But if the application requires to store also historical information, the schema is too restricted:



- You must mark attributes which can be missing as optional. E.g. in this case, what happens if a book is currently not borrowed?

Too Restricted Schemas (3)

- Also keys can be too restrictive. This schema allows only one appointment per day and one patient per appointment (the doctor will not have much work . . .):

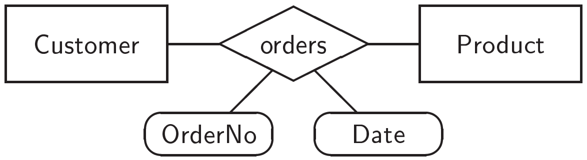


Redundant Information (1)

- Specifying attributes or relationships which are derivable from other information in the schema counts as an error (unless you also specify the derivation rule as an integrity constraint).
- E.g. we have seen “shortcut relationships” which link E_1 and E_2 if and only if they are also linked via some other path of relationships.
- Another error is to repeat attributes of related entity types (i.e. the same information is available by following a relationship and then taking the attribute value).

Redundant Information (2)

- Sometimes a schema requires to specify certain pieces of information redundantly:

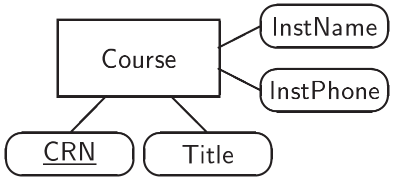


If a customer has ordered multiple products in one order, the date of this order is stored for every product he/she ordered.

You need to make order an entity by itself in this case.

Redundant Information (3)

- In this case, no attribute can be left out, but still the same piece of information (phone number of instructor) is stored repeatedly:

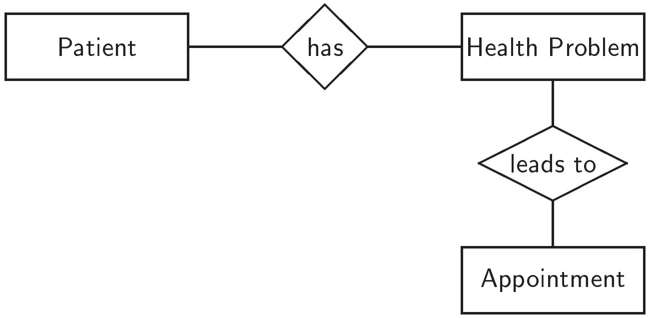


- Here, you must create an entity type for the instructor.

  See the chapter about relational normal forms for the underlying theory.

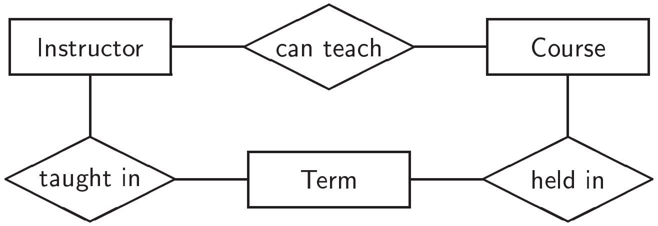
Information Not Represented (1)

- Here, if multiple patients have the same health problem, it is not clear who has which appointment:



Information Not Represented (2)

- The information represented in this schema does not allow to conclude who taught which course in which term:



  E.g. SB teaches DB in Fall 1999 and DS in Spring 2000.
  RF teaches DS in Fall 1999 and DB in Spring 2000.

- Of course, also the error that you simply forgot an attribute (relationship, entity type) falls in this category.

Inconsistent Cardinalities

- These cardinalities imply that there are equally many E_1 and E_2 entities, and the $(1,*)$ cardinality is really $(1,1)$.