

Subtype Relationship and Rules in ORM

(Chapter 6)

Mustafa Jarrar

Birzeit University
mjarrar@birzeit.edu
www.jarrar.info



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Some diagrams in this lecture are based on [1]

Keywords: subtype, subclass, subset, concept, instance, Rules, Business Rules, Business logic derivation rules, integrity constraints

Conceptual Schema Design Steps

1. From examples to elementary facts



2. Draw fact types and apply population check



3. Combine entity types



4. Add uniqueness constraints



5. Add mandatory constraints



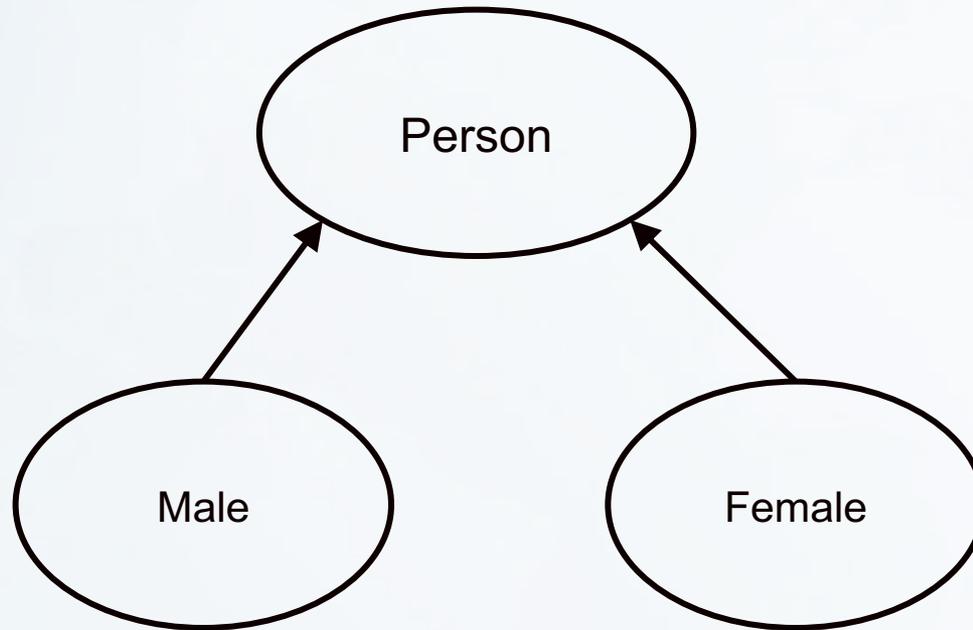
6. Add subtype relations and other constraints



7. Final checks, & schema engineering issues

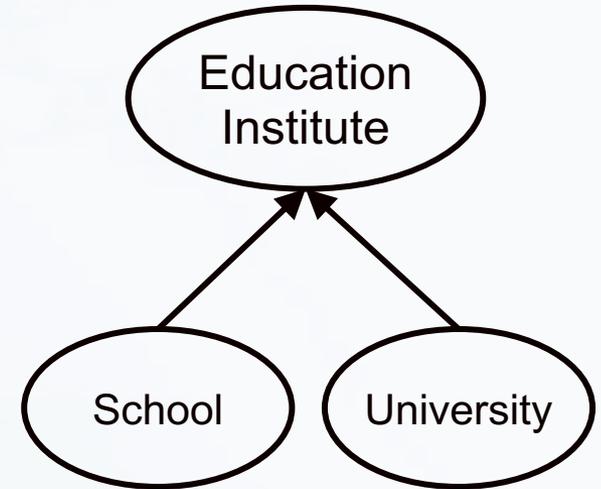
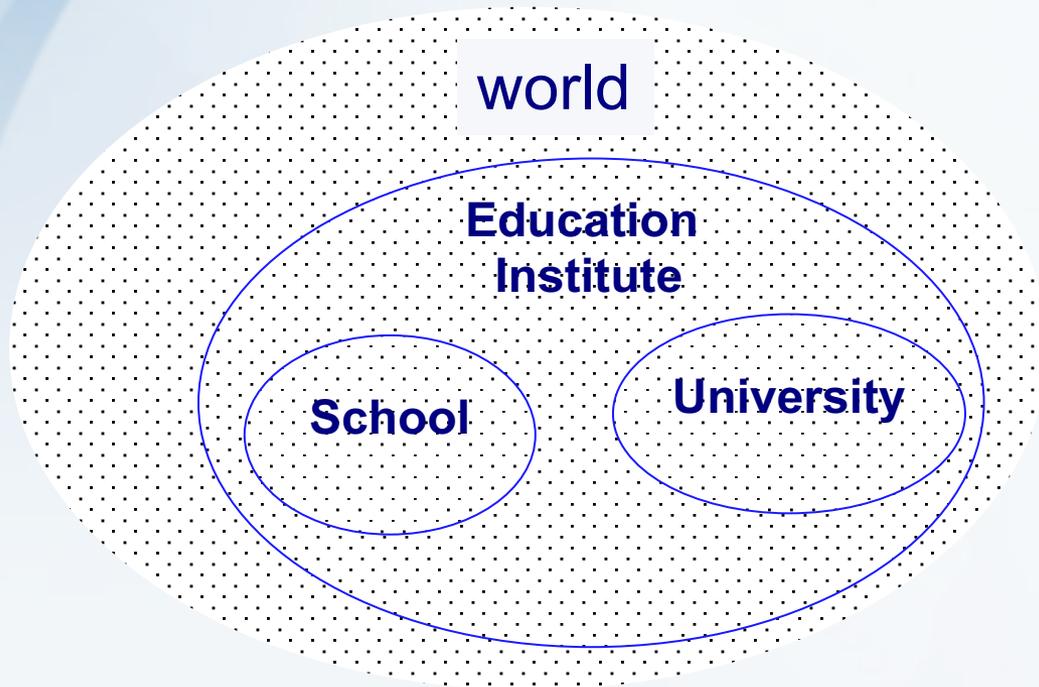


Subtypes



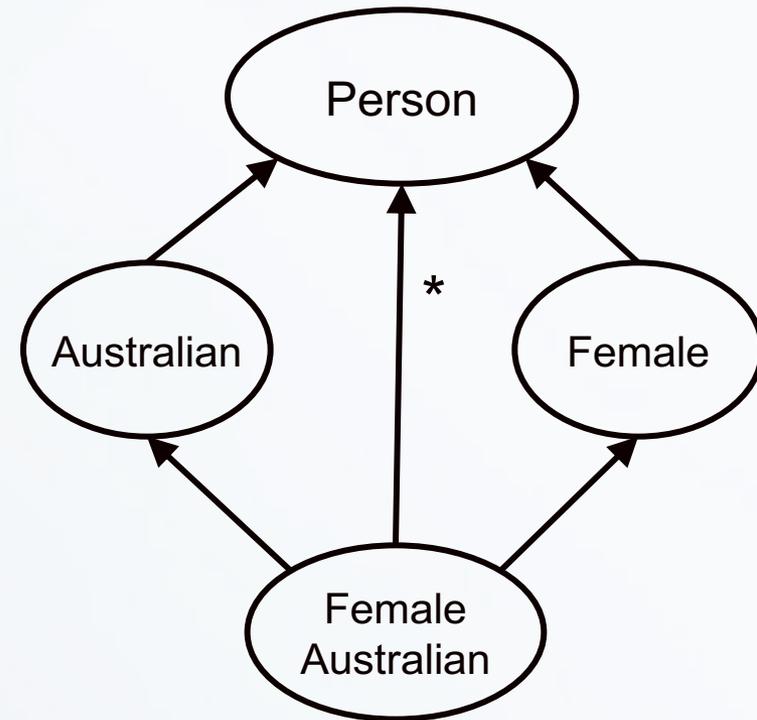
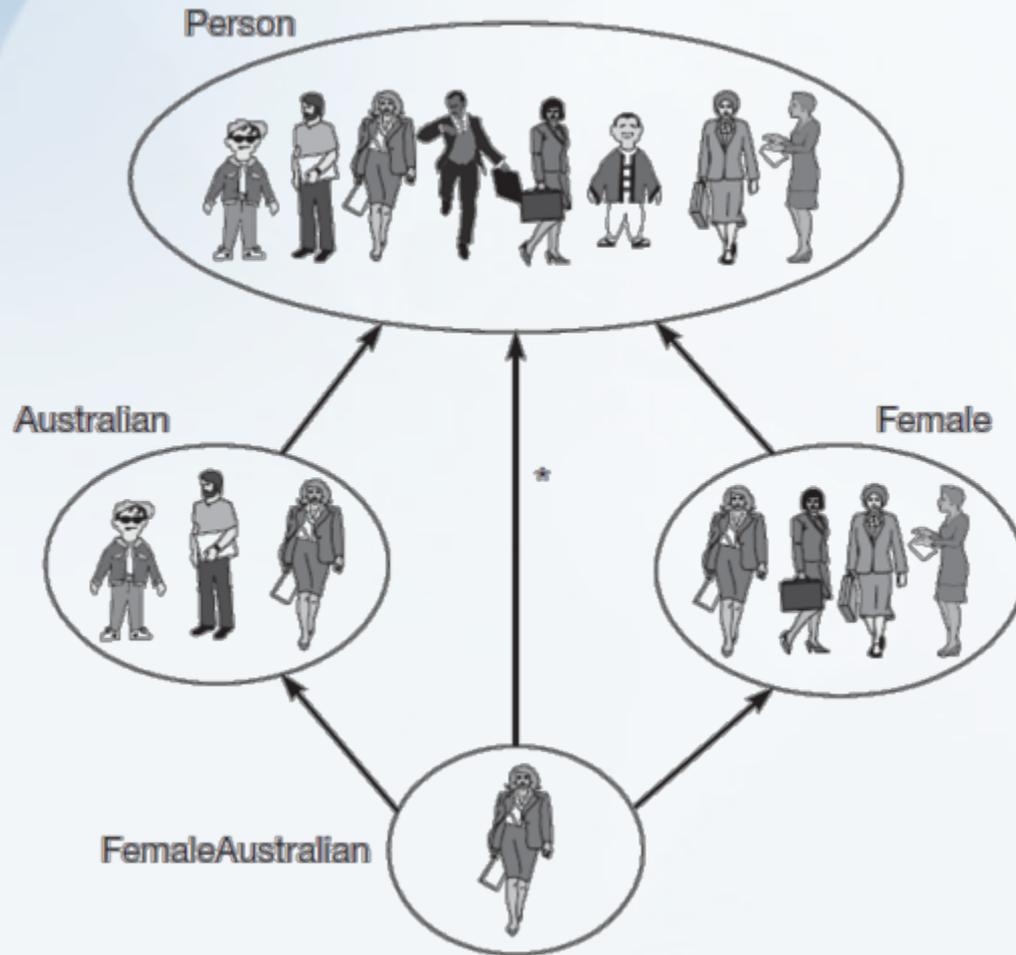
- Generalization/Specialization hierarchy.
- Subtype inherits the properties of its supertype.

Subtypes as subsets



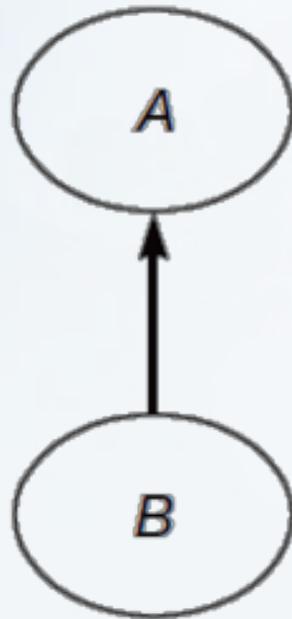
- “Education Institute” is a set of properties.
- Thing carrying these properties are called **instances** of “Education Institute”.
- Every instance of the concept “School” is also an instance of “Education Institute”.

Subtypes



* The indirect subtype connection is implied, so it should be omitted

Proper Subtypes



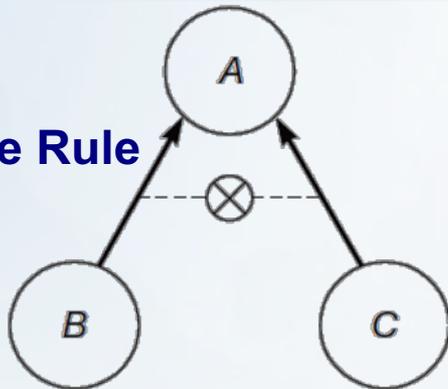
$A \neq B$, and for each database state:

$$\text{pop}(B) \subseteq \text{pop}(A)$$

(unlike EER and UML) ORM subtypes are proper

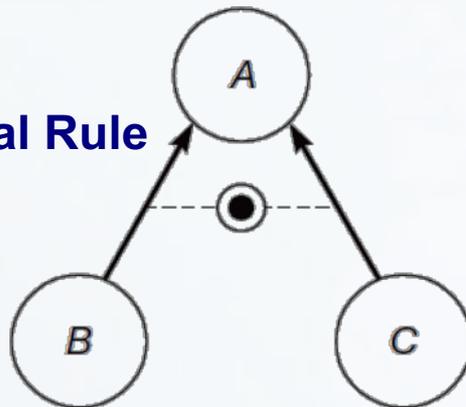
Subtype Rules (Total and Exclusive)

Exclusive Rule



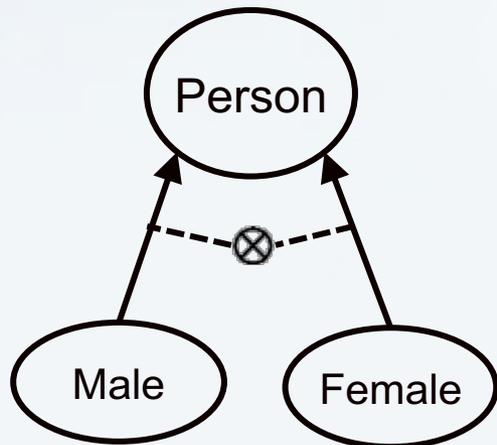
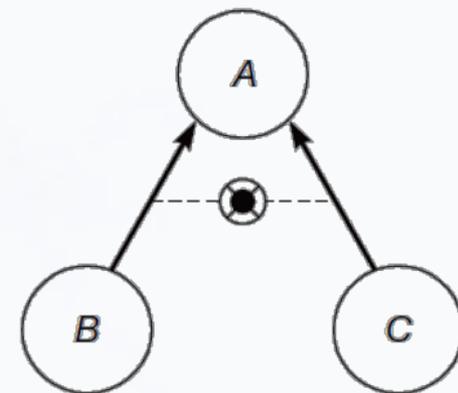
$$B \cap C = \{\}$$

Total Rule

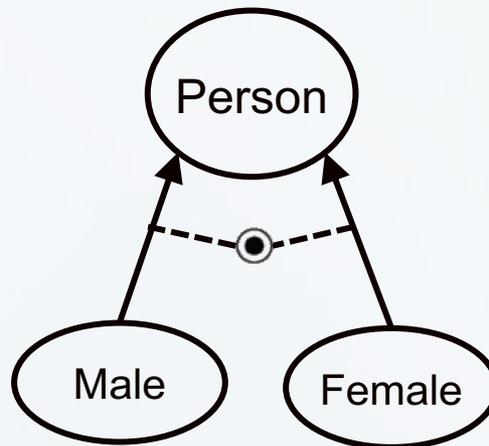


$$A = B \cup C$$

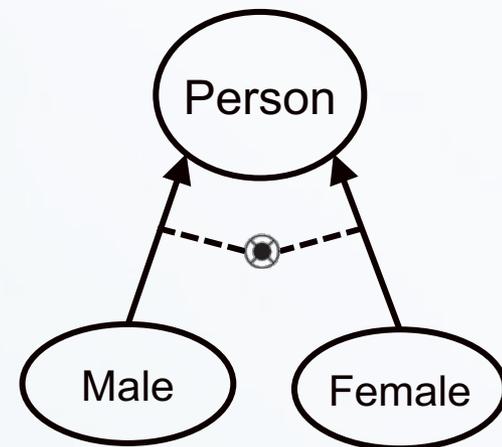
Both



There is no person that can be Male and Female at the same time.

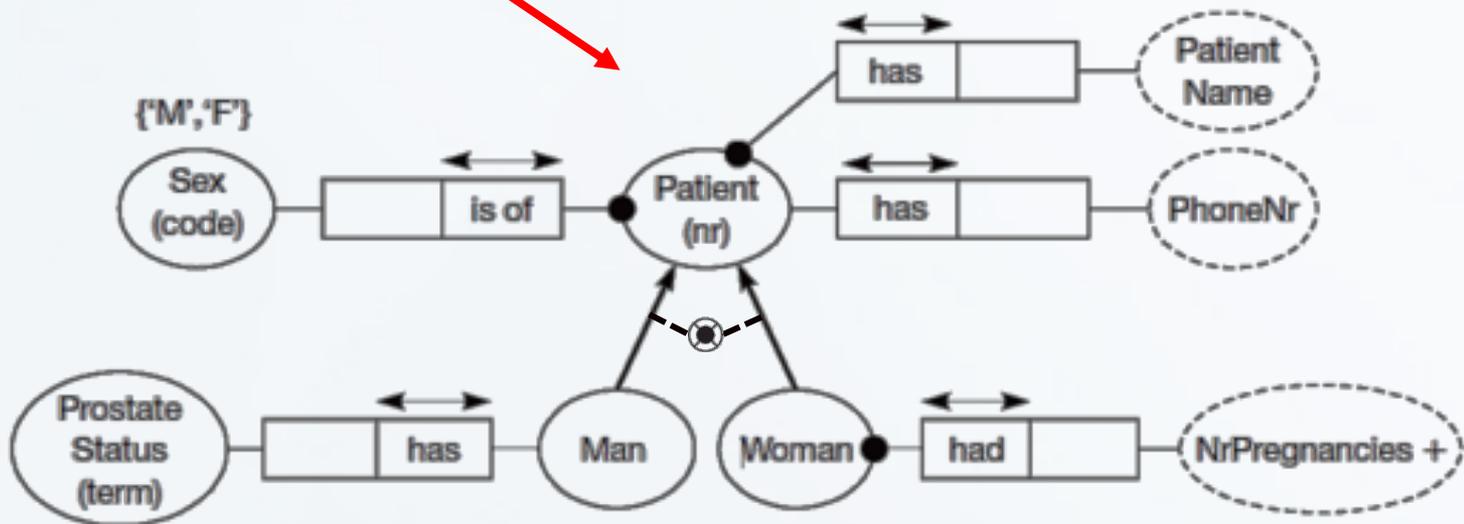
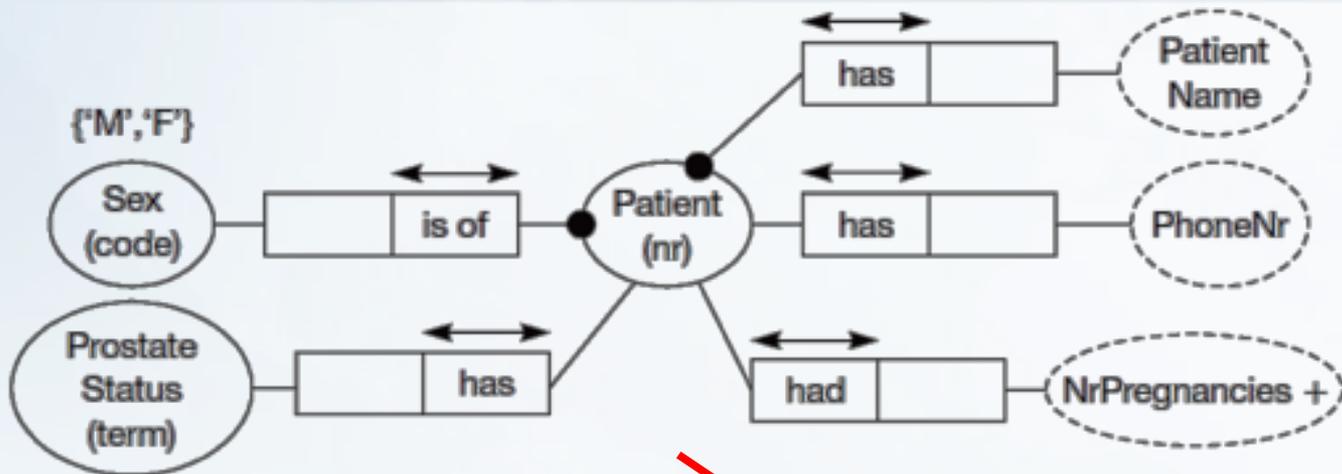


Every person must be a Male or a female.



Every person must be either a Male or a Female

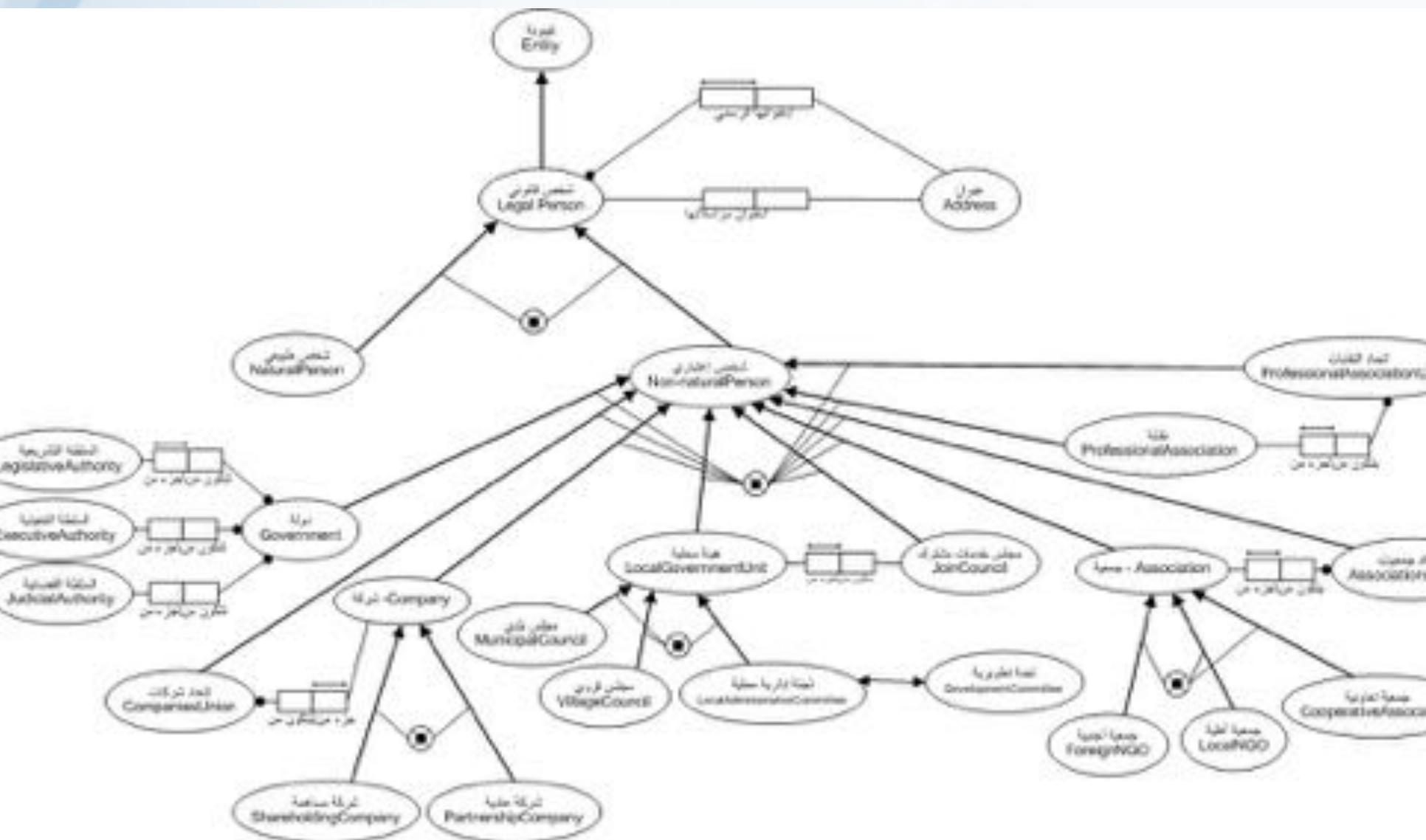
Subtypes Vs. Value Constraints



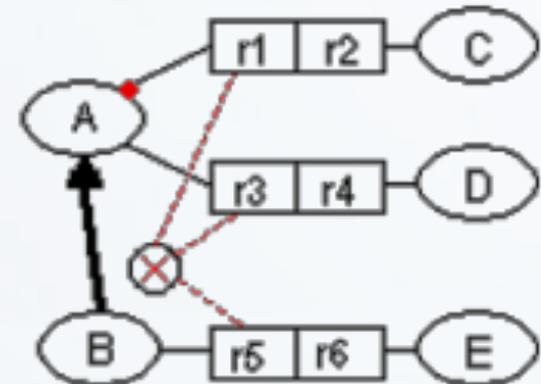
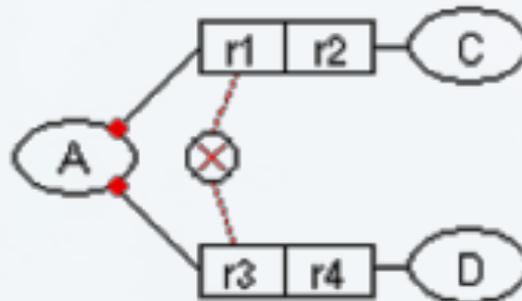
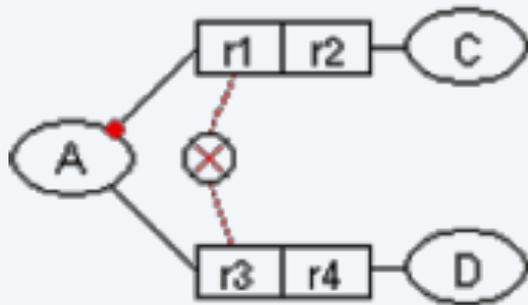
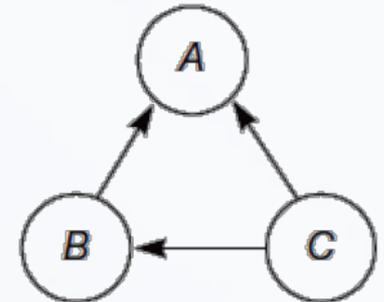
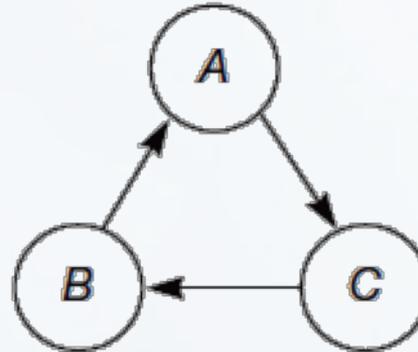
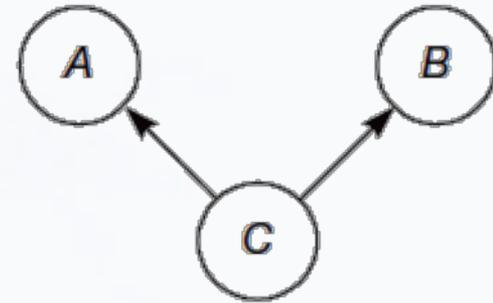
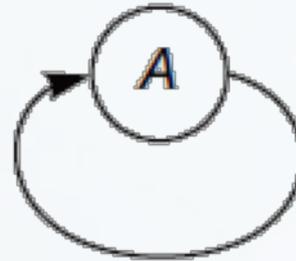
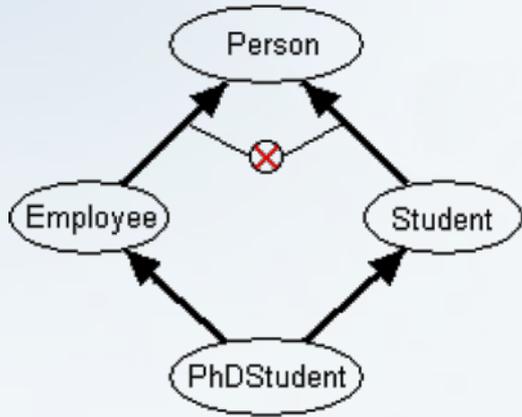
What is Inherited?

each Man is a Patient who is of Sex 'M'
each Woman is a Patient who is of Sex 'F'

Example (Palestinian Legal Person Ontology)



What is Wrong?



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