SWE 207
Database Management Systems

~ Extended Entity Relationship Model ~

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Content

- Generalization
  - Overlap
  - Disjoint
  - Partial Completeness
  - Total Completeness
- Clustering

Generalization

- In a database, a base entity can be created that contains common fields for entities with similar properties, and other entities can be derived from this base entity.
- This has several advantages:
  - Modifications can be made easily.
  - Rapid design can be made.
  - Clarity is increased.
- It is similar to the inheritance in the OOP paradigm.

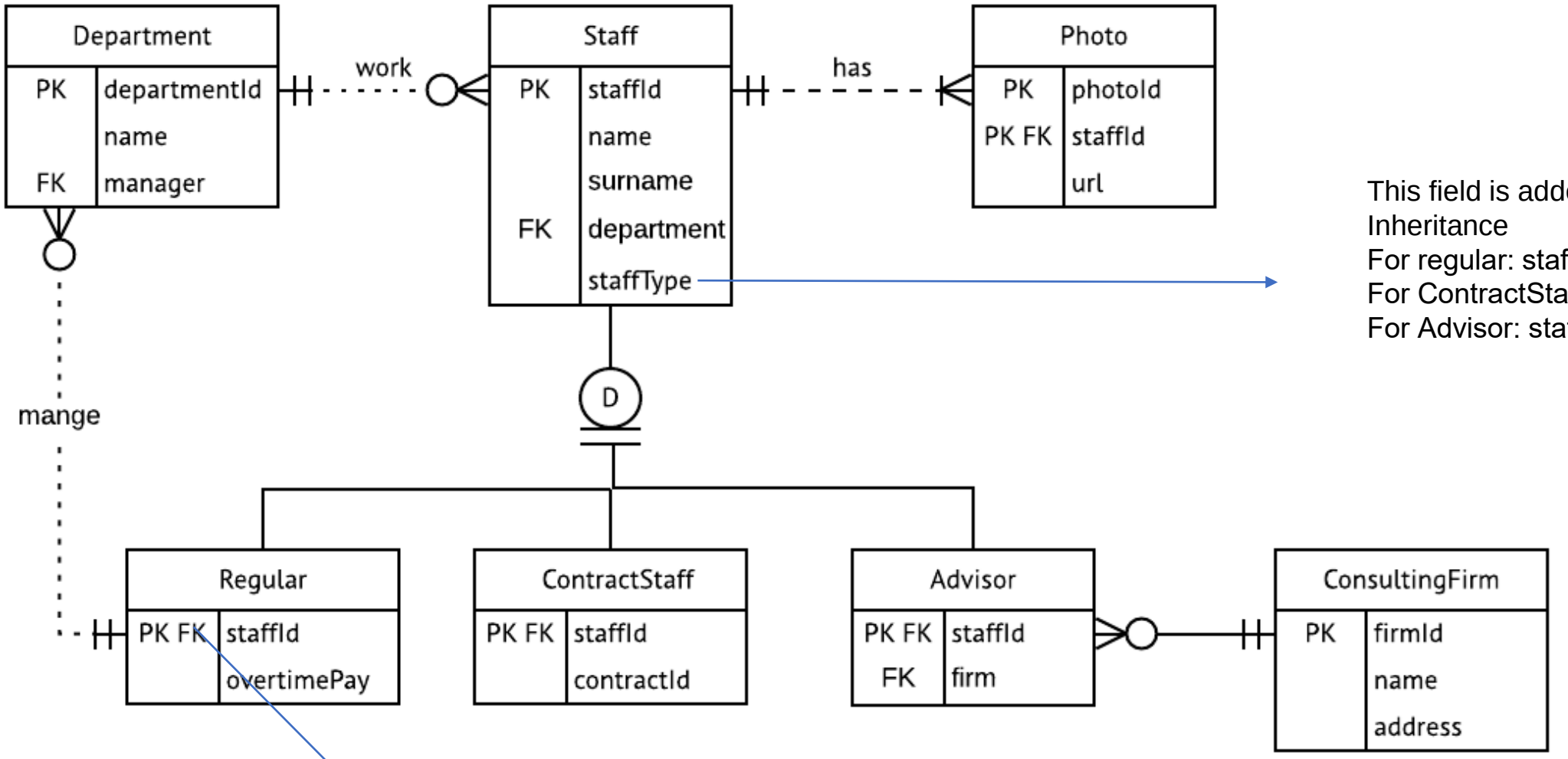
Basic concepts

- Overlap (O):
  - There can be more than one child entity related to the same base entity.
  - For example, a person in the student information system can be both a staff and a student.
- Disjoint (D):
  - There can be only one child entity related to the same base entity.
  - For example, a person in an e-commerce application can be either a customer or a staff, but not both.

Basic concepts

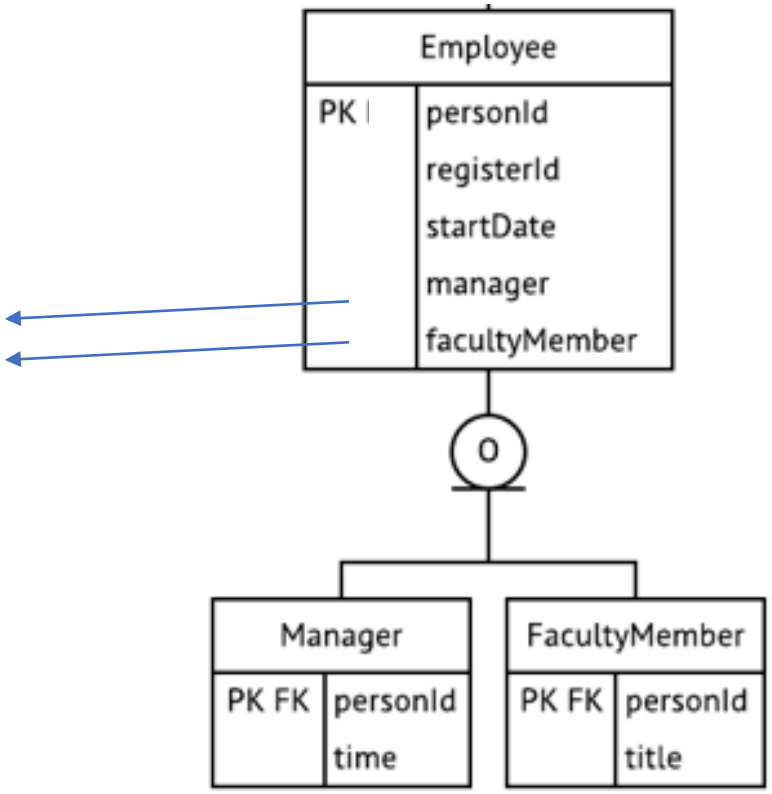
- Partial Completeness (single line):
  - Supertype records can exist without subtype records.
- Total Completeness (double line):
  - Every supertype record must have at least one subtype record.

Examples

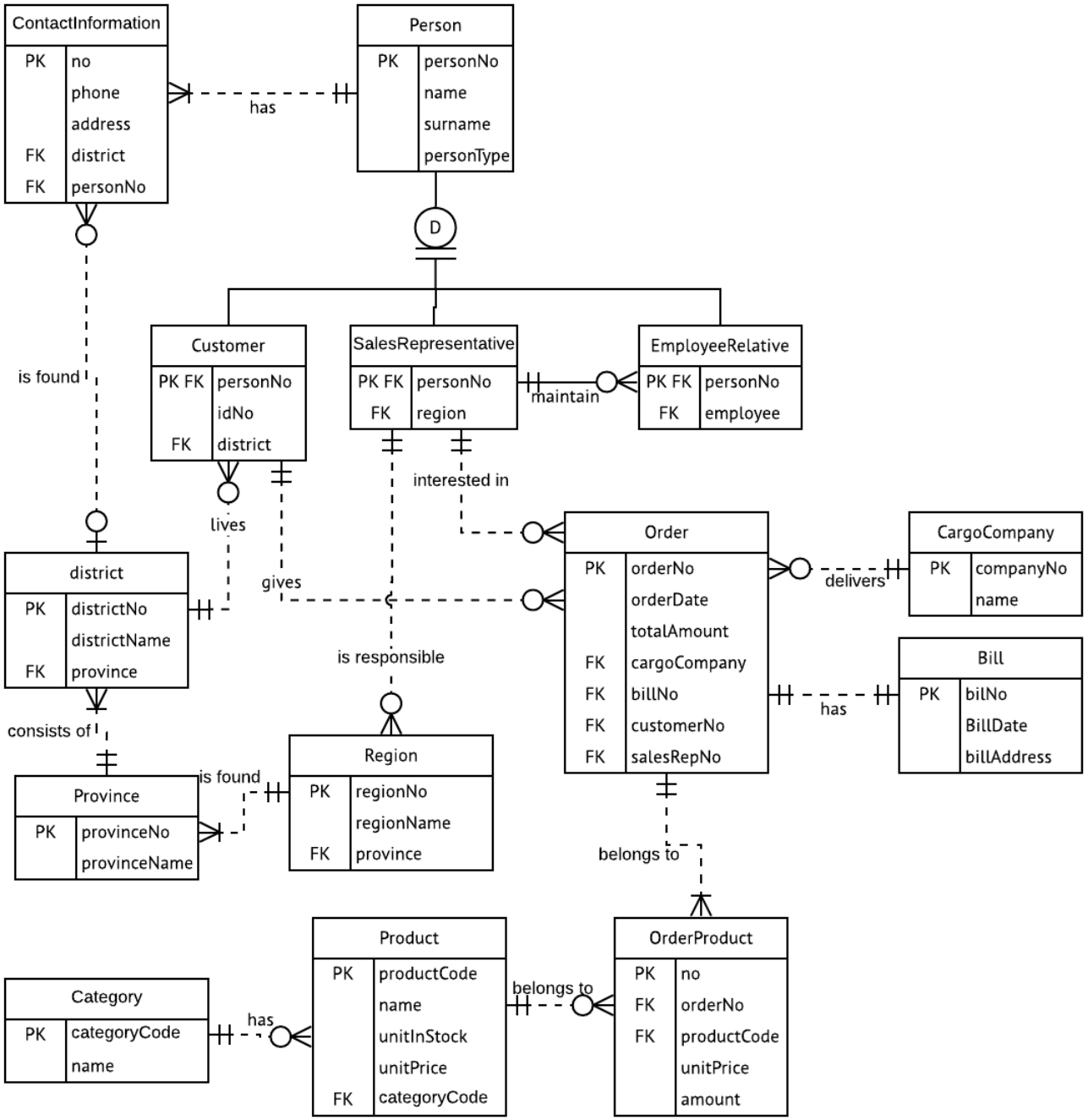

Department
PK departmentId
name
FK manager
work
Staff
PK staffId
name
surname
FK department
staffType
has
Photo
PK photoId
PK FK staffId
url
mange
D
Regular
PK FK staffId
overtimePay
ContractStaff
PK FK staffId
contractId
Advisor
PK FK staffId
FK firm
ConsultingFirm
PK firmId
name
address
This field is added for Disjoint Inheritance
For regular: staffType:'r'
For ContractStaff: staffType:'c'
For Advisor: staffType:'A'
Base class primary key ⇒ derived class Primary and Foreign Key.

Examples

For overlap inheritance, the fields as many as the number of children are added to the parent entity.



Examples


ContactInformation
PK no
phone
address
FK district
FK personNo
has
Person
PK personNo
name
surname
personType
D
is found
Customer
PK FK personNo
idNo
FK district
SalesRepresentative
PK FK personNo
FK region
maintain
EmployeeRelative
PK FK personNo
FK employee
interested in
lives
gives
district
PK districtNo
districtName
FK province
Order
PK orderNo
orderDate
totalAmount
FK cargoCompany
FK billNo
FK customerNo
FK salesRepNo
delivers
CargoCompany
PK companyNo
name
has
Bill
PK bilNo
BillDate
billAddress
is responsible
consists of
Region
PK regionNo
regionName
FK province
is found
Province
PK provinceNo
provinceName
belongs to
Product
PK productCode
name
unitInStock
unitPrice
FK categoryCode
belongs to
OrderProduct
PK no
FK orderNo
FK productCode
unitPrice
amount
Category
PK categoryCode
name
has

Examples

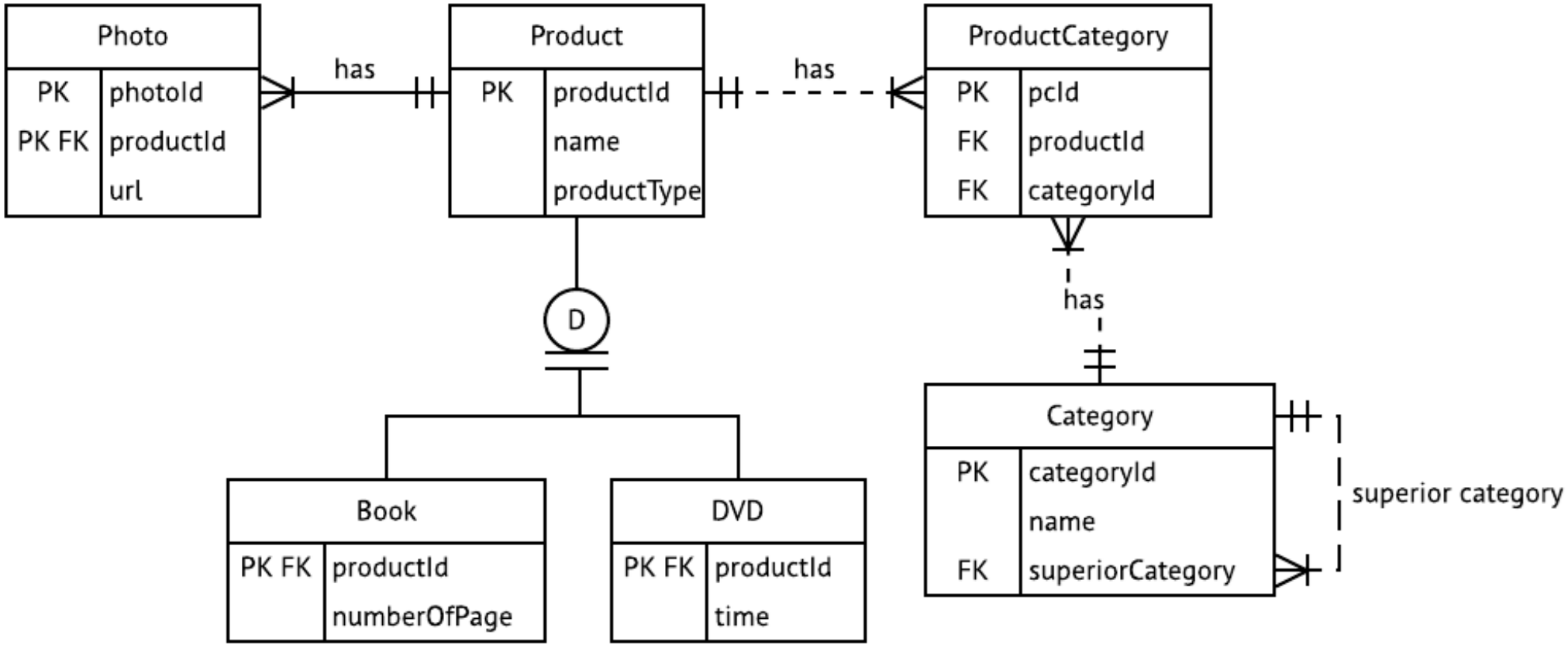


Photo
PK photoId
PK FK productId
url
has
Product
PK productId
name
productType
has
ProductCategory
PK pcId
FK productId
FK categoryId
has
D
Book
PK FK productId
numberOfPage
DVD
PK FK productId
time
Category
PK categoryId
name
FK superiorCategory
superior category

Examples

The business rules of one of the sub-modules of a university information system are as follows.

* In the system, a person can exist in just two categories: an employee and a student. A person can also be both of them. Each person has personid, name, surname information.

*Employee information should include registration number, name, surname and starting date of employment.

* Student information should include student number, name, surname and registration date.

* Department information includes department number, name and address information.

* The photos of people will be stored. For photos, ID, the location information of photo studio should be stored.

* An employee can be both a faculty member and a manager at the same time, and there can be an employee other than faculty members and managers.

* The working time information of the manager and the title information of the faculty member should also be kept.

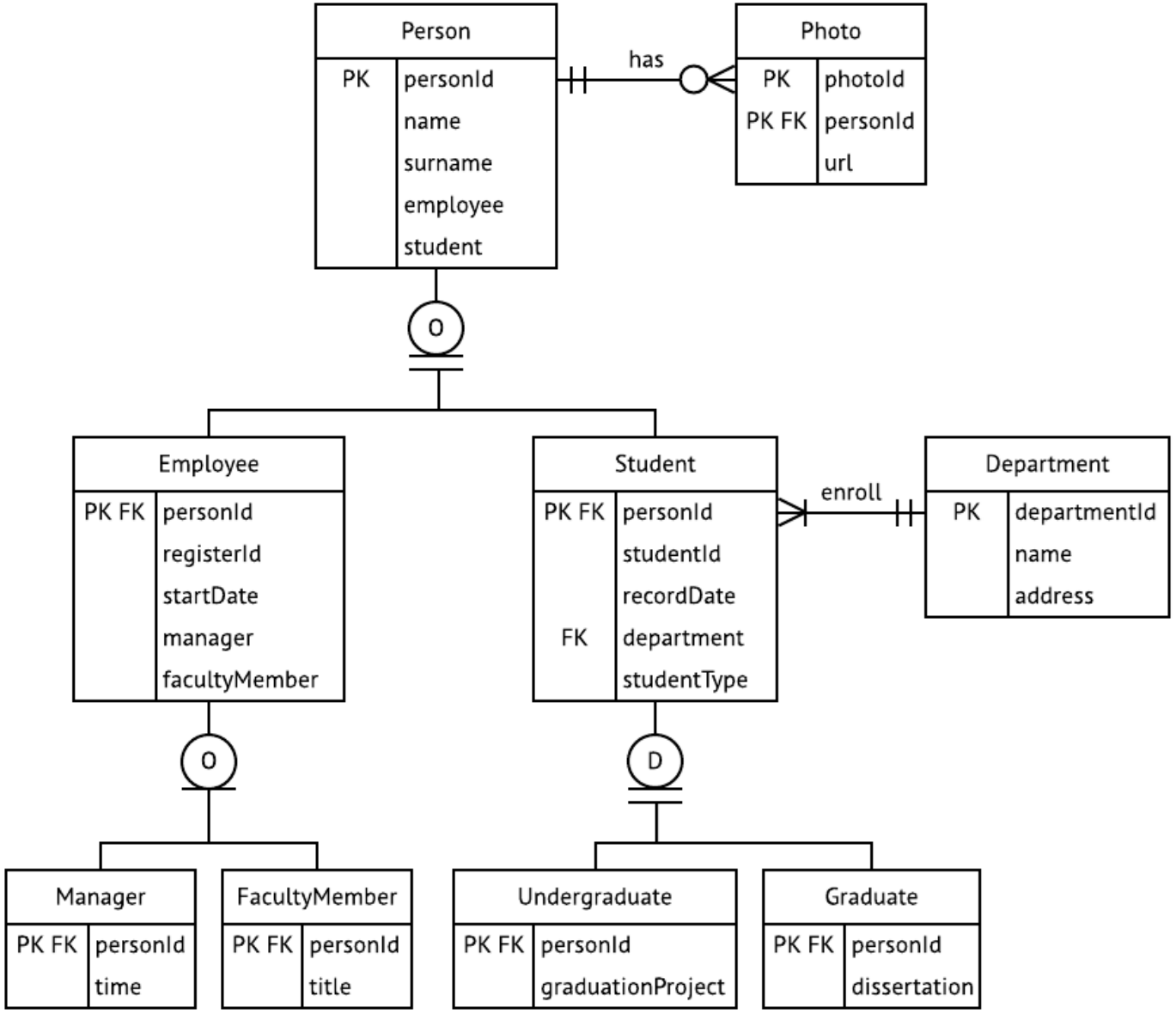
* Students must be registered under only one of the two categories, undergraduate and graduate. There can not be other students in the system.

* If a student is an undergraduate student, graduation project information should be kept, and if a student is a graduate student, thesis information should also be kept.

* A department must have at least one student, but it can also have many students. A student can be a student of only one department.

* A photo can belong to just one person. A person may not have any photo, or they may have multiple photos.

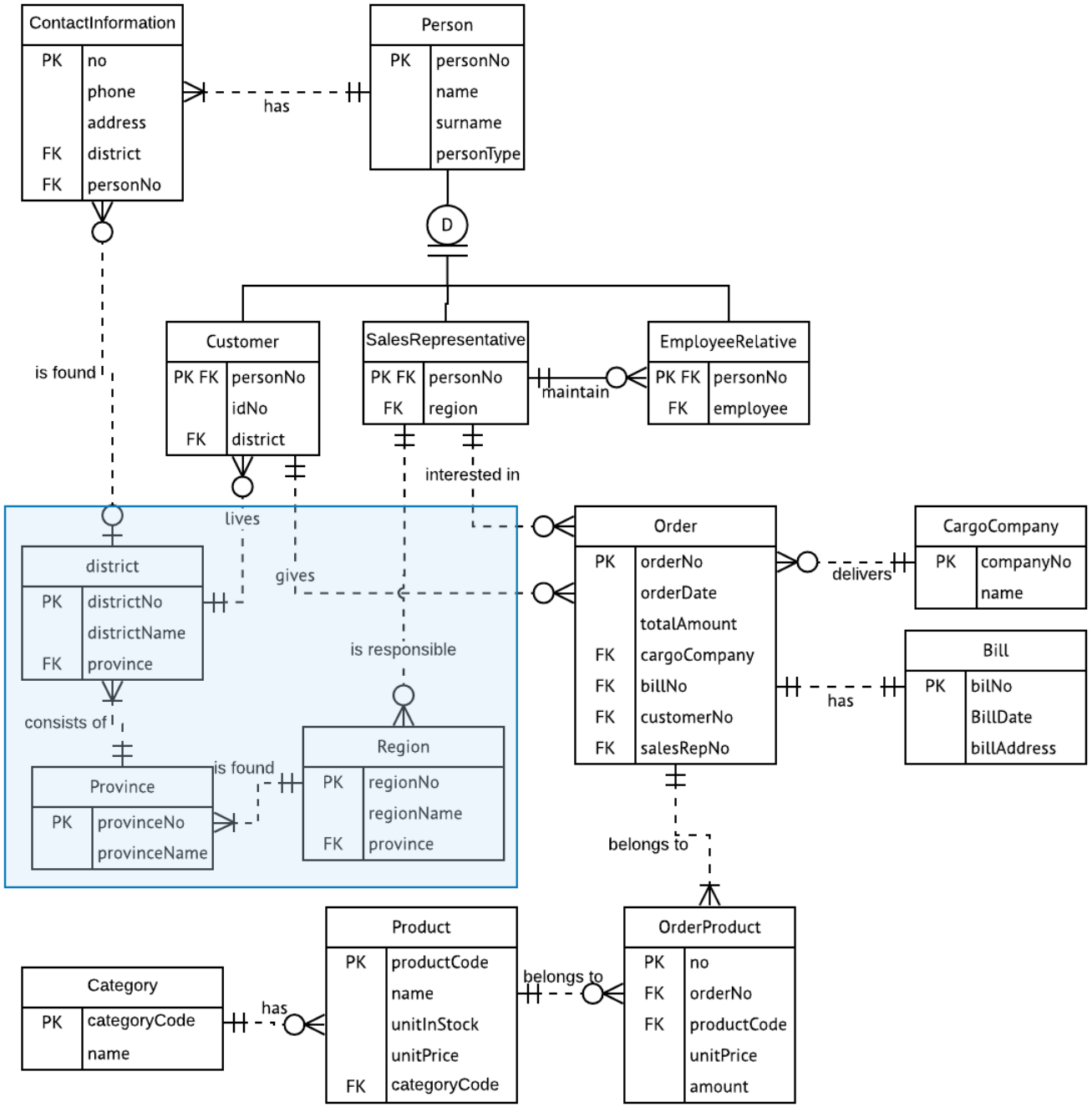
Examples


Person
PK personId
name
surname
employee
student
has
Photo
PK photoId
PK FK personId
url
O
Employee
PK FK personId
registerId
startDate
manager
facultyMember
Student
PK FK personId
studentId
recordDate
FK department
studentType
enroll
Department
PK departmentId
name
address
O
D
Manager
PK FK personId
time
FacultyMember
PK FK personId
title
Undergraduate
PK FK personId
graduationProject
Graduate
PK FK personId
dissertation

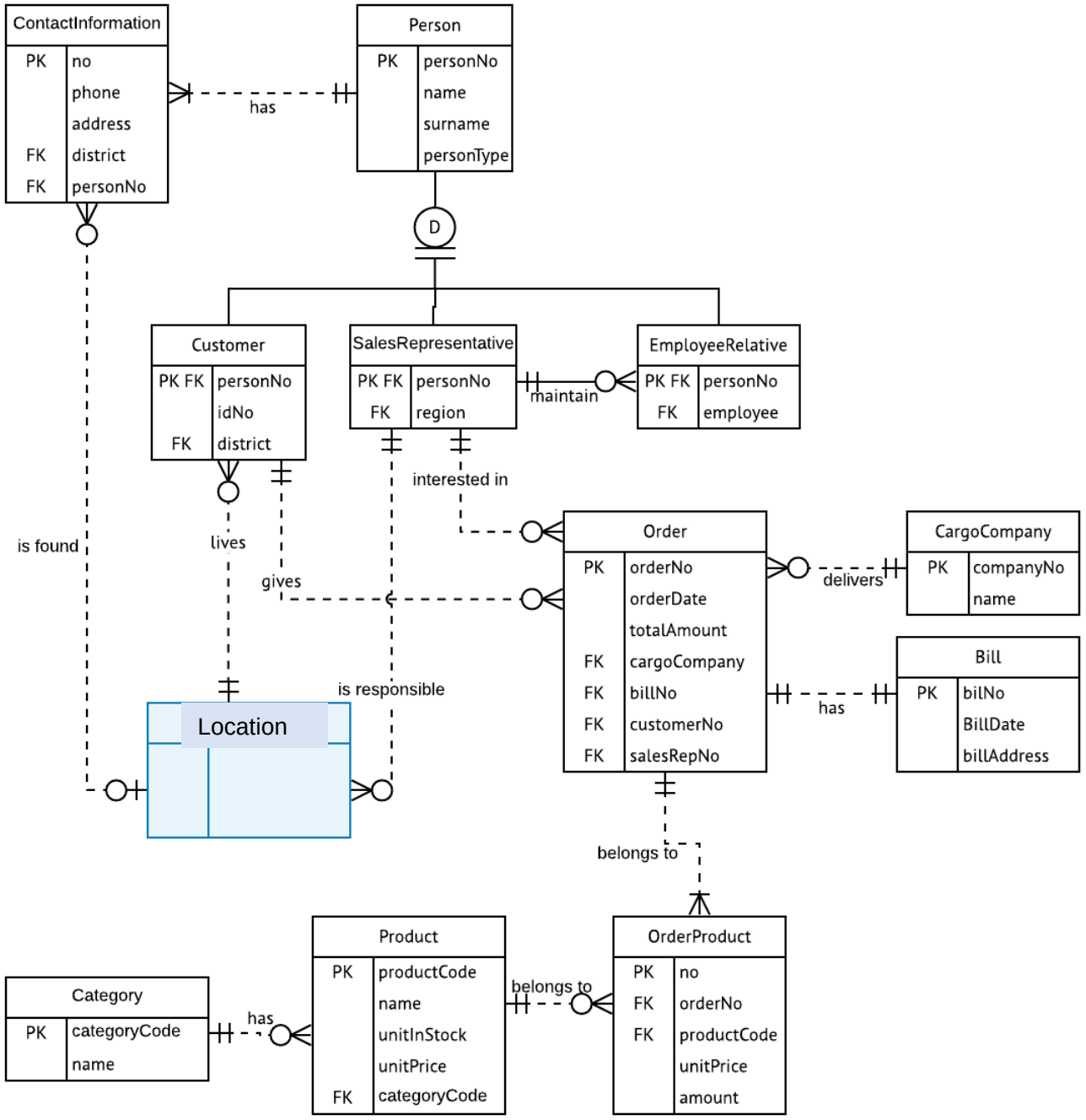
Clustering

- To simplify and increase readability of ER diagrams, using virtual entities instead of multiple entities and their relations is called clustering.

Clustering


ContactInformation
PK no
phone
address
FK district
FK personNo
has
Person
PK personNo
name
surname
personType
D
is found
Customer
PK FK personNo
idNo
FK district
SalesRepresentative
PK FK personNo
FK region
maintain
EmployeeRelative
PK FK personNo
FK employee
interested in
lives
gives
district
PK districtNo
districtName
FK province
consists of
Province
PK provinceNo
provinceName
is found
Region
PK regionNo
regionName
FK province
is responsible
Order
PK orderNo
orderDate
totalAmount
FK cargoCompany
FK billNo
FK customerNo
FK salesRepNo
delivers
CargoCompany
PK companyNo
name
has
Bill
PK bilNo
BillDate
billAddress
belongs to
Category
PK categoryCode
name
has
Product
PK productCode
name
unitInStock
unitPrice
FK categoryCode
belongs to
OrderProduct
PK no
FK orderNo
FK productCode
unitPrice
amount

Clustering


ContactInformation
PK no
phone
address
FK district
FK personNo
has
Person
PK personNo
name
surname
personType
D
Customer
PK FK personNo
idNo
FK district
SalesRepresentative
PK FK personNo
FK region
maintain
EmployeeRelative
PK FK personNo
FK employee
interested in
is found
lives
gives
Order
PK orderNo
orderDate
totalAmount
FK cargoCompany
FK billNo
FK customerNo
FK salesRepNo
delivers
CargoCompany
PK companyNo
name
Bill
PK billNo
BillDate
billAddress
has
is responsible
Location
belongs to
Product
PK productCode
name
unitInStock
unitPrice
FK categoryCode
belongs to
OrderProduct
PK no
FK orderNo
FK productCode
unitPrice
amount
Category
PK categoryCode
name
has