# Example:  COMPANY DB – ER Diagram
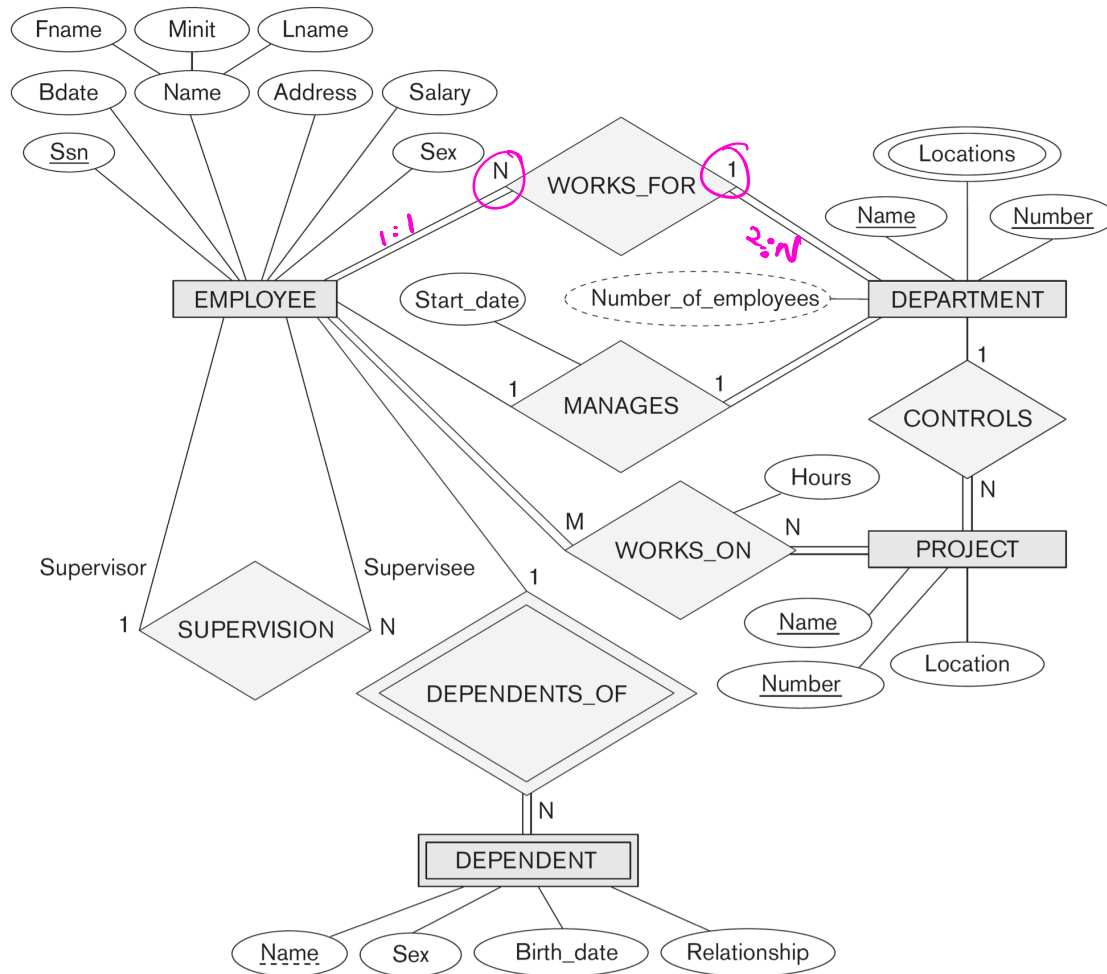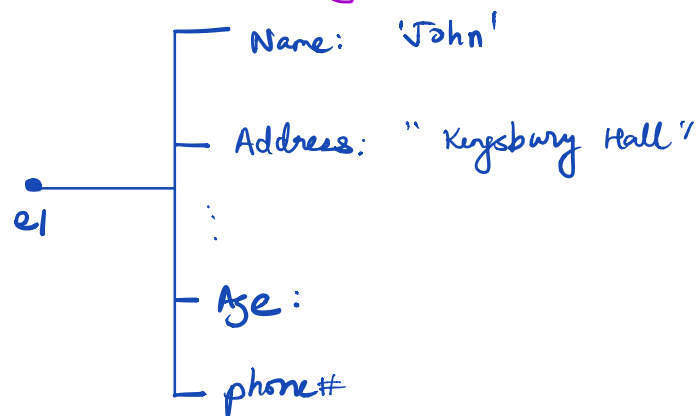
## ER Models

① Classes: entities — tables (objects with attributes)

② Associations: relationships between entities
(interconnected tables)

* Entities & attributes

EMPLOYEE  entity

e1 ─── ┬── Name: 'John'
       ├── Address: " Kingsbury Hall"
       ⋮
       ├── Age:
       └── phone#

entity                    attributes

```
  • e1      • e2      • e3
  • e4      • e5      • e6
```
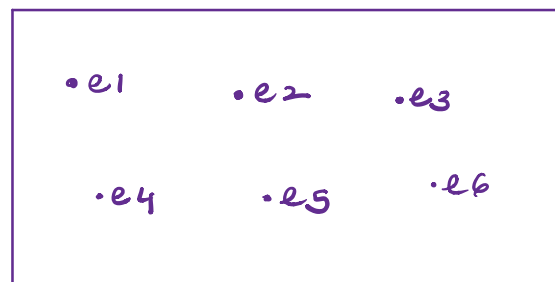                              Set Instance

## Attribute types

* simple    vs.    composite
     ↓               ↓

"John"                    Fname M Lname

* single-valued    vs.    multivalued
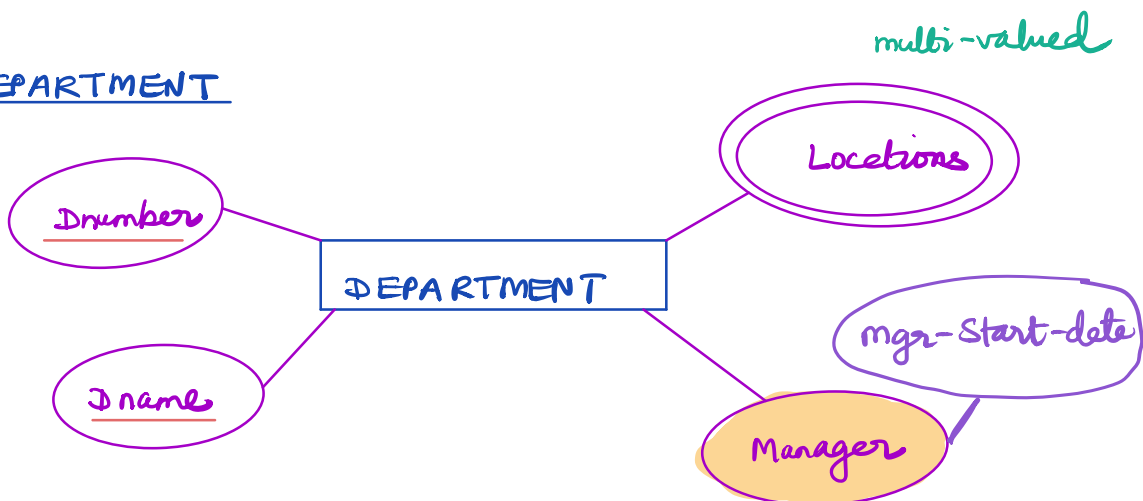        ↓                       ↓
   603 862 2134            w#
                           home#
                           cell #

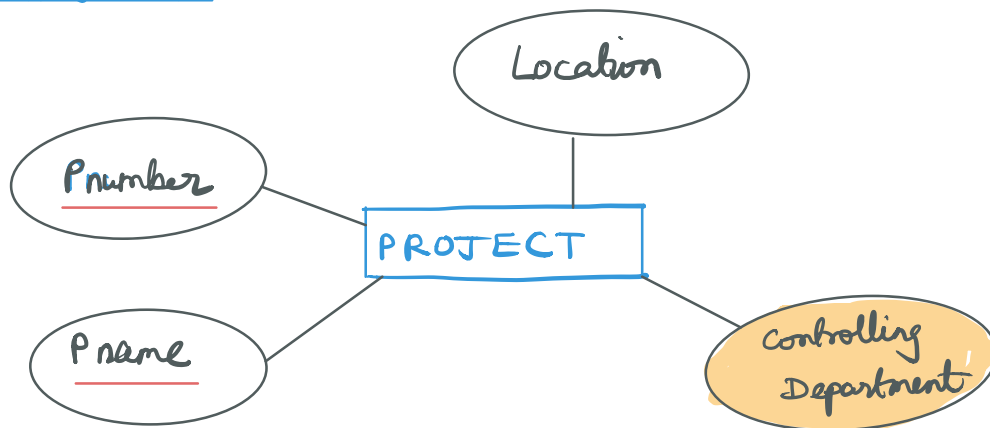* stored   vs.   derived
      ↓                ↓
   age = 40         Bdate

* NULL


COMPANY Database

* EMPLOYEE
* DEPARTMENT
* PROJECTS
* DEPENDENTS


DEPARTMENT                                    multi-valued



* underline all candidate keys.

## PROJECT

- Location
- Pnumber
- PROJECT
- Pname
- Controlling Department

## EMPLOYEE

- Fname
- M
- LName
- Name
- Bdate
- Age — Derived Attribute
- Project
- EMPLOYEE
- Works_ON
- SSN
- Department
- Sex
- Salary
- Address
- Hours

# DEPENDENT

```
        (Bdate)        (Sex)

                              Key: Name + Employee

    ╔═══════════════════════╗
    ║   DEPENDENT           ║
    ╚═══════════════════════╝


    (Name)                    (Employee)
     ----
```
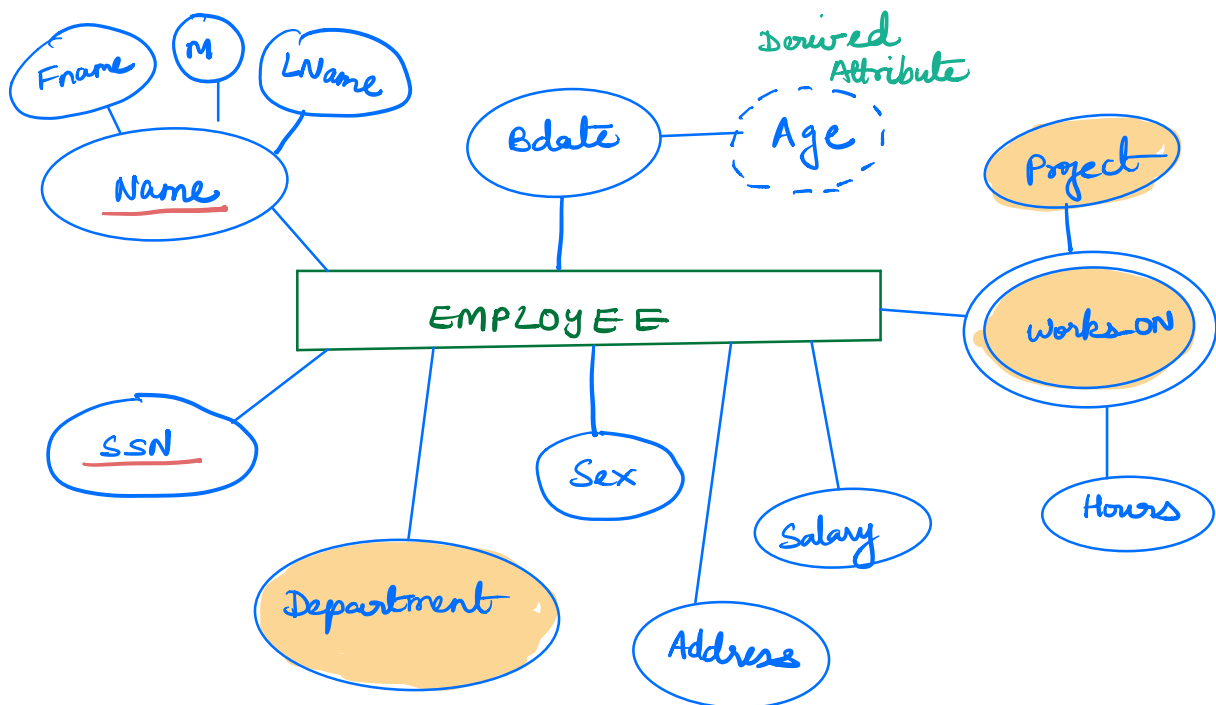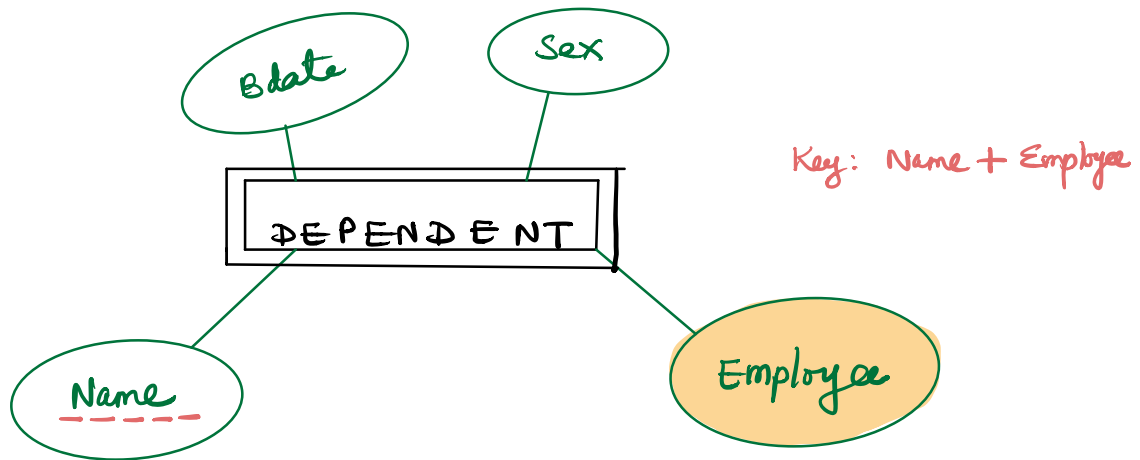
* <u>Weak Entity Type</u> — no key
* <u>Strong</u> Entity — Employee
                        — Department
                        — Project

## <u>Relationships</u>   (Associations)

    ↳ capture the link between two entities

<u>Constraint 1</u>: Every employee must work for 1 and only 1 department.

<u>Constraint 2</u>: Every department must have a minimum of 2 and a maximum of $N \geq 2$ employees.

EMPLOYEE — works-FOR — DEPARTMENT

minimum maximum
1:1     2:N
N       1

double line: total participation

$(e_1, d_1)$
$(e_2, d_2)$
     Emp
$(e_3, d_3)$
$(e_4, d_4)$

$e_1$
$e_2$      $d_1$   Department
$e_3$
$e_4$

many-to-one relationship
$N : 1$ relationship

$(e_5, d_2)$
$(e_6, d_2)$
$(e_7, d_2)$

$e_5$
$e_6$     $d_2$
$e_7$