



ISE 211 - Industrial Information Systems Databases and Analysis

Lecture 2 - Chapter 3

Data Modelling



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2011, İzmir

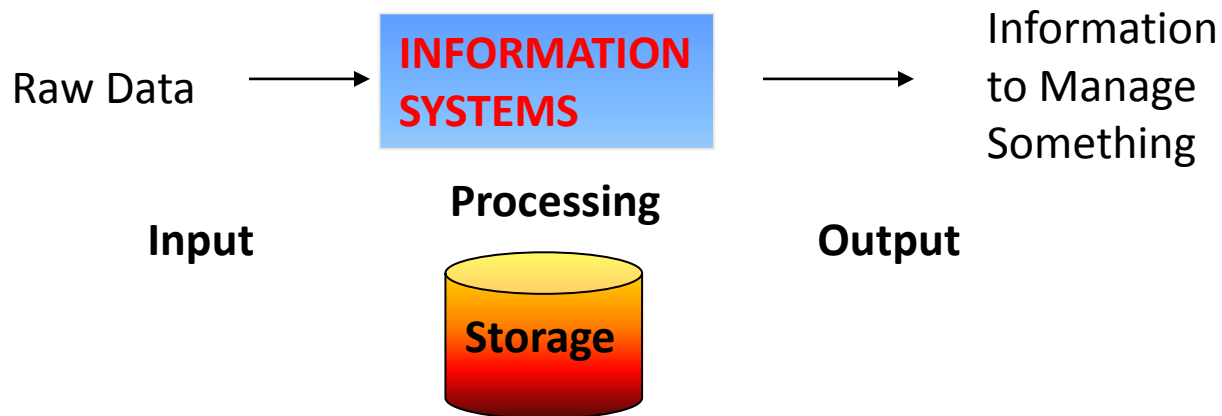
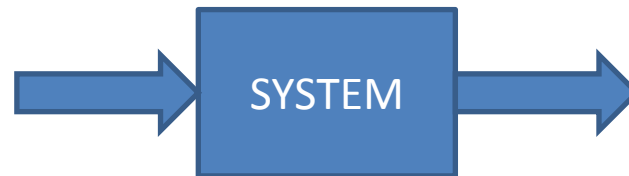


Agenda

- Summary Ch 1
- Introduction – Abstract Modeling
- E-R Modeling
 - Diagramming basics
 - Degree Of Relationship
 - Composite entities
 - Recursive entities
- HOMEWORK - Case Study



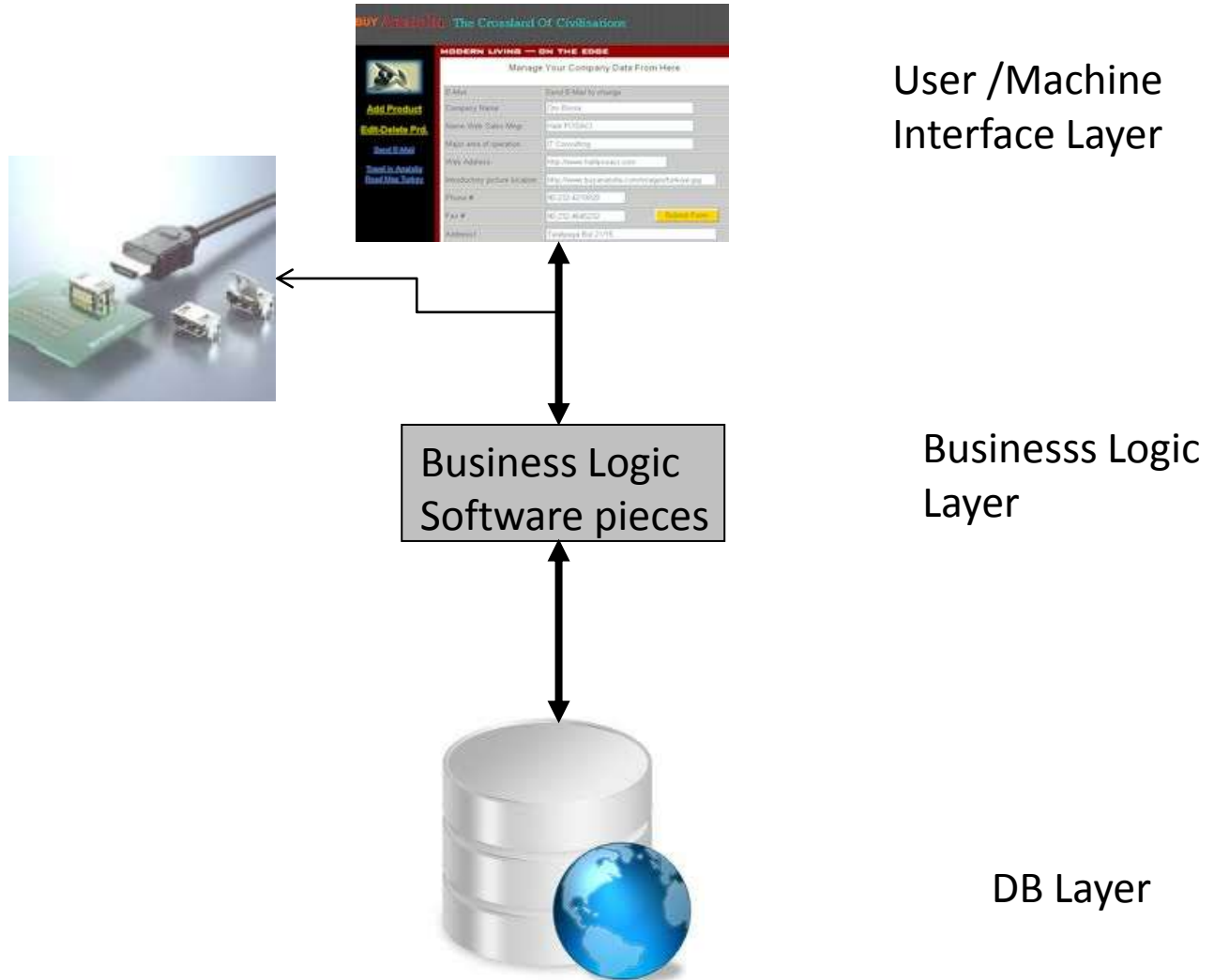
Summary Ch 1





Summary Ch 1

Layers Of Software

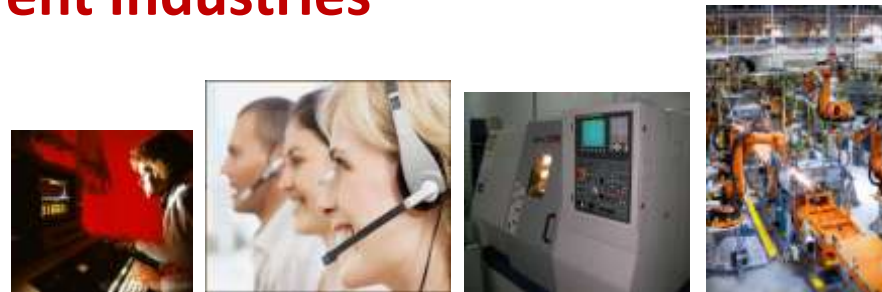




Summary Ch 1 About The Course

Industrial Information Systems - Databases and Analysis

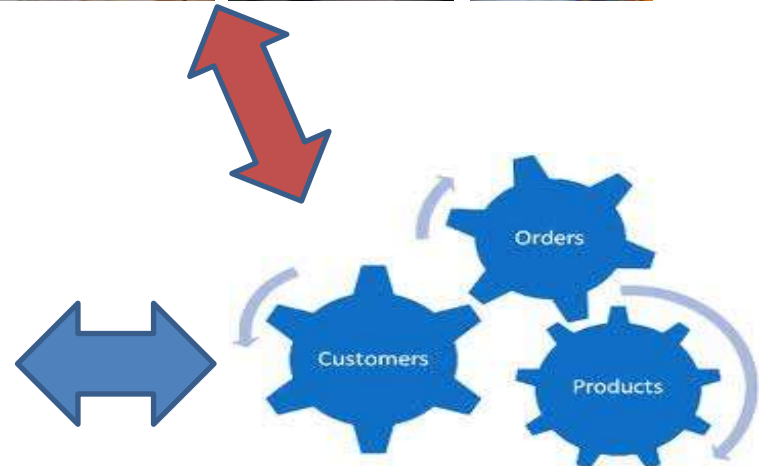
Different Design for Different Industries



ACCESS

DBMS

ORACLE
MS SQL
DB/2 – INFORMIX
SYBASE
MYSQL

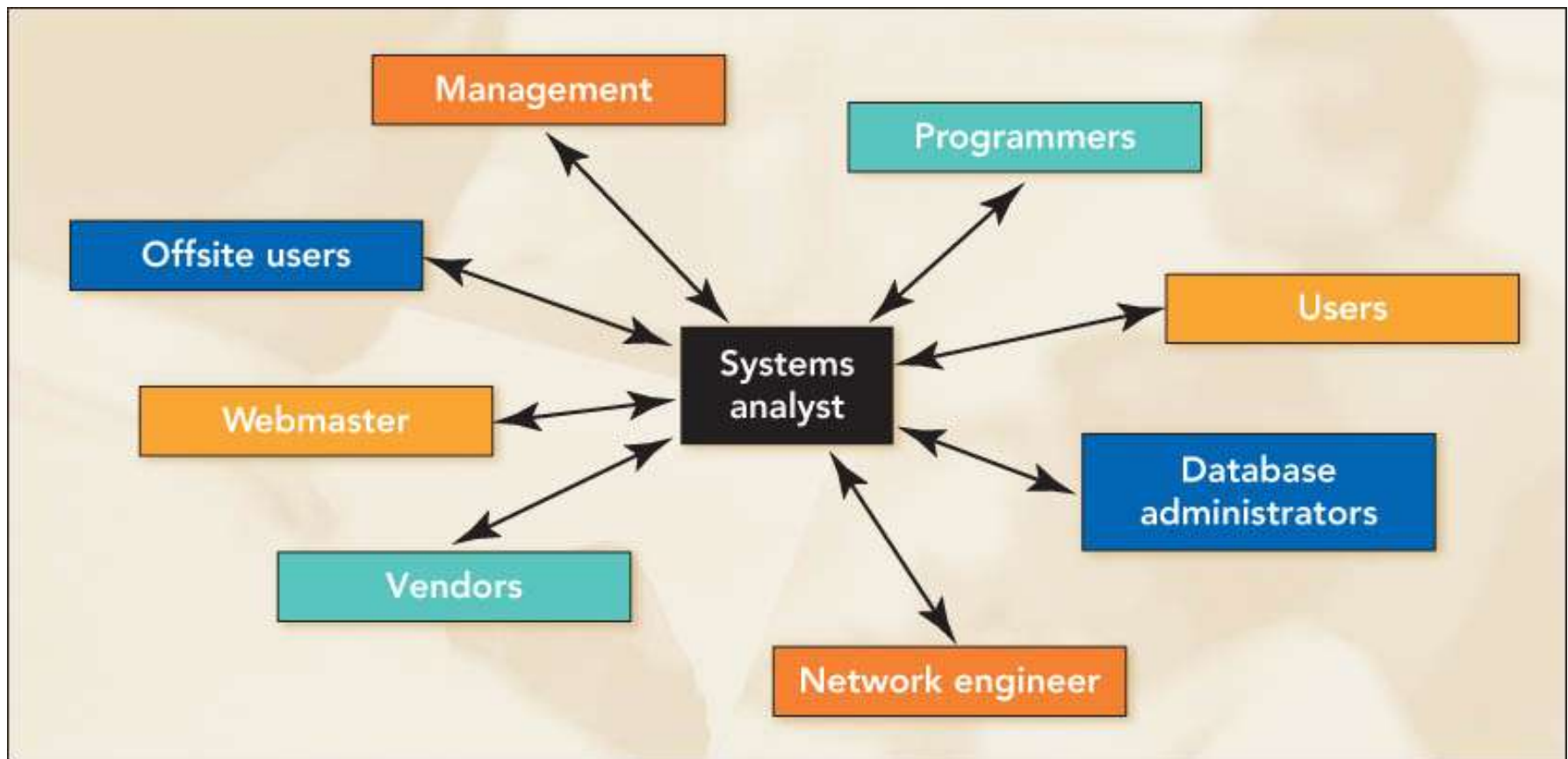




Summary Ch 1 Design

Start with System Analysis

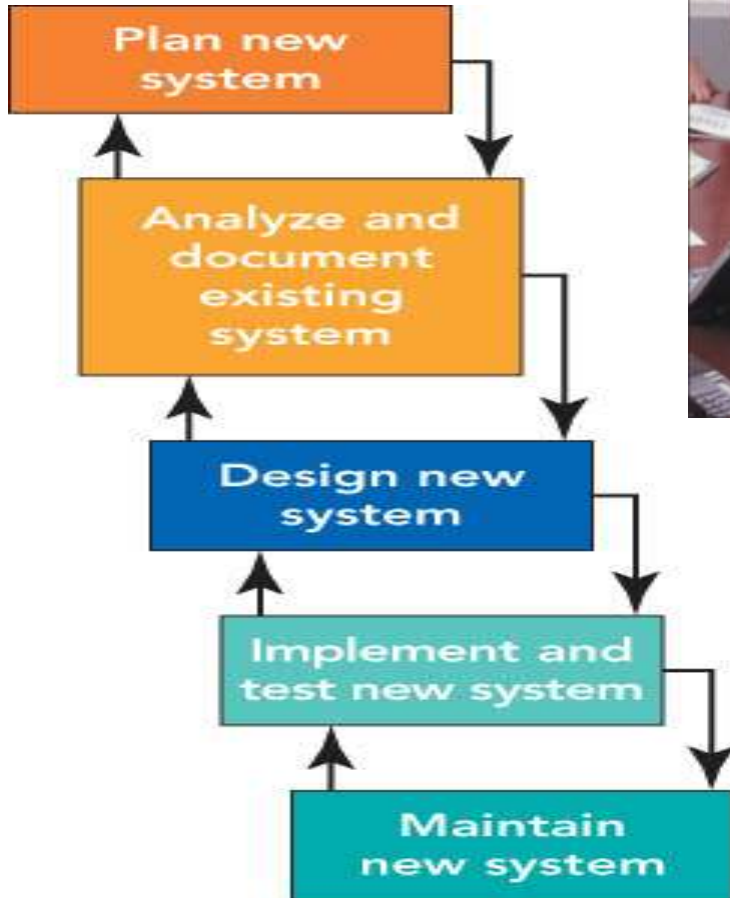
- IE are usually at the hearth of design cycle





Summary Ch 1 Phases Of Design

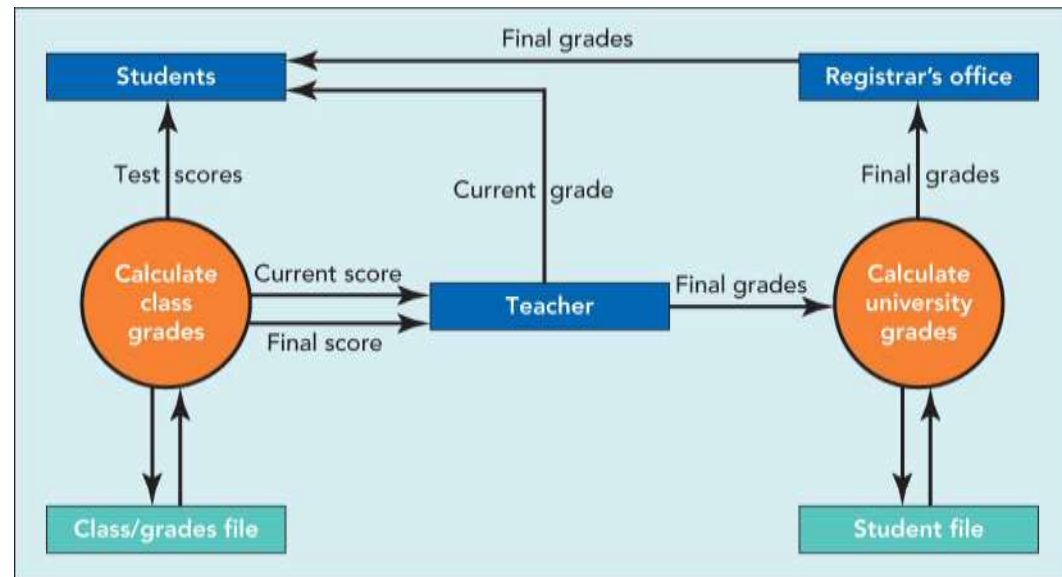
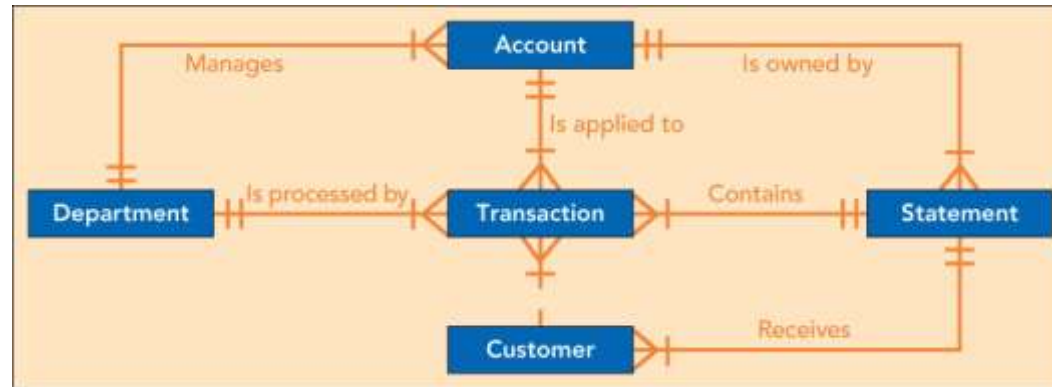
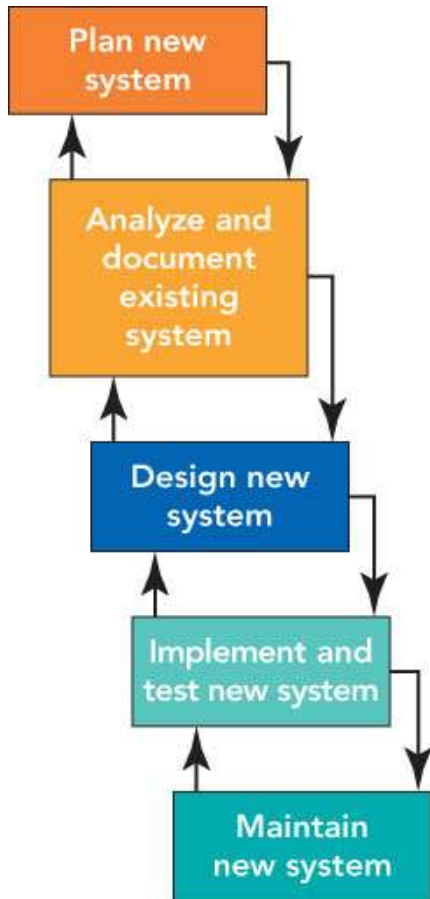
Interact – Interact - Interact





Phases Of Design

Use Diagrams to Interact



ANSI/SPARC Architecture

Design Of DataBase - Abstract Presentation

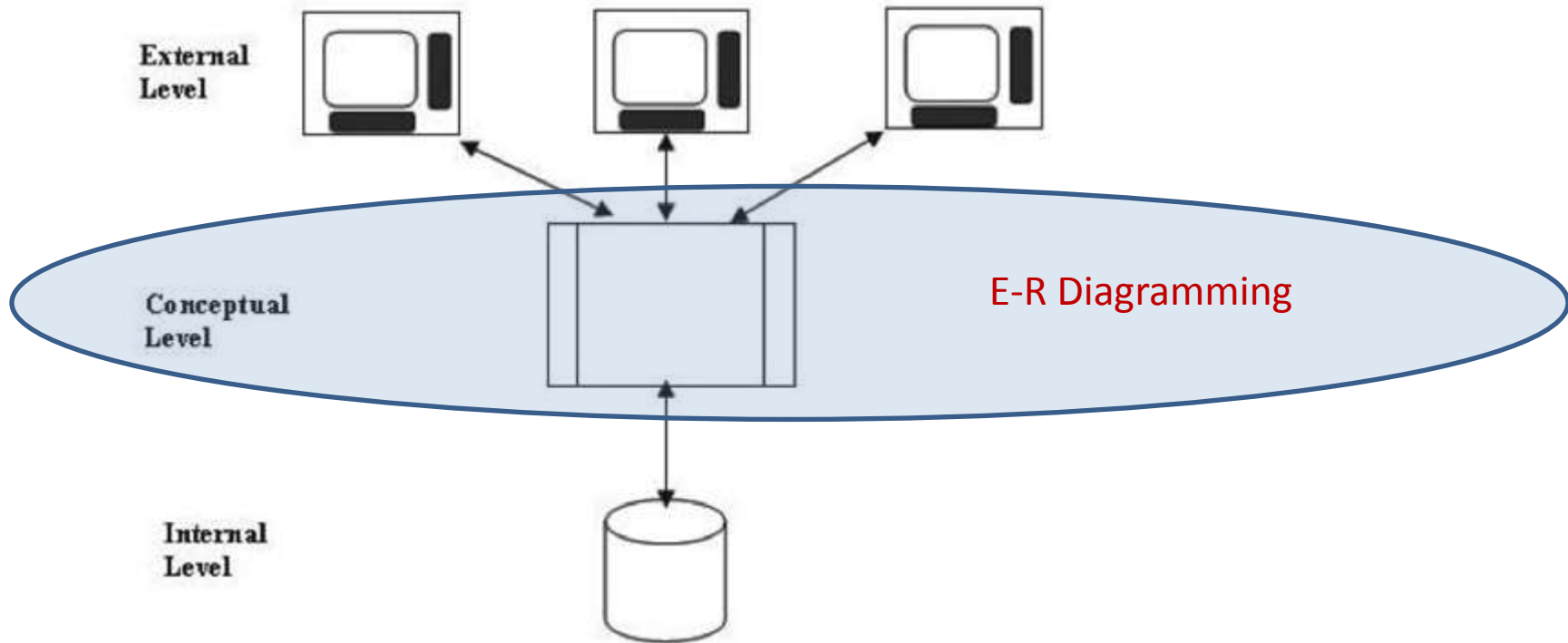
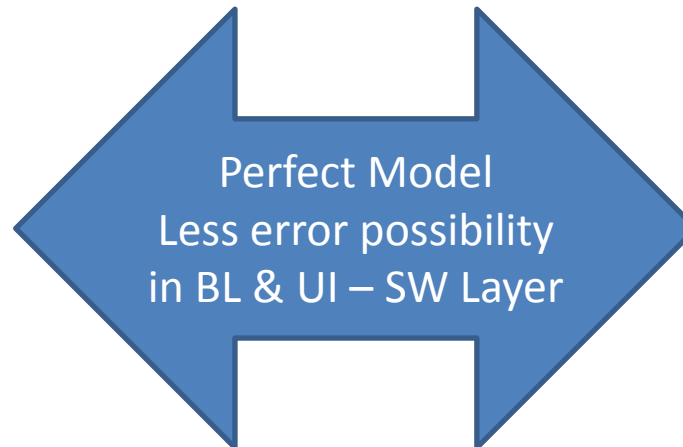


Figure 3.1 ANSI/SPARC three-level architecture.



Aim Of E-R Diagramming

1. Communicate – Interact
2. Design over a data model
3. Logical Model for Implementation of DB

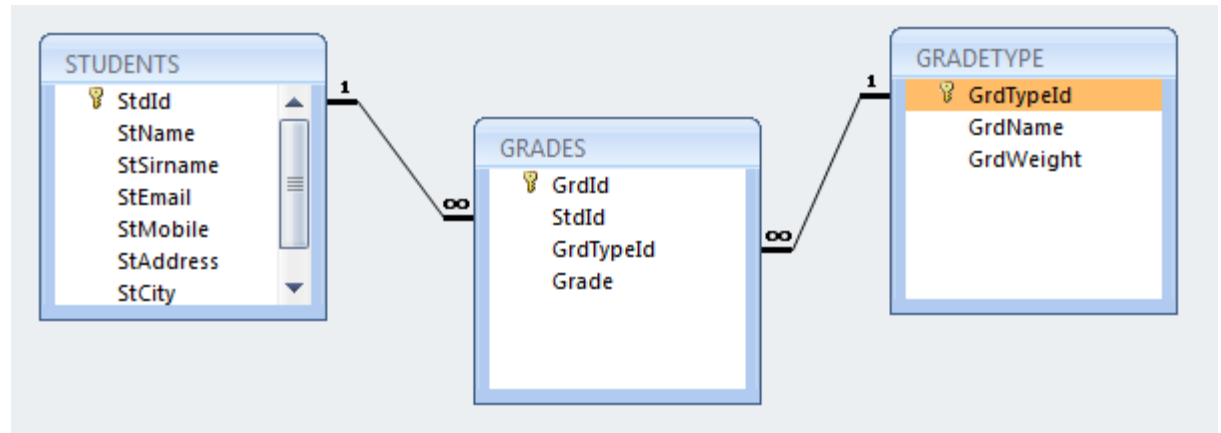


By a perfect model and good DB xor DBMS selection
you may put most of the Business rules into DB itself



ER- Diagramming Focus

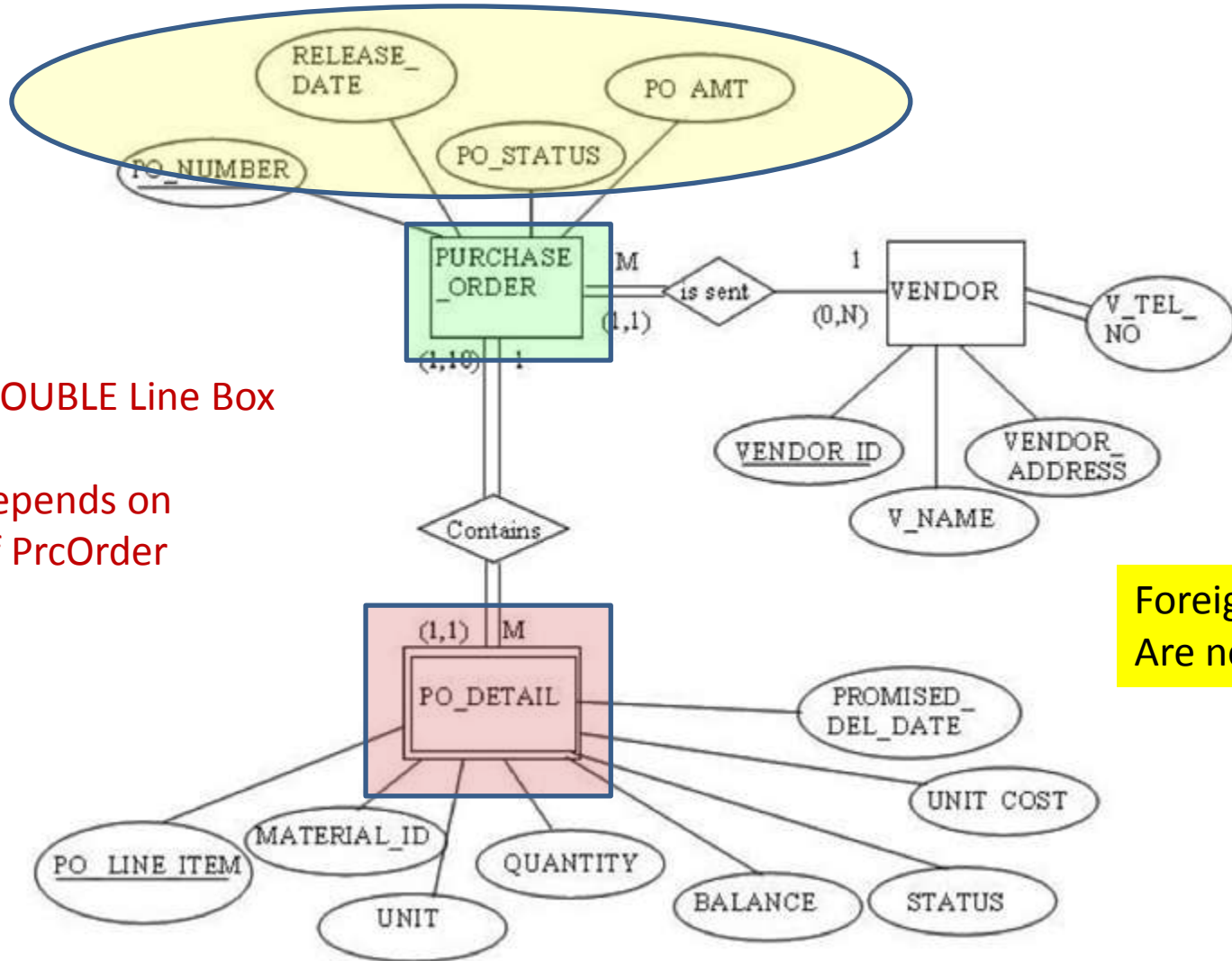
1. Entity sets
2. Attributes
3. Relationships between Entity Sets



StdId	StName	StSurname	StEmail	StMobile	StAddress	StCity	StCountry
20110603042	Erdem	Sönmez	esönmezi@std.ieu.edu.tr	05072126526		Ankara	Turkey
20070603008	Beril	Sözer	b.sozer@std.ieu.edu.tr	05333333333		Aydın	Turkey
20040203036	Nuri Nihat	Atasever	nn.atasever@std.ieu.edu.t	05224518521		Aydın	Turkey
20090603025	Simge	Gök	s.gok@std.ieu.edu.tr	05322506231	Balçova	İzmir	Turkey
20080603059	Aytunç	Serdal	a.serdal@std.ieu.edu.tr	05542128525	Balçova	İzmir	Turkey
20080603029	Gizem	Kandemir	g.kandemir@std.ieu.edu.t	05546920667	Üçkuyular	İzmir	Turkey
20080602514	Aylin	Çalışkan	a.caliskan@std.ieu.edu.tr	05369514245		Manisa	Turkey



Weak Entity – Child Entity Strong Entity And Attributes



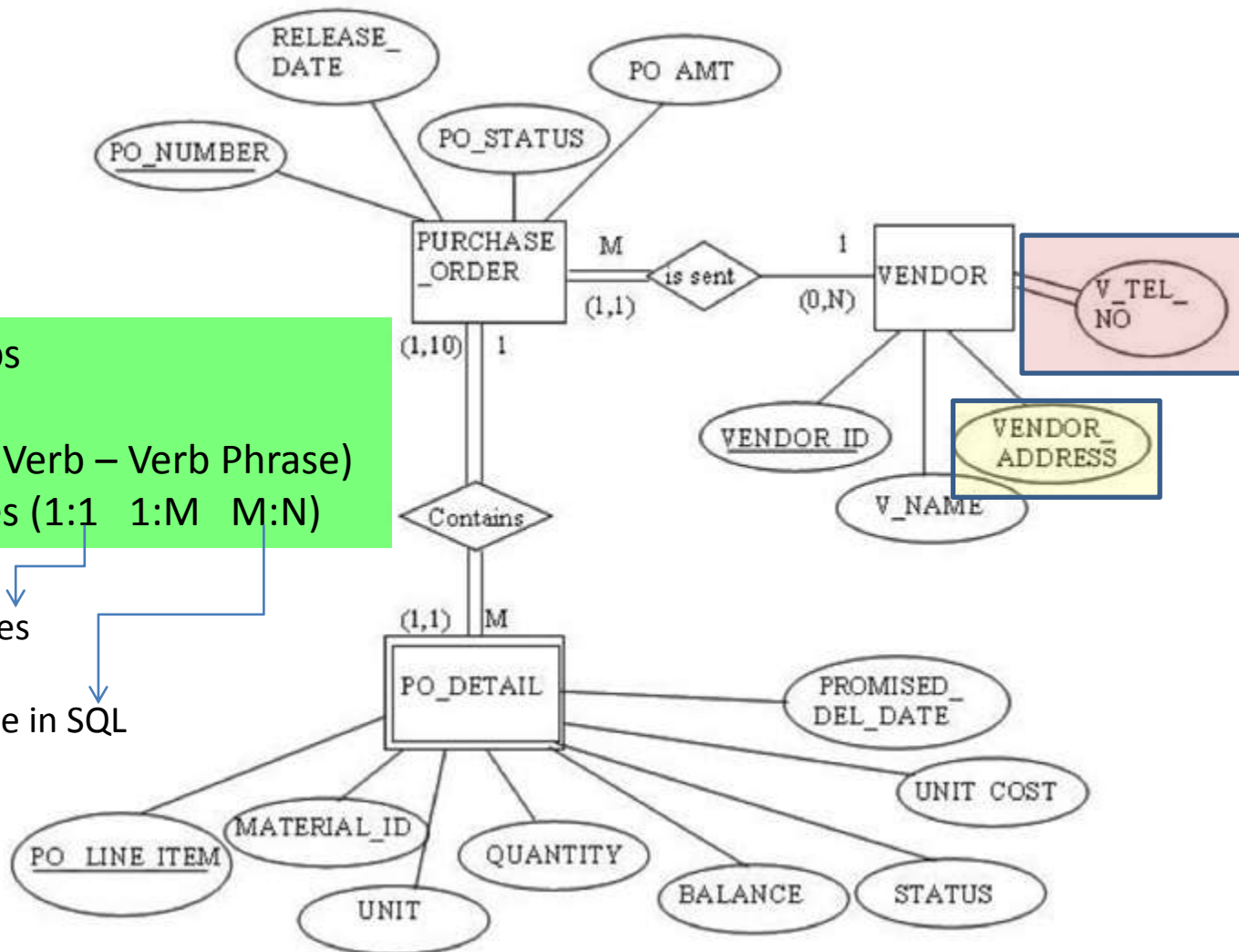
Shown by DOUBLE Line Box

Existence depends on existence of PrcOrder

Primary Key

Foreign Keys Are not Shown

Composite – Multi Valued Attributes Relationships



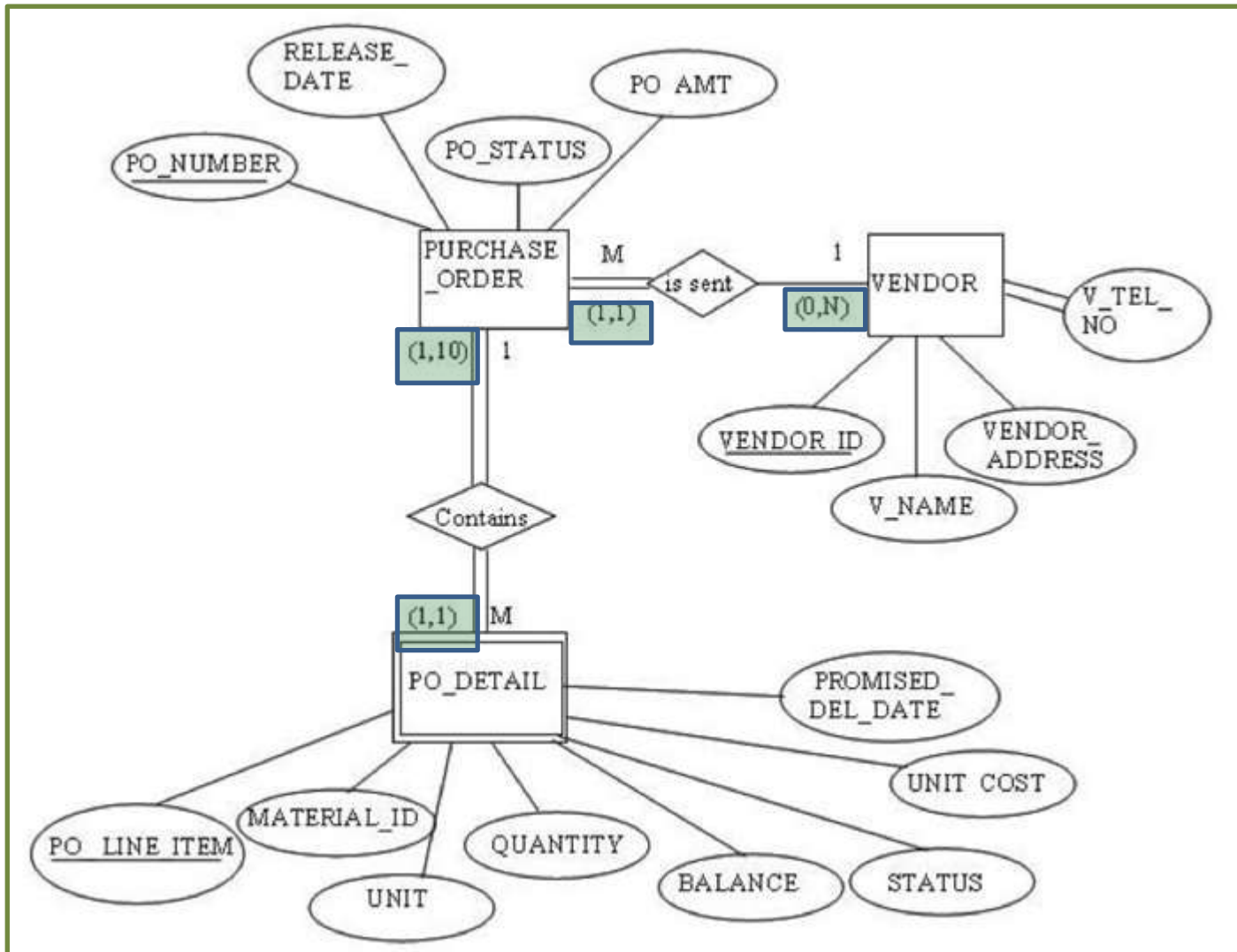
Relationships

- Arcs
- Diamonds (Verb – Verb Phrase)
- Cardinalities (1:1 1:M M:N)

Combine tables

Hard to handle in SQL

Relationships - Cardinality Limits



IF Relationships – Cardinalities are Complicated USE Semantic Net Diagrams

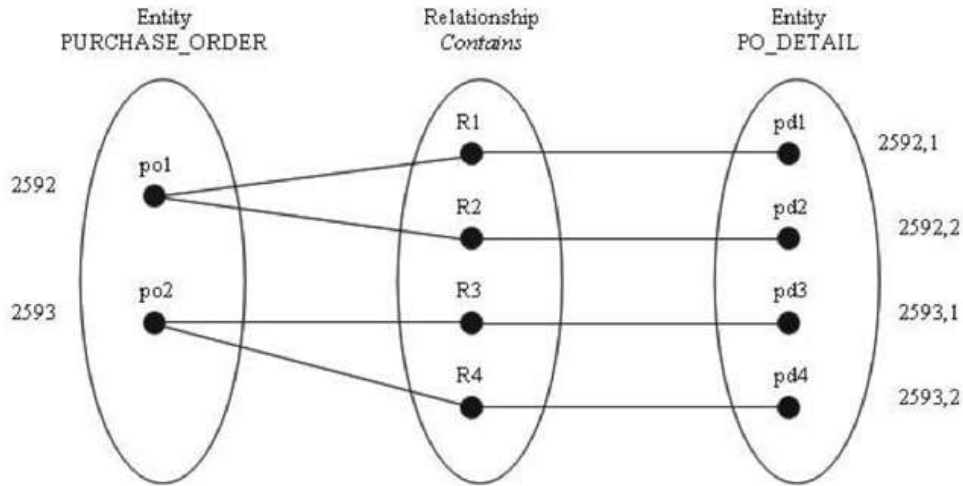


Figure 3.3 A 1:M relationship in a semantic net diagram.

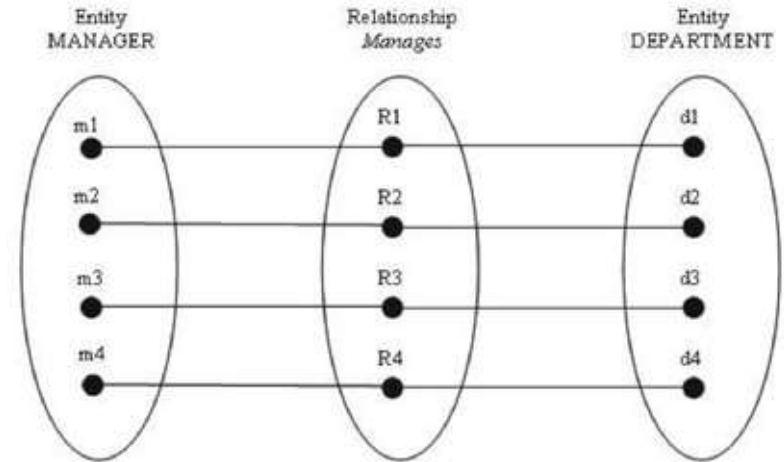


Figure 3.4 A 1:1 relationship in a semantic net diagram.

If You Don't Understand
Go to Gemba (Do not hesitate)

Ask for each entity one by one

Try to draw by hand as asking

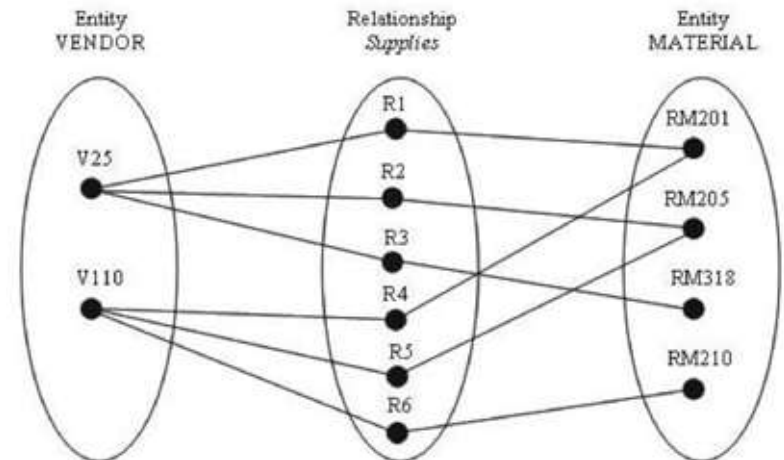


Figure 3.5 M:N Relationship in a semantic net diagram.



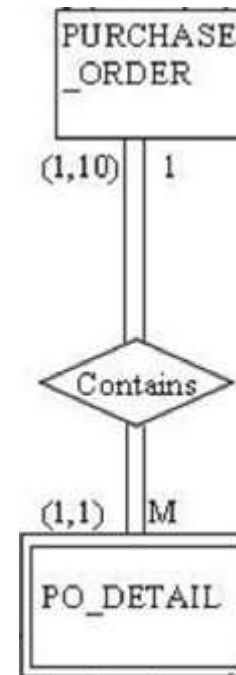
ER Diagramming Basics

Degree of Participation

- Optional (Partial)



- Mandatory





ER Diagramming

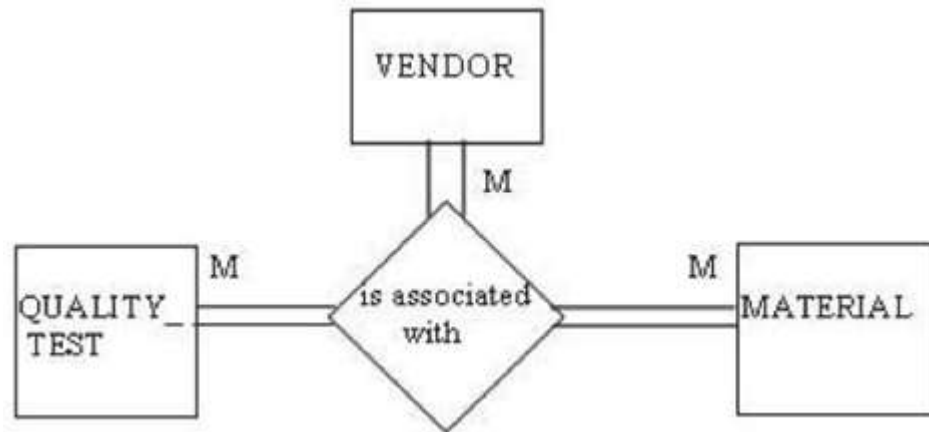
Degree Of Relationships

- Number of entities sharing same association

- Binary



- Ternary



- n-ary (seldom)

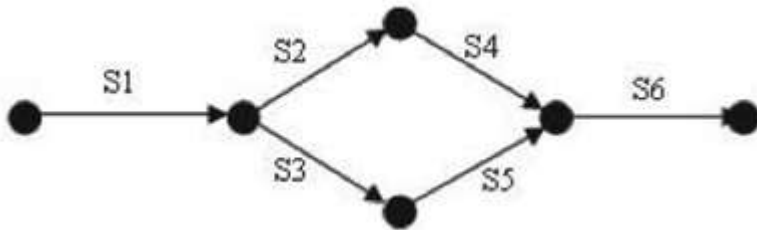
- Unary (recursive)



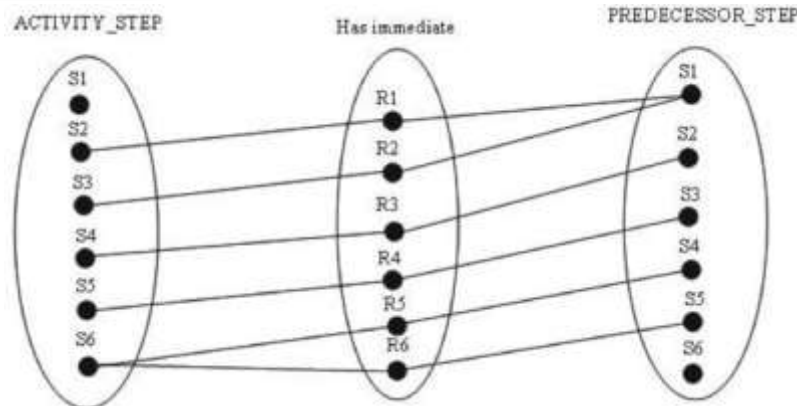
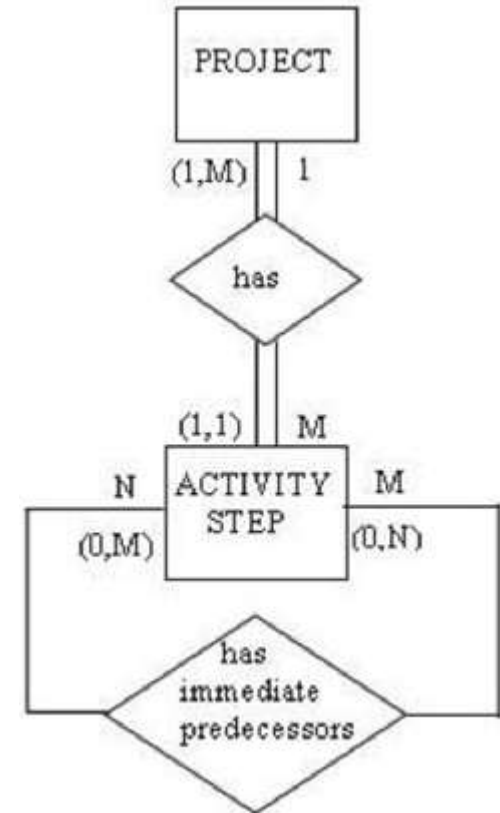
ER Diagramming

Degree Of Relationships

– Unary (recursive)



If You Don't Understand
Go to Gemba (Do not hesitate)
 Ask for each entity one by one
 Try to draw by hand as asking



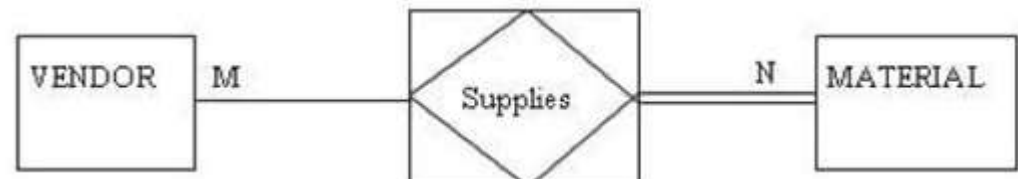
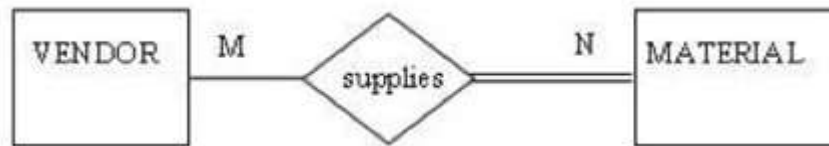


ER Diagramming Composite Entities

M:N
Relationship

Use Composite
Entity

1:N
Relationship





ER Diagramming

Composite Entities

Entity Set: **VENDOR**

VENDOR ID	V NAME	V STREET	V CITY	V STATE	V ZIP
V110	Jersey	2 Main St.	Patterson	NJ	07055
V25	General	125 Common	Boise	ID	44830
V250	Spices	25 Salty Lane	East Hampton	NY	10027
V75	Pasta Supply.	34 Henry St.	Philadelphia	PA	09098

Entity Set: **MATERIAL**

MATERIAL ID	MATL DESCRIPTION
RM201	Carrots, whole
RM202	Carrots, diced, 1/4 inch
RM205	Potatoes, Eastern, whole
RM210	Peas, shelled
RM211	Tomatoes, whole
RM310	Garlic, whole
RM311	Garlic powder
RM318	Salt, iodized
RM308	Onion salt
RM305	Paprika
RM340	Sugar, bulk
RM805	Olive oil
RM810	Vinegar, white

Entity Set: **VENDOR_MATL_XREF**

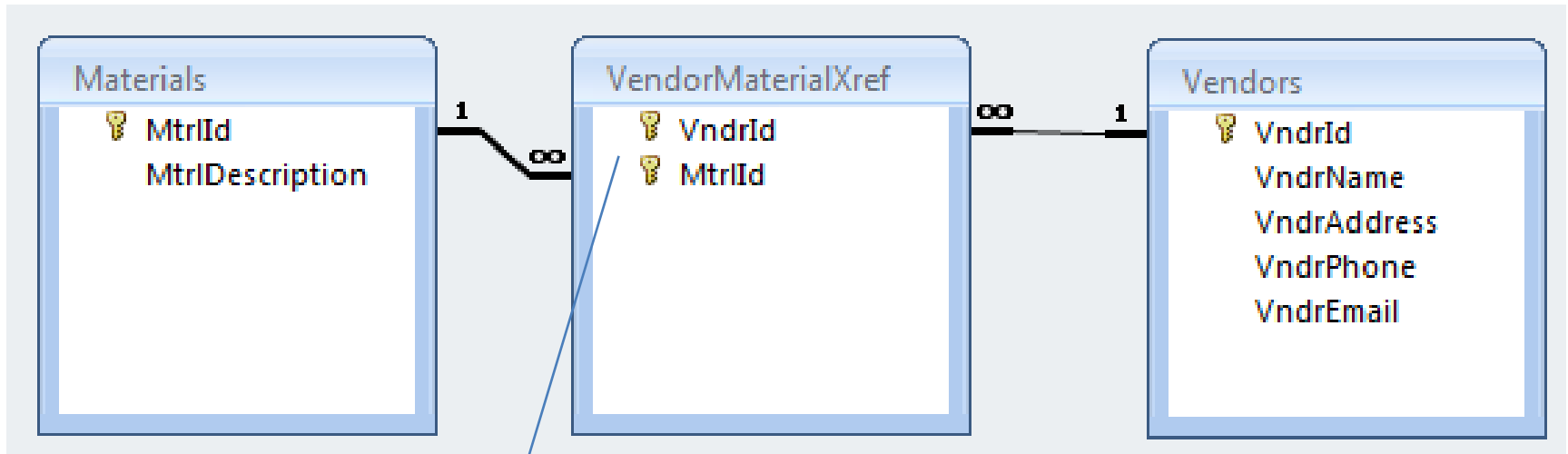
VENDOR ID	MATERIAL ID
V25	RM201
V25	RM205
V25	RM318
V25	RM340
V110	RM201
V110	RM202
V110	RM205
V110	RM210
V110	RM211
V250	RM310
V250	RM311
V250	RM318
V250	RM340
V250	RM308
V250	RM305
V25	RM805
V25	RM810

Figure 3.12 Use of the composite entity.



ER Diagramming

Composite Entities



Compound key



ER Diagramming

Recursive Entities - Unary

Production Example

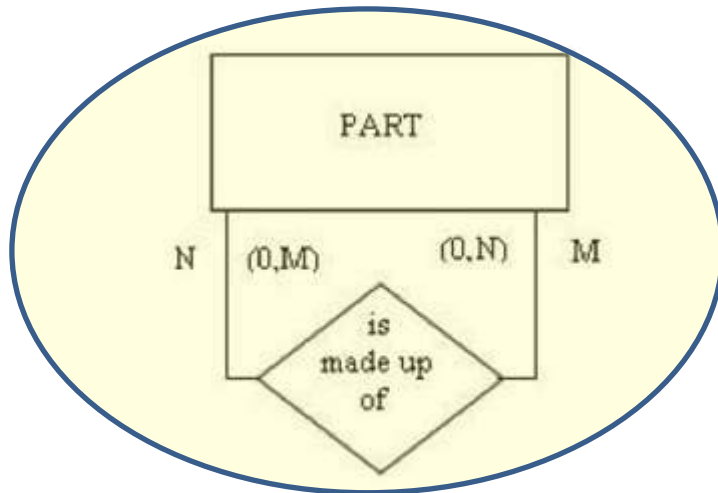
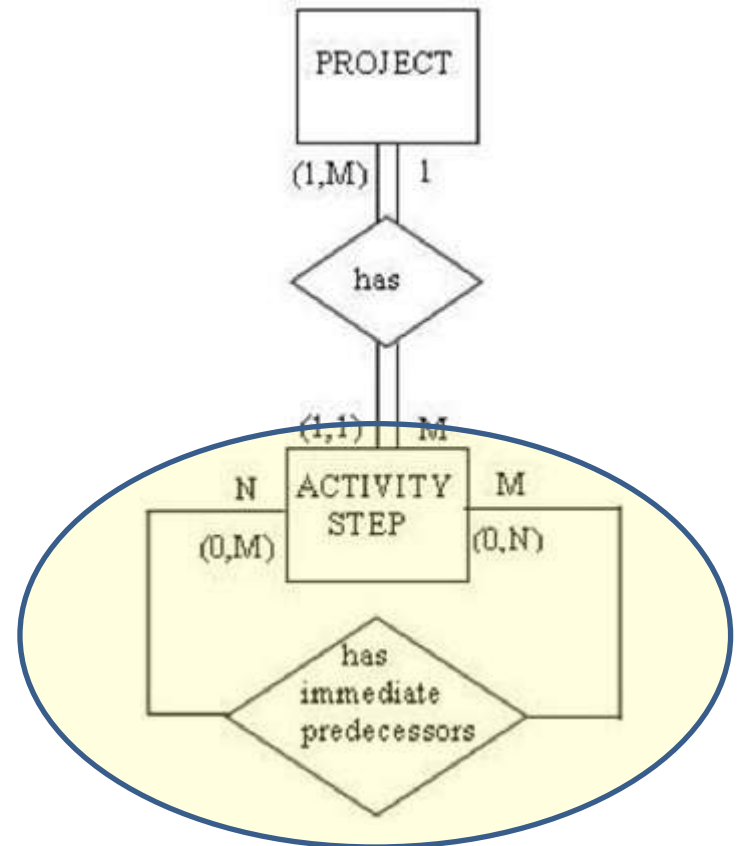


Figure 3.14 A recursive entity.

Project Management Example





ER Diagramming

Recursive Entities - Unary

- BOM example

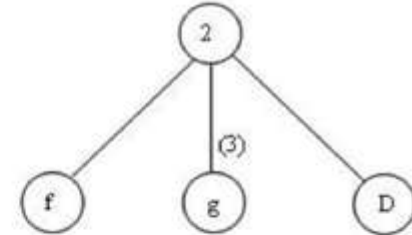
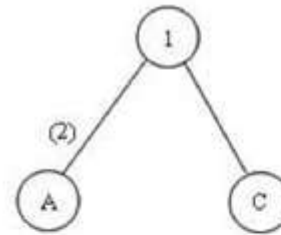
- May not be so easy to convert 1-N

Bill of Materials Matrix

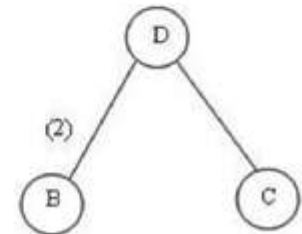
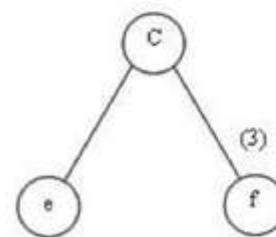
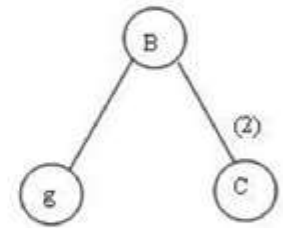
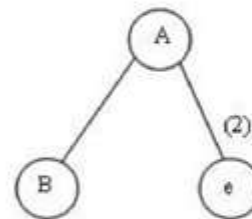
	1	2	A	D	B	C	g	e	f
1			2			1			
2				1			3		1
A					1			2	
D					2	1			
B						2	1		
C								1	3
g									
e									
f									

Item Level Assignments

	Level			
0	1	2	3	4
1	A	B	C	e
2	D		g	f



Two end products (1 and 2)



Four subassemblies (A, B, C, and D)



ER Diagramming

Recursive Entities - BOM Example

Bill of Materials Matrix

	1	2	A	D	B	C	g	e	f
1			2			1			
2				1			3		1
A					1			2	
D					2	1			
B						2	1		
C								1	3
g									
e									
f									

Software may consider **Tact Time**
To reduce in production inventory

Item Level Assignments

	Level				
	0	1	2	3	4
1		A	B	C	e
2		D		g	f

TABLE PART

PART_NO	PART_DESC	DRAWING_NO
1	Product 1	102-23
2	Product 2	110-20
A	Subassembly A	290-10
B	Subassembly B	220-05
C	Subassembly C	256-01
D	Subassembly D	245-90
e	Component e	335-23
f	Component f	304-20
g	Component g	356-90

TABLE PART_COMPONENT

PART_NO	PART_COMP_NO	PART_COMP_QTY
1	A	2
1	C	1
2	D	1
2	f	1
2	g	3
A	B	1
A	e	2
B	C	2
B	g	1
C	e	1
C	f	3
D	B	2
D	C	1

Figure 3.15 PART tables using the BOM matrix.



ER Diagramming

Recursive Entities - BOM Example

Software can not consider **Tact Time**

High in process inventory
if tact-time is high

TABLE PART

PART_NO	PART_DESC	DRAWING_NO
1	Product 1	102-23
2	Product 2	110-20
A	Subassembly A	290-10
B	Subassembly B	220-05
C	Subassembly C	256-01
D	Subassembly D	245-90
e	Component e	335-23
f	Component f	304-20
g	Component g	356-90

TABLE PART_COMPONENT

PART_NO	SUB_PART_NO	SUB_PART_QTY
1	A	2
1	B	2
1	C	5
1	e	9
1	f	15
1	g	2
2	B	3
2	C	7
2	D	1
2	e	7
2	f	21
2	g	6
A	B	1
A	C	2
A	e	4
A	f	6
A	g	1
B	C	2
B	e	2
B	f	6
B	g	1
C	e	1
C	f	3
D	B	2
D	C	5
D	e	5
D	f	15
D	g	2

Total Requirements Matrix

	1	2	A	D	B	C	g	e	f
1	1		2		2	5	2	9	15
2		1		1	3	7	6	7	21
A			1		1	2	1	4	6
D				1	2	5	2	5	15
B					1	2	1	2	6
C						1		1	3
γ							1		
α								1	
β									1

Figure 3.16 PART tables using total-requirements matrix.



ER Diagramming

Super class and Subclass Entity Types

To simplify your diagram
Use few entities as possible

Specialization circle
Overlapping, Distinct

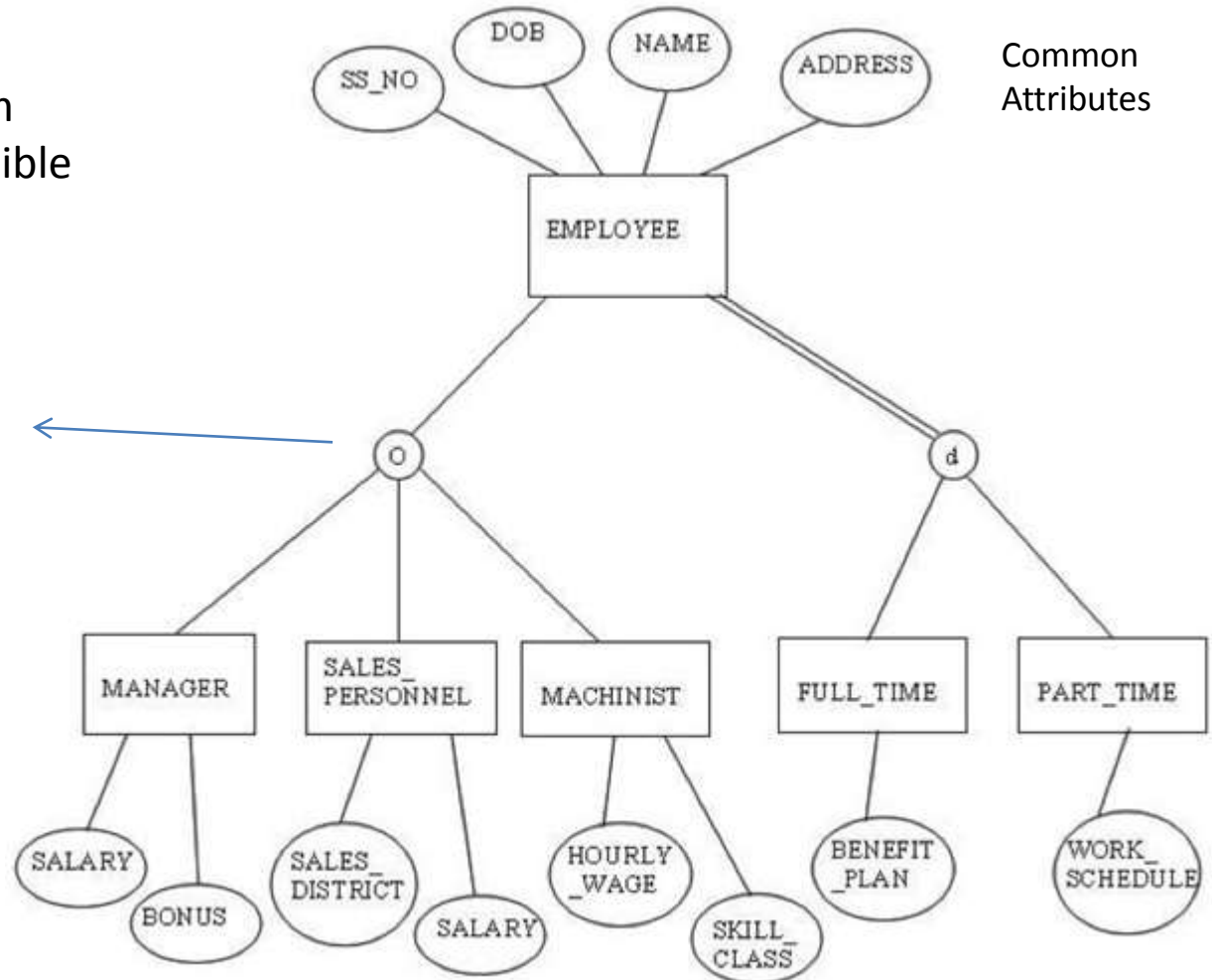


Figure 3.17 Superclass and subclass hierarchy.



Homework – Case study

- Read Chapter 3.3
- Rewrite the analysis in your own words
- Draw the E-R diagram on A4
 - according to your rewriting
 - Do not look to Figure 3.26
 - Use pencil and eraser in your work
- Compare it with Figure 3.26
 - Explain the reasons for differences.** (on another A4)



Questions

Questions?

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