



Database Systems

Introduction of DB Design Support Tool





Outline

- Introduction
- Getting started with ER-win
- Choose model type and target database
- Basic screen configuration
- Choose data model diagram notation
- Choose data modeling phase
- Logical data modeling with ER-win (Company DB)
- Supplement

Introduction

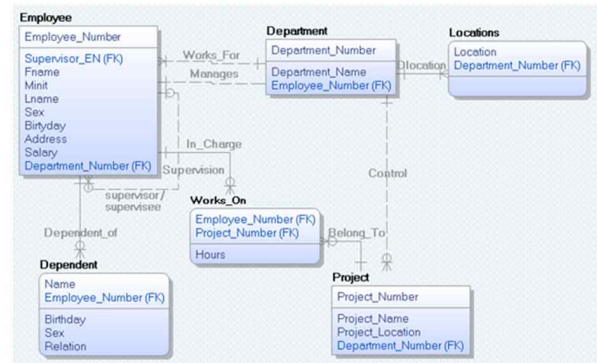
- ER-win
 - Data modeling tool
 - One of most popular CASE tool for database design
 - It can support not only to conceptual design with ER diagram but also to convert the conceptual schema to logical schema and even for forward/backward engineering.

Figure 8.1
The ER conceptual schema diagram for the COMPANY database.



Example of conceptual diagram

convert

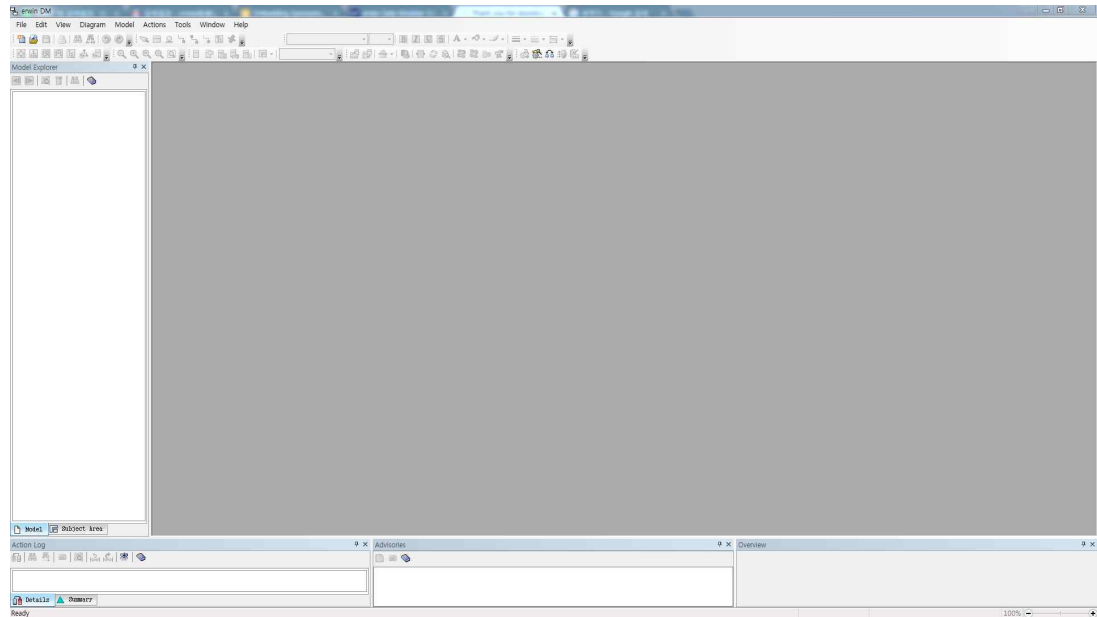


Example of logical diagram

Getting started with ER-win

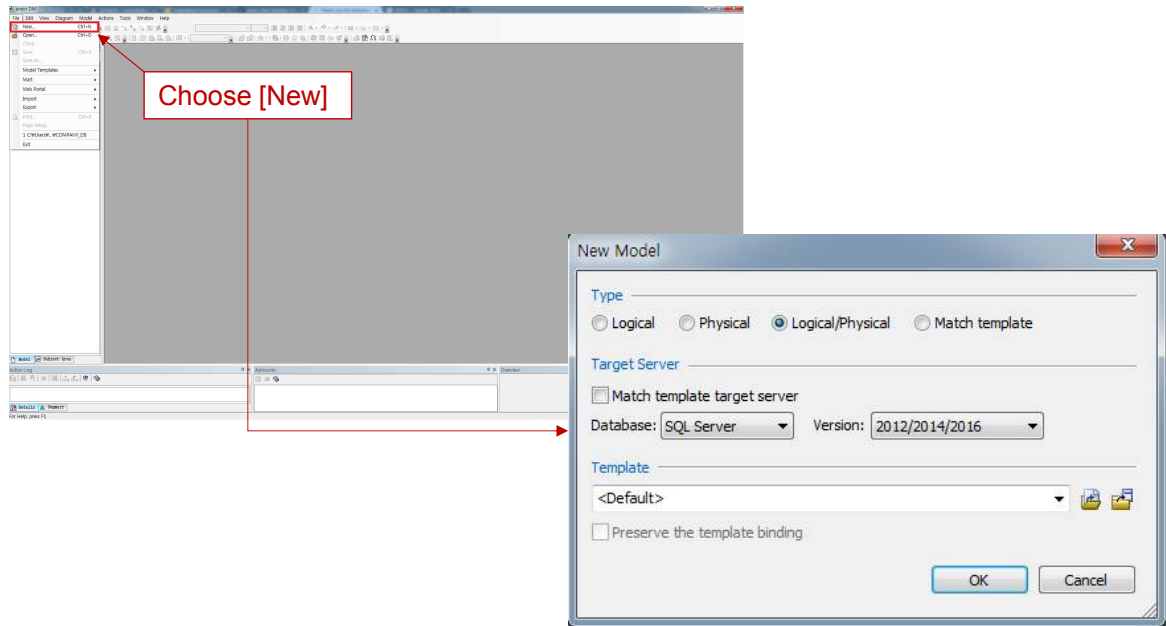
- Program execution

- [start button] → [program] → [erwin] → [AllFusion] → [Erwin Data Modeler r9.7] → Execute [Erwin Data Modeler r9.7]



Choose model type and target database (cont'd.)

- Choose **[File]** in menu → choose **[New]** to open '**New Model**' dialog box.

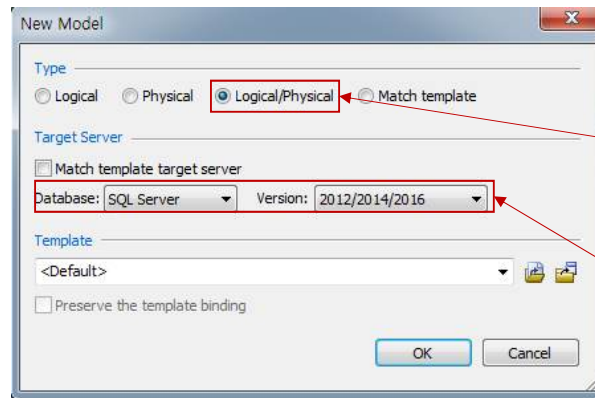


Choose model type and target database (cont'd.)

- Choose model type.
 - **‘Logical’** model
 - For designing conceptual schema which contains the detailed information of entity types and relationship type such as attribute, primary key etc.
 - Not support to specify and design target DBMS and version, trigger, stored procedures etc.
 - **‘Physical’** model
 - For designing physical schema which contains the features related with specified DBMS
- The **‘logical/physical’** model type usually is used for normal and full design procedure.

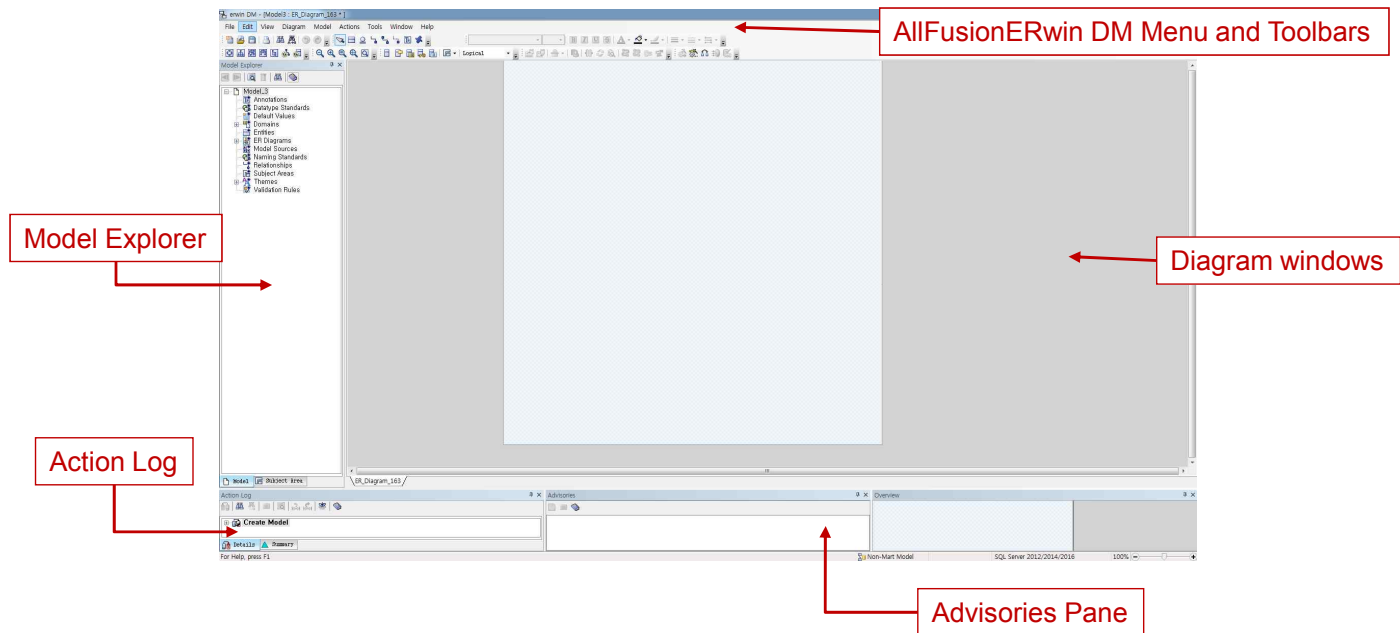
Choose model type and target database (cont'd.)

- Choose model type and target DBMS.
 - In this class, we will use “**SQL Server 201X**”.



Basic screen configuration

- It consists of one menu bar for user friendly interface and four sub windows for displaying different contents.



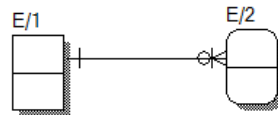
Basic screen configuration (cont'd.)

Division	Function
Toolbars	<ul style="list-style-type: none">➤ The buttons to help modeling works are gathered.➤ It can be rearranged with that user wants.
Advisories Pane	<ul style="list-style-type: none">➤ The certain amount of information about processed works by current user is shown.
Model Explorer	<ul style="list-style-type: none">➤ It is explorer window in model.➤ Each object shown in explorer has hierarchical structure.
Action Log	<ul style="list-style-type: none">➤ Processed works by current user are recorded in real time.
Diagram Windows	<ul style="list-style-type: none">➤ After model generation, the name of window is basically set as 'Display1', and user can progress modeling process on this area.

Choose data model diagram notation

• IE notation

- Information Engineering
- Notation uses the combination of line and circle looks like crow's foot.
- Widely used notation



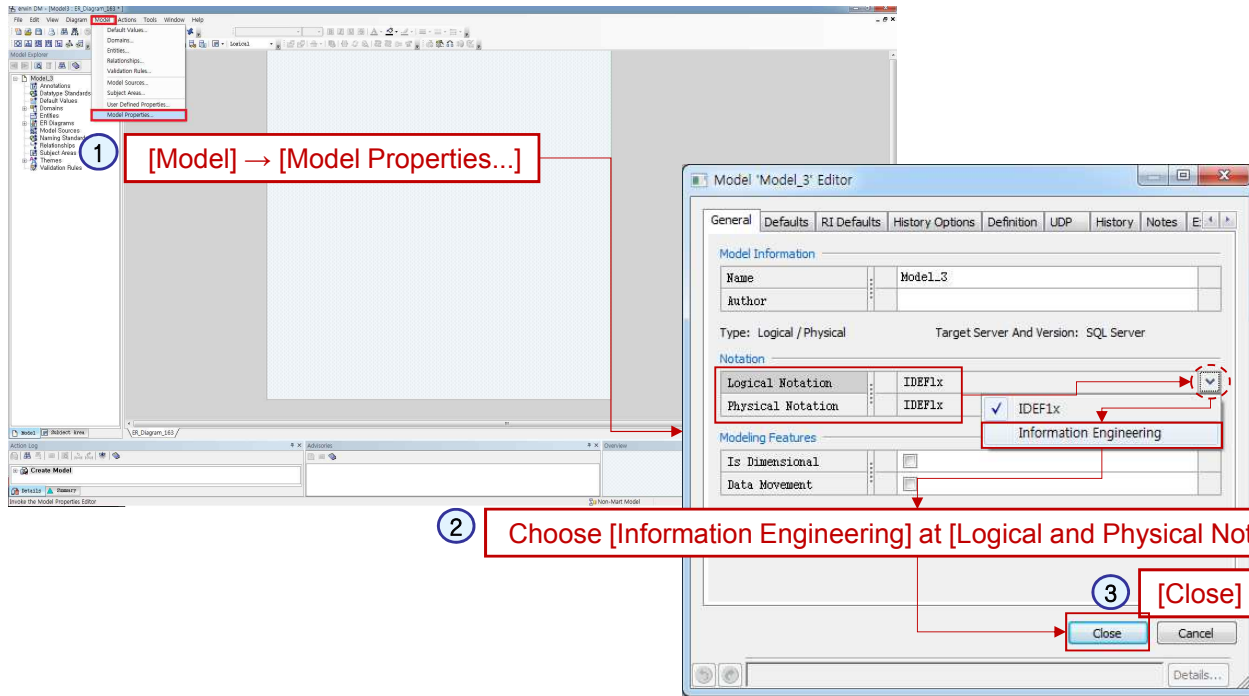
• IDEF1X notation

- Notation uses circle and diamond.
- Initial setup notation of ER-win



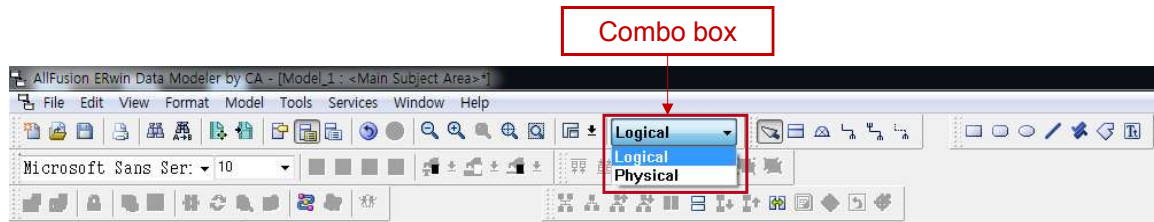
Choose data model diagram notation (cont'd.)

- **Change to IE from the initial IDEF1X notation.**



Choose data modeling phase

- User can choose 'Logical' or 'physical' data modeling
 - If user choose 'Logical/Physical' type model when they started data modeling.
 - At combo box in toolbar
 - Refer to slide 6 for the details of each mode type.





Logical data modeling with ER-win (Company DB)

- Logical data modeling with ER-win is generally performed by the following 5 steps.
 - Step 1: Draw entity types
 - Step 2: Arrange entity types
 - Step 3: Set relationship type between entity types
 - Step 4: Naming relationship types
 - Step 5: Set the cardinality and optionality of each relationship type

Logical data modeling with ER-win (Company DB) (cont'd.)

- This is conceptual diagram of company database as an example.

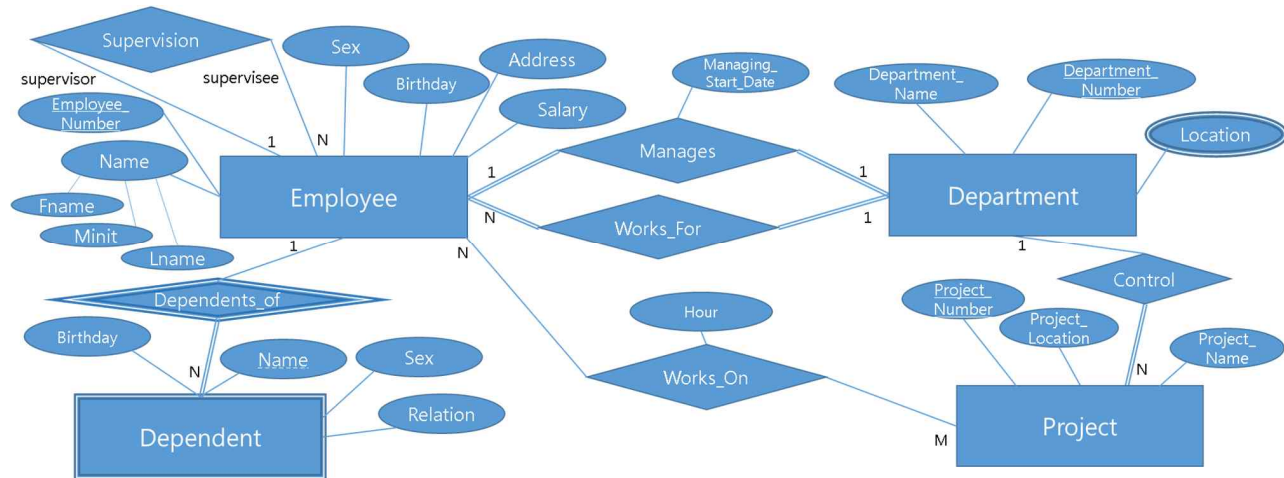
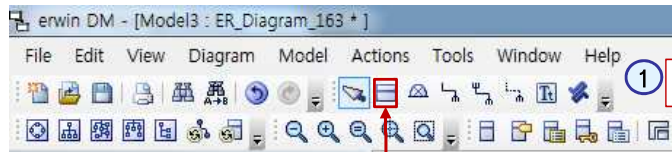


Figure 2. Conceptual diagram of company DB

Step 1: Draw entity types

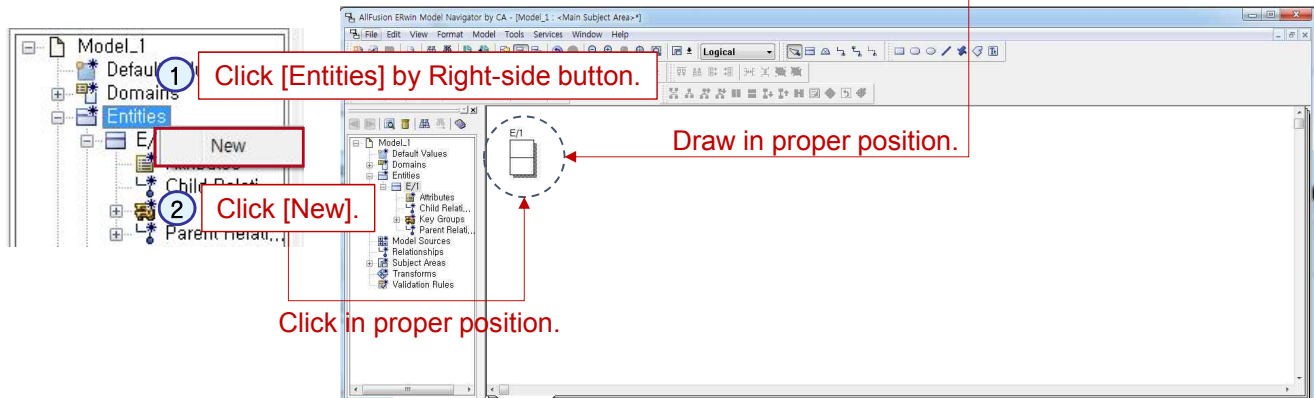
- Entity type can be created by either 'Method 1' or 'Method 2'.
- Method 1: Using toolbar**



Click [Entity] icon and draw in diagram windows.

Entity

- Method 2: Using model explorer**



Click [Entities] by Right-side button.

Click [New].

Draw in proper position.

Click in proper position.

Step 1: Draw entity types (cont'd.)

- Entity type

Entity Name

Area for the primary key attribute

Area for normal attributes

- How to fill in each area?
 - Click entity
 - Push 'Tab' key at keyboard to move to next area
 - Write contents

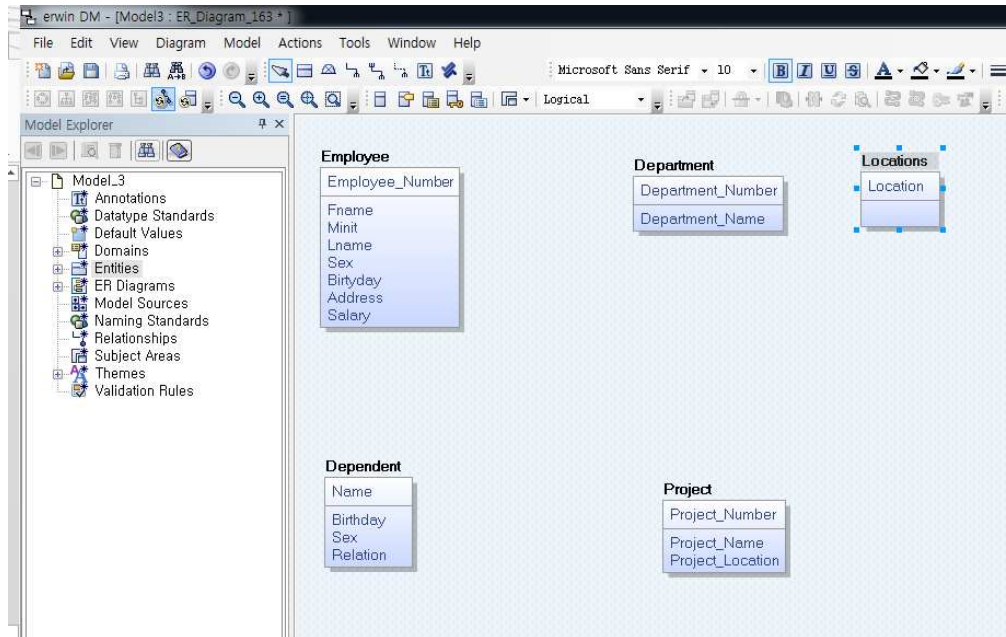
Fill in →

Employee

Employee_Number
Fname
Minit
Lname
Sex
Birthdate
Address
Salary

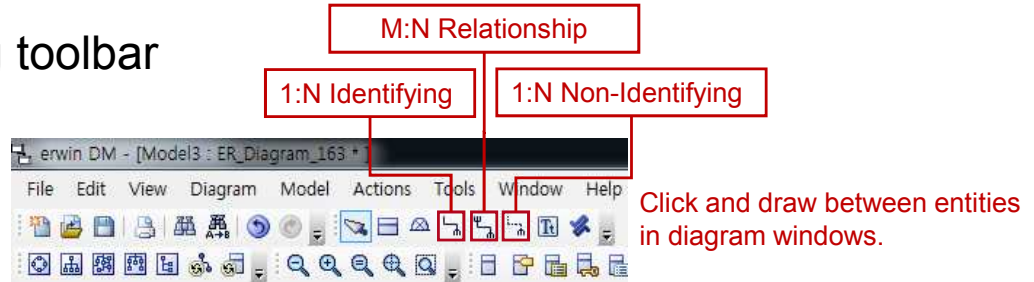
Step 2: Arrange entity types

- Entity types are placed properly by rearranging.



Step 3: Set relationship types

- **Method:** Using toolbar



- Relationship type

- **Identifying** for between weak entity type and its owner:
 - Primary key of the owner is used as part of the primary key of the weak entity type.
 - The weak entity is represented by rounded rectangle in ER-win.
- **Non-Identifying** for between strong entity types:
 - Primary key of the first entity type is used for normal attribute of the other.

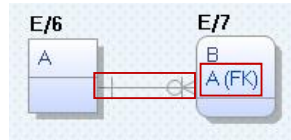


Figure 3. Example of identifying

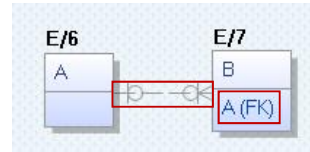
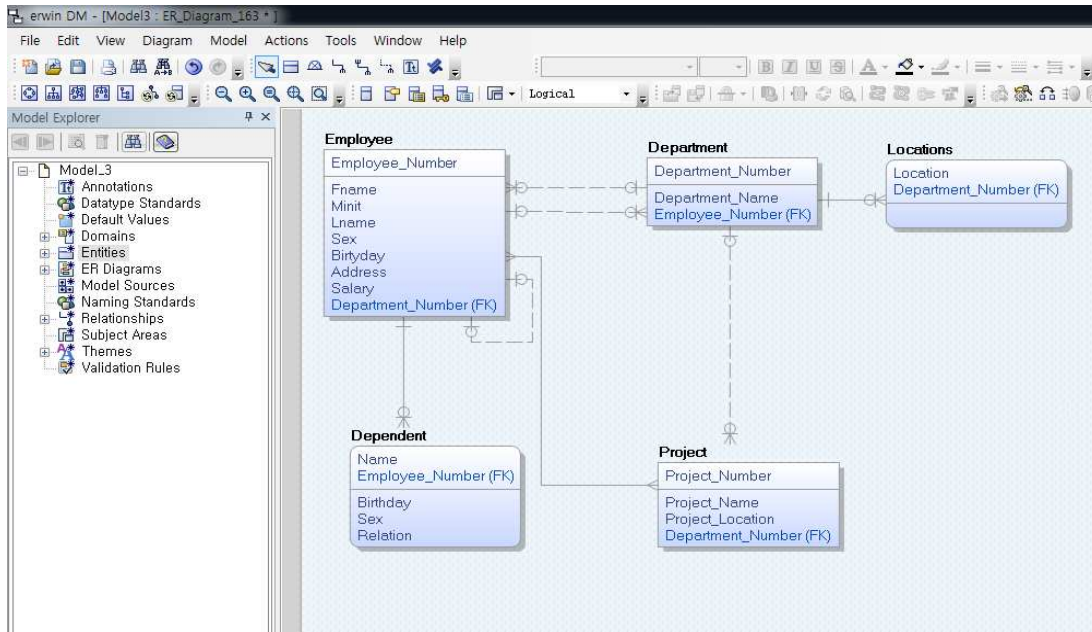


Figure 4. Example of non-identifying

Step 3: Set relationship type (cont'd.)

- After creating the relationship types between entity types.



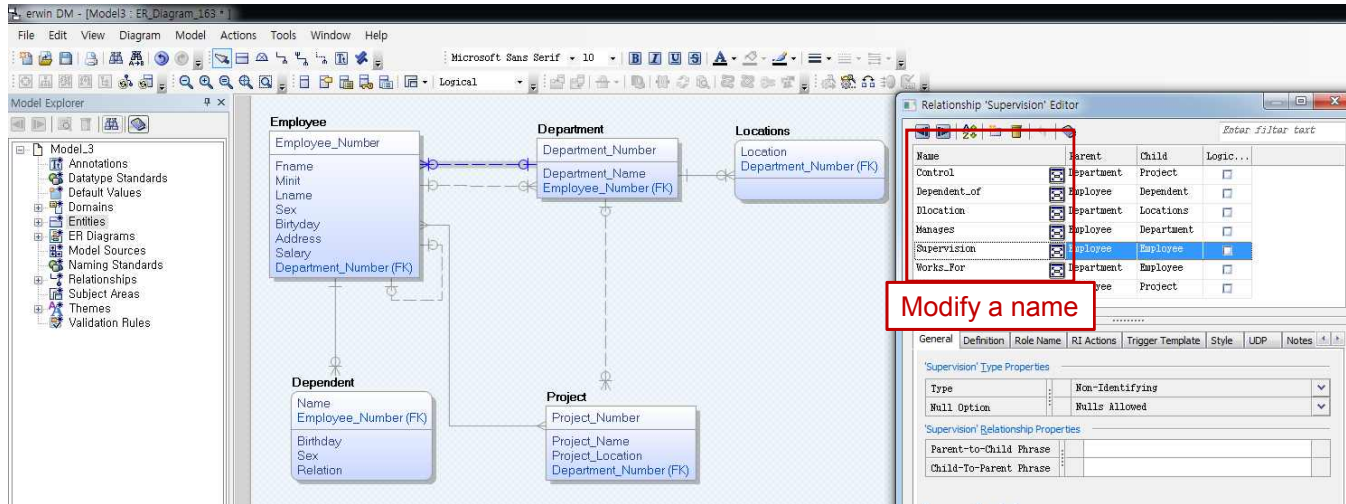
Step 4: Naming relationship types

- **Method:** Using relationship property dialog box

The diagram illustrates the process of naming a relationship type in a database model. It consists of three main parts:

- Relationship Diagram:** A diagram showing two entities, E/9 (A) and E/10 (B A (FK)), connected by a relationship line. A red arrow labeled '1' points from the relationship line to the context menu.
- Context Menu:** A menu that appears after a right-click. The 'Properties' option is highlighted with a red box. A red arrow labeled '2' points from this option to the 'Relationship 'R/12' Editor' dialog box.
- Relationship 'R/12' Editor:** A dialog box for editing the relationship type. The 'Name' tab is selected, showing a list of relationship types. The relationship type 'R/12' is highlighted with a red box. A red arrow labeled 'Relation Name' points from this box to the 'Name' field in the 'General' tab. The 'General' tab shows the 'Type' set to 'Identifying' and the 'Cardinality' set to 'Zero, One or More'.

Step 4: Naming relationship types (cont'd.)



Step 4: Naming relationship types (cont'd.)

- To show name of relationship type in diagram
 - Using model property dialog box

The screenshot shows the erwin DM - [Model3: ER_Diagram_163] Editor. The main diagram displays entities: Employee (Employee_Number, FName, MInit, LName, Sex, Birthday, Address, Salary, Department_Number (FK)), Department (Department_Number, Department_Name, Employee_Number (FK)), Locations (Location, Department_Number (FK)), and Project (Project_Number, Project_Name, Project_Location, Department_Number (FK)).

Annotations and steps:

- 1 Click right-side button anywhere in diagram window area
- 2 Choose
- 3 Choose [relationship] tap.
- 4 Choose

The 'Properties...' dialog box is open, showing the 'Relationship' tab. The 'Display Logical Relationship Name' checkbox is checked.

Relationship Display Options:

Option	Value
Display Relationships	<input checked="" type="checkbox"/>

Relationship Logical Display Options:

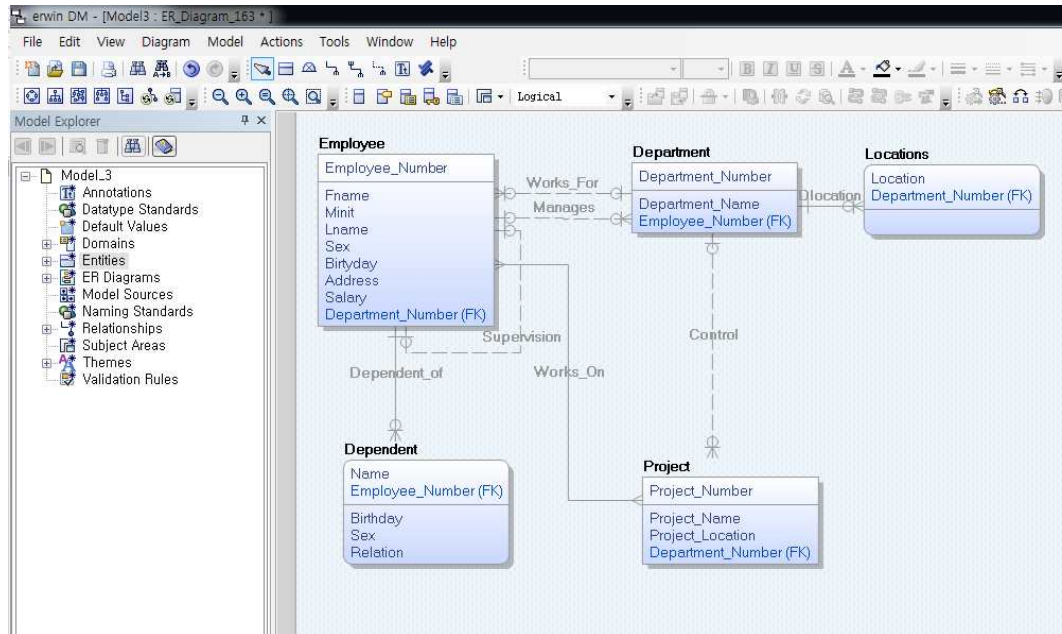
Option	Value
Display Logical Relationship Name	<input checked="" type="checkbox"/>
Display Logical Cardinality	<input type="checkbox"/>
Display Logical Referential Integrity	<input type="checkbox"/>
Display Subtype Discriminator	<input checked="" type="checkbox"/>

Relationship Physical Display Options:

Option	Value
Display Physical Relationship Name	<input type="checkbox"/>
Display Physical Cardinality	<input type="checkbox"/>
Display Physical Referential Integrity	<input type="checkbox"/>
Display Generated Relationships	<input checked="" type="checkbox"/>

Step 4: Naming relationship types (cont'd.)

- After naming relationship types



Step 5: Set the cardinality and optionality

- **Method:** Using relationship property dialog box

The diagram illustrates the process of setting cardinality and optionality for a relationship. It consists of three main parts:

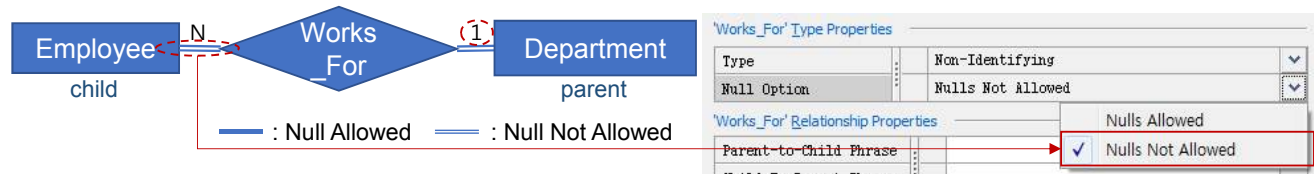
- Relationship Diagram:** A diagram showing two entities, E/9 (A) and E/10 (B A (FK)), connected by a relationship line. A red arrow labeled '1' points to the right-side button on the relationship line.
- Context Menu:** A menu titled 'Properties' is shown, with a red arrow labeled '2' pointing to the 'Properties' option. The menu includes options like 'Go to Parent', 'Go to Child', 'Delete', 'Go To Model Explorer', 'Override Fonts and Colors...', 'Reset Relationship Path', 'Copy Theme and Overridden Styles', and 'Paste Theme and Overridden Styles'.
- Relationship Control Editor:** A dialog box titled 'Relationship Control Editor' is shown. It contains a table of relationships and three sections for configuring properties:
 - Control Type Properties:** Includes 'Type' (Non-Identifying) and 'Null Option' (Nulls Allowed).
 - Control Relationship Properties:** Includes 'Parent-to-Child Phrase' and 'Child-to-Parent Phrase'.
 - Control Cardinality Properties:** Includes 'Cardinality' (Zero, One or More) and 'Cardinality Value' (1).

Red arrows point from the 'Properties' menu to the 'Relationship Control Editor' dialog box, and from the 'Control Type Properties', 'Control Relationship Properties', and 'Control Cardinality Properties' sections to their respective labels: 'Type & Null option', 'Phrase', and 'Cardinality'.

Step 5: Set the cardinality and optionality (cont'd.)

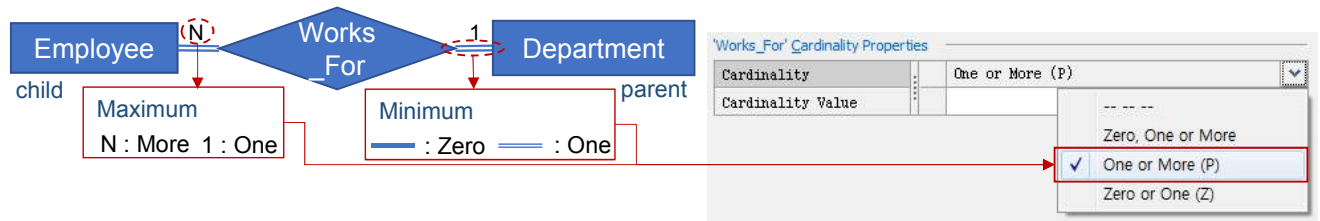
• Null option

- Ascertain whether an instance at child entity type must have the relationship with the instance at parent entity type or not



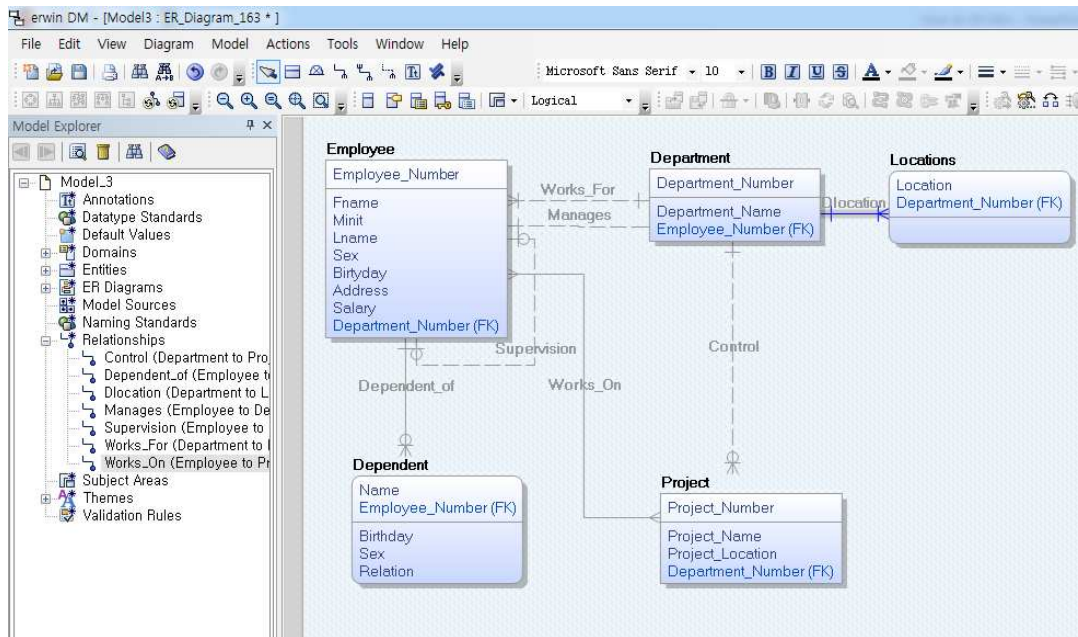
• Cardinality

- The limit number of instances at child entity type which have the relationship with one instance at parent entity type



Step 5: Set the cardinality and optionality (cont'd.)

- After specifying the proper cardinality and optionality for relationship types (compared with the figure in slide 23)

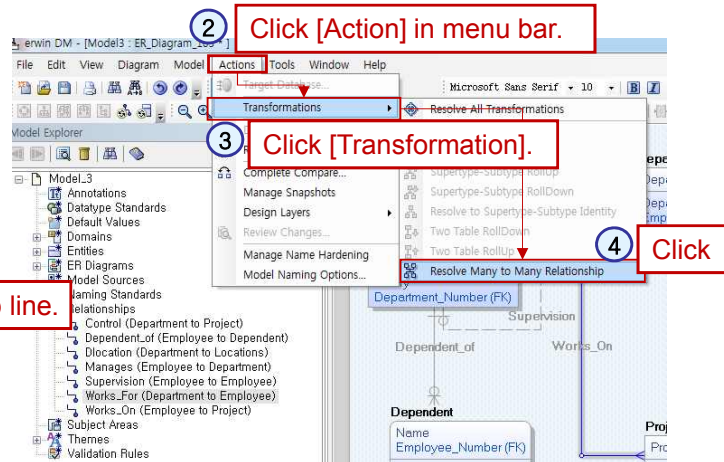
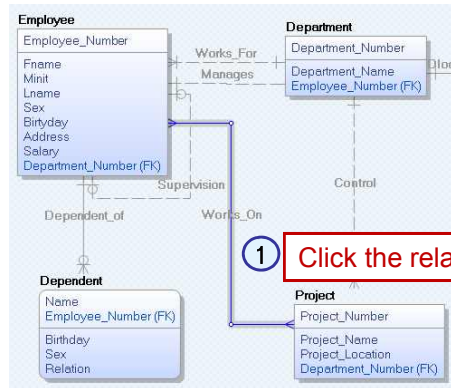


Step 5: Set the cardinality and optionality (cont'd.)

- For M:N relationship
 - Method: Transformation

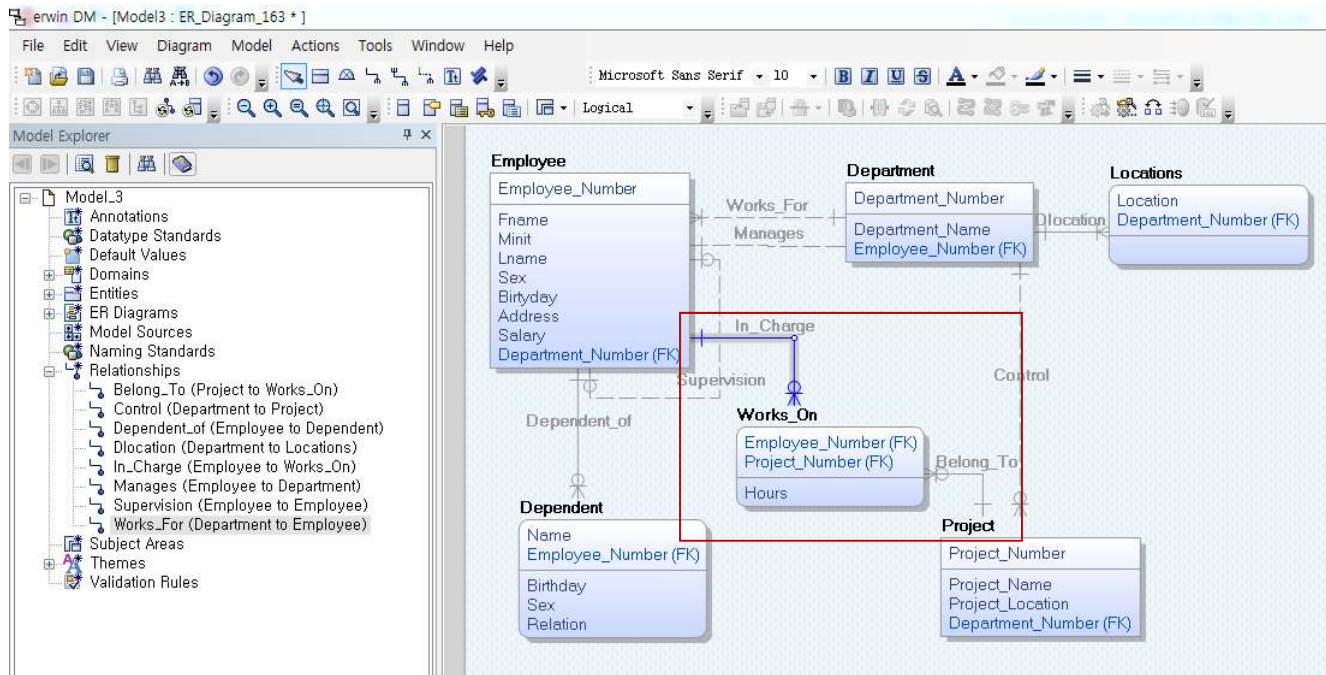


M:N relationship type



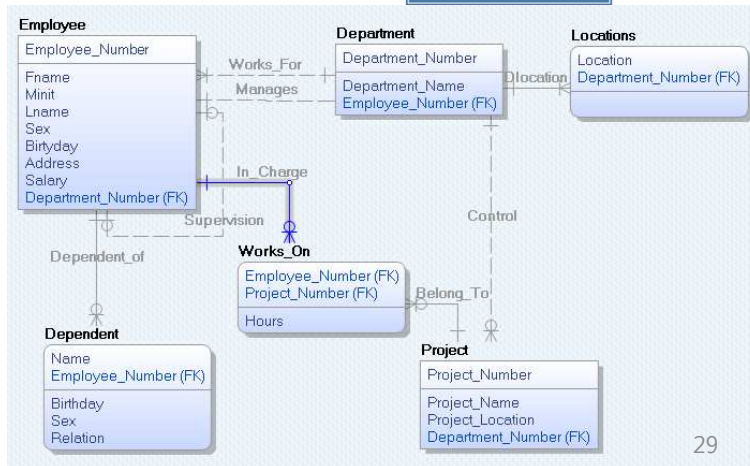
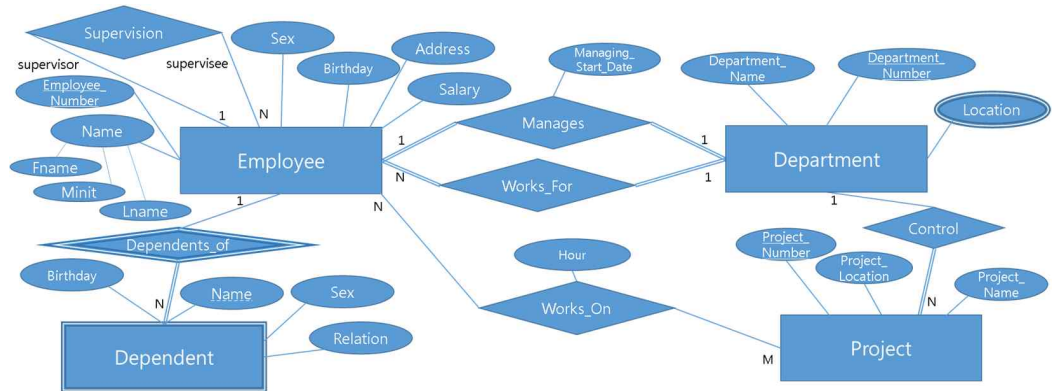
Step 5: Set the cardinality and optionality (cont'd.)

- After transformation and naming M:N relationship type



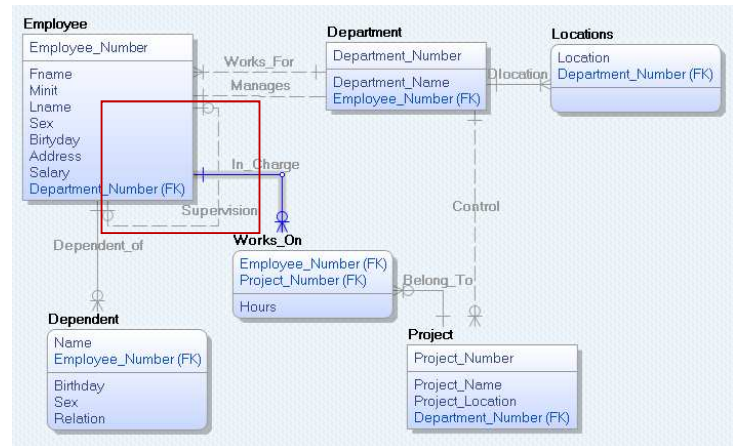
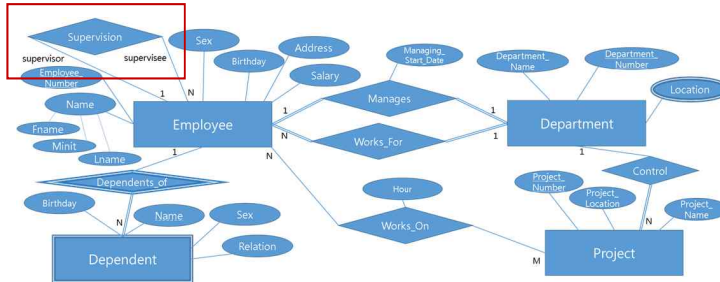
Step 5: Set the cardinality and optionality (cont'd.)

- Final result



Supplement

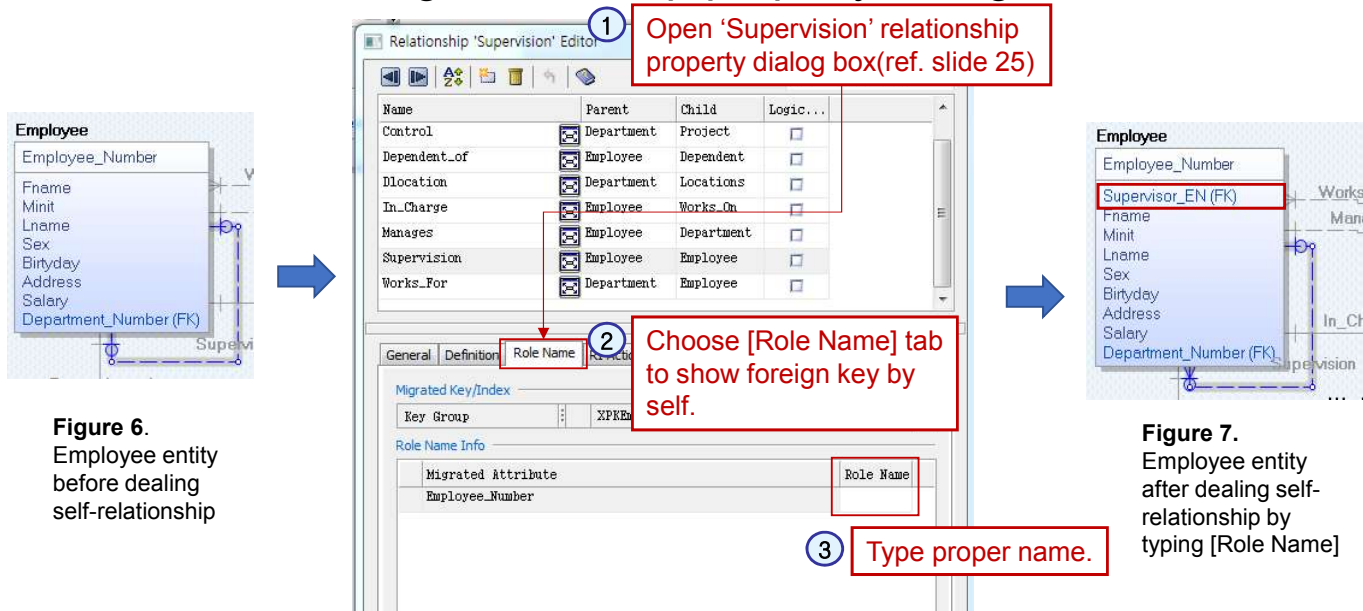
1. How to show **self-relationship**



Supplement (cont'd.)

1. How to show **self-relationship**

– **Method:** Using relationship property dialog box



Supplement (cont'd.)

1. How to show **self-relationship**

– **Method:** Using relationship property dialog box



Figure 6.
Employee entity
before dealing
self-relationship

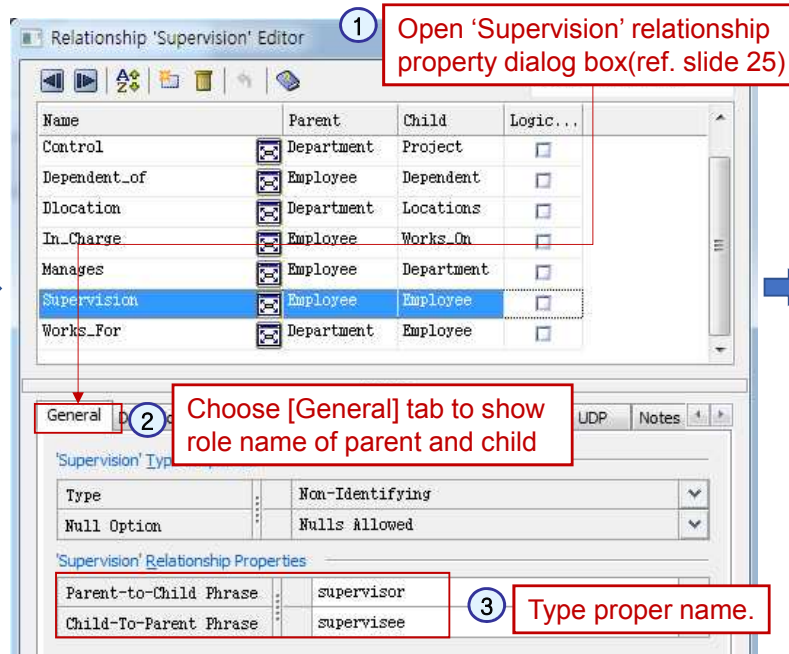
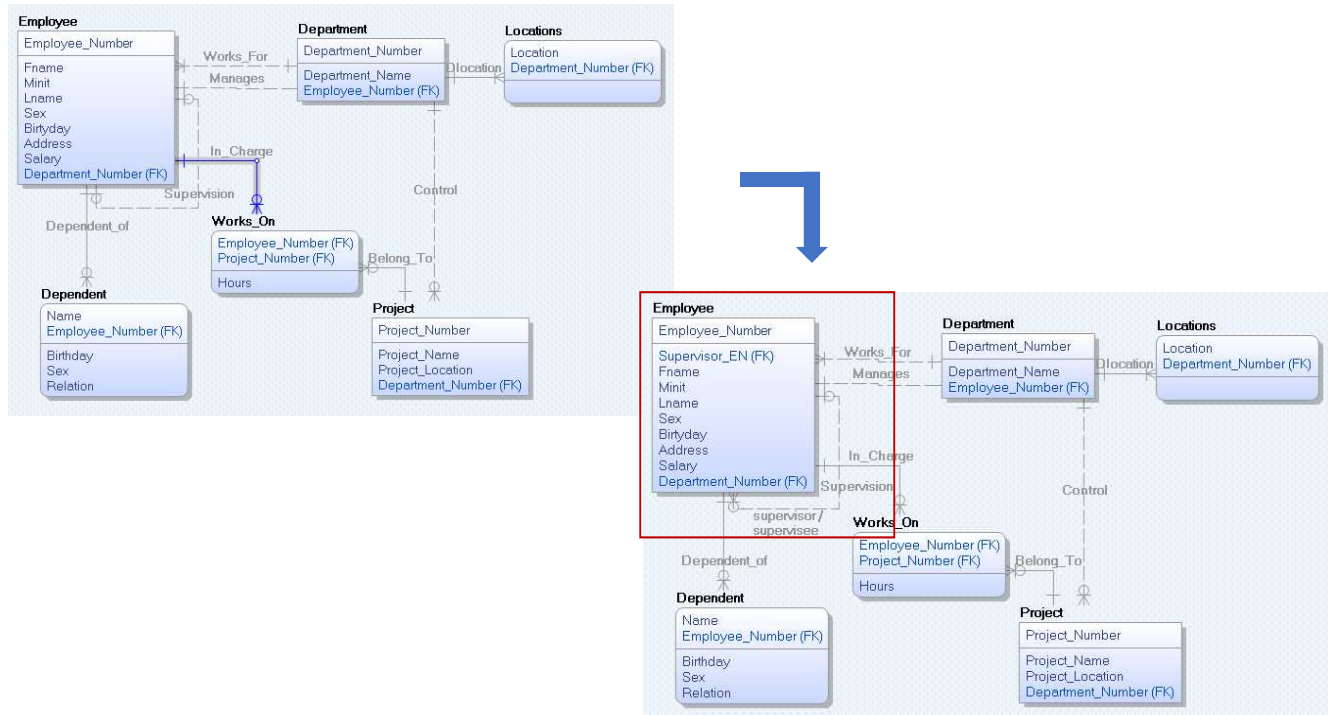


Figure 8.
Employee entity
after dealing
self-relationship
by typing name
of between
parent and child

Supplement (cont'd.)

1. How to show **self-relationship**

– Result



Supplement (cont'd.)

2. [Physical] modeling mode

- The modeling mode to design physical schema for the specified DBMS
- ER-Win helps to design physical data model.
- How choose?

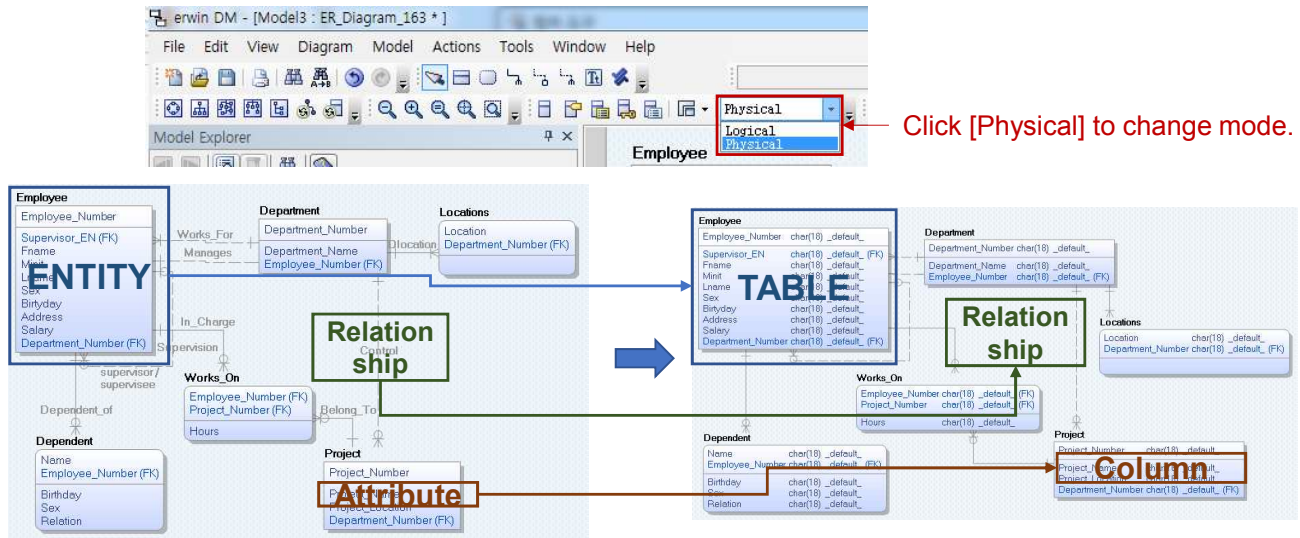


Figure . Logical diagram of company DB

Figure . Physical diagram of company DB

Supplement (cont'd.)

2.[Physical] modeling mode

– How to set domain or datatype for columns?

– **Method:** using column editor

The diagram illustrates the process of editing column characteristics in SQL Server Enterprise Architect. It consists of three main parts:

- Database Model:** A physical model showing tables: Employee, Department, Works_On, Dependent, and Project. The 'Employee' table has columns: Employee_Number, Supervisor_EN, Pname, Minit, Lname, Sex, Birthday, Address, Salary, and Department_Number. A red box highlights the 'Minit' column, and a blue circle with the number '1' is next to it. A red text box says 'Double click certain column name to edit characteristics' with an arrow pointing to the 'Minit' column.
- SQL Server Table 'Employee' Column 'Pname' Editor:** A window showing the 'Pname' column. It has a table with columns: Physical Name, Domain Parent, Physical Data Type, Primary Key, and Physical Only. The 'Pname' row shows 'Pname' as the Physical Name, 'char(18)' as the Physical Data Type, and 'Primary Key' checked. A red box highlights the 'Physical Data Type' column.
- Domain Parent Selection Dialog:** A dialog box showing the 'Domain Parent' tree. It has a 'Physical Name' field with '%AttName' and a 'Physical Data Type' dropdown menu. A red box highlights the 'Physical Data Type' dropdown. Two red arrows point from the 'Physical Data Type' dropdown to two red text boxes: '2-1 Choose Domain' and '2-2 Choose datatype'.

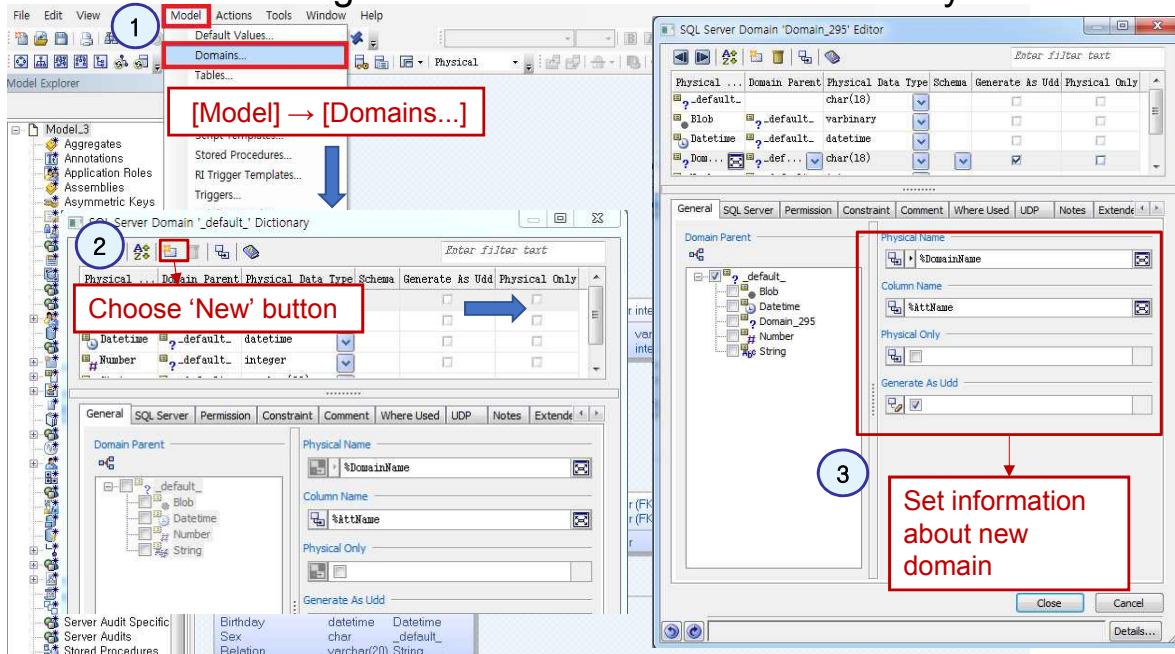
35

Supplement (cont'd.)

2.[Physical] modeling mode

– How to make new domain for columns?

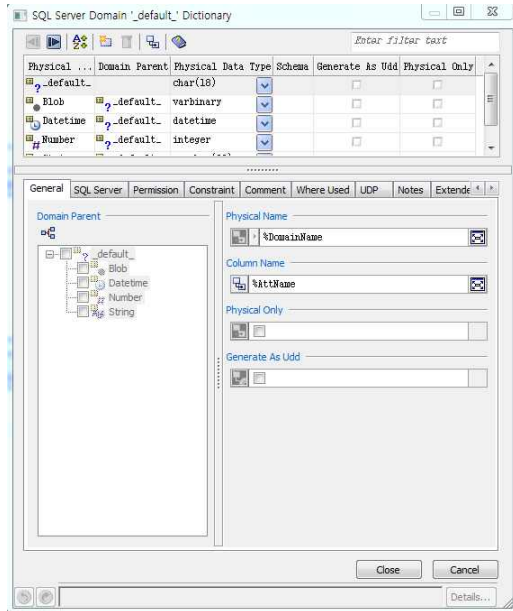
– **Method:** using Domain editor in domain dictionary



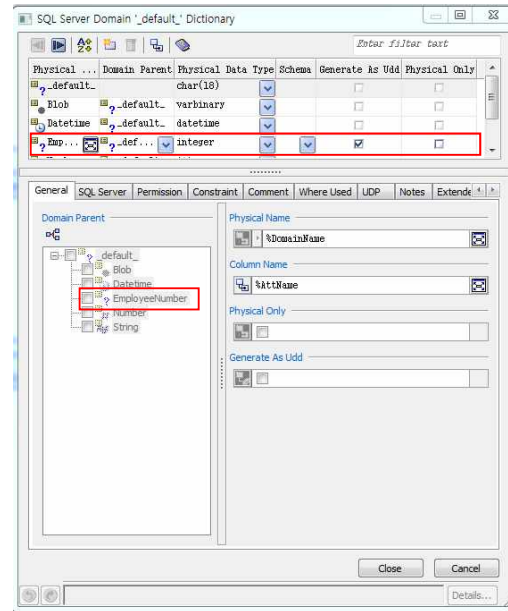
Supplement (cont'd.)

2.[Physical] modeling mode

– How to make new domain for columns?

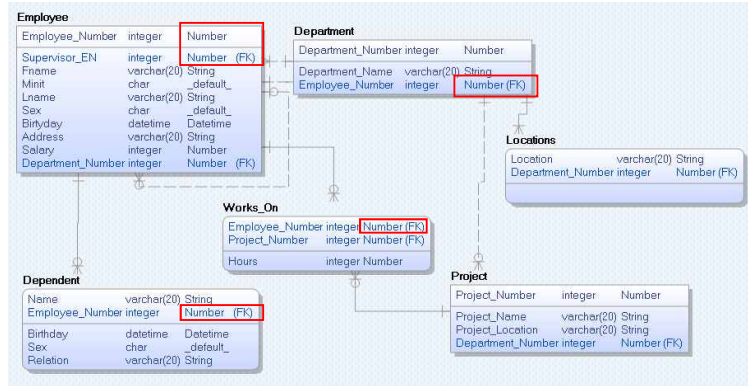


Domain dictionary before make new domain

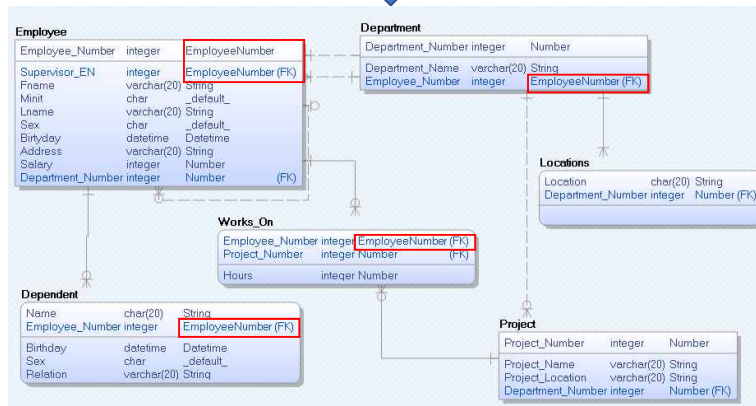


Domain dictionary after make new domain

Supplement (cont'd.)



Physical diagram before setting new domain




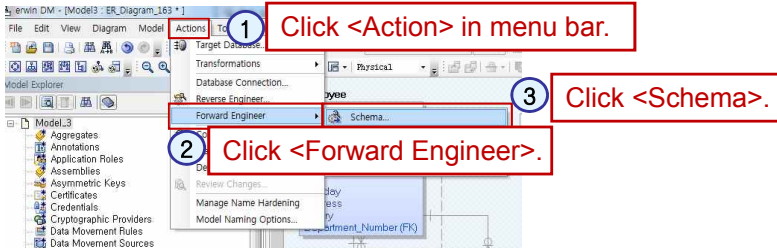
Physical diagram after setting new domain at appropriate position

Supplement (cont'd.)

3. Forward engineering

- The process of building from a high-level model to the actual database within the specified DBMS
- ER-win can support the forward engineering.
- How?

1)  Click [Physical] to change mode.

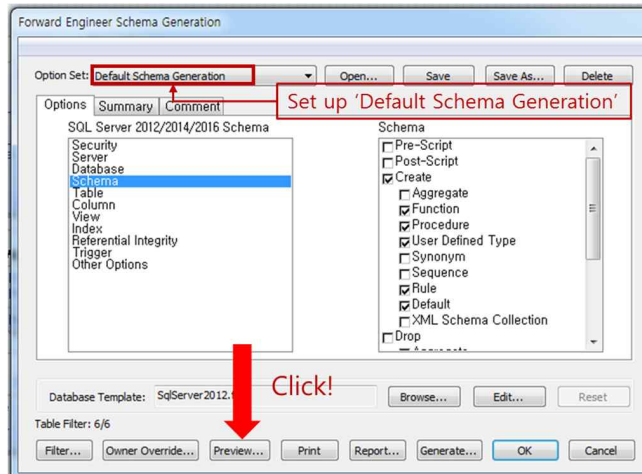
2)  Click <Action> in menu bar.
Click <Forward Engineer>.
Click <Schema>.

Supplement (cont'd.)

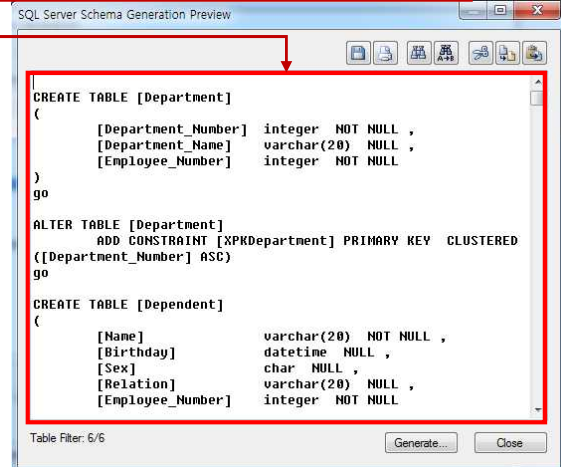
3. Forward engineering

– How?

3) DDL script previewing



Use DDL query to create database

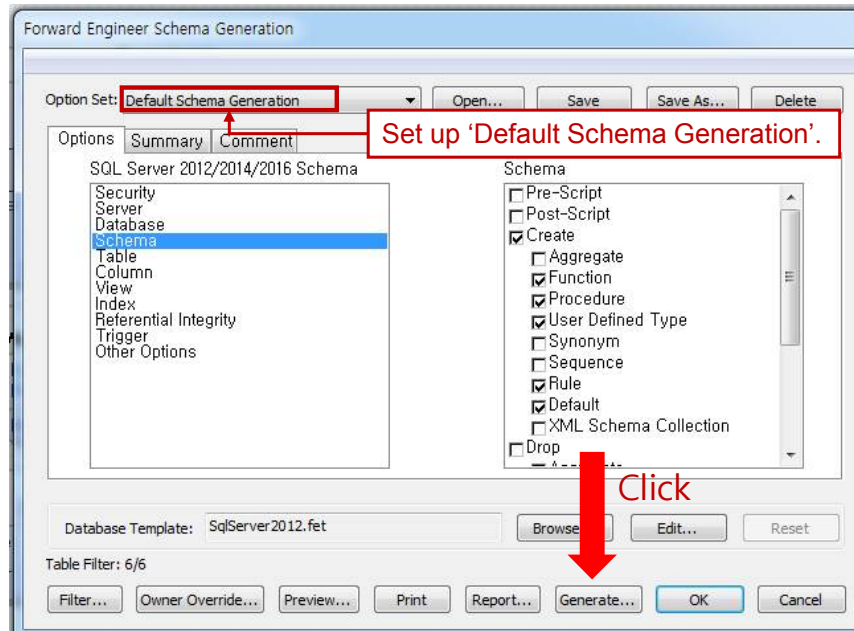


Supplement (cont'd.)

3. Forward engineering

– How?

4) DB schema generation

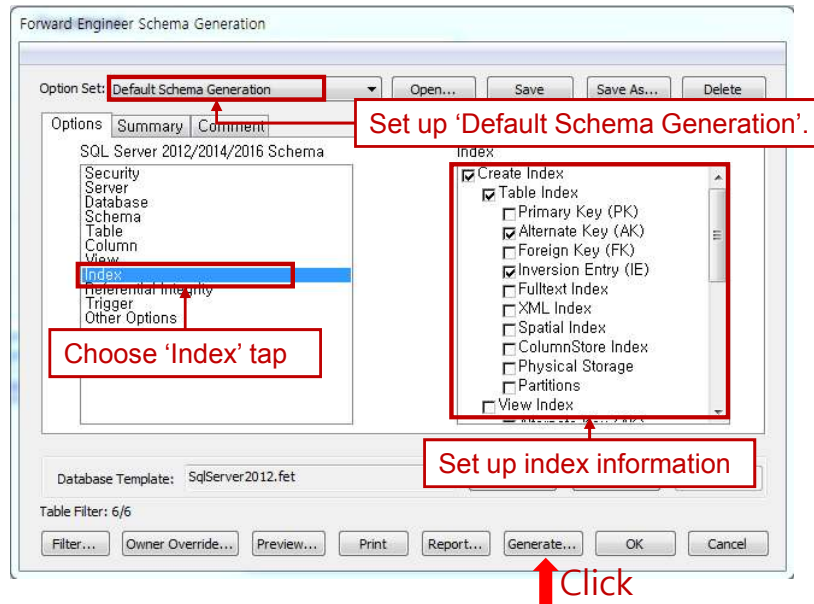


Supplement (cont'd.)

3. Forward engineering

– How?

4) Index generation

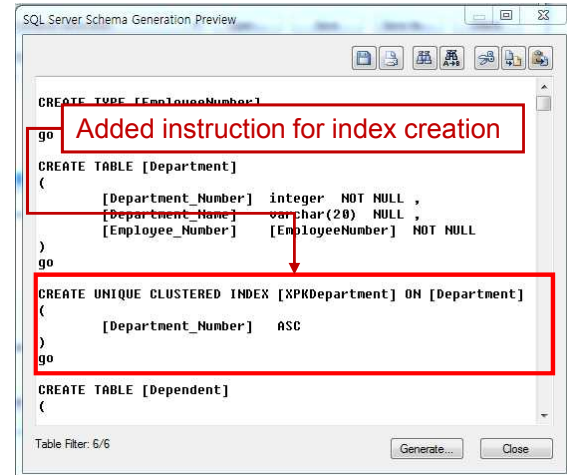
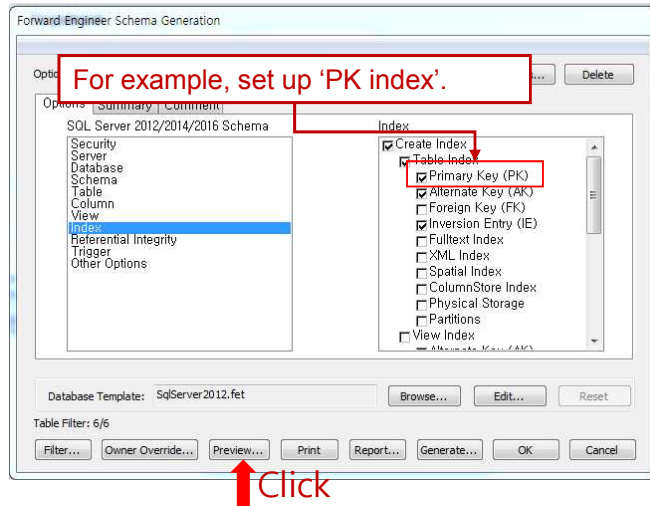


Supplement (cont'd.)

3. Forward engineering

– How?

4) Index generation





THANK YOU



인하대학교