

Edith Cowan University
CSG1207
Systems & Database Design
Assignment 1

Martin Ponce
Student 10371381

Tutor: Greg Baatard

March 30, 2015

Contents

1	Task 1: Normalisation	3
1.1	Assumptions	3
1.2	0NF: Unnormalised form	3
1.3	1NF: First normal form	3
1.4	2NF: Second normal form	4
1.5	3NF: Third normal form	4
1.6	Named relations	4
1.7	Physical E-R diagram	4
2	Task 2: Advanced normalisation	5
2.1	Assumptions	5
2.2	0NF: Unnormalised form	6
2.3	1NF: First normal form	6
2.4	2NF: Second normal form	6
2.5	3NF: Third normal form	6
2.6	Named relations	7
2.7	Physical E-R diagram	7
3	Task 3: Entity-Relationship modelling	8
3.1	Assumptions	8
3.2	Logical E-R diagram	9
3.3	Physical E-R diagram	10
4	Task 4: Advanced Entity-Relationship modelling	11
4.1	Assumptions	11
4.2	Logical E-R diagram	12
4.3	Physical E-R diagram	13
4.4	Data Dictionary & Creation Order	14

1 Task 1: Normalisation

Figure 1 below shows part of a spreadsheet used by a tavern which allows customers to book rooms for events and functions. Each row represents a booking.

Figure 1: Tavern Bookings

Booking #	Booking Date	Duration	Room #	Room Name	Room Capacity	Customer Phone	Customer Name
1241	12-08-21 18:30	4	3	Side Bar	15	0432514658	Sam Crocker
1242	12-08-21 18:30	4	1	Function Room 1	30	0432514658	Sam Crocker
1243	12-08-23 16:00	8	2	Function Room 2	50	0425748641	Joe Pardy
1244	12-08-24 17:00	5	2	Function Room 2	50	0485475265	Cameron West
1245	12-08-26 15:00	3	1	Function Room 1	30	0428654854	Jimbo Lawkins
1246	12-08-26 19:30	4	1	Function Room 1	30	0438924565	Pattie Forbes
1247	12-08-27 17:30	3	4	Garden Area	25	0425748641	Joe Pardy

1.1 Assumptions

- A room cannot have multiple bookings at the same time
- Auto-incrementing Customer# has been created, replacing CustomerPhone as customer identifier
 - Auto-incrementing identifier avoids user input error which may result in multiple customers with the same phone number
 - Allows CustomerPhone to be updated without having to update foreign keys if CustomerPhone remained as identifier
- A Customer must make at least one booking to exist on the database
- It is possible a Room may never be booked

1.2 0NF: Unnormalised form

R1 = (Customer#, CustomerPhone, CustomerName, Booking#, BookingDate, Duration, Room#, RoomName, RoomCapacity)

1.3 1NF: First normal form

R1 = (Customer#, CustomerPhone, CustomerName, {Booking#, BookingDate, Duration, Room#, RoomName, RoomCapacity})

R11 = (Customer#, CustomerPhone, CustomerName)

R12 = (Booking#, BookingDate, Duration, Room#, RoomName, RoomCapacity, Customer#)

1.4 2NF: Second normal form

No partial dependencies, already 2NF.

R11 = (Customer#, CustomerPhone, CustomerName)

R12 = (Booking#, BookingDate, Duration, Room#, RoomName, RoomCapacity, *Customer#*)

1.5 3NF: Third normal form

R11 = (Customer#, CustomerPhone, CustomerName)

R12 = (Booking#, BookingDate, Duration, Room#, RoomName, RoomCapacity, *Customer#*)

R121 = (Booking#, BookingDate, Duration, Room#, *Customer#*)

R122 = (Room#, RoomName, RoomCapacity)

1.6 Named relations

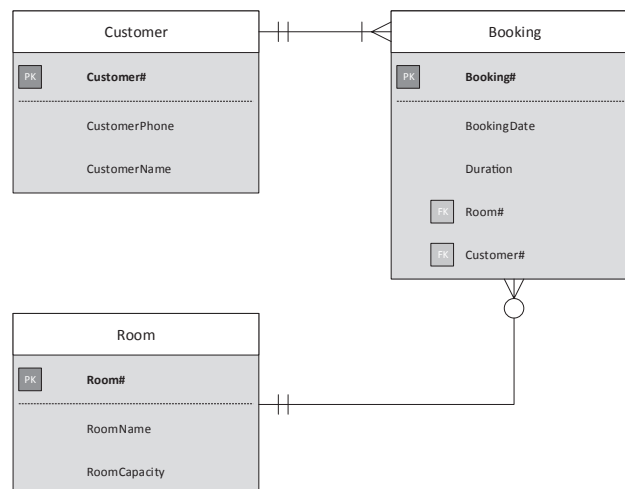
Customer = (Customer#, CustomerPhone, CustomerName)

Booking = (Booking#, BookingDate, Duration, Room#, *Customer#*)

Room = (Room#, RoomName, RoomCapacity)

1.7 Physical E-R diagram

Figure 2: Tavern Bookings Physical E-R Diagram



2 Task 2: Advanced normalisation

Figure 2 below depicts an invoice for an order from a store.

Figure 3: Pakoko Tax Invoice

Tax Invoice

Pakoko
112 St. Georges Terrace, Perth, WA 6000
 Ph: 9325 2458 • ABN: 658475896

Tax Invoice

Invoice #: 24130
Invoice Date: 23-04-2012
Delivery Address:
 52 Brook Street, Noranda, 6062, WA
Delivery Instructions:
 Knock on side door not front door

Email: p.ford@gmail.com

Name: Patrick Ford

Phone: 0425874569

Item Code	Item Name	Cat. Code	Cat. Name	Cost (each)	Qty	Subtotal
SKU8789	Hunter x Hunter, volume 31	CMGN	Comics & Graphic Novels	\$9.99	1	\$9.99
SKU6927	Watchmen (Hard Cover)	CMGN	Comics & Graphic Novels	\$29.99	1	\$29.99
SKU3305	Final Fantasy Master Creatures - Kefka	AFIG	Action Figures	\$34.99	1	\$34.99
SKU6421	Serenity Movie Poster	PSTR	Posters	\$9.80	2	\$19.60
SKU3312	Final Fantasy Master Creatures - Ifrit	AFIG	Action Figures	\$34.99	1	\$34.99
SKU7899	Angry Birds 9" Plushies (Birds)	PLSH	Plush Toys	\$35.00	2	\$70.00
SKU7898	Angry Birds 9" Plushies (Pigs)	PLSH	Plush Toys	\$25.00	1	\$25.00
Grand Total						\$214.57

Thank you for shopping with Pakoko! Please see our return policy at www.pakoko.com.au/returns for any missing, incorrect or damaged items.

2.1 Assumptions

- Auto-incrementing Cust# has been created, replacing CustEmail as customer identifier
 - Auto-incrementing identifier avoids user input error which may result in multiple customers with the same email address
 - Allows CustEmail to be updated without having to update foreign keys if CustEmail remained as identifier
- Each item is only in one category
- Item codes are unique per item, even if the items are in different categories
- Invoice header and footer is static and is not stored in the database
 - Includes Pakoko business details header and thank you / return policy URL footer
- Derived attributes are not stored in the database
 - Includes Item Subtotal and Invoice Grand Total
- A Customer must make at least one order to exist on the database

- An Invoice must contain at least one InvoiceItem
- An Item may never be ordered
- A Category may never be used

2.2 0NF: Unnormalised form

$R1 = (\text{Cust\#}, \text{CustEmail}, \text{CustName}, \text{CustPhone}, \text{DeliveryAddress}, \text{DeliveryInstructions}, \{\text{Invoice\#}, \text{InvoiceDate}, \{\text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost}, \text{Qty}\}\})$

2.3 1NF: First normal form

$R1 = (\text{Cust\#}, \text{CustEmail}, \text{CustName}, \text{CustPhone}, \text{DeliveryAddress}, \text{DeliveryInstructions}, \{\text{Invoice\#}, \text{InvoiceDate}, \{\text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost}, \text{Qty}\}\})$

$R11 = (\text{Cust\#}, \text{CustEmail}, \text{CustName}, \text{CustPhone}, \text{DeliveryAddress}, \text{DeliveryInstructions})$

$R12 = (\text{Invoice\#}, \text{InvoiceDate}, \text{Cust\#})$

$R13 = (\text{Invoice\#}, \text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost}, \text{Qty})$

2.4 2NF: Second normal form

$R11 = (\text{Cust\#}, \text{CustEmail}, \text{CustName}, \text{CustPhone}, \text{DeliveryAddress}, \text{DeliveryInstructions})$

$R12 = (\text{Invoice\#}, \text{InvoiceDate}, \text{Cust\#})$

$R13 = (\text{Invoice\#}, \text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost}, \text{Qty})$

$R131 = (\text{Invoice\#}, \text{ItemCode}, \text{Qty})$

$R132 = (\text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost})$

2.5 3NF: Third normal form

$R11 = (\text{Cust\#}, \text{CustEmail}, \text{CustName}, \text{CustPhone}, \text{DeliveryAddress}, \text{DeliveryInstructions})$

$R12 = (\text{Invoice\#}, \text{InvoiceDate}, \text{Cust\#})$

$R131 = (\text{Invoice\#}, \text{ItemCode}, \text{Qty})$

$R132 = (\text{ItemCode}, \text{ItemName}, \text{CatCode}, \text{CatName}, \text{Cost})$

$R1321 = (\text{ItemCode}, \text{ItemName}, \text{CatCode})$

R1322 = (CatCode, CatName)

2.6 Named relations

Customer = (Cust#, CustEmail, CustName, CustPhone, DeliveryAddress, DeliveryInstructions)

Invoice = (Invoice#, InvoiceDate, Cust#)

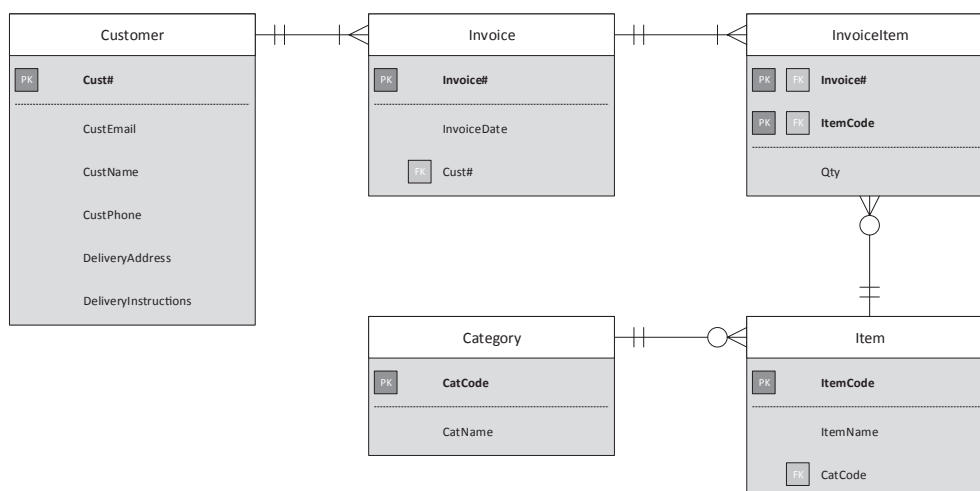
InvoiceItem = (Invoice#, ItemCode, Qty)

Item = (ItemCode, ItemName, CatCode)

Category = (CatCode, CatName)

2.7 Physical E-R diagram

Figure 4: Tax Invoice Physical E-R Diagram



3 Task 3: Entity-Relationship modelling

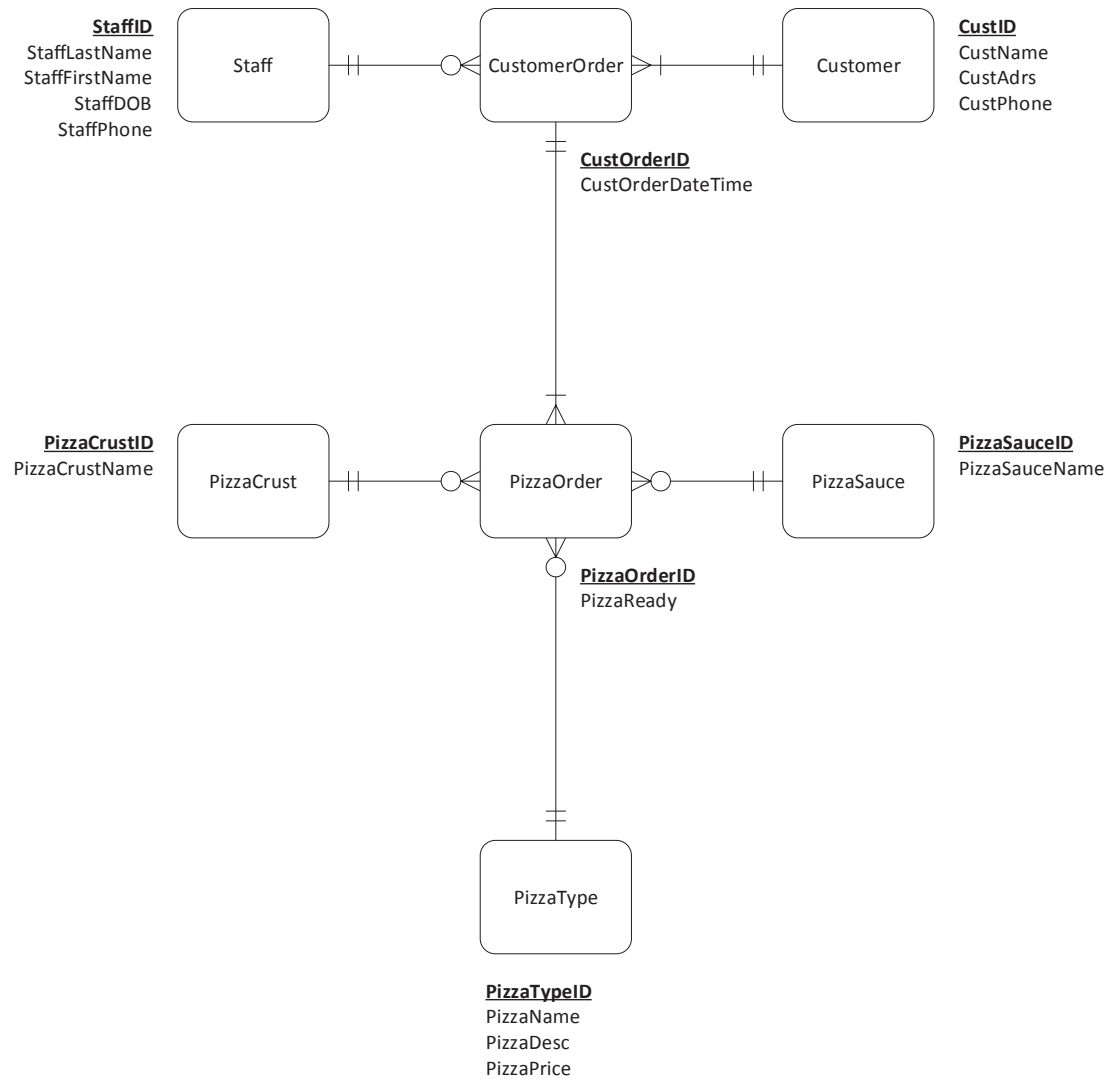
You have been hired to design a database system for a pizza store. The database must encompass the customers, staff, pizza details and the pizza orders made by customers.

3.1 Assumptions

- A Customer must make at least one CustomerOrder to exist on database
- Some staff may not take any CustomerOrders
- A CustomerOrder must contain at least one PizzaOrder
- A PizzaOrder must include one PizzaType selection
 - It is possible that a PizzaType may never be selected for a PizzaOrder
- A PizzaOrder must include one PizzaCrust selection
 - It is possible that a PizzaCrust may never be selected for a PizzaOrder
- A PizzaOrder must include one PizzaSauce selection
 - It is possible that a PizzaSauce may never be selected for a PizzaOrder

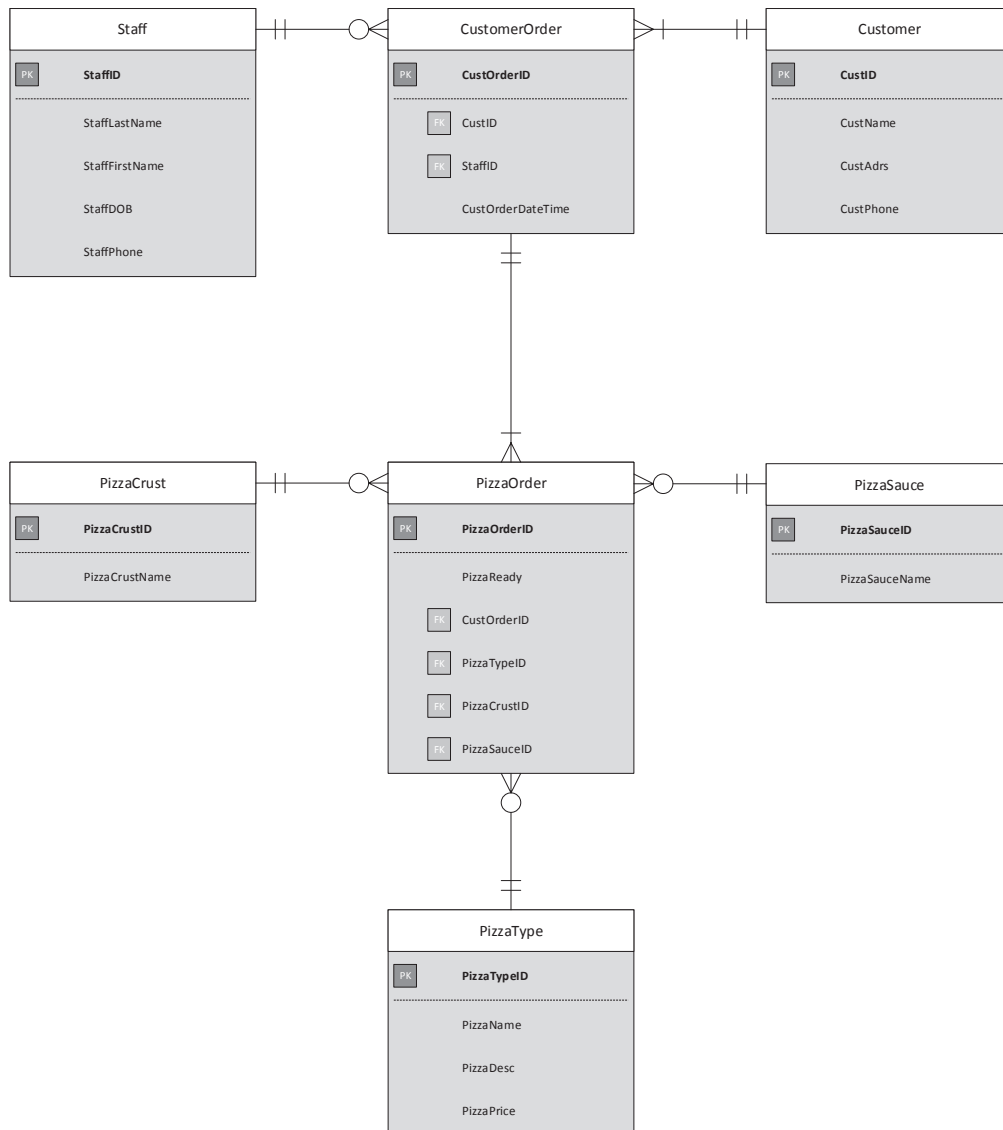
3.2 Logical E-R diagram

Figure 5: Pizza Store Logical E-R Diagram



3.3 Physical E-R diagram

Figure 6: Pizza Store Physical E-R Diagram



4 Task 4: Advanced Entity-Relationship modelling

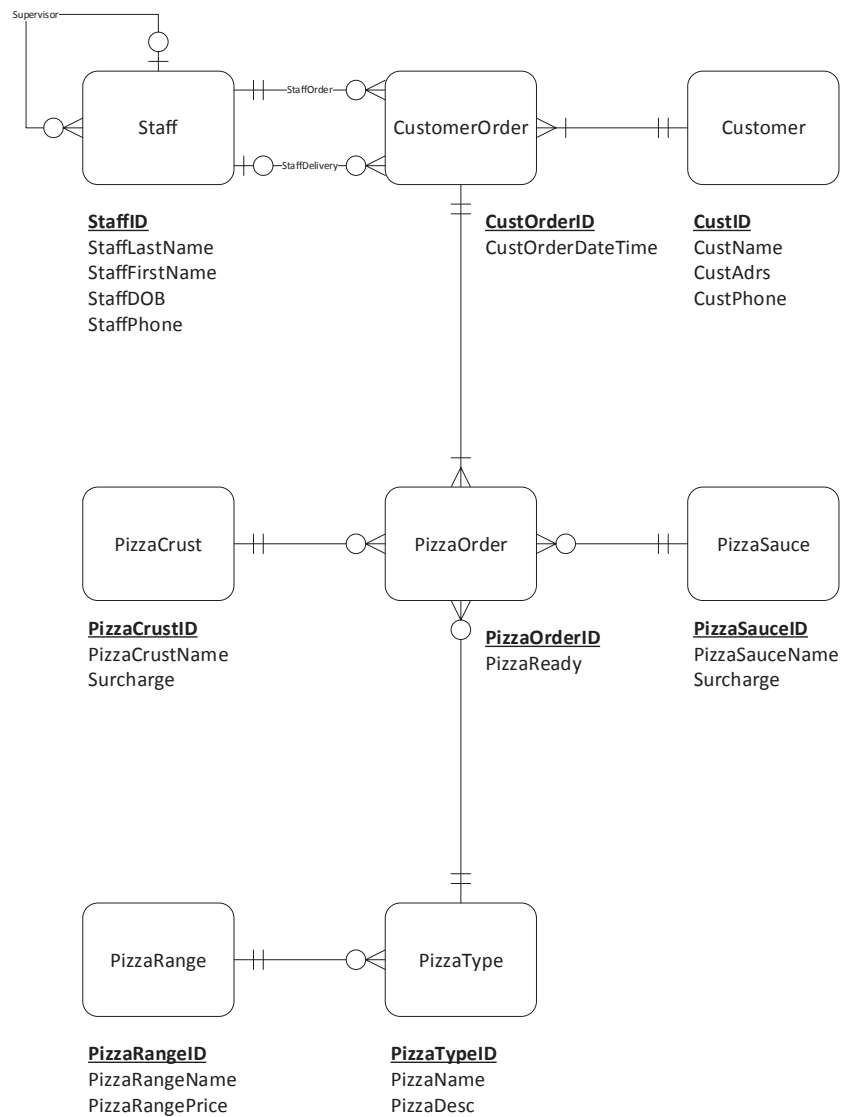
The pizza store from Task 3 now requires you to update and expand the previous database you designed for them, in order to record some additional information.

4.1 Assumptions

- A staff member may be a supervisor to many staff members
 - A staff member may only have one supervisor
 - Some staff may not have a supervisor
- A staff member may not deliver any pizzas
- A PizzaType must include one PizzaRange selection
 - It is possible that a PizzaRange may never be selected for a PizzaOrder

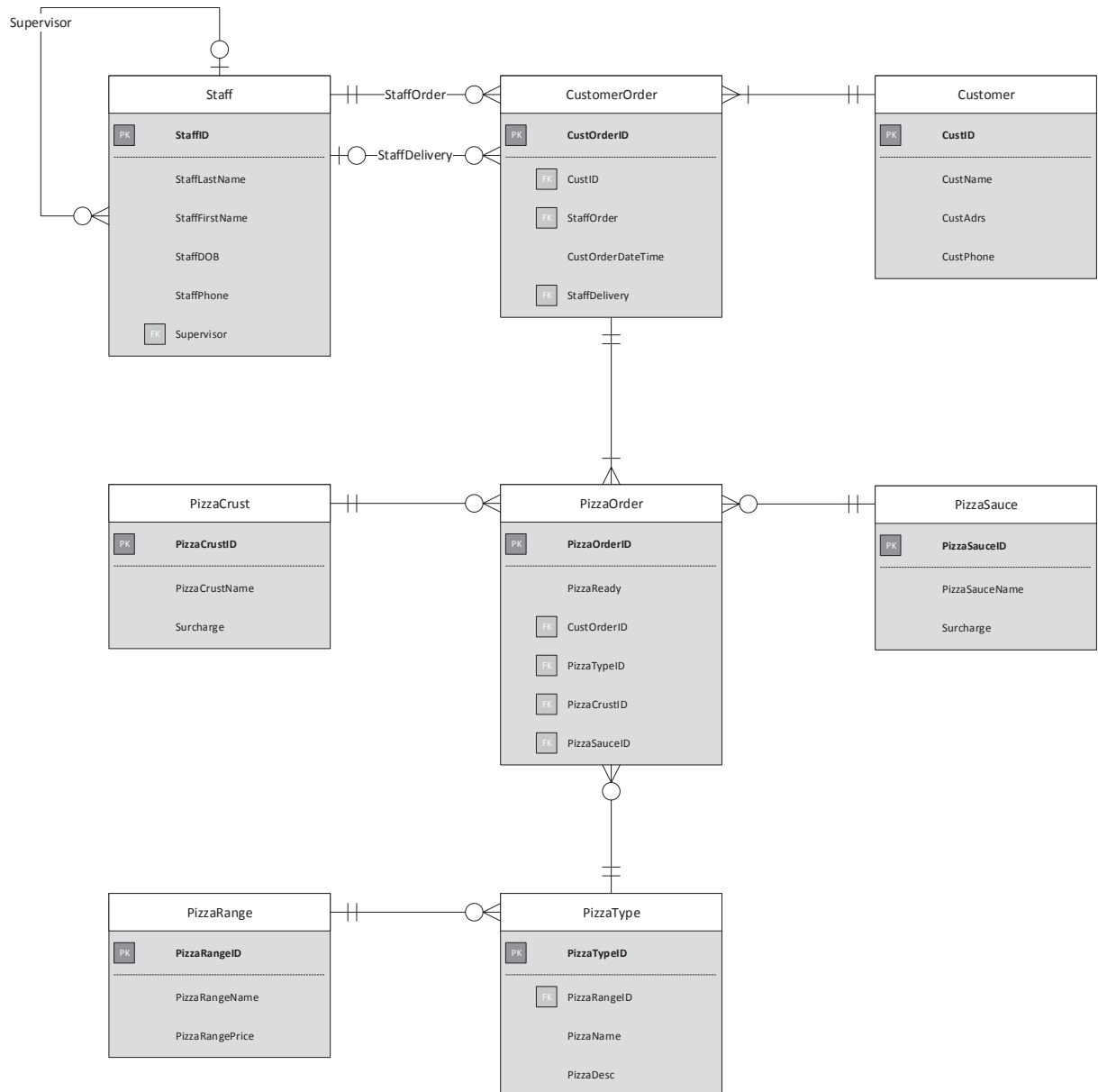
4.2 Logical E-R diagram

Figure 7: Pizza Store Advanced Logical E-R Diagram



4.3 Physical E-R diagram

Figure 8: Pizza Store Advanced Physical E-R Diagram



4.4 Data Dictionary & Creation Order

Table 1: “**staff**” stores details about staff

Column name	Type/Length	Null	Constraints	Other
staff_id	INT	NOT NULL	PK	IDENTITY
staff_last_name	VARCHAR(20)	NOT NULL		
staff_first_name	VARCHAR(20)	NOT NULL		
staff_dob	DATE	NOT NULL		
staff_phone	VARCHAR(20)	NOT NULL		
supervisor	INT	NULL	FK (staff.staff_id)	

Table 2: “**customer**” stores details about customer

Column name	Type/Length	Null	Constraints	Other
cust_id	INT	NOT NULL	PK	IDENTITY
cust_name	VARCHAR(50)	NOT NULL		
cust_adrs	TEXT	NOT NULL		
cust_phone	VARCHAR(20)	NOT NULL		

Table 3: “**customer_order**” stores details about customer order

Column name	Type/Length	Null	Constraints	Other
cust_order_id	INT	NOT NULL	PK	IDENTITY
cust_id	INT	NOT NULL	FK (customer.cust_id)	
staff_order	INT	NOT NULL	FK (staff.staff_id)	
cust_order_datetime	DATETIME	NOT NULL		
staff_delivery	INT	NULL	FK (staff.staff_id)	

Table 4: “**pizza_crust**” stores details about pizza crust

Column name	Type/Length	Null	Constraints	Other
pizza_crust_id	INT	NOT NULL	PK	IDENTITY
pizza_crust_name	VARCHAR(20)	NOT NULL		
surcharge	MONEY	NOT NULL		

Table 5: “**pizza_sauce**” stores details about pizza sauce

Column name	Type/Length	Null	Constraints	Other
pizza_sauce_id	INT	NOT NULL	PK	IDENTITY
pizza_sauce_name	VARCHAR(20)	NOT NULL		
surcharge	MONEY	NOT NULL		

Table 6: “**pizza_range**” stores details about pizza range

Column name	Type/Length	Null	Constraints	Other
pizza_range_id	INT	NOT NULL	PK	IDENTITY
pizza_range_name	VARCHAR(20)	NOT NULL		
pizza_range_price	MONEY	NOT NULL		

Table 7: “**pizza_type**” stores details about pizza type

Column name	Type/Length	Null	Constraints	Other
pizza_type_id	INT	NOT NULL	PK	IDENTITY
pizza_range_id	INT	NOT NULL	FK (pizza_range.pizza_range_id)	
pizza_name	VARCHAR(20)	NOT NULL		
pizza_desc	TEXT	NOT NULL		

Table 8: “**pizza_order**” stores details about pizza order

Column name	Type/Length	Null	Constraints	Other
pizza_order_id	INT	NOT NULL	PK	IDENTITY
pizza_ready	BIT	NOT NULL		DEFAULT 0
cust_order_id	INT	NOT NULL	FK (customer.cust_id)	
pizza_type_id	INT	NOT NULL	FK (pizza_type.pizza_type_id)	
pizza_crust_id	INT	NOT NULL	FK (pizza_crust.pizza_crust_id)	
pizza_sauce_id	INT	NOT NULL	FK (pizza_sauce.pizza_sauce_id)	