

Edith Cowan University
CSG1207
Systems & Database Design
Assignment 1

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March 7, 2015

Contents

1	Task 1: Normalisation	3
1.1	0NF: Unnormalised form	3
1.2	1NF: First normal form	3
1.3	2NF: Second normal form	4
1.4	3NF: Third normal form	4
1.5	Named relations	4
1.6	Physical E-R diagram	4
2	Task 2: Advanced normalisation	5
2.1	0NF: Unnormalised form	6
2.2	1NF: First normal form	6
2.3	2NF: Second normal form	6
2.4	3NF: Third normal form	6
2.5	Named relations	7
2.6	Physical E-R diagram	7
3	Task 3: Entity-Relationship modelling	7
3.1	Logical E-R diagram	7
3.2	Physical E-R diagram	7
4	Task 4: Advanced Entity-Relationship modelling	7
4.1	Logical E-R diagram	7
4.2	Physical E-R diagram	7

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

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
- BookingDate time element has been split into its own attribute
 - New attributes created called BookingTimeStart and BookingTimeEnd
 - Duration attribute is now derived
 - Allows system to check availability of room before a new booking can be created

1.1 0NF: Unnormalised form

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

1.2 1NF: First normal form

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

R11 = (Customer#, CustomerPhone, CustomerName)

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

1.3 2NF: Second normal form

No partial dependencies, already 2NF.

R11 = (Customer#, CustomerPhone, CustomerName)

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

1.4 3NF: Third normal form

R11 = (Customer#, CustomerPhone, CustomerName)

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

R121 = (Booking#, BookingDate, BookingTimeStart, BookingTimeEnd, *Room#*, *Customer#*)

R122 = (Room#, RoomName, RoomCapacity)

1.5 Named relations

Customer = (Customer#, CustomerPhone, CustomerName)

Booking = (Booking#, BookingDate, BookingTimeStart, BookingTimeEnd, *Room#*, *Customer#*)

Room = (Room#, RoomName, RoomCapacity)

1.6 Physical E-R diagram

2 Task 2: Advanced normalisation

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

Figure 2: 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.

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
- 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

2.1 0NF: Unnormalised form

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

2.2 1NF: First normal form

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

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

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

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

2.3 2NF: Second normal form

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

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

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

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

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

2.4 3NF: Third normal form

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

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

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

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

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

$R1322 = (\text{CatCode}, \text{CatName})$

2.5 Named relations

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

Invoice = (Invoice#, InvoiceDate, *Cust#*)

InvoiceItem = (Invoice#, ItemCode, Qty)

Item = (ItemCode, ItemName, *CatCode*)

Category = (CatCode, CatName)

2.6 Physical E-R diagram

3 Task 3: Entity-Relationship modelling

3.1 Logical E-R diagram

3.2 Physical E-R diagram

4 Task 4: Advanced Entity-Relationship modelling

4.1 Logical E-R diagram

4.2 Physical E-R diagram