Scenario description

A hotel wants to have a simple application to keep track of their customers, their personal details, the room, the room number assigned to them, the services available to them, the check in and out dates.

Assumptions:
1. Each hotel room is only occupied by one guest
2. There is only one serviceperson per room
3. Each serviceperson may carry out more than 1 service
4. The same room can be booked twice, assuming it is vacant at the time of booking
5. Each customer has only one mobile number and home address each
6. Each employee has only one mobile number

Customer (ID, Name, Gender, mobile no, address, room no, Check in, Check out, Service Name, Service ID no, ServicePerson)

ID	Name	Gender	mobile no	address	room no	Check in	Check out	Service Name	Service ID no	ServicePerson
123A	Josef Segal	M	87982495	5001 Summer Street	1	19/11/2017	24/11/2017	Breakfast, cleaning	1, 2	Joss Mullins
234B	Karen Monroe	F	95410926	2000 Winter Road	2	3/10/2017	8/10/2017	Laundry, massage	3, 4	Aahil Milne
345C	Rosa Lawrence	F	87454018	666 Spring Avenue	3	16/9/2017	20/9/2017	Breakfast, massage	1, 4	Lara Hope
456D	Alicia Perry	F	82874025	961 Woodbridge Lane	4	20/12/2019	25/12/2019	Breakfast, cleaning	1, 2	Uzma Mill
567E	Clare Sharp	F	81609760	8322 Court Dr	5	4/1/2017	9/1/2017	Laundry, massage	3, 4	Kaylie Watson
678F	Jamarion Collins	F	96076920	9288 East Drive	6	10/2/2017	15-Feb	Reception	5	Diane Watt
789G	Sincere Ponce	M	80378903	200 Summer St.	7	15/3/2017	20/3/2017	Room Service	6	Niyah Alford
890H	Paris Sweeney	F	95320203	439 N.Cross St	8	29/3/2017	3/4/2017	Laundry	3	Dominik Torres
560I	Rosa Cooke	F	96042044	27 North Stillwater Cou	9	1/9/2017	6/9/2017	Massage	4	Milosz Lin
408J	Briana Cunningha	F	94824165	87 Bay Meadows Drive	10	20/11/2017	25/11/2017	Safes	7	Asma Paterson
503K	Alyson Lee	M	86769762	3 Devonshire Street	11	30/11/2017	5/12/2017	Room Service	6	Velma Hardin
782L	Isabell Odom	F	98686273	417 Thomas Drive	12	27/6/2017	2/7/2017	Cleaning	2	Radhika Sheppard
397M	Lilyana Robbins	F	86938323	7467 Miller St.	13	13/9/2018	18/9/2018	Breakfast	1	Kayley Munro
808N	Logan Crosby	M	93205138	607 Marconi Lane	14	14/11/2018	19/11/2018	Cleaning	2	Caprice Kouma
120O	Aldo Meyers	M	86070255	9602 Sunset Rd	15	13/12/2018	18/12/2018	Room service	6	Kezia Livingston
312P	Gabriela Lopez	F	93233857	641 Holly Street	16	30/7/2019	4/8/2019	Reception	5	Zoe Randolph
133Q	Fletcher Brooks	M	95127494	9973 Jennings St	17	6/8/2019	11/8/2019	Room Service	6	Abigail Adamson
892R	Raegan Day	M	94462766	20 River Lane	18	12/9/2019	17/9/2019	Massage	4	Precious Francis
232S	Ashtyn Potter	M	92839612	9238 Fairfield St	19	5/12/2019	10/12/2019	Breakfast	1	Arlene Cousins

The current way of managing the data is not ideal as there are data redundancies which could lead to inconsistency in the data.

Normalisation

The earlier table does not fulfil the conditions of 1NF since some people have more than one service mapped to them, It can be normalised to 1NF by creating separate records for rows that contain multiple values:

Customer (ID, Name, Gender, Mobile No, Address, Room Number, BookingNo, Check in, Check out, ServiceName, ServiceID, ServicePerson)

ID	Name	Gender	mobile no	address	room no	BookingNo	Check in	Check out	Service Na	Service ID no	ServicePerson	ServicePerson Mobile
123A	Josef Segal	M	87982495	5001 Summer Street	1	S001	19/11/2017	24/11/2017	Breakfast	1	Joss Mullins	99065766
123A	Josef Segal	M	87982495	5001 Summer Street	1	S001	19/11/2017	24/11/2017	Cleaning	2	Aahil Milne	82235925
234B	Karen Monroe	F	95410926	2000 Winter Road	2	S003	3/10/2017	8/10/2017	Laundry	3	Lara Hope	86422008
234B	Karen Monroe	F	95410926	2000 Winter Road	2	S004	3/10/2017	8/10/2017	Massage	4	Kaylie Watson	95538750
345C	Rosa Lawrence	F	87454018	666 Spring Avenue	3	S005	16/9/2017	20/9/2017	Breakfast	1	Craw Carson	81231213
345C	Rosa Lawrence	F	87454018	666 Spring Avenue	3	S006	16/9/2017	20/9/2017	Massage	4	Kaylie Watson	95538750
456D	Alicia Perry	F	82874025	961 Woodbridge Lane	4	S007	20/12/2019	25/12/2019	Breakfast	1	Joss Mullins	99065766
456D	Alicia Perry	F	82874025	961 Woodbridge Lane	4	S008	20/12/2019	25/12/2019	Cleaning	2	Aahil Milne	82235925
567E	Clare Sharp	F	81609760	8322 Court Dr	5	S009	4/1/2017	9/1/2017	Laundry	3	Lara Hope	86422008
567E	Clare Sharp	F	81609760	8322 Court Dr	5	S010	4/1/2017	9/1/2017	Massage	4	Kaylie Watson	95538750
678F	Jamarion Collin	F	96076920	9288 East Drive	6	S011	10/2/2017	15/2/2017	Reception	5	Diane Watt	98757063
789G	Sincere Ponce	M	80378903	200 Summer St.	7	S012	15/3/2017	20/3/2017	Room Serv	6	Zoe Randolph	97122197
890H	Paris Sweeney	F	95320203	439 N.Cross St	8	S013	29/3/2017	3/4/2017	Laundry	3	Lara Hope	86422008
560I	Rosa Cooke	F	96042044	27 North Stillwater Cou	9	S014	1/9/2017	6/9/2017	Massage	4	Kaylie Watson	95538750
408J	Briana Cunningh	F	94824165	87 Bay Meadows Drive	10	S015	20/11/2017	25/11/2017	Safes	7	Asma Paterson	87139526
503K	Alyson Lee	M	86769762	3 Devonshire Street	11	S016	30/11/2017	5/12/2017	Room Serv	6	Zoe Randolph	97122197
782L	Isabell Odom	F	98686273	417 Thomas Drive	12	S017	27/6/2017	2/7/2017	Cleaning	2	Aahil Milne	82235925
397M	Lilyana Robbins	F	86938323	7467 Miller St.	13	S018	13/9/2018	18/9/2018	Breakfast	1	Joss Mullins	99065766
808N	Logan Crosby	M	93205138	607 Marconi Lane	14	S019	14/11/2018	19/11/2018	Cleaning	2	Aahil Milne	82235925
120O	Aldo Meyers	M	86070255	9602 Sunset Rd	15	S020	13/12/2018	18/12/2018	Room serv	6	Zoe Randolph	97122197
312P	Gabriela Lopez	F	93233857	641 Holly Street	16	S021	30/7/2019	4/8/2019	Reception	5	Diane Watt	98757063
133Q	Fletcher Brooks	M	95127494	9973 Jennings St	17	S022	6/8/2019	11/8/2019	Room Serv	6	Zoe Randolph	97122197
892R	Raegan Day	M	94462766	20 River Lane	18	S023	12/9/2019	17/9/2019	Massage	4	Kaylie Watson	95538750
232S	Ashtyn Potter	M	92839612	9238 Fairfield St	19	S024	5/12/2019	10/12/2019	Breakfast	1	Joss Mullins	99065766

The table does not fulfil the conditions of 2NF since some of the attributes do not entirely depend on the primary key. It can be further normalised to 2NF by splitting into 3 tables:

1. Customer (ID, Name, Gender, Mobile no, address) - 2NF

ID	Name	Gender	mobile no	address
123A	Josef Segal	M	87982495	5001 Summer Street
234B	Karen Monroe	F	95410926	2000 Winter Road
345C	Rosa Lawrence	F	87454018	666 Spring Avenue
456D	Alicia Perry	F	82874025	961 Woodbridge Lane
567E	Clare Sharp	F	81609760	8322 Court Dr
678F	Jamarion Collins	F	96076920	9288 East Drive
789G	Sincere Ponce	M	80378903	200 Summer St.
890H	Paris Sweeney	F	95320203	439 N.Cross St
560I	Rosa Cooke	F	96042044	27 North Stillwater Court
408J	Briana Cunningham	F	94824165	87 Bay Meadows Drive
503K	Alyson Lee	M	86769762	3 Devonshire Street
782L	Isabell Odom	F	98686273	417 Thomas Drive
397M	Lilyana Robbins	F	86938323	7467 Miller St.
808N	Logan Crosby	M	93205138	607 Marconi Lane
120O	Aldo Meyers	M	86070255	9602 Sunset Rd
312P	Gabriela Lopez	F	93233857	641 Holly Street
133Q	Fletcher Brooks	M	95127494	9973 Jennings St
892R	Raegan Day	M	94462766	20 River Lane
232S	Ashtyn Potter	M	92839612	9238 Fairfield St

2. Room (BookingNo, RoomNo, Check in Date, Check out Date

	BookingNo	room no	Check in	Check out	CustomerID
1					
2	S001	1	19/11/2017	24/11/2017	123A
3	S002	2	3/10/2017	8/10/2017	234B
4	S003	3	16/9/2017	20/9/2017	345C
5	S004	4	20/12/2019	25/12/2019	456D
6	S005	5	4/1/2017	9/1/2017	567E
7	S006	6	10/2/2017	15/2/2017	678F
8	S007	6	15/3/2017	20/3/2017	789G
9	S008	4	29/3/2017	3/4/2017	890H
10	S009	2	1/9/2017	6/9/2017	560I
11	S010	5	20/11/2017	25/11/2017	408J
12	S011	1	30/11/2017	5/12/2017	503K
13	S012	7	27/6/2017	2/7/2017	782L
14	S013	3	13/9/2018	18/9/2018	397M
15	S014	2	14/11/2018	19/11/2018	808N
16	S015	1	13/12/2018	18/12/2018	120O
17	S016	4	30/7/2019	4/8/2019	312P
18	S017	4	6/8/2019	11/8/2019	133Q
19	S018	5	12/9/2019	17/9/2019	892R
20	S019	6	5/12/2019	10/12/2019	232S
21	S020	1	21/12/2017	2/1/2018	123A

3. Service Called(BookingNo*, ServiceID, ServicePerson Mobile no)

	BookingN	ServiceID	ServicePersonMobile
1			
2	S001	1	99065766
3	S001	2	82235925
4	S002	3	86422008
5	S002	4	95538750
6	S003	5	98757063
7	S003	6	97122197
8	S004	4	95538750
9	S004	3	86422008
10	S005	3	86422008
11	S005	3	86422008
12	S006	5	98757063
13	S007	7	87139526
14	S008	4	95538750
15	S009	5	98757063
16	S010	1	99065766
17	S011	2	82235925
18	S012	4	95538750
19	S013	7	87135926
20	S014	5	98757063
21	S015	2	82235925
22	S016	4	95538750
23	S017	3	86422008
24	S018	2	82235925
25	S019	1	81231213
26	S020	1	81231213

The third table, *Service Called* does not fulfil the conditions of 3NF since there are transitional dependencies within the table: The service ID provided is assigned to a Booking ID while the Mobile number of the serviceperson providing the service is dependent on the Service ID. It can be further normalised to 3NF by further splitting it into 2 more tables:

1. Services(<u>ServiceID*</u>,ServiceName,Price,EmployeeID*)

ServiceID	ServiceNa	Price	EmployeeID
1	Breakfast	5	1
2	Cleaning	3	2
3	Laundry	3	3
4	Massage	10	4
5	Reception	0.5	5
6	Room Ser	10	6
7	Safes	3	7

2. Booked Services(<u>BookingNo*</u>, ServiceID*)

BookingN	ServiceID
S001	1
S001	3
S002	2
S002	1
S003	2
S003	1
S004	2
S004	1

Design of Database

The application is therefore designed using a relational database schema.
The entities are as follows:

- Customer
- Room
- Employee
- Service

From the Entity-Entity Matrix:

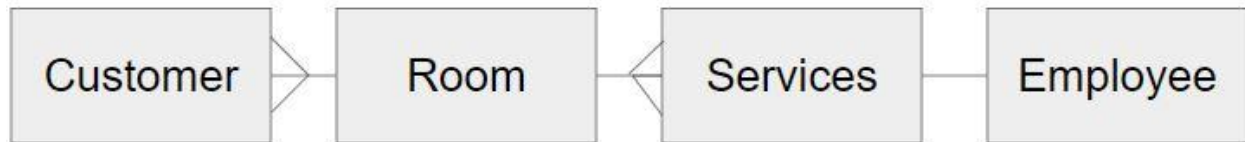|	Customer	Room	Service	Employee
Customer		Books	Requests	
Room	Booked By			
Service	Requested	By Booking		Provided by
Employee			Provides	

ER Diagram

The following relationships between the entities are established
Customer - Room: Many-to-one
Room - Service: One-to-Many
Service - Employee: One-to-one

Functionality
These are the different queries that can be made through the application:

Basic search:
1. List all customers and their details
2. List all rooms and retrieve their details
3. List all employees and retrieve their details
4. Show all services available
5. Show all room bookings
6. Show bookings with customer names
7. Show booking with room details
8. Show services in each booking

Aggregates queries:
9. Count total customers
10. Count total bookings
11. Count bookings per customer
12. Average stay length
13. Total revenue from services
14. Revenue per employee
15. Most popular service