4: Zillow

- **Tanvi Deosarkar**
- **Aakash Jadhav**
- **Faizalabbas Saiyed**

The Challenge: Design a Database and Implement for Your E-Business Using A Life Cycle Approach to Database Design

1. Describe your understanding of the problem. How will you address the business requirements? What questions do you have and what assumption have you made to address these ambiguities?

Zillow Business requirements?

While researching and analyzing e-commerce business Zillow. We found out the initial requirement is to build an end to end database management system.

Problem statement for building the database system is Zillow is getting huge amounts of data from different users and their aim was to store the data and connect the database tables and avoid the partial dependency or transitive dependency from the the data and all the chunk of data should be in 3rd normal form so that these data sets will be used to show front end information.

Users of the systems are Customer, Agent, and zillow website employees. This database will have data about the properties, location, mortgage, amenities, transactions etc

- Scalability: Designing the database system to handle a large volume of data and accommodate future growth as the number of properties and users increases.

- Performance: Optimizing the database system to provide fast and efficient access to property information, enabling users to search, browse, and retrieve data quickly.

- Security: Implementing robust security measures to protect sensitive user information and prevent unauthorized access to the database.

Hypothetical questions and answers for the requirements:

1. Which particular data points should be incorporated into the Zillow database design system?
    - The main data points we can include are Property ID, Address, Listing Price, Number of Bedrooms, Number of Bathrooms, Square Footage, Property Type, Listing Status, and other basic property details. Additional data points such as property features, images, and historical data can also be incorporated.
2. What kind of structure and organization do you want the data to have inside the database?
    - A Relational DataBase model with appropriate tables for entities like Property, Sell Property, Rent Property, Agents, Listings and many more. Then we need to define the relationship between these tables by using PK and FK. After that we need Normalization to avoid data redundancy.

3. Does the database design need to take any special conditions or limitations into account?
    - The database should be designed in accordance with local real estate and privacy laws. For example we must manage user data and payment information securely while maintaining compliance to data protection requirements.

4. How often will fresh data need to be added to the database?
   - Data will be continuously updated as new properties are listed or sold and user interactions take place. The structure of the database should allow for frequent data additions, updates and data retrieval while keeping the other data as it is.
5. Do you have a preference for the database management system or technological stack that will be employed?
   - Yes, we would like to implement a database management system of MS access as the data in our database design will be from small to medium sized.

6. Will any particular search or filtering features need to be supported by the database?
   - Websites like zillow require robust search to provide user friendly and efficient experience for property seekers. We are going to include filtering features such as Location Based search, Property Type, Price Range, Square footage, Property Status.

Assumption:

While creating relationships between the table we made few assumptions like
- Property to Lease Agreement: Here we assume that one property can have only one lease agreement if it is rented and zero lease agreement if it is active in listing and not yet rented.

- Property to location: Property search is mainly based on the location that's why we created subtype location from the supertype property. It will have detailed information about the property location and searching location would be easy.

- Admin would be the person who will be managing the users, agents and properties that's why admin and other entities are connected with one to many relationships

- Multiple User Roles: This statement makes the assumption that the database system would accommodate many user roles, each with a unique set of rights and access levels, such as administrators, agents, customer sellers, and buyers.

- Data Validation: Presuming that the database system would be equipped with features to verify and guarantee the accuracy of the data being input, like identifying legitimate addresses and avoiding duplicate entries.

- Scalability and High Availability: This refers to the expectation that the database system would be built to support numerous users at once and be expandable to meet future expansion, with safeguards in place to guarantee high availability and low downtime.

2. Identify (list and describe) the Entities and Relationships you derived from your analysis

1. **User:**
    - Attributes: User_ID(PK), Name, Email, Phone_Number, Address.

2. **Property:**
    - Attributes: Property_ID(PK), Listing_Price, Bedrooms, Bathrooms, Square_Footage, Home_Type, Property_Type, Listing_Status, User_ID(FK).

3. **Agent:**
    - Attributes: Agent_ID(PK), User_ID(FK), Property_ID(FK) Name, Email, Phone_Number, Agency_Name.

4. **Review:**
    - Attributes: Review_ID(PK), User_ID(FK), Property_ID(FK), Rating, Comment, Review_Date.

5. **Transaction:**
    - Attributes: Transaction_ID(PK), User_ID(FK), Property_ID(FK), Transaction_Date, Sell_Price.

6. **Location:**
    - Attributes: Location_ID(PK), Apt_Number, Street, City, State, Country, Property_ID(FK).

7. **Mortgage:**
    Attributes: Mortgage_ID(PK), Mortgage_amount, Mortgage_provider, Date, Amount, Tenure, User_ID(FK), Property_ID(FK).

8. **Amenities:**
    - Attributes: Amenities_ID(PK), Property_ID(FK), Amenities_Name, Description.

9. **Lease Agreement:**
    - Attributes: Lease_Agreement_ID(PK), User_ID(FK), Property_ID(FK), Lease_Start_Date, Lease_End_Date, Terms_and_Conditions.

10. **Admin:**
    - Attributes: Admin_ID(PK), Name, Email, Agent_ID(FK), User_ID(FK), Property_ID(FK),

Relationships of entities:
1) Admin to Agent one to many
2) Admin to Property one to many
3) Admin to User one to many
4) User to Agent one to many
5) User to Property one to many
6) User to Review one to many
7) User to Lease Agreement one to one
8) User to Transaction one to many
9) User to Mortgage one to many
10) Property to Transaction one to many

11) Property to Mortgage one to many
12) Property to Amenities one to many
13) Property to Review one to many
14) Property to Lease agreement one to one

**3. Design a Fist Cut "Top Down" ERD (do not normalize) based on the initial set of information that has been provided. Show the basic entity relationships without concern for M:N relationship. Use Crowsfoot Notation. Remember the ERD is the initial output of your design process to show to the business and validate your understanding of its needs.**

ERD diagram

4. Design a Logical Relational Model and Assign Primary and Foreign Keys Using Crowsfoot Notation. You must Resolve M:N Relationships and Note Cardinality in your model. Also:
a) Identify the Types of Entities in Your Model. For example: Composite, Super-type and Sub-type. Strong vs. Weak. Recursive.
b) Determine Entity Integrity and Referential Integrity (see Entity tables below).

Logical Relational Diagram

Zillow Logical Relational Diagram
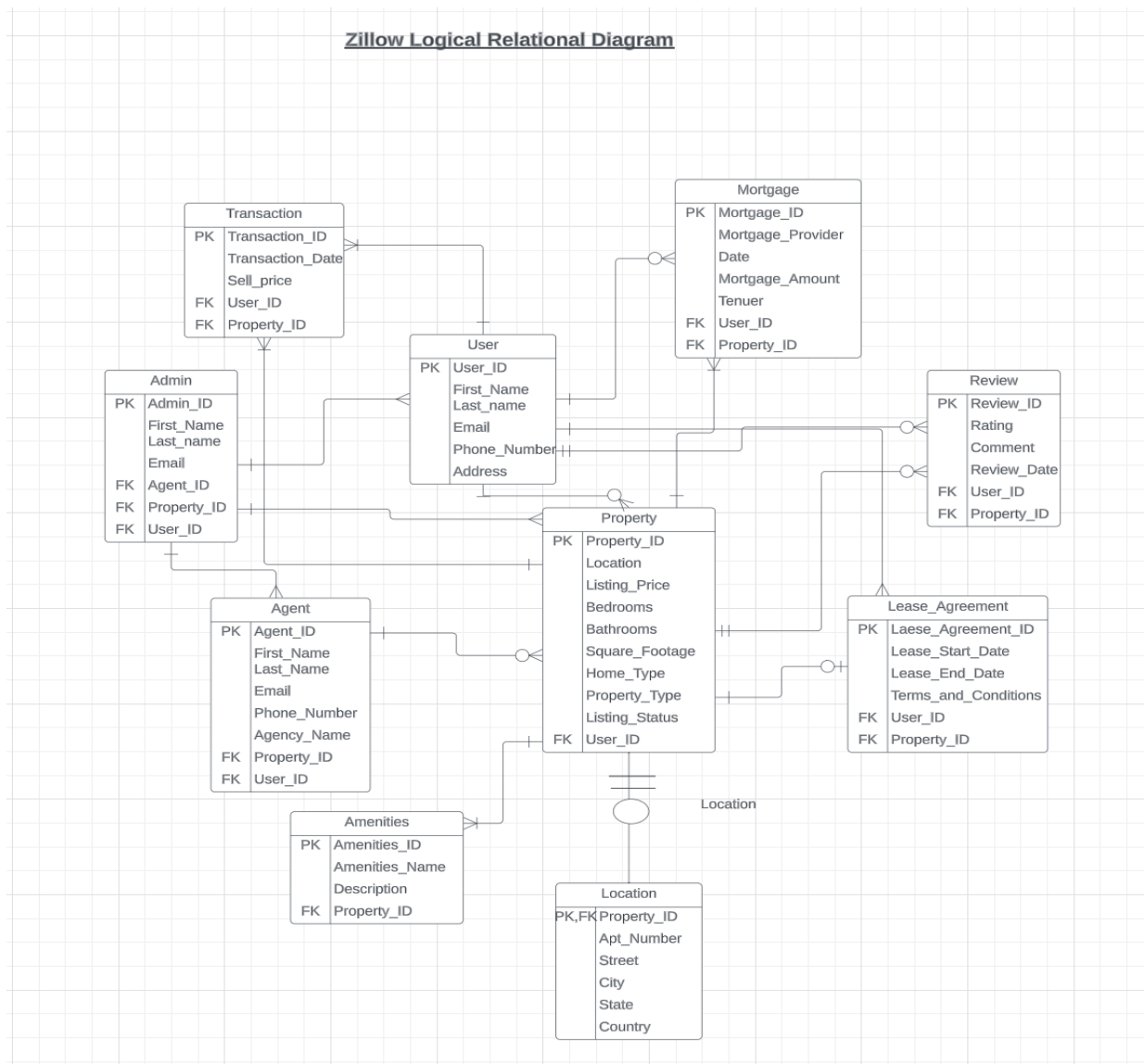
5. Describe Your Approach to Achieving a Fully Normalized Logical Model (with assumptions and tradeoffs that may exist). Are there redundant tables and 1:1 relationships that can be eliminated? Describe partial and transitive dependencies you encountered as you took your model from 1NF to 2NF to 3NF.

Answer:

For the Normalization we got mainly the property data and we found that agent and user data is also present property data in that case we performed following operations

1NF: To achieve the first normal form we made sure there is no duplicate data and data is atomic. To clean the atomic data we separated the attributes like name to first_name & last_name. Address to apt_no, street, city, state, country.
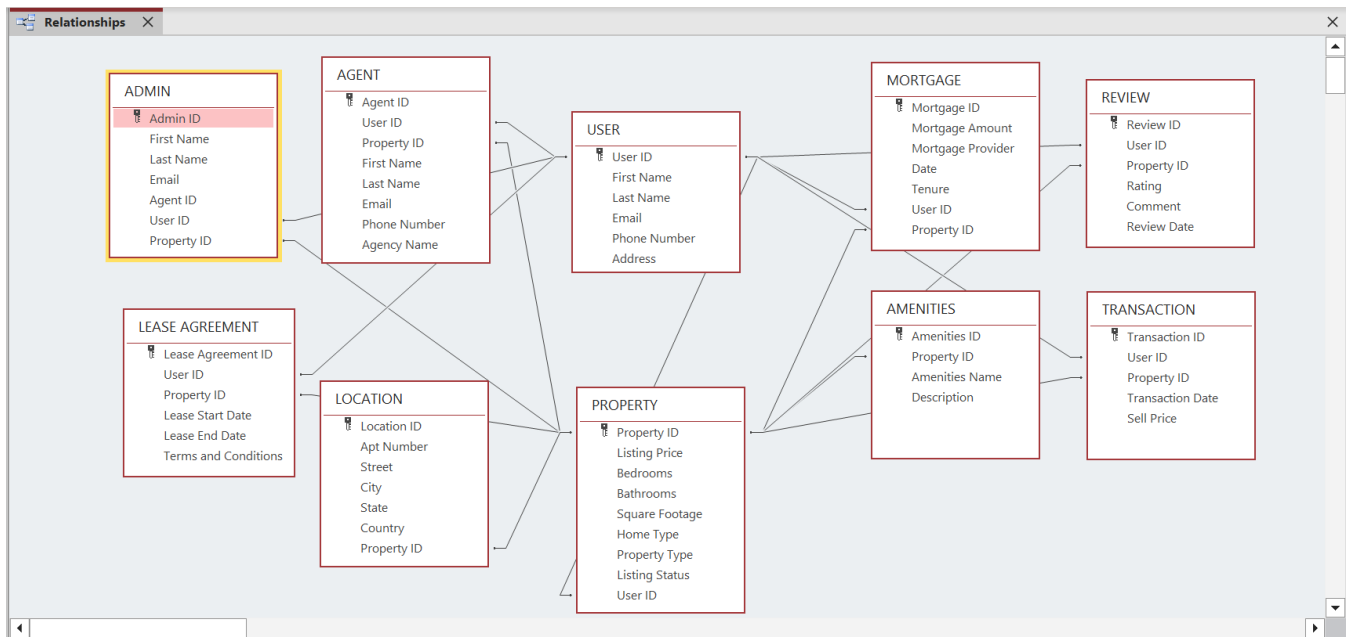
2NF: To achieve the second normal form we made sure it is in first normal form and separated the table to remove the partial dependency like separating User table and Agent table from Property table

3NF: To achieve the third normal form we made sure that data is in 1nf and 2nf and separated the transitive dependencies from each table. Transitive dependencies wear Amenities, Lease_Agreement, Review, Mortgage.

6. Create a Data Dictionary. Create data dictionary for all the tables

USER

Field Name	Data Type
User ID	Number
First Name	Short Text
Last Name	Short Text
Email	Short Text
Phone Number	Short Text
Address	Short Text

TRANSACTION

Field Name	Data Type
Transaction ID	Number
User ID	Number
Property ID	Number
Transaction Date	Date/Time
Sell Price	Currency

REVIEW

Field Name	Data Type
Review ID	Number
User ID	Number
Property ID	Number
Rating	Number
Comment	Short Text
Review Date	Short Text

MORTGAGE

Field Name	Data Type
Mortgage ID	Number
Mortgage Amount	Number
Mortgage Provider	Short Text
Date	Date/Time
Tenure	Short Text
User ID	Number
Property ID	Number

PROPERTY

Field Name	Data Type
Property ID	Number
Listing Price	Currency
Bedrooms	Number
Bathrooms	Number
Square Footage	Short Text
Home Type	Short Text
Property Type	Short Text
Listing Status	Short Text
User ID	Number

LOCATION

Field Name	Data Type
Location ID	Number
Apt Number	Short Text
Street	Short Text
City	Short Text
State	Short Text
Country	Short Text
Property ID	Number

LEASE AGREEMENT

Field Name	Data Type
Lease Agreement ID	Number
User ID	Number
Property ID	Number
Lease Start Date	Date/Time
Lease End Date	Date/Time
Terms and Conditions	Short Text

AMENITIES

Field Name	Data Type
Amenities ID	Number
Property ID	Number
Amenities Name	Short Text
Description	Short Text

AGENT

Field Name	Data Type
Agent ID	Number
User ID	Number
Property ID	Number
First Name	Short Text
Last Name	Short Text
Email	Short Text
Phone Number	Short Text
Agency Name	Short Text

ADMIN

Field Name	Data Type
Admin ID	Number
First Name	Short Text
Last Name	Short Text
Email	Short Text
Agent ID	Number
User ID	Number
Property ID	Number

7. Implement your Relational Logical Model in MS Access.

8. Enter Sample Data in Each Table with at least 20 rows of data per table.

PROPERTY ✕

	Property ID	Listing Price	Bedrooms	Bathrooms	Square Foota	Home Type	Property Typ	Listing Status	User ID
⊞	1	$250,000	3	2	1500 sqft	House	Rent	Active	10
⊞	2	$350,000	4	3	2000 sqft	Apartment	Sell	Pending	5
⊞	3	$180,000	2	1	1000 sqft	House	Rent	Active	15
⊞	4	$420,000	5	4	2500 sqft	Apartment	Rent	Active	4
⊞	5	$300,000	3	2	1800 sqft	House	Rent	Pending	2
⊞	6	$275,000	2	1	1100 sqft	Apartment	Rent	Active	11
⊞	7	$320,000	4	3	1950 sqft	House	Sell	Pending	17
⊞	8	$400,000	3	2	2200 sqft	Apartment	Sell	Active	8
⊞	9	$220,000	2	1	1300 sqft	House	Rent	Active	7
⊞	10	$380,000	4	3	2100 sqft	Apartment	Rent	Pending	19
⊞	11	$260,000	2	1	1250 sqft	House	Rent	Active	14
⊞	12	$360,000	4	3	1900 sqft	Apartment	Sell	Pending	1
⊞	13	$290,000	3	2	1700 sqft	House	Rent	Active	12
⊞	14	$430,000	5	4	2300 sqft	Apartment	Rent	Active	3
⊞	15	$240,000	2	1	1150 sqft	House	Sell	Pending	13
⊞	16	$350,000	4	3	2000 sqft	Apartment	Sell	Active	6
⊞	17	$200,000	3	2	1450 sqft	House	Sell	Pending	18
⊞	18	$410,000	5	4	2400 sqft	Apartment	Rent	Active	9
⊞	19	$270,000	2	1	1250 sqft	House	Rent	Active	20
⊞	20	$390,000	4	3	2100 sqft	Apartment	Rent	Pending	16

LEASE AGREEMENT ✕

Lease Agreer	User ID	Property ID	Lease Start Da	Lease End Date	Terms and Conditions
1	8	17	15/1/2023	15/1/2024	Tenant is responsible for all utilities.
2	16	4	20/3/2023	20/3/2024	No pets allowed on the premises.
3	7	9	10/5/2023	10/5/2024	Rent is due on the 1st of every month.
4	15	13	5/7/2023	5/7/2024	Property should be maintained in good condition.
5	19	1	12/9/2023	12/9/2024	Smoking is not allowed inside the property.
6	2	10	30/11/2023	30/11/2024	No subletting of the property is allowed.
7	11	5	14/2/2024	14/2/2025	Tenant must give 30 days' notice before moving out.
8	4	18	25/4/2024	25/4/2025	Landlord is responsible for lawn maintenance.
9	13	14	9/6/2024	9/6/2025	Property must be returned in a clean condition.
10	5	2	19/8/2024	19/8/2025	Tenant is responsible for any damage to the property.
11	1	7	7/10/2024	7/10/2025	No loud parties or disturbances are allowed.
12	9	11	30/12/2024	30/12/2025	Rent increase of 5% after the first year.
13	12	8	25/3/2025	25/3/2026	Property must be used for residential purposes only.
14	10	6	18/5/2025	18/5/2026	Tenant is responsible for snow removal.
15	18	12	2/7/2025	2/7/2026	Tenant must provide 60 days' notice before leaving.
16	14	19	11/9/2025	11/9/2026	Landlord has the right to inspect the property.
17	6	3	24/11/2025	24/11/2026	Tenant must have renter's insurance.
18	17	15	6/2/2026	6/2/2027	No alterations to the property without permission.
19	3	16	15/4/2026	15/4/2027	Landlord is responsible for pest control.
20	20	20	28/6/2026	28/6/2027	Any breaches of the lease will result in penalties.

Location ID	Apt Number	Street	City	State	Country	Property ID
1	Apt 101	123 Main St	New York City	New York	USA	9
2	Suite 200	456 Elm St	Los Angeles	California	USA	18
3	Unit 3B	789 Oak Ave	Chicago	Illinois	USA	7
4	#305	1010 Maple Rd	Houston	Texas	USA	12
5	Apt 15C	234 Pine Ln	Phoenix	Arizona	USA	2
6	Unit 22D	567 Birch Dr	Philadelphia	Pennsylvania	USA	14
7	Suite 50	890 Cedar St	San Antonio	Texas	USA	16
8	Apt 12	112 Willow Ave	San Diego	California	USA	5
9	#102	345 Redwood Rd	Dallas	Texas	USA	10
10	Unit 7	678 Spruce Blvd	San Jose	California	USA	11
11	Apt 9A	901 Oakwood Ln, Apt 9A	Austin	Texas	USA	20
12	Suite 3C	12345 Palm St	Jacksonville	Florida	USA	4
13	#201	67890 Pine Ave	Indianapolis	Indiana	USA	8
14	Apt 305	23456 Cedar St	San Francisco	California	USA	3
15	Unit 2B	78901 Elm Rd	Columbus	Ohio	USA	1
16	#501	34567 Birch Dr	Fort Worth	Texas	USA	19
17	Apt 10A	123 Oak Ln	Charlotte	North Carolina	USA	13
18	Suite 20	456 Maple Ave	Seattle	Washington	USA	6
19	Apt 305	789 Pine St	Denver	Colorado	USA	15
20	#150	1010 Cedar Rd	Washington	Columbia	USA	17

MORTGAGE

Mortgage ID	Mortgage Amount	Mortgage Provider	Date	Tenure	User ID	Property ID
1	250000	ABC Mortgage	5/1/2023	30 years	14	5
2	300000	XYZ Loans	10/2/2023	25 years	3	17
3	200000	Mortgage Co. Inc.	15/3/2023	20 years	10	13
4	350000	LoanPros	20/4/2023	30 years	6	8
5	280000	Home Finance LLC	25/5/2023	20 years	18	1
6	220000	Dream Homes Ltd.	30/6/2023	25 years	1	19
7	400000	Mortgage Master	5/7/2023	30 years	16	11
8	180000	Easy Loans Inc.	10/8/2023	15 years	5	7
9	320000	First Mortgage Co.	15/9/2023	30 years	7	3
10	260000	Quick Funding	20/10/2023	20 years	13	12
11	240000	Loan Express	25/11/2023	25 years	20	16
12	450000	Secure Lending	30/12/2023	30 years	4	20
13	190000	Happy Homes Loans	5/1/2024	15 years	8	10
14	300000	Your Mortgage Co.	10/2/2024	20 years	11	4
15	280000	Elite Lenders	15/3/2024	25 years	19	15
16	420000	Capital Mortgages	20/4/2024	30 years	2	2
17	240000	Happy Homes Loans	25/5/2024	20 years	12	9
18	200000	Quick Funding	30/6/2024	25 years	9	14
19	350000	Secure Lending	5/7/2024	30 years	17	18
20	260000	Elite Lenders	10/8/2024	20 years	15	6

REVIEW

Review ID	User ID	Property ID	Rating	Comment	Review Date
1	12	8	4.5	Great place to stay!	2023-01-15
2	6	16	3	Needs improvement	2023-02-02
3	3	7	5	Wonderful experience	2023-03-10
4	17	12	4	Good location	2023-04-21
5	9	20	2.5	Not recommended	2023-05-05
6	14	4	4	Excellent service	2023-06-12
7	5	15	3.5	Average stay	2023-07-19
8	18	1	4.5	Highly recommended	2023-08-28
9	10	14	2	Disappointing	2023-09-04
10	2	6	3	Could be better	2023-10-15
11	7	10	4	Lovely place	2023-11-02
12	19	13	3.5	Decent accommodation	2023-12-09
13	11	18	5	Outstanding service	2024-01-11
14	8	2	2.5	Not worth the price	2024-02-19
15	4	9	4.5	A hidden gem	2024-03-25
16	20	5	3	Average experience	2024-04-30
17	1	11	4	Comfortable stay	2024-05-15
18	15	19	2	Terrible	2024-06-22
19	13	3	3.5	Good value for money	2024-07-29
20	16	17	4	Enjoyed my stay	2024-08-10

TRANSACTION

Transaction I	User ID	Property ID	Transaction Date	Sell Price
1	19	5	15/1/2023	$250,000
2	8	13	10/2/2023	$320,000
3	12	1	20/3/2023	$180,000
4	2	12	5/4/2023	$400,000
5	16	8	12/5/2023	$280,000
6	14	17	28/6/2023	$350,000
7	4	2	3/7/2023	$220,000
8	11	11	17/8/2023	$310,000
9	9	15	22/9/2023	$260,000
10	7	18	14/10/2023	$290,000
11	18	9	19/11/2023	$420,000
12	6	16	1/12/2023	$175,000
13	10	3	8/1/2023	$380,000
14	3	19	25/2/2023	$310,000
15	5	14	14/3/2023	$290,000
16	1	7	30/4/2023	$240,000
17	20	20	7/5/2023	$375,000
18	13	4	10/6/2023	$200,000
19	17	6	26/7/2023	$340,000
20	15	10	9/8/2023	$265,000

USER

User ID	First Name	Last Name	Email	Phone Number	Address
1	John	Smith	john.smith@email.com	555-123-4567	123 Main St, Cityville, USA
2	Jane	Doe	jane.doe@email.com	555-987-6543	456 Elm St, Townsville, USA
3	Alice	Brown	alice.brown@email.com	555-456-7890	789 Oak Ave, Villagetown, USA
4	Bob	Johnson	bob.johnson@email.com	555-789-1234	321 Pine Rd, Hamletville, USA
5	Emma	White	emma.white@email.com	555-234-5678	567 Cedar Ln, Countryside, USA
6	Michael	Lee	michael.lee@email.com	555-567-8901	901 Birch Dr, Riverside, USA
7	Sarah	Turner	sarah.turner@email.com	555-345-6789	234 Willow Rd, Suburbia, USA
8	David	Harris	david.harris@email.com	555-890-1234	789 Maple Ave, Townville, USA
9	Olivia	Martin	olivia.martin@email.com	555-678-9012	345 Oak St, Countryside, USA
10	James	Wilson	james.wilson@email.com	555-432-1098	543 Pine Rd, Hamletville, USA
11	Sophia	Hall	sophia.hall@email.com	555-109-8765	456 Elm St, Villagetown, USA
12	Ethan	Clark	ethan.clark@email.com	555-765-4321	678 Birch Dr, Riverside, USA
13	Mia	Parker	mia.parker@email.com	555-321-0987	890 Willow Rd, Suburbia, USA
14	William	Adams	william.adams@email.com	555-987-6543	123 Maple Ave, Townsville, USA
15	Ava	Scott	ava.scott@email.com	555-876-5432	234 Oak St, Countryside, USA
16	Benjamin	Green	benjamin.green@email.com	555-543-2109	567 Pine Rd, Hamletville, USA
17	Charlotte	King	charlotte.king@email.com	555-432-1098	678 Elm St, Villagetown, USA
18	Daniel	Turner	daniel.turner@email.com	555-210-9876	789 Birch Dr, Riverside, USA
19	Grace	Miller	grace.miller@email.com	555-109-8765	901 Willow Rd, Suburbia, USA
20	Henry	Harris	henry.harris@email.com	555-987-6543	123 Cedar Ln, Townsville, USA

AGENT

Agent ID	User ID	Property ID	First Name	Last Name	Email	Phone Number	Agency Name
1	15	19	Frank	Dsouza	Frank.Dsouza@example.com	(123) 555-1001	Allstate Insurance
2	8	3	Jane	Dias	jane.dias@example.com	(456) 555-2002	State Farm Insurance
3	11	11	Michael	Davis	michael.davis@example.com	(789) 555-3003	Geico Insurance
4	5	13	Emily	Wilson	emily.wilson@example.com	(234) 555-4004	Progressive Insurance
5	17	8	David	Brown	david.brown@example.com	(567) 555-5005	Nationwide Insurance
6	3	2	Lisa	Taylor	lisa.taylor@example.com	(890) 555-6006	Farmers Insurance
7	9	17	James	Anderson	james.anderson@example.com	(321) 555-7007	Liberty Mutual Insurance
8	2	4	Jennifer	Lee	jennifer.lee@example.com	(654) 555-8008	American Family Insurance
9	20	6	William	Hall	william.hall@example.com	(987) 555-9009	Travelers Insurance
10	13	14	Karen	Clark	karen.clark@example.com	(432) 555-1010	Chubb Insurance
11	6	7	Robert	Turner	robert.turner@example.com	(765) 555-1011	The Hartford Insurance
12	4	20	Jessica	Green	jessica.green@example.com	(321) 555-1012	Cigna Insurance
13	12	10	Richard	Parker	richard.parker@example.com	(654) 555-1013	MetLife Insurance
14	7	9	Amanda	Evans	amanda.evans@example.com	(987) 555-1014	Erie Insurance
15	19	1	Christopher	King	christopher.king@example.com	(234) 555-1015	Mercury Insurance
16	1	16	Mary	Harris	mary.harris@example.com	(567) 555-1016	Auto-Owners Insurance
17	16	12	Daniel	White	daniel.white@example.com	(890) 555-1017	Kemper Insurance
18	10	5	Laura	Brown	laura.brown@example.com	(321) 555-1018	Safeco Insurance
19	14	15	Matthew	Turner	matthew.turner@example.com	(654) 555-1019	The General Insurance
20	18	18	Susan	Wilson	susan.wilson@example.com	(987) 555-1020	Acuity Insurance

ADMIN

Admin ID	First Name	Last Name	Email	Agent ID	User ID	Property ID
1	Sakura	Tanaka	sakura.tanaka@example.com	3	13	6
2	Akira	Kim	akira.kim@example.com	17	8	11
3	Mei	Chen	mei.chen@example.com	11	16	18
4	Hiroshi	Suzuki	hiroshi.suzuki@example.com	9	5	5
5	Yuki	Sato	yuki.sato@example.com	2	10	15
6	Rahul	Sharma	rahul.sharma@example.com	8	3	1
7	Priya	Patel	priya.patel@example.com	14	20	19
8	Wei	Li	wei.li@example.com	19	6	4
9	Jia	Zhang	jia.zhang@example.com	1	18	16
10	Hana	Tan	hana.tan@example.com	16	4	9
11	Seung	Lee	seung.lee@example.com	5	15	8
12	Aisha	Khan	aisha.khan@example.com	6	19	10
13	Kenji	Yamamoto	kenji.yamamoto@example.com	18	9	13
14	Priyanka	Gupta	priyanka.gupta@example.com	12	1	2
15	Ravi	Patel	ravi.patel@example.com	4	11	12
16	Mei	Ling	mei.ling@example.com	20	7	3
17	Hiroko	Suzuki	hiroko.suzuki@example.com	10	14	20
18	Daichi	Tanaka	daichi.tanaka@example.com	15	2	14
19	Ying	Chen	ying.chen@example.com	13	12	17
20	Yukihiro	Kim	yukihiro.kim@example.com	7	17	7

AMENITIES

Amenities ID	Property ID	Amenities Name	Description
1	5	Swimming Pool	A large outdoor swimming pool
2	19	Garage	Two-car attached garage
3	8	Garden	Spacious backyard garden
4	2	Fireplace	Cozy living room fireplace
5	14	Walk-in Closet	Master bedroom walk-in closet
6	10	Wood Flooring	Hardwood flooring throughout the house
7	11	Jacuzzi Tub	Relaxing jacuzzi tub in the bathroom
8	6	Open Kitchen	Modern open kitchen design
9	15	Home Theater	Dedicated home theater room
10	3	Fitness Room	Private fitness room
11	12	Wine Cellar	Temperature-controlled wine cellar
12	18	Solar Panels	Energy-efficient solar panels on the roof
13	1	Wet Bar	Stylish wet bar in the entertainment area
14	7	Sauna	Relaxing sauna room
15	4	Study Room	Quiet study room with built-in shelving
16	17	Pool Table	Billiards or pool table room
17	9	Guest Suite	Private guest suite with a bathroom
18	13	Wine Cellar	Temperature-controlled wine cellar
19	20	Home Office	Spacious home office with a view
20	16	Deck	Spacious outdoor deck with a great view

9. Select 10 Business/User Views and Implement Using Query and Reports (Produce Samples). Select 2-3 transaction inputs to populate your logical model tables and test against your physical model.

1. Show User with specific property and mortgage details where tenure is more than 15 years
   Query:
   SELECT PROPERTY.[Listing Price], PROPERTY.[Square Footage], PROPERTY.[Home Type], PROPERTY.[Property Type], PROPERTY.[Listing Status], MORTGAGE.[Mortgage Amount], MORTGAGE.[Mortgage Provider], MORTGAGE.Date, MORTGAGE.Tenure
   FROM PROPERTY INNER JOIN MORTGAGE ON PROPERTY.[Property ID] = MORTGAGE.[Property ID]
   WHERE MORTGAGE.[Tenure] >= "15 years";

   Output:

Listing Price	Square Foota	Home Type	Property Typ	Listing Status	Mortgage An	Mortgage Pri	Date	Tenure
$300,000	1800 sqft	House	Rent	Pending	250000	ABC Mortgage	5/1/2023	30 years
$200,000	1450 sqft	House	Sell	Pending	300000	XYZ Loans	10/2/2023	25 years
$290,000	1700 sqft	House	Rent	Active	200000	Mortgage Co. Ir	15/3/2023	20 years
$400,000	2200 sqft	Apartment	Sell	Active	350000	LoanPros	20/4/2023	30 years
$250,000	1500 sqft	House	Rent	Active	280000	Home Finance I	25/5/2023	20 years
$270,000	1250 sqft	House	Rent	Active	220000	Dream Homes I	30/6/2023	25 years
$260,000	1250 sqft	House	Rent	Active	400000	Mortgage Mast	5/7/2023	30 years
$320,000	1950 sqft	House	Sell	Pending	180000	Easy Loans Inc.	10/8/2023	15 years
$180,000	1000 sqft	House	Rent	Active	320000	First Mortgage	15/9/2023	30 years
$360,000	1900 sqft	Apartment	Sell	Pending	260000	Quick Funding	20/10/2023	20 years
$350,000	2000 sqft	Apartment	Sell	Active	240000	Loan Express	25/11/2023	25 years
$390,000	2100 sqft	Apartment	Rent	Pending	450000	Secure Lending	30/12/2023	30 years
$380,000	2100 sqft	Apartment	Rent	Pending	190000	Happy Homes L	5/1/2024	15 years
$420,000	2500 sqft	Apartment	Rent	Active	300000	Your Mortgage	10/2/2024	20 years
$240,000	1150 sqft	House	Sell	Pending	280000	Elite Lenders	15/3/2024	25 years
$350,000	2000 sqft	Apartment	Sell	Pending	420000	Capital Mortgat	20/4/2024	30 years
$220,000	1300 sqft	House	Rent	Active	240000	Happy Homes L	25/5/2024	20 years
$430,000	2300 sqft	Apartment	Rent	Active	200000	Quick Funding	30/6/2024	25 years
$410,000	2400 sqft	Apartment	Rent	Active	350000	Secure Lending	5/7/2024	30 years
$275,000	1100 sqft	Apartment	Rent	Active	260000	Elite Lenders	10/8/2024	20 years

2. Show lease agreement details for user name "Emma White"
   Query:
   SELECT [LEASE AGREEMENT].*, USER.Name
   FROM [USER] INNER JOIN [LEASE AGREEMENT] ON USER.[User ID] = [LEASE AGREEMENT].[User ID]
   WHERE (((USER.Name)="Emma White"));

   Output:

Lease Agreement ID	LEASE AGREEMENT.User ID	Property ID	Lease Start Date	Lease End Date	Terms and Conditions	Name
10	5	2	19/8/2024	19/8/2025	Tenant is responsible for any damage to the property.	Emma White

3. Show Home Type, Square Footage, Amenities Name, Description, CIty and State where Listing Price is greater than $300000.
Query:
SELECT PROPERTY.[Home Type], PROPERTY.[Square Footage], AMENITIES.[Amenities Name], AMENITIES.Description, LOCATION.City, LOCATION.State, PROPERTY.[Listing Price] FROM (PROPERTY INNER JOIN LOCATION ON PROPERTY.[Property ID] = LOCATION.[Property ID]) INNER JOIN AMENITIES ON PROPERTY.[Property ID] = AMENITIES.[Property ID] WHERE (((PROPERTY.[Listing Price]) >=300000));

Output:

Home Type	Square Foota	Amenities Na	Description	City	State	Listing Price
Apartment	2000 sqft	Fireplace	Cozy living roo	Phoenix	Arizona	$350,000
Apartment	2500 sqft	Study Room	Quiet study roo	Jacksonville	Florida	$420,000
House	1800 sqft	Swimming Poo	A large outdoo	San Diego	California	$300,000
House	1950 sqft	Sauna	Relaxing sauna	Chicago	Illinois	$320,000
Apartment	2200 sqft	Garden	Spacious backy	Indianapolis	Indiana	$400,000
Apartment	2100 sqft	Wood Flooring	Hardwood floc	Dallas	Texas	$380,000
Apartment	1900 sqft	Wine Cellar	Temperature-c	Houston	Texas	$360,000
Apartment	2300 sqft	Walk-in Closet	Master bedroc	Philadelphia	Pennsylvania	$430,000
Apartment	2000 sqft	Deck	Spacious outdc	San Antonio	Texas	$350,000
Apartment	2400 sqft	Solar Panels	Energy-efficien	Los Angeles	California	$410,000
Apartment	2100 sqft	Home Office	Spacious home	Austin	Texas	$390,000

4. Show State, Home Type and Name of the person who owns that Property.
Query:
SELECT LOCATION.State, PROPERTY.[Home Type], USER.[First Name], USER.[Last Name] FROM ([USER] INNER JOIN PROPERTY ON USER.[User ID] = PROPERTY.[User ID]) INNER JOIN LOCATION ON PROPERTY.[Property ID] = LOCATION.[Property ID];

Output:

State	Home Type	First Name	Last Name
Ohio	House	James	Wilson
Arizona	Apartment	Emma	White
California	House	Ava	Scott
Florida	Apartment	Bob	Johnson
California	House	Jane	Doe
Washington	Apartment	Sophia	Hall
Illinois	House	Charlotte	King
Indiana	Apartment	David	Harris
New York	House	Sarah	Turner
Texas	Apartment	Grace	Miller
California	House	William	Adams
Texas	Apartment	John	Smith
North Carolina	House	Ethan	Clark
Pennsylvania	Apartment	Alice	Brown
Colorado	House	Mia	Parker
Texas	Apartment	Michael	Lee
Columbia	House	Daniel	Turner
California	Apartment	Olivia	Martin
Texas	House	Henry	Harris
Texas	Apartment	Benjamin	Green

5. Show Home Type, State and Count of Home Type.
Query:
SELECT PROPERTY.[Home Type], LOCATION.[State], count(*)
FROM PROPERTY INNER JOIN LOCATION ON PROPERTY.[Property ID] = LOCATION.[Property ID]
GROUP BY PROPERTY.[Home Type], LOCATION.[State];

Output:

Home Type	State	Expr1002
Apartment	Arizona	1
Apartment	Florida	1
Apartment	Indiana	1
Apartment	Pennsylvania	1
Apartment	Texas	4
Apartment	Washington	1
Apartment	California	1
House	California	1
House	Colorado	1
House	Columbia	1
House	Illinois	1
House	New York	1
House	North Carolina	1
House	Ohio	1
House	Texas	1
House	California	2

6. Show the count of different types of Homes.
Query:
SELECT PROPERTY.[Home Type], COUNT (*)
FROM PROPERTY
GROUP BY PROPERTY.[Home Type];

Output:

Home Type	Expr1001
Apartment	10
House	10

7. Show all details of Property where Property ID is less than 8
Query:
SELECT *
FROM PROPERTY
WHERE PROPERTY.[Property ID] <= 8;

Output:

Property ID	Listing Price	Bedrooms	Bathrooms	Square Foota	Home Type	Property Typ	Listing Status	User ID
1	$250,000	3	2	1500 sqft	House	Rent	Active	10
2	$350,000	4	3	2000 sqft	Apartment	Sell	Pending	5
3	$180,000	2	1	1000 sqft	House	Rent	Active	15
4	$420,000	5	4	2500 sqft	Apartment	Rent	Active	4
5	$300,000	3	2	1800 sqft	House	Rent	Pending	2
6	$275,000	2	1	1100 sqft	Apartment	Rent	Active	11
7	$320,000	4	3	1950 sqft	House	Sell	Pending	17
8	$400,000	3	2	2200 sqft	Apartment	Sell	Active	8

8. Show average sell price of Property Type.
   Query:
   SELECT PROPERTY.[Property Type], AVG(TRANSACTION.[SELL PRICE]) AS AVERAGE
   FROM PROPERTY INNER JOIN [TRANSACTION] ON PROPERTY.[Property ID] =
   TRANSACTION.[Property ID]
   GROUP BY PROPERTY.[Property Type];

   Output:

Property Typ	AVERAGE
Rent	$302,307.69
Sell	$275,000.00

9. Show Property Type, Home Type, Rating, Amenities Name and state where rating is greater than 4.5 and
   state is california.
   Query:
   SELECT PROPERTY.[Property Type], PROPERTY.[Home Type], REVIEW.Rating,
   AMENITIES.[Amenities Name], LOCATION.State
   FROM ((PROPERTY INNER JOIN AMENITIES ON PROPERTY.[Property ID] =
   AMENITIES.[Property ID]) INNER JOIN LOCATION ON PROPERTY.[Property ID] =
   LOCATION.[Property ID]) INNER JOIN REVIEW ON PROPERTY.[Property ID] = REVIEW.[Property
   ID]
   WHERE (((REVIEW.Rating)>4.5) AND ((LOCATION.State)="California"));

   Output:

Property Typ	Home Type	Rating	Amenities Na	State
Rent	Apartment	5	Solar Panels	California

10. Show average rating of a property based on its reviews

Query:

SELECT PROPERTY.[Property ID], REVIEW.Rating, Avg(REVIEW.Rating) AS Average_Rating
FROM PROPERTY LEFT JOIN REVIEW ON PROPERTY.[Property ID] = REVIEW.[Property ID]
GROUP BY PROPERTY.[Property ID], REVIEW.Rating;

Output:

Property ID	Rating	Average_Rating
1	4.5	4.5
2	2.5	2.5
3	3.5	3.5
4	4	4
5	3	3
6	3	3
7	5	5
8	4.5	4.5
9	4.5	4.5
10	4	4
11	4	4
12	4	4
13	3.5	3.5
14	2	2
15	3.5	3.5
16	3	3
17	4	4
18	5	5
19	2	2
20	2.5	2.5

10. Summary Conclusions Based on Your Design: How Confident are you that your design will meet the originally stated requirements. Describe how you feel about the life cycle process you have undertaken and whether you are comfortable using this approach in designing other database projects.

Conclusion:

The business problem we came across has been solved using the database system we have designed. We are confident that the business requirements we took into consideration we achieved those. We followed every step of database system design starting from understanding the requirement, identifying the entities creating entity relationship diagrams by taking business rules under consideration. We created a logical relational diagram and assigned primary key and foreign key wherever required. We also normalized the overall data and remove duplicates, partial dependencies and transitive dependencies. We moved forward with creating a physical database using the Access tool. We performed multiple operations under access. We created the data dictionary. We tested our result from business and user point of view and we ran a few queries on the database.

All the above steps helped us learn more about how the database system looks and how every step is important to achieve the desired result. We are very much comfortable with solving other problems and designing multiple database systems. It is definitely a value adding project we worked upon. We were excited to work on this project and this project helped us learn collaboration and appreciate team work. We welcomed suggestions from each team member. We brainstormed more about it and came to the conclusion.