

EECS 3421

Project Report

Topic: Used Cars for Sale

Course Section: M

1. Introduction and preliminary study

The Organization:

AutoTrader is the largest and most trusted automotive marketplace in Canada. Established in 1975, AutoTrader.ca offers the most new and used car inventory, together with the largest audience of buyers in Canada. AutoTrader enables and empowers millions of car sales every year for Canadians across the country. AutoTrader receives over 26 million monthly visits to the marketplace, and the top-rated AutoTrader mobile app has been downloaded by more than 7 million Canadians.

Business Objective:

The business objective of AutoTrader is to connect car buyers and sellers efficiently through a trusted digital marketplace, offering a wide selection of vehicles, tools, and services that support the buying, selling, and ownership experience. Visitors can buy or sell cars, trucks, or other motorized vehicles quickly, easily, and confidently. Buyers can search based on vehicle model, make, colour, and geographic location to find the deal that is right for them. AutoTrader is also an online destination for automotive research and entertainment, featuring news, reviews, videos, and podcasts from award-winning automotive journalists.

Scope and Functional requirements:

To create a scope for an AutoTrader.ca database that supports both buyers and sellers, multiple core functions will be implemented to simulate a functional online vehicle marketplace. The system will begin with **user registration**, allowing both buyers and sellers to create profiles by providing personal details and contact information. For sellers, the platform will include a **vehicle listing feature**, where they can post vehicles for sale by entering details such as make, model, year, mileage, price, condition (new, used, or certified pre-owned), photos, and a brief description. Sellers will also be able to manage and update their listings. For buyers, a **search and filter system** will allow them to browse vehicles using various criteria such as make, model, body type, price range, mileage, payment options, and vehicle condition. They must enter their **postal code** to view listings in nearby areas, enabling **location-based search**. The platform will maintain a centralised **vehicle database** and link each listing to its respective seller. Although the full AutoTrader.ca service includes advanced tools like financing and dealer reviews, this project will focus on the core interactions between buyers and sellers, which are listing, searching, and saving vehicles, within a simplified, well-structured database environment.

2. Database modelling

External views:

- 1) As shown in Figure 1, customers can create an account, and their personal details include first name, last name, email address, phone and postal code. This will help them speed up future ordering.

The screenshot shows a user account creation or profile editing page. It includes fields for First Name (Liang), Last Name (Xiao), Postal Code (M3H0A7), and Phone Number (4373353476). Below this, there's a section for Account settings with an Email field containing emmaxiao@my.yorku.ca. A red link labeled "Delete my account" is visible at the bottom.

Figure 1. Create user account

- 2) As shown in Figure 2, customers can sell their vehicles as well as buy vehicles from the website .

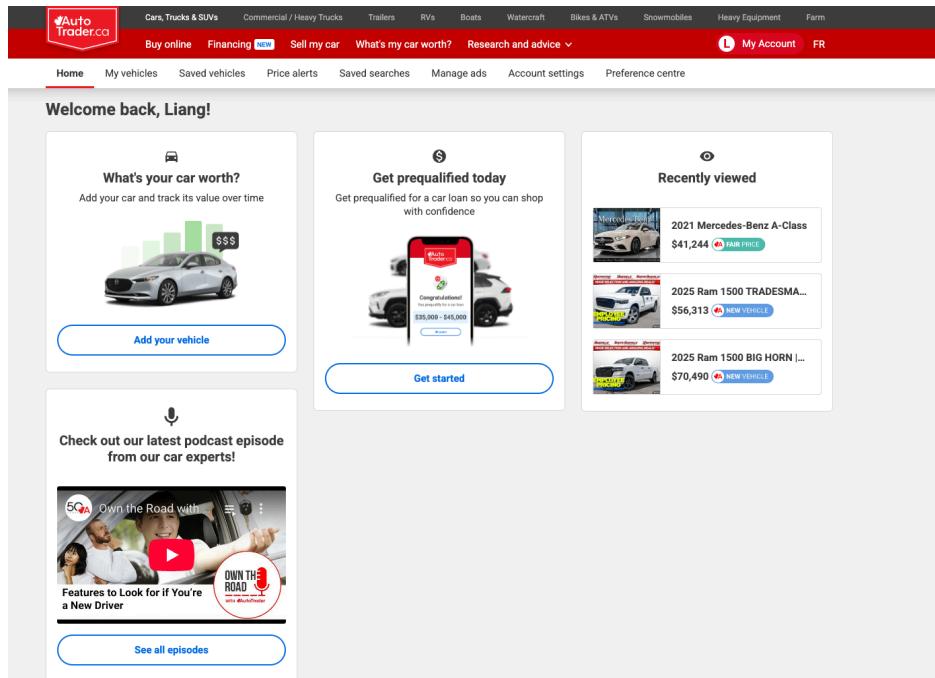


Figure 2 customers sell and buy vehicles

- 3) As shown in Figure 3, vehicle details include, Make, Model, Year, Price, Mileage, Transmission, FuelType, Trim,VIN, Status, Engine, Color, Description and so on.

Description	
Why Buy from Hanna Motors?	
No Admin Fees What you see is what you pay.	
Full Tank of Gas Every new vehicle leaves our lot ready for the road.	
Family-Owned Since 1951 Trusted by generations in our community.	
No Surprises Straightforward, honest deals every time.	
<p>At Hanna Motors, we want to keep your vehicle purchase simple and hassle-free. That means no admin fees, no surprises, and a full tank of gas with every new vehicle purchase-so you're ready to hit the road. We've been family owned and operated since 1951, proudly ...</p>	
Read More	
Specifications	
Kilometres	24 km
Status	New
Trim	DARK HORSE PREMIUM
Body Type	Coupe
Engine	5L 8cyl.
Cylinder	8
Transmission	Manual
Drivetrain	RWD
Stock Number	00C123
Exterior Colour	Blue Ember Metallic
Interior Colour	Black
Doors	2
Fuel Type	Gas
City Fuel Economy	16.5L - 17.1L/100km
Hwy Fuel Economy	10.7L - 10.9L/100km

Figure 3 Vehicle details

- 4) The website allows customers to search vehicles based on specified categories as shown in Figure 4.

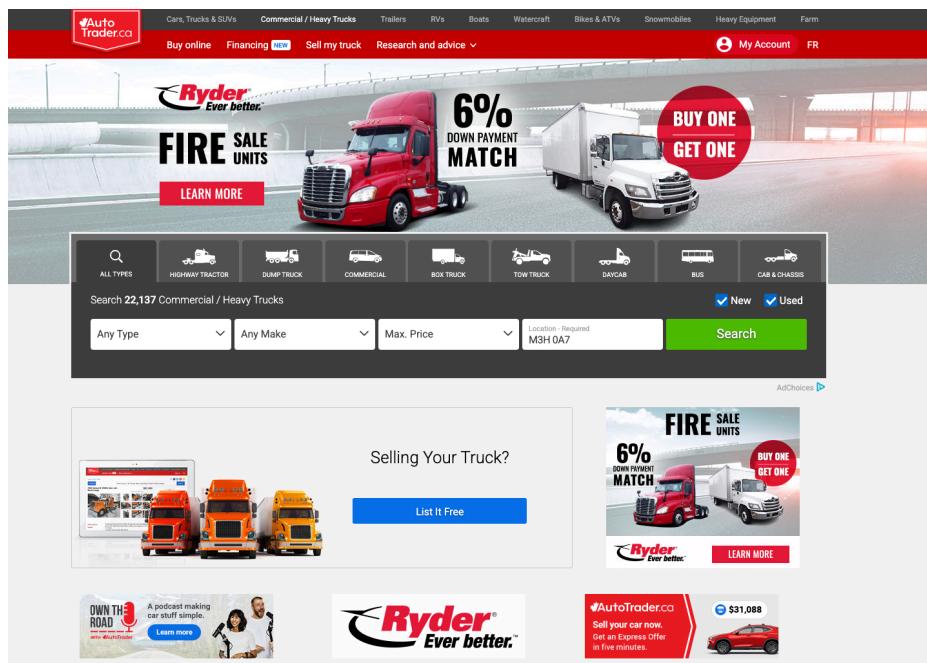


Figure 4 Searching vehicles based on specified categories

- 5) The website has a **search and filter system that will** allow buyers to browse vehicles using various criteria such as make, model, body type, price range, mileage, payment options, and vehicle condition. They must enter their **postal code** to view listings in nearby areas, enabling **location-based search** as shown in Figure 5.

Figure 5 location-based search and filter system

- 6) The website allows customers to sell vehicles to a dealer as shown in Figure 6.

The screenshot shows a website interface for selling a car. At the top, there's a red header with the text "Sell your car, fast." and a subtext "As the largest automotive marketplace in Canada, we can help you sell your car today for free." Below the header, there are two cars displayed: a red sedan in the foreground and a white SUV in the background. To the right of the cars is a dark grey sidebar titled "Sell to a dealership" which contains fields for "VIN*" and "Trim*". A blue button labeled "Get your offer now" is at the bottom of this sidebar. Below the sidebar, a link says "Looking to find out what your car is worth? Click here".

Below the sidebar, there are two tabs: "Sell to a dealer" (which is selected) and "Sell privately".

The main content area has a white background. On the left, there's a vertical sidebar with questions: "Why sell to a dealer?", "How much can I sell for?", and "How long does it take?". Below these is a red button with the text "What is the process?".

The main content area also features a white car (a white SUV) centered. To its right, a numbered process is shown:

- Provide us with your information
Answer a few questions for us so we can provide you with an estimate
- Get your coupon
Get your coupon that will tell you the value of your car
- Contact a trusted dealer
Contact dealers near you to get an in person appraisal
- Gather important documents
We will provide you with a list of documents you will need when visiting the dealership

At the bottom of the main content area, there's a blue button labeled "Visit the dealership and redeem your offer!".

Figure 6 The process of getting an offer from a dealer

- 7) The website allows customers to sell vehicles privately as shown in Figure 7.

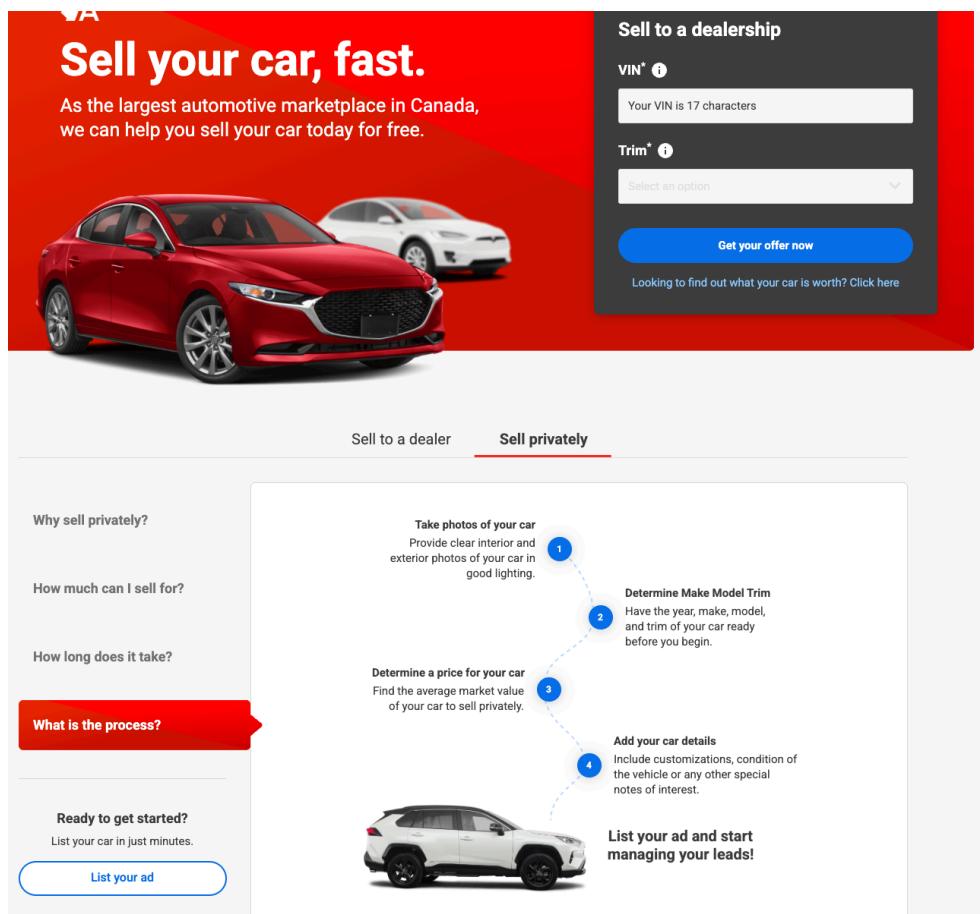


Figure 7 The process of selling a vehicle privately

- 8) The website allows customers to get a prequalification as shown in Figure 8.

The screenshot shows the AutoTrader.ca homepage with a red header bar containing the logo, navigation links like 'Cars, Trucks & SUVs', 'Commercial / Heavy Trucks', etc., and user account options. Below the header, a large banner features the text 'Prequalify for a loan' with a subtext about understanding what you can afford. It includes a smartphone displaying a success message ('Congratulations! You prequalify for a car loan \$35,000 - \$45,000') and a white car. A blue button labeled 'What can I afford?' is visible. Below the banner, a section titled 'Benefits of getting prequalified for a car loan:' lists four items: 'Know your budget' (with a money icon), 'Save time and effort' (with a hand holding a phone icon), 'Safe and secure' (with a shield icon), and 'Won't impact credit score' (with a credit score icon). Each benefit has a brief description.

Figure 8 The process of get a prequalification

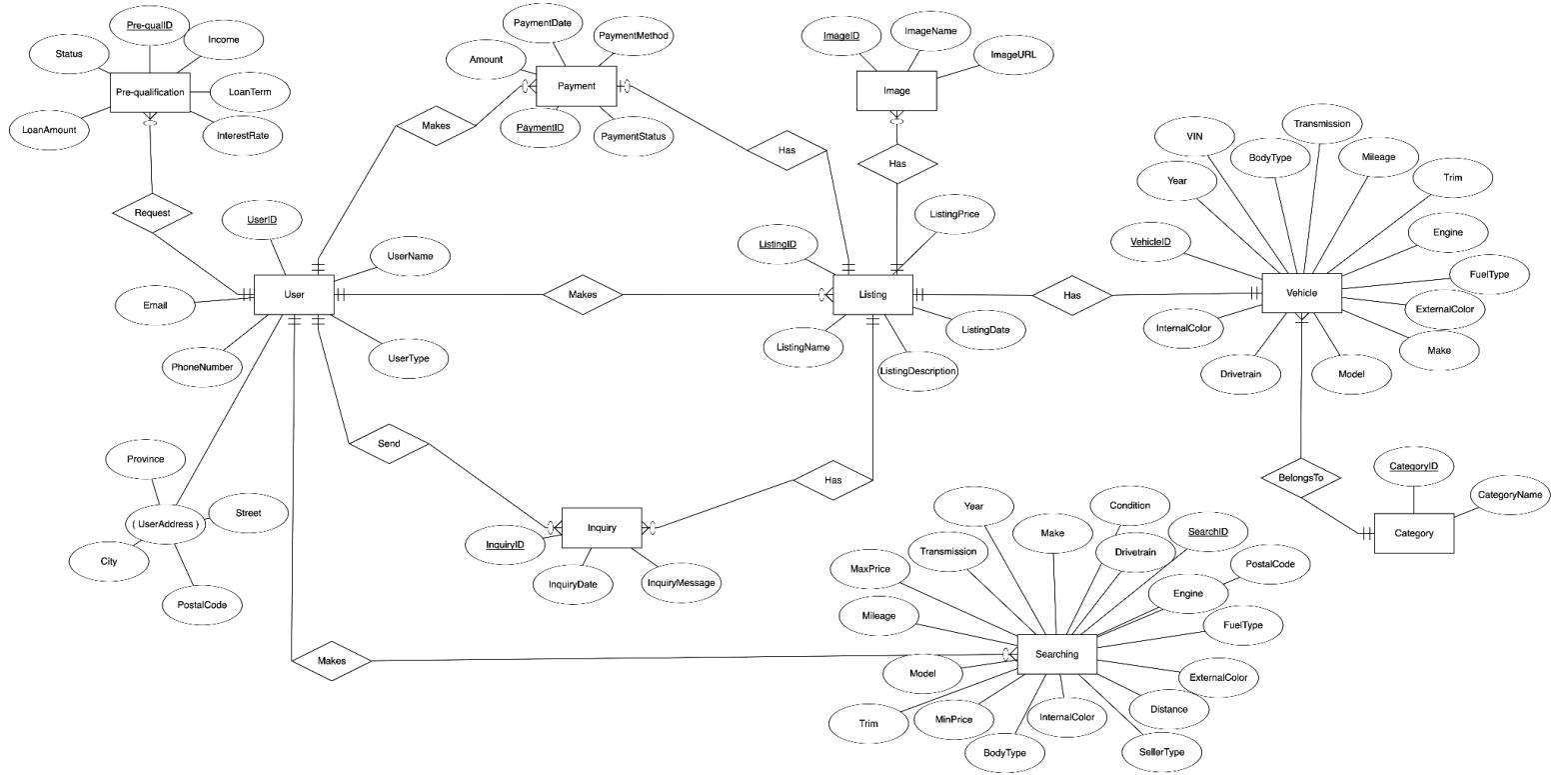
Business rules and assumptions

- User Accounts & Roles: Every individual registers a unique account (email, phone) and is assigned a UserID. A user may function both as a buyer and a seller (dealer or private). Dealers and private users are recognized via UserType.
- Vehicle Listings: Sellers can create free listings for their vehicles; paid upgrades (e.g., highlighted, priority) for better visibility are excluded from the simplified model. Each listing attaches a vehicle (by VIN), location, price, description, and optional photos.
- Category Classification: Vehicles must be assigned one category (SUV, sedan, truck, etc.) for searchable organization and analytics.
- Payments: AutoTrader doesn't process buyer payments—sellers collect payment themselves using cheques, cash, or e-transfer. Dealers may offer financing or alternate payment methods—but still, AutoTrader doesn't mediate; transactions are through the dealer.

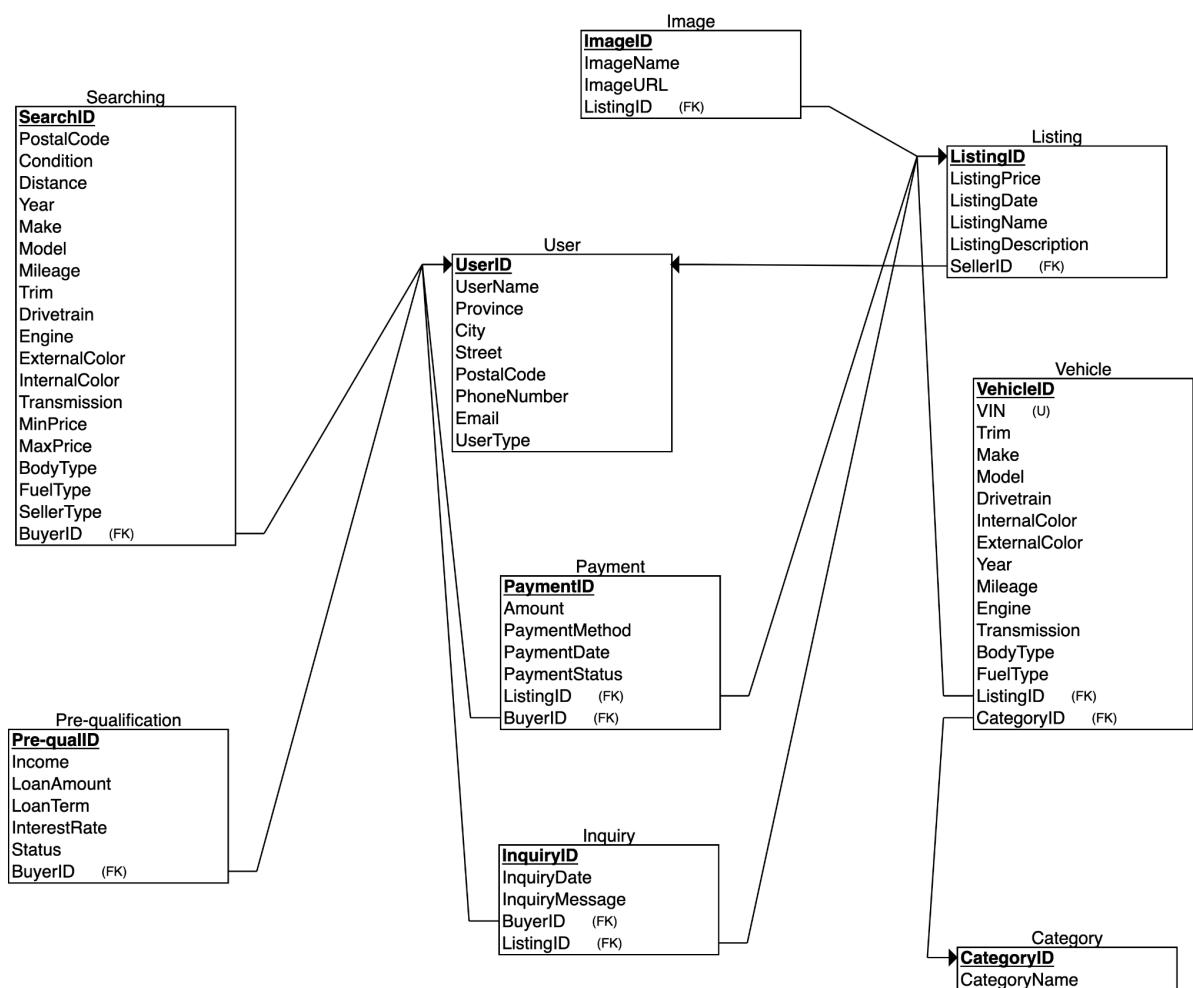
In this project, we assume the website can process payment by suggestion of the professor. Buyers can make multiple payments, and each payment is only associated with one listing.

- Negotiation: A Buyer initiates negotiation by sending a Message to the Seller regarding a Listing. The message typically includes a question, interest, or a proposed offer price.
- Search Tracking Analytics: Every user search result interaction (views, clicks) is recorded via Search, enabling insights into popular vehicles and conversion funnels.
- Soft Pre-qualification: Buyers can request pre-qualification (soft credit check), producing an estimate (LoanAmountEstimate, InterestRateEstimate, etc.) without a hard credit pull. Multiple pre-qualifications per buyer are supported, each tagged by PreQualID.
- Other Assumptions: Financing and dealer reviews are excluded from the simplified model.

The E-R data model



Logical design of the relational database



3. Database design and implementation

Table design and data integrity control:

```
CREATE TABLE Users
(
    UserID INT NOT NULL,
    UserName VARCHAR(30) NOT NULL,
    Province VARCHAR(30) NOT NULL,
    City VARCHAR(30) NOT NULL,
    Street VARCHAR(30) NOT NULL,
    PostalCode VARCHAR(30) NOT NULL,
    PhoneNumber VARCHAR(30) NOT NULL,
    Email VARCHAR(30) NOT NULL,
    UserType VARCHAR(30) NOT NULL,
    PRIMARY KEY (UserID)
);
```

```
CREATE TABLE Searching
(
    SearchID INT IDENTITY(200,1) NOT NULL,
    PostalCode VARCHAR(30) NOT NULL,
    Distance INT NOT NULL,
    Condition VARCHAR(30),
    YearMade INT,
    Make VARCHAR(30),
    Model VARCHAR(30),
    Mileage INT,
    Trim VARCHAR(30),
    Drivetrain VARCHAR(30),
    Engine VARCHAR(30),
    ExternalColor VARCHAR(30),
    InternalColor VARCHAR(30),
```

```
Transmission VARCHAR(30),  
MinPrice INT,  
MaxPrice INT,  
BodyType VARCHAR(30),  
FuelType VARCHAR(30),  
SellerType VARCHAR(30),  
BuyerID INT NOT NULL,  
PRIMARY KEY (SearchID),  
FOREIGN KEY (BuyerID) REFERENCES Users(UserID)  
ON DELETE NO ACTION  
ON UPDATE NO ACTION,  
);
```

```
CREATE TABLE Listing  
(  
ListingID INT NOT NULL,  
ListingPrice INT NOT NULL,  
ListingDate DATE NOT NULL,  
ListingName VARCHAR(30) NOT NULL,  
ListingDescription VARCHAR(100),  
SellerID INT NOT NULL,  
PRIMARY KEY (ListingID),  
FOREIGN KEY (SellerID) REFERENCES Users(UserID)  
ON DELETE CASCADE  
ON UPDATE CASCADE,  
);
```

```
CREATE TABLE Image  
(  
ImageID INT NOT NULL,  
ImageName VARCHAR(30) NOT NULL,  
ImageURL VARCHAR(30) NOT NULL,  
ListingID INT NOT NULL,
```

```
    PRIMARY KEY (ImageID),
    FOREIGN KEY (ListingID) REFERENCES Listing(ListingID)
ON DELETE CASCADE
ON UPDATE CASCADE,
);
```

```
CREATE TABLE Payment
(
    PaymentID INT NOT NULL,
    Amount INT NOT NULL,
    PaymentMethod VARCHAR(30) NOT NULL,
    PaymentDate DATE NOT NULL,
    PaymentStatus VARCHAR(30) NOT NULL,
    ListingID INT NOT NULL,
    SellerID INT NOT NULL,
    PRIMARY KEY (PaymentID),
    FOREIGN KEY (ListingID) REFERENCES Listing(ListingID)
ON DELETE CASCADE
ON UPDATE CASCADE,
    FOREIGN KEY (SellerID) REFERENCES Users(UserID)
ON DELETE NO ACTION
ON UPDATE NO ACTION,
);
```

```
CREATE TABLE Prequalification
(
    PrequalID INT NOT NULL,
    Income Numeric(15,2) NOT NULL,
    LoanAmount Numeric(15,2) NOT NULL,
    LoanTerm INT NOT NULL,
    InterestRate NUMERIC(4,2) NOT NULL,
    PrequalStatus VARCHAR(30) NOT NULL,
    BuyerID INT NOT NULL,
```

```
    PRIMARY KEY (PrequalID),
    FOREIGN KEY (BuyerID) REFERENCES Users(UserID)
    ON DELETE NO ACTION
    ON UPDATE NO ACTION,
);
```

```
CREATE TABLE Category
(
    CategoryID INT NOT NULL,
    CategoryName VARCHAR(30) NOT NULL,
    PRIMARY KEY (CategoryID)
);
```

```
CREATE TABLE Inquiry
(
    InquiryID INT NOT NULL,
    InquiryDate DATE NOT NULL,
    InquiryMessage VARCHAR(100) NOT NULL,
    BuyerID INT NOT NULL,
    ListingID INT NOT NULL,
    PRIMARY KEY (InquiryID),
    FOREIGN KEY (BuyerID) REFERENCES Users(UserID)
    ON DELETE NO ACTION
    ON UPDATE NO ACTION,
    FOREIGN KEY (ListingID) REFERENCES Listing(ListingID)
    ON DELETE CASCADE
    ON UPDATE CASCADE,
);
```

```
CREATE TABLE Vehicle
(
    VehicleID INT NOT NULL,
    VIN CHAR(17) NOT NULL,
```

```
Trim VARCHAR(30) NOT NULL,  
Make VARCHAR(30) NOT NULL,  
Model VARCHAR(30) NOT NULL,  
Drivetrain VARCHAR(30) NOT NULL,  
InternalColor VARCHAR(30) NOT NULL,  
ExternalColor VARCHAR(30) NOT NULL,  
YearMade INT NOT NULL,  
Mileage INT NOT NULL,  
Engine VARCHAR(30) NOT NULL,  
Transmission VARCHAR(30) NOT NULL,  
BodyType VARCHAR(30) NOT NULL,  
FuelType VARCHAR(30) NOT NULL,  
ListingID INT,  
CategoryID INT,  
PRIMARY KEY (VehicleID),  
FOREIGN KEY (ListingID) REFERENCES Listing(ListingID)  
ON DELETE SET NULL  
ON UPDATE CASCADE,  
FOREIGN KEY (CategoryID) REFERENCES Category(CategoryID)  
ON DELETE SET NULL  
ON UPDATE CASCADE,  
);
```

Data integrity control

In this section, we have defined and implemented the necessary integrity constraints. Below is a brief description:

1. Entity Integrity: to ensure each table has a unique identifier, as a primary key (PK)

Table	Primary Key	Entity integrity rule enforced
Users	UserID	NOT NULL, PRIMARY KEY
Searching	SearchID	NOT NULL, PRIMARY KEY
Listing	ListingID	NOT NULL, PRIMARY KEY
Image	ImageID	NOT NULL, PRIMARY KEY
Payment	PaymentID	NOT NULL, PRIMARY KEY
Prequalification	PrequalID	NOT NULL, PRIMARY KEY
Category	CategoryID	NOT NULL, PRIMARY KEY
Inquiry	InquiryID	NOT NULL, PRIMARY KEY
Vehicle	VehicleID	NOT NULL, PRIMARY KEY

Referential Integrity: to ensure foreign key values match existing primary key values or are NULL when allowed.

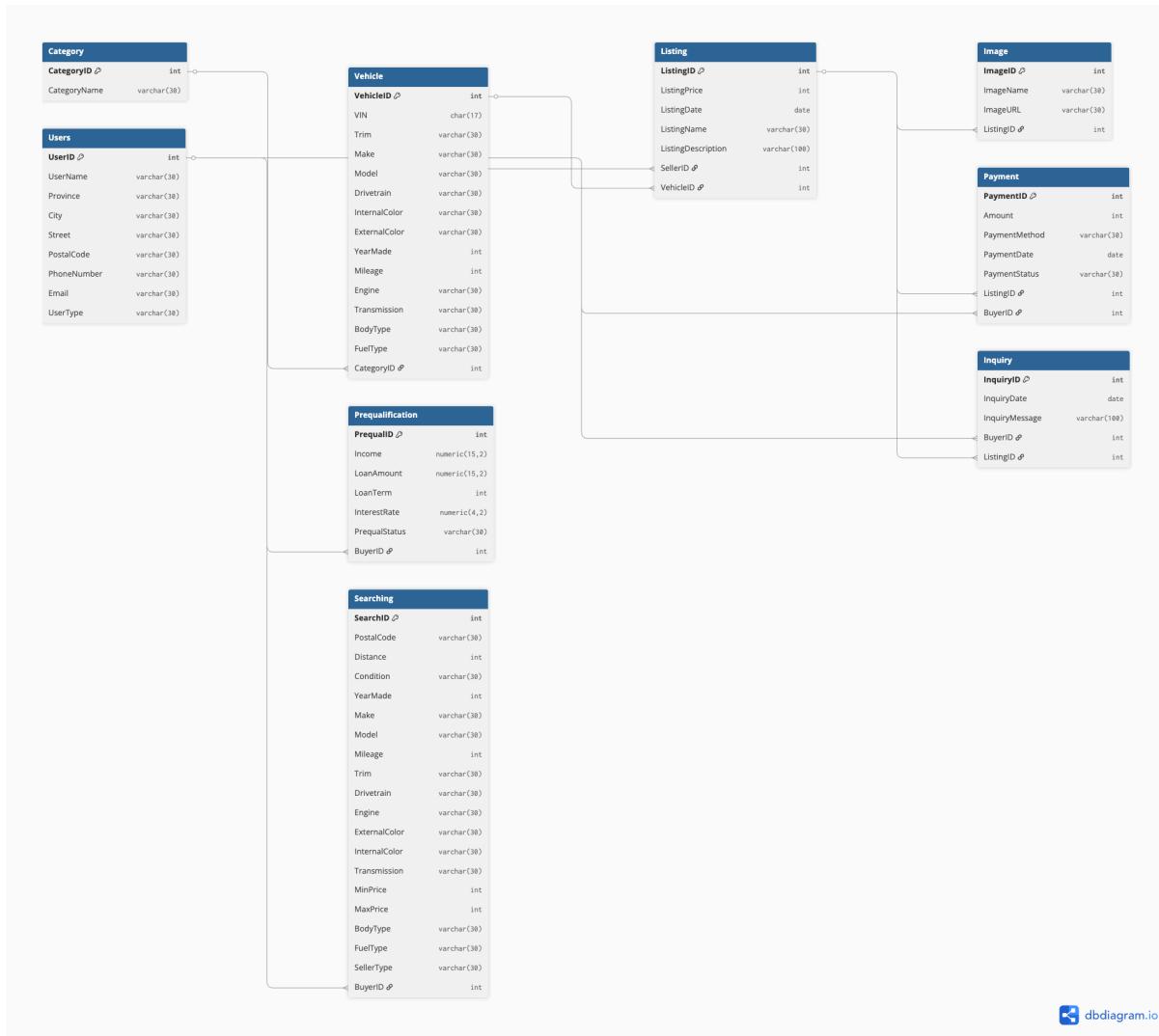
Table	Foreign Key	References	On Delete	On Update
Searching	BuyerID	Users(UserID)	NO ACTION	NO ACTION
Listing	SellerID	Users(UserID)	CASCADE	CASCADE
Image	ListingID	Listing(ListingID)	CASCADE	CASCADE
Payment	ListingID, SellerID	Listings, Users	CASCADE, NO ACTION	CASCADE, NO ACTION
Prequalification	BuyerID	Users(UserID)	NO ACTION	NO ACTION
Inquiry	BuyerID, ListingID	Users, Listing	NO ACTION, CASCADE	NO ACTION, CASCADE
Vehicle	ListingID, CategoryID	Listing, Category	SET NULL	CASCADE

Domain Integrity: to ensure values entered into columns match expected types and constraints.

Table	Column	Constraint Type	Domain Rule
Users	UserName	Varchar(30) NOT NULL	Must be a non-empty string up to 30 characters
Users	Email	Varchar(30) NOT NULL	Must be a non-empty string up to 30 characters
Users	Province	Varchar(30) Not NULL	Must be a non-empty String
Users	PostalCode	Varchar(30) Not Null	Must be a non-empty String
Users	Phone number	Varchar(30) Not null	Must be a non-empty string
Users	UserType	Varchar(30) not null	Expected to be either buyer, seller or both
Searching	Distance	Int NOT NULL	Must be a positive integer
Searching	MinPrice	INT	Optional, Numeric
Searching	MaxPrice	INT	Optional, Numeric >= MinPrice if both exist
Listing	ListingPrice	Int NOT NULL	Must be numeric
Listing	ListingDate	Date NOT NULL	Must be a valid date
Image	ImageURL	Varchar(30) NOT NULL	Valid string
Payment	Amount	INT NOT NULL	Must be numeric
Prequalification	Income	Numeric(15,2) NOT NULL	Must be a positive number with up to 2 decimals
Prequalification	LoanAmount	Numeric(15,2) NOT NULL	Must be positive, less than or equal to income
Prequalification	InterestRate	Numeric(4,2) NOT NULL	Must be a positive number with up to 2 decimals
Vehicle	VIN	CHAR(17) NOT NULL	Must be exactly 17 characters
Vehicle	Mileage	INT NOT NULL	Must be a positive

			number
--	--	--	--------

Design relational diagram



Sample data for all the tables

Users Table:

UserID	UserName	Province	City	Street	PostalCode	PhoneNumber	Email	UserType
100	gummyethics	Ontario	Toronto	12 Victoria Park Ave	M2J 3T7	617-897-8267	gummethics@yahoo.com	Dealer
101	jupiter123	Alberta	Grande Prairie	2150 th St	T8V 0S1	416-276-8162	jupiter123@gmail.com	Private
102	eecslover	Ontario	Toronto	4926 LeslieStreet	L3Y 2A3	176-979-6128	eecslover@gmail.com	Dealer
103	excee19	Ontario	Toronto	2908 Weir Crescent	M1E 3T8	197-281-2361	excee19@yahoo.com	Private
104	batmanheat	Ontario	Chatham	4577 Charing Cross Rd	N7M 2G9	519-360-8817	uxidm@iubridge.com	Dealer
105	ironmanfox	Ontario	Markham	4458 Davis Drive	L3P 2M4	905-471-3041	foxdaniel@gmail.com	Dealer
106	piealamode	Alberta	Edmonton	3298 th Street	T5J 2R4	780-465-0945	daisydog@mail.com	Private
107	blackberry	Ontario	Toronto	2416 Wellington Street	M9C 3J5	905-625-5271	jakemiller@yahoo.com	Dealer
108	oysterskis	Quebec	Montreal	3987 René-Lévesque Blvd	H3B 4W8	514-586-1626	seaqueen@mail.com	Private
109	neofencing	Quebec	Chicoutimi	668 rue des Champs	G7H 4N3	418-590-1377	shinoshin@gmail.com	Private
110	giraffepie	Ontario	London	3027 Gorham Street	N0N 0N0	519-675-3280	rvzolarsts@iubridge.com	Private

```
INSERT INTO Users (
    UserID,
    UserName,
    Province,
    City,
    Street,
```

```
PostalCode,  
PhoneNumber,  
Email,  
UserType  
) VALUES  
(100, 'gummyethics', 'Ontario', 'Toronto', '12 Victoria Park  
Ave', 'M2J 3T7', '617-897-8267', 'gummethics@yahoo.com',  
'Dealer'),  
(101, 'jupiter123', 'Alberta', 'Grande Prairie', '2150 th St',  
'T8V 0S1', '416-276-8162', 'jupiter123@gmail.com', 'Private'),  
(102, 'eecslover', 'Ontario', 'Toronto', '4926 LeslieStreet',  
'L3Y 2A3', '176-979-6128', 'eecslover@gmail.com', 'Dealer'),  
(103, 'excee19', 'Ontario', 'Toronto', '2908 Weir Crescent',  
'M1E 3T8', '197-281-2361', 'excee19@yahoo.com', 'Private'),  
(104, 'batmanheat', 'Ontario', 'Chatham', '4577 Charing Cross  
Rd', 'N7M 2G9', '519-360-8817', 'uxidm@iubridge.com',  
'Dealer'),  
(105, 'ironmanfox', 'Ontario', 'Markham', '4458 Davis Drive',  
'L3P 2M4', '905-471-3041', 'foxdaniel@gmail.com', 'Dealer'),  
(106, 'piealamode', 'Alberta', 'Edmonton', '3298 th Street',  
'T5J 2R4', '780-465-0945', 'daisyydog@gmail.com', 'Private'),  
(107, 'blackberry', 'Ontario', 'Toronto', '2416 Wellington  
Street', 'M9C 3J5', '905-625-5271', 'jakemiller@yahoo.com',  
'Dealer'),  
(108, 'oysterskis', 'Quebec', 'Montreal', '3987 René-Lévesque  
Blvd', 'H3B 4W8', '514-586-1626', 'seagueen@gmail.com',  
'Private'),  
(109, 'neofencing', 'Quebec', 'Chicoutimi', '668 rue des  
Champs', 'G7H 4N3', '418-590-1377', 'shinoshin@gmail.com',  
'Private'),  
(110, 'giraffepie', 'Ontario', 'London', '3027 Gorham Street',  
'NON ONO', '519-675-3280', 'rvzolarsts@iubridge.com',  
'Private');
```

1 SELECT * FROM Users;

Results Messages														
	UserID	UserName	Province	City	Street	PostalCode	PhoneNumber	Email	UserType					
1	100	gummyethics	Ontario	Toronto	12 Victoria Park Ave	M2J 3T7	617-897-8267	gummethics@yahoo.com	Dealer					
2	101	jupiter123	Alberta	Grande Prairie	2150 th St	T8V 0S1	416-276-8162	jupiter123@gmail.com	Private					
3	102	eecslover	Ontario	Toronto	4926 Leslie Street	L3Y 2A3	176-979-6128	eecslover@gmail.com	Dealer					
4	103	excee19	Ontario	Toronto	2908 Weir Crescent	M1E 3T8	197-281-2361	excee19@yahoo.com	Private					
5	104	batmanheat	Ontario	Chatham	4577 Charing Cross Rd	N7M 2G9	519-360-8817	uxid@iubridge.com	Dealer					
6	105	iromanfox	Ontario	Markham	4458 Davis Drive	L3P 2M4	905-471-3041	foxdaniel@gmail.com	Dealer					
7	106	piealarmode	Alberta	Edmonton	3298 th Street	T5J 2R4	780-465-0945	daisydog@gmail.com	Private					
8	107	blackberry	Ontario	Toronto	2416 Wellington Street	M9C 3J5	905-625-5271	jakemiller@yahoo.com	Dealer					
9	108	oysterskis	Quebec	Montreal	3987 René-Lévesque Blvd	H3B 4W8	514-586-1626	seaqueen@gmail.com	Private					
10	109	neofencing	Quebec	Chicoutimi	668 rue des Champs	G7H 4N3	418-590-1377	shinoshin@gmail.com	Private					
11	110	giraffepie	Ontario	London	3027 Gorham Street	N0N 0N0	519-675-3280	rvzolarsts@iubridge.com	Private					

Searching Table:

SearchingID	PostalCode	Distance	Condition	Year Made	Make	Model	Mielage	Trim	Drive train	Engine	External Color	Internal Color	Transmission	Min Price	Max Price	Body Type	FuelType	Seller Type	BuyerID
200	L3Y 2A3	25	Used	2020	Ford	Expedition	102444	LIMITED	4x4	V6 Cylinder Engine	White	Black	Automatic	NULL	NULL	SUV	Gas	Dealer	102
201	M1E 3T8	100	Used	2019	Ferrari	488 Pista Spider	100000	NUL L	NUL L	NUL L	NULL	NULL	NULL	NULL	NULL	NULL	Gas	Private	103
202	N7M 2G9	250	Used	2011	Honda	Crosstour	100000	EX-L	4WD	V6 Cylinder Engine	Grey	Black	Automatic	NULL	NULL	SUV	Gas	Private	105
203	L3P 2M4	50	Used	2016	Land Rover	Discover	100000	HSE LUXURY	NUL L	4 Cylinder Engine	White	NULL	Automatic	20000	10000	SUV	Gas	Private	106
204	T5J 2R4	50	Used	2016	Cadillac	Escalade	100000	Platinum	4x4	8 Cylinder Engine	NULL	NULL	6 Speed Automatic	NULL	NULL	SUV	Gas	Private	101
205	M9C 3J5	50	Used	NUL L	NULL	NULL	NUL L	NUL L	NUL L	NUL L	NULL	NULL	NULL	NULL	NULL	NULL	NULL	Dealer	109
206	H3B 4W8	50	Used	2011	Chevrolet	Impala	100000	LT	FWD	V6 Cylinder Engine	Grey	Black	Automatic	NULL	NULL	Sedan	Gas	Private	107
207	T8V 0S1	50	New	2016	Lexus	GS	70000	Executive	AWD	3.5L 6cyl	Atomic Silver	Black	6 Speed Automatic	NULL	NULL	Sedan	Gas	Dealer	101
208	N0N 0N0	25	Used	2024	Mitsubishi	Eclipse Cross	50000	ES	AWD	4 Cylinder	Sterling Silver	NULL	CVT	NULL	NULL	SUV	Gas	Private	108

									Engin e												
209	M1E 3T8	100	NUL L	2012	NULL	NULL	NULL	NUL L	NUL L	NUL L	NULL	NULL	NULL	NULL	NUL L	NUL L	NUL L	Dealer	110		

```

INSERT INTO Searching
(PostalCode, Distance, Condition, YearMade, Make, Model, Mileage, Trim,
Drivetrain, Engine, ExternalColor, InternalColor, Transmission,
MinPrice, MaxPrice, BodyType, FuelType,
SellerType, BuyerID)

VALUES
('L3Y 2A3', 25, 'Used', 2020, 'Ford', 'Expedition', 102444,
'LIMITED 7', '4x4', 'V6 Cylinder Engine', 'White', 'Black', 'Automatic',
NULL, NULL, 'SUV', 'Gas', 'Dealer', 102),
('M1E 3T8', 100, 'Used', 2019, 'Ferrari', '488 Pista Spider',
100000, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 'Gas',
'Private', 103),
('N7M 2G9', 250, 'Used', 2011, 'Honda', 'Crosstour', 1000000,
'EX-L', '4WD', 'V6 Cylinder Engine', 'Grey', 'Black', 'Automatic',
NULL, NULL, 'SUV', 'Gas', 'Private', 105),
('L3P 2M4', 50, 'Used', 2016, 'Land Rover', 'Discover', 100000,
'HSE LUXURY', 'NULL', '4 Cylinder Engine', 'White', NULL, 'Automatic',
20000, 100000, 'SUV', 'Gas', 'Private', 106),
('T5J 2R4', 50, 'Used', 2016, 'Cadillac', 'Escalade', 100000,
'Platinum', '4x4', '8 Cylinder Engine', NULL, NULL, '6 Speed
Automatic', NULL, NULL, 'SUV', 'Gas', 'Private', 101),
('M9C 375', 50, 'Used', NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL, NULL, 'Dealer', 109),
('H3B 4W8', 50, 'Used', 2011, 'Chevrolet', 'Impala', 100000, 'LT',
'FWD', 'V6 Cylinder Engine', 'Grey', 'Black', 'Automatic', NULL, NULL,
'Sedan', 'Gas', 'Private', 107),
('T8V 0S1', 50, 'New', 2016, 'Lexus', 'GS', 70000, 'Executive',
'AWD', '3.5L 6cyl', 'Atomic Silver', 'Black', '6 Speed Automatic',
NULL, NULL, 'Sedan', 'Gas', 'Dealer', 101),
('NON 0NO', 25, 'Used', 2024, 'Mitsubishi', 'Eclipse Cross', 50000,
'ES', 'AWD', '4 Cylinder Engine', 'Sterling Silver', NULL, 'CVT', NULL,
NULL, 'SUV', 'Gas', 'Private', 108),
('M1E 3T8', 100, NULL, 2012, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL, NULL, 'Dealer', 110);

```

84														
85	SELECT * FROM Searching;													
86														
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULTS														
Results Messages														
1	200	L3Y 2A3	25	Used	2020	Ford	Expedition	102444	LIMITED 7	4x4	V6 Cylinder Engine	White	ExternalColor	Open in New Tab
2	201	M1E 3T8	100	Used	2019	Ferrari	488 Pista Spider	100000	NULL	NULL	NULL	NULL	NULL	
3	202	N7M 2G9	250	Used	2011	Honda	Crosstour	1000000	EX-L	4WD	V6 Cylinder Engine	Grey		
4	203	L3P 2M4	50	Used	2016	Land Rover	Discover	100000	HSE LUXURY	NULL	4 Cylinder Engine	White		
5	204	T53 2R4	50	Used	2016	Cadillac	Escalade	100000	Platinum	4x4	8 Cylinder Engine	NULL		
6	205	M9C 375	50	Used	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	
7	206	H3B 4WB	50	Used	2011	Chevrolet	Impala	100000	LT	FWD	V6 Cylinder Engine	Grey		
8	207	T8V 0S1	50	New	2016	Lexus	GS	70000	Executive	AWD	3.5L 6cyl	Atomic Silver		
9	208	N0N 0N0	25	Used	2024	Mitsubishi	Eclipse Cross	50000	ES	AWD	4 Cylinder Engine	Sterling Silver		
10	209	M1E 3T8	100	NULL	2012	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	

Listing Table:

ListingID	ListingPrice	ListingDate	ListingName	ListingDescription	SellerID
300	28,998	21-Mar-2025	2020 Mazda CX-5 GT GT	Here at Yorkdale Dufferin Mazda we have a wide selection of Mazda's to choose from...	101
301	37,990	12-Feb-2024	2023 Cadillac XT4 Luxury AWD	Cadillac User Experience Infotainment System w/ Colour Touch Display, Bluetooth Streaming, Integrated Wireless Apple CarPlay and Android Auto...	103
302	39,655	25-Jun-2025	2021 Audi Q7 Progressiv S-LINE	This accident-free and locally traded 2021 Audi Q7 Progressiv is a luxury midsize SUV offering a refined interior, advanced technology, and...	105
303	53,898	20-May-2025	2024 Kia Carnival SX 7 PASS NAVI	Visit our dealership to explore the recent trade-in of the 2024 KIA CARNIVAL SX This exceptional vehicle, finished in a stylish...	107
304	67,495	19-Feb-2025	2024 Lexus TX 350 Ultra Luxury	Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350. This exceptional vehicle...	106
305	24,998	2-Jun-2025	2017 Volkswagen Golf R 4Motion	Recent Arrival! Odometer is 23643 kilometers below market average! White 2017...	107

306	36,995	10-Jul-2025	2024 Ford Maverick	NULL	101
307	26,588	17-May-2025	2021 Volkswagen	NULL	102
308	20,985	1-Jul-2025	2019 Honda HR-V HR-V TOURING	NULL	110
309	39,990	11-Apr-2025	2023 Cadillac XT4 Premium Luxury	NULL	101
310	67,495	29-Apr-2025	2024 Lexus TX 350 Ultra Luxury	Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350. This exceptional...	107

```

INSERT INTO Listing (
    ListingID,
    ListingPrice,
    ListingDate,
    ListingName,
    ListingDescription,
    SellerID
) VALUES
(300, 28998, '2025-03-21', '2020 Mazda CX-5 GT GT', 'Here
at Yorkdale Dufferin Mazda we have a wide selection of
Mazda''s to choose from...', 101),
(301, 37990, '2024-02-12', '2023 Cadillac XT4 Luxury AWD',
'Cadillac User Experience Infotainment System w/ Colour
Touch Display...', 103),
(302, 39655, '2025-06-25', '2021 Audi Q7 Progressiv
S-LINE', 'This accident-free and locally traded 2021 Audi
Q7 Progressiv is a luxury midsize SUV...', 105),
(303, 53898, '2025-05-20', '2024 Kia Carnival SX 7',
'Visit our dealership to explore the recent trade-in of
the 2024 KIA CARNIVAL SX...', 107),

```

(304, 67495, '2025-02-19', '2024 Lexus TX 350 Ultra Luxury', 'Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350...', 106),
 (305, 24998, '2025-06-02', '2017 Volkswagen Golf R 4Motion', 'Recent Arrival! Odometer is 23643 kilometers below market average! White 2017...', 107),
 (306, 36995, '2025-07-10', '2024 Ford Maverick', NULL, 101),
 (307, 26588, '2025-05-17', '2021 Volkswagen', NULL, 102),
 (308, 20985, '2025-07-01', '2019 Honda HR-V HR-V TOURING', NULL, 110),
 (309, 39990, '2025-04-11', '2023 Cadillac XT4', NULL, 101),
 (310, 67495, '2025-04-29', '2024 Lexus TX 350', 'Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350...', 107);

1 SELECT * FROM Listing;						
Results Messages						
	ListingID	ListingName	ListingDescription	SellerID		
1	300	28998	2025-03-21 2020 Mazda CX-5 GT GT	Here at Yorkdale Dufferin Mazda we have a wide selection of Mazda's to choose from... 101	101	
2	301	37998	2024-02-12 2023 Cadillac XT4 Luxury AWD	Cadillac User Experience Infotainment System w/ Colour Touch Display... 103	103	
3	302	39655	2025-06-25 2021 Audi Q7 Progressiv S-LINE	This accident-free and locally traded 2021 Audi Q7 Progressiv is a luxury midsize SUV... 105	105	
4	303	53898	2025-05-20 2024 Kia Carnival SX 7	Visit our dealership to explore the recent trade-in of the 2024 KIA CARNIVAL SX... 107	107	
5	304	67495	2025-02-19 2024 Lexus TX 350 Ultra Luxury	Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350... 106	106	
6	305	24998	2025-06-02 2017 Volkswagen Golf R 4Motion	Recent Arrival! Odometer is 23643 kilometers below market average! White 2017... 107	107	
7	306	36995	2025-07-10 2024 Ford Maverick	NULL 101	101	
8	307	26588	2025-05-17 2021 Volkswagen	NULL 102	102	
9	308	20985	2025-07-01 2019 Honda HR-V HR-V TOURING	NULL 110	110	
10	309	39990	2025-04-11 2023 Cadillac XT4	NULL 101	101	
11	310	67495	2025-04-29 2024 Lexus TX 350	Visit our dealership to explore the recent trade-in of the 2024 LEXUS TX 350... 107	107	

Image Table:

ImageID	ImageName	ImageURL	ListingID-
401	FrontAngle	front.jpg	301
402	Dashboard	dash.jpg	301
403	RearView	rear.jpg	301
404	SideProfile	side.jpg	302

405	Interior	interior.jpg	302
406	Dashboard	dashboard.jpg	303
407	Engine	engine.jpg	303
408	WheelDetail	wheel.jpg	304
409	SeatDetail	seat.jpg	304
410	RoofView	roof.jpg	305

```

INSERT INTO Image (
    ImageID,
    ImageName,
    ImageURL,
    ListingID
) VALUES
(401, 'FrontAngle', 'front.jpg', 301),
(402, 'Dashboard', 'dash.jpg', 301),
(403, 'RearView', 'rear.jpg', 301),
(404, 'SideProfile', 'side.jpg', 302),
(405, 'Interior', 'interior.jpg', 302),
(406, 'Dashboard', 'dashboard.jpg', 303),
(407, 'Engine', 'engine.jpg', 303),
(408, 'WheelDetail', 'wheel.jpg', 304),
(409, 'SeatDetail', 'seat.jpg', 304),
(410, 'RoofView', 'roof.jpg', 305);

```

	Image...	ImageNa...	ImageURL	ListingID	
1	401	FrontAngle	front.jpg	301	
2	402	Dashboard	dash.jpg	301	
3	403	RearView	rear.jpg	301	
4	404	SideProfile	side.jpg	302	
5	405	Interior	interior.j...	302	
6	406	Dashboard	dashboard...	303	
7	407	Engine	engine.jpg	303	
8	408	WheelDetail	wheel.jpg	304	
9	409	SeatDetail	seat.jpg	304	
1...	410	RoofView	roof.jpg	305	

Payment Table:

PaymentID	Amount	PaymentMethod	PaymentDate	PaymentStatus	ListingID	BuyerID
501	22000	Credit Card	2025-07-01	Completed	301	101
502	18500	Interac	2025-07-03	Pending	302	102
503	15000	Cash	2025-07-05	Completed	303	103
504	28000	PayPal	2025-07-06	Failed	304	104
505	17000	Credit Card	2025-07-10	Completed	305	101
506	19999	Bank Transfer	2025-07-12	Completed	306	105
507	23999	Interac	2025-07-13	Completed	307	106
508	16000	Cash	2025-07-14	Pending	308	102

INSERT INTO Payment (

 PaymentID,
 Amount,
 PaymentMethod,
 PaymentDate,
 PaymentStatus,
 ListingID,
 BuyerID

) VALUES

```
(501, 22000, 'Credit Card', '2025-07-01', 'Completed',
301, 101),
(502, 18500, 'Interac', '2025-07-03', 'Pending', 302,
102),
(503, 15000, 'Cash', '2025-07-05', 'Completed', 303, 103),
(504, 28000, 'PayPal', '2025-07-06', 'Failed', 304, 104),
(505, 17000, 'Credit Card', '2025-07-10', 'Completed',
305, 101),
(506, 19999, 'Bank Transfer', '2025-07-12', 'Completed',
306, 105),
(507, 23999, 'Interac', '2025-07-13', 'Completed', 307,
106),
(508, 16000, 'Cash', '2025-07-14', 'Pending', 308, 102);
```

	Payme...	Amount	Payment...	PaymentDate	PaymentStatus	ListingID	BuyerID
1	501	22000	Credit Card	2025-07-01	Completed	301	101
2	502	18500	Interac	2025-07-03	Pending	302	102
3	503	15000	Cash	2025-07-05	Completed	303	103
4	504	28000	PayPal	2025-07-06	Failed	304	104
5	505	17000	Credit Card	2025-07-10	Completed	305	101
6	506	19999	Bank Trans...	2025-07-12	Completed	306	105
7	507	23999	Interac	2025-07-13	Completed	307	106
8	508	16000	Cash	2025-07-14	Pending	308	102

Prequalification Table:

PrequalID	Income	LoanAmount	LoanTerm	InterestRate	PrequalStatus	BuyerID
601	65000.00	20000.00	60	5.25	Approved	101
602	48000.00	15000.00	48	6.10	Pending	102
603	90000.00	30000.00	72	4.75	Approved	103
604	35000.00	12000.00	36	7.00	Rejected	104
605	72000.00	25000.00	60	5.00	Approved	105
606	41000.00	13000.00	48	6.25	Pending	106
607	82000.00	28000.00	60	4.95	Approved	102
608	56000.00	19000.00	48	5.80	Rejected	103

```
INSERT INTO Prequalification (
```

```

PrequalID,
Income,
LoanAmount,
LoanTerm,
InterestRate,
PrequalStatus,
BuyerID
)
```

) VALUES

```

(601, 65000.00, 20000.00, 60, 5.25, 'Approved', 101),
(602, 48000.00, 15000.00, 48, 6.10, 'Pending', 102),
(603, 90000.00, 30000.00, 72, 4.75, 'Approved', 103),
(604, 35000.00, 12000.00, 36, 7.00, 'Rejected', 104),
(605, 72000.00, 25000.00, 60, 5.00, 'Approved', 105),
(606, 41000.00, 13000.00, 48, 6.25, 'Pending', 106),
(607, 82000.00, 28000.00, 60, 4.95, 'Approved', 102),
(608, 56000.00, 19000.00, 48, 5.80, 'Rejected', 103);
```

	Prequ...	Income	LoanAmo...	LoanTerm	InterestRate	PrequalSt...	BuyerID
1	601	65000.00	20000.00	60	5.25	Approved	101
2	602	48000.00	15000.00	48	6.10	Pending	102
3	603	90000.00	30000.00	72	4.75	Approved	103
4	604	35000.00	12000.00	36	7.00	Rejected	104
5	605	72000.00	25000.00	60	5.00	Approved	105
6	606	41000.00	13000.00	48	6.25	Pending	106
7	607	82000.00	28000.00	60	4.95	Approved	102
8	608	56000.00	19000.00	48	5.80	Rejected	103

Category table:

CategoryID	CategoryName
701	Sedan
702	SUV
703	Truck
704	Coupe
705	Convertible
706	Hatchback
707	Minivan
708	Wagon

709	Electric
710	Hybrid

```
INSERT INTO Category (
    CategoryID,
    CategoryName
) VALUES
(701, 'Sedan'),
(702, 'SUV'),
(703, 'Truck'),
(704, 'Coupe'),
(705, 'Convertible'),
(706, 'Hatchback'),
(707, 'Minivan'),
(708, 'Wagon'),
(709, 'Electric'),
(710, 'Hybrid');
```

	Categ...	Categor...
1	701	Sedan
2	702	SUV
3	703	Truck
4	704	Coupe
5	705	Convertible
6	706	Hatchback
7	707	Minivan
8	708	Wagon
9	709	Electric
1...	710	Hybrid

Inquiry Table:

InquiryID	InquiryDate	InquiryMessage	BuyerID	ListingID
801	2025-07-10	“Is this listing still available?”	105	303
802	2025-07-11	“Can I schedule a viewing?”	103	310

803	2025-07-11	“Does this include any warranty?”	100	302
804	2025-07-12	“Is the price negotiable?”	100	303
805	2025-07-13	“Does it come with winter tires?”	106	306
806	2025-07-14	“Can I come tomorrow, and at what time?”	109	301
807	2025-07-16	“How many previous owners has it had?”	110	304
808	2025-07-18	“Is this vehicle still for sale?”	104	301

```

INSERT INTO Inquiry (
    InquiryID,
    InquiryDate,
    InquiryMessage,
    BuyerID,
    ListingID
) VALUES
(801, '2025-07-10', 'Is this listing still available?', 105, 303),
(802, '2025-07-11', 'Can I schedule a viewing?', 103, 310),
(803, '2025-07-11', 'Does this include any warranty?', 100, 302),
(804, '2025-07-12', 'Is the price negotiable?', 100, 303),
(805, '2025-07-13', 'Does it come with winter tires?', 106, 306),
(806, '2025-07-14', 'Can I come tomorrow, and at what time?', 109, 301),
(807, '2025-07-16', 'How many previous owners has it had?', 110, 304),

```

(808, '2025-07-18', 'Is this vehicle still for sale?', 104, 301);

	InquiryID	InquiryDate	InquiryMessage	BuyerID	ListingID
1	801	2025-07-10	Is this listing still available?	105	303
2	802	2025-07-11	Can I schedule a viewing?	103	310
3	803	2025-07-11	Does this include any warranty?	100	302
4	804	2025-07-12	Is the price negotiable?	100	303
5	805	2025-07-13	Does it come with winter tires?	106	306
6	806	2025-07-14	Can I come tomorrow, and at what time?	109	301
7	807	2025-07-16	How many previous owners has it had?	110	304
8	808	2025-07-18	Is this vehicle still for sale?	104	301

Vehicle Table:

VehicelID	VIN	Trim	Make	Model	Drivetrain	InternalColor	ExternalColor	YearMade	Mileage	Engine	Transmission	BodyType	FuelType	ListingID	CategoryID
900	1HGCM82633A004352	GT	Mazda	CX-5	AWD	Black	Red	2020	42000	2.5L 4-Cyl	Automatic	SUV	Gasoline	300	702
901	2T3ZF4DV7AW012345	Luxury	Cadillac	XT4	AWD	Black	White	2023	8500	2.0L Turbo I4	Automatic	SUV	Gasoline	301	702
902	WAULFAFR2DA098765	S-Line	Audi	Q7	AWD	Brown	White	2021	95000	2.0 Turbo I4	Automatic	Sedan	Gasoline	302	702
903	1C4RJFAG7FC789012	SX 7-Pass	Kia	Carnival	FWD	Beige	White	2024	0	3.5L V6	Automatic	Minivan	Gasoline	303	707
904	3FAHP0HA2AR123456	Luxury	Lexus	TX 350	AWD	Gray	Black	2024	0	2.4L Turbo I4	Automatic	Sedan	Gasoline	304	701
905	2T1BURHE5KC789321	R 4Motion	Volkswagen	Golf	AWD	Black	Blue	2017	72000	2.0L Turbo I4	Automatic	Hatchback	Gasoline	305	706
906	1FTFW1EF3EK567890	XLT	Ford	Maverick	4WD	Gray	Black	2020	15000	5.0L V8	Automatic	Truck	Gasoline	306	703
907	1N4AL3AP9GC123789	Highline 4Motion	Volkswagen	Tiguan	AWD	Black	Pearl	2021	40200	2.0 Turbo I4	Automatic	SUV	Gasoline	307	702
908	CZRU6H5XKM123456	Touring	Honda	HR-V	AWD	Black	Silver	2019	38000	1.8L I4	CVT	SUV	Gasoline	308	702
909	3FAHP0HA6AR420871	Luxury	Cadillac	XT4	AWD	Red	Green	2023	7200	2.0L Turbo I4	Automatic	SUV	Gasoline	309	702
910	5YJSA1E26HF212934	Luxury	Lexus	TX 350	AWD	Yellow	Pink	2024	1200	2.4L Turbo I4	Automatic	Sedan	Gasoline	310	701

```
INSERT INTO Vehicle (
    VehicleID,
    VIN,
    Trim,
    Make,
    Model,
    Drivetrain,
    InternalColor,
    ExternalColor,
    YearMade,
    Mileage,
    Engine,
    Transmission,
    BodyType,
    FuelType,
    ListingID,
    CategoryID
) VALUES
(900, '1HGCM82633A004352', 'GT', 'Mazda', 'CX-5', 'AWD',
'Black', 'Red', 2020, 42000, '2.5L 4-Cyl', 'Automatic',
'SUV', 'Gasoline', 300, 702),
(901, '2T3ZF4DV7AW012345', 'Luxury', 'Cadillac', 'XT4',
'AWD', 'Black', 'White', 2023, 8500, '2.0L Turbo I4',
'Automatic', 'SUV', 'Gasoline', 301, 702),
(902, 'WAULFAFR2DA098765', 'S-Line', 'Audi', 'Q7', 'AWD',
'Brown', 'White', 2021, 95000, '2.0 Turbo I4',
'Automatic', 'Sedan', 'Gasoline', 302, 702),
(903, '1C4RJFAG7FC789012', 'SX 7-Pass', 'Kia', 'Carnival',
'FWD', 'Beige', 'White', 2024, 0, '3.5L V6', 'Automatic',
'Minivan', 'Gasoline', 303, 707),
```

```

(904, '3FAHP0HA2AR123456', 'Luxury', 'Lexus', 'TX 350',
'AWD', 'Gray', 'Black', 2024, 0, '2.4L Turbo I4',
'Automatic', 'Sedan', 'Gasoline', 304, 701),
(905, '2T1BURHE5KC789321', 'R 4Motion', 'Volkswagen',
'Golf', 'AWD', 'Black', 'Blue', 2017, 72000, '2.0L Turbo
I4', 'Automatic', 'Hatchback', 'Gasoline', 305, 706),
(906, '1FTFW1EF3EK567890', 'XLT', 'Ford', 'Maverick',
'4WD', 'Gray', 'Black', 2020, 15000, '5.0L V8',
'Automatic', 'Truck', 'Gasoline', 306, 703),
(907, '1N4AL3AP9GC123789', 'Highline 4Motion',
'Volkswagen', 'Tiguan', 'AWD', 'Black', 'Pearl', 2021,
40200, '2.0 Turbo I4', 'Automatic', 'SUV', 'Gasoline',
307, 702),
(908, 'CZRU6H5XKM123456', 'Touring', 'Honda', 'HR-V',
'AWD', 'Black', 'Silver', 2019, 38000, '1.8L I4', 'CVT',
'SUV', 'Gasoline', 308, 702),
(909, '3FAHP0HA6AR420871', 'Luxury', 'Cadillac', 'XT4',
'AWD', 'Red', 'Green', 2023, 7200, '2.0L Turbo I4',
'Automatic', 'SUV', 'Gasoline', 309, 702),
(910, '5YJSA1E26HF212934', 'Luxury', 'Lexus', 'TX 350',
'AWD', 'Yellow', 'Pink', 2024, 1200, '2.4L Turbo I4',
'Automatic', 'Sedan', 'Gasoline', 310, 701);

```

	Vehic...	VIN	Trim	Make	Model	Driv...	InternalC...	ExternalC...	YearMade	Mileage	Engine	Transmiss...	BodyType	Fueltype	ListingID	CategoryID
1	980	1HGCM8263...	GT	Mazda	CX-5	AWD	Black	Red	2020	42000	2.5L 4-Cyl	Automatic	SUV	Gasoline	300	702
2	981	2T3ZF4DV7A...	Luxury	Cadillac	XT4	AWD	Black	White	2023	8500	2.0L Turbo I4	Automatic	SUV	Gasoline	301	702
3	982	WAULFAFR2D...	S-Line	Audi	Q7	AWD	Brown	White	2021	95000	2.0 Turbo I4	Automatic	Sedan	Gasoline	302	702
4	983	1C4RJFAGTF...	SX 7-Pass	Kia	Carnival	FWD	Beige	White	2024	0	3.5L V6	Automatic	Minivan	Gasoline	303	707
5	984	3FAHP0HA2A...	Luxury	Lexus	TX 350	AWD	Gray	Black	2024	0	2.4L Turbo I4	Automatic	Sedan	Gasoline	304	701
6	985	2T1BURHE5K...	R 4Motion	Volkswagen	Golf	AWD	Black	Blue	2017	72000	2.0L Turbo I4	Automatic	Hatchback	Gasoline	305	706
7	986	1FTFW1EF3E...	XLT	Ford	Maverick	4WD	Gray	Black	2020	15000	5.0L V8	Automatic	Truck	Gasoline	306	703
8	987	1N4AL3AP9G...	Highline 4M...	Volkswagen	Tiguan	AWD	Black	Pearl	2021	40200	2.0 Turbo I4	Automatic	SUV	Gasoline	307	702
9	988	CZRU6H5XKM...	Touring	Honda	HR-V	AWD	Black	Silver	2019	38000	1.8L I4	CVT	SUV	Gasoline	308	702
10	989	3FAHP0HA6A...	Luxury	Cadillac	XT4	AWD	Red	Green	2023	7200	2.0L Turbo I4	Automatic	SUV	Gasoline	309	702
11	910	5YJSA1E26H...	Luxury	Lexus	TX 350	AWD	Yellow	Pink	2024	1200	2.4L Turbo I4	Automatic	Sedan	Gasoline	310	701

Sample SQL queries to support applications and reports for management use:

- 1) Query that shows the number of listings associated with each seller:

```
SELECT U.UserID, U.UserName, COUNT(L.ListingID) AS TotalListings
FROM Users AS U
JOIN Listing AS L ON U.UserID = L.SellerID
GROUP BY U.UserID, U.UserName;
```

	UserID	UserName	TotalListings
1	101	jupiter123	3
2	102	eecslover	1
3	103	excee19	1
4	105	ironmanfox	1
5	106	piealamode	1
6	107	blackberry	3
7	110	giraffepie	1

- 2) Query that shows the total sales per seller:

```
1 SELECT U.UserID, U.UserName, SUM(P.Amount) AS TotalSales
2 FROM Listing AS L
3 JOIN Users AS U ON U.UserID = L.SellerID
4 JOIN Payment AS P ON L.ListingID = P.ListingID
5 GROUP BY U.UserID, U.UserName;
```

	UserID	UserName	TotalSales
1	101	jupiter123	19999
2	102	eecslover	23999
3	103	excee19	22000
4	105	ironmanfox	18500
5	106	piealamode	28000
6	107	blackberry	32000
7	110	giraffepie	16000

- 3) Query that shows the top 3 most common vehicle makes:

```
SELECT TOP 3 Make, COUNT(*) AS MakeCount
FROM Vehicle
GROUP BY Make
ORDER BY MakeCount DESC;
```

	Make	MakeCount
1	Cadillac	2
2	Lexus	2
3	Volkswagen	2

- 4) Query that displays the category name and total number of inquiries for each category, sorted by total number of inquiries.

```
SELECT CategoryName, count(InquiryID) as TotalInquiry
FROM Category C, Inquiry I, Vehicle V, Listing L
WHERE C.CategoryID = V.CategoryID
AND V.ListingID = L.ListingID
AND I.ListingID = L.ListingID
GROUP BY CategoryName
ORDER BY sum(InquiryID);
```

	CategoryName	TotalInquiry
1	Truck	1
2	Minivan	2
3	Sedan	2
4	SUV	3

- 5) Query that displays the category name and total amount of sales for each category, sorted by category name.

```
SELECT CategoryName, sum(Amount) as TotalSales
FROM Category C, Payment P, Vehicle V, Listing L
WHERE C.CategoryID = V.CategoryID
AND V.ListingID = L.ListingID
AND P.ListingID = L.ListingID
GROUP BY CategoryName
```

```
ORDER BY CategoryName;
```

	CategoryName	TotalSales
1	Hatchback	17000
2	Minivan	15000
3	Sedan	28000
4	SUV	80499
5	Truck	19999

- 6) Query that displays the vehicle make and model for each seller whose name begins with 'e', sorted by make.

```
SELECT UserName, Make, Model  
FROM Listing L, Vehicle V, Users U  
WHERE L.ListingID = V.ListingID  
AND U.UserID = L.SellerID  
AND UserName LIKE 'e%'  
ORDER by Make;
```

Results Messages

	UserName	Make	Model
1	excee19	Cadillac	XT4
2	eecslover	Volkswagen	Tiguan

4. Evaluation and conclusion

The achievement of the project:

The project aims to build a comprehensive relational database for a simplified version of [AutoTrader.ca](#). The system works for both buyers and sellers through user registration. Vehicle listing, search and filter functionality, inquiry handling, pre-qualification, and payment tracking. We created ER models, relational schema, and sample data for various use cases. The major use cases were supported by SQL queries and relationships.

Core functionalities of the system:

- Vehicle listing by sellers (dealers or private)
- Vehicle browsing by buyers
- Pre-qualifications requests
- Recording payments and associating them with buyers and listing

Further development and improvement:

To improve and enhance the current system, many extensions could take place, such as:

- Review system: Enabling users to review dealers, and saving their experience for other buyers to view. Buyers could rate sellers and vice versa after a transaction.
- Multiple offer system: The current system only takes enquiries and payments. It lacks the ability for buyers to place multiple offers on listings.

The advantages and limitations of the database package used:

Advantages

- Referential constraints and relational integrity are strongly supported.
- Easy integration with Azure Data Studio and Visual Studio
- Good visualisation and management tools

Limitations

- No built-in support for NoSQL.
- Manual enforcement of incorporating business rules.

The experience learned from this project:

Throughout the project, the team gained experience in various topics such as:

- Relational modelling and database normalisation.
- Writing and testing SQL queries, both DDL and DML.
- Visualising entity relationships
- Solving integrity issues and making sure there is referential consistency.