COS221 Assignment 5: CompareIt Price Comparison Website

By Ctrl + Alt + Elite

Task 1

The development of online shopping and price comparison in e-commerce.

E Commerce has transformed the way we shop today. We see this transition brought about by growth in digital technology and the widespread use of smartphones. Also because of these changes we have access to a greater variety of products and are able to make more informed purchase decisions with the help of price comparison tools.

What Consumers Buy

Online shopping has a large share for electronics like mobiles, computers and smart gadgets. Also, 34% of the world's population do electronic products' price comparison sites. As for other products, we see that clothing and health beauty take the 2nd and 3rd place with 15% and 10% respectively. During the COVID 19 pandemic we saw growth in online grocery shopping as people valued the home delivery aspect.

Tools for Comparing Prices

Prices which you will get to compare are what you need for the best deals. We see that they make retailers compete which in turn benefits consumers with better choices. Also, some which are very popular include:.

- Google Shopping: This tool uses different retailers as a source for its product listings which also include in depth info and reviews.
- ShopSavvy: This app which is also available to download allows you to scan barcodes and compare prices online and in store.
- CamelCamelCamel: It logs Amazon price history and notifications for price drops.
- Radar: A UK based app which also does rental and reselling.

These tools are used by consumers to find great deals and also play a role in how retailers set their prices.

Popular Shopping Categories

In electronics and fashion we are seeing growth in other areas which include sustainable products, health and wellness, and subscription services. In the case of Netflix or meal kit services we see great convenience in these also. Also we are seeing an increase in eco friendly products as more people pay attention to environmental issues which in turn is transforming the retail space.

The Importance of User Experience (UX)

In order for e-commerce sites to be successful, great user experience is key. Features of great UX include:.
- Mobile Optimization: With the increase of shopping via mobile devices we see that which have mobile friendly sites and apps do better in terms of customer satisfaction and sales.
- Simple Checkout: Making check out a breeze and we present a variety of payment options which in turn reduces cart abandonment and increases satisfaction.
- Personalization: Using info to put forward products that fit the customer improves engagement and builds loyalty.

Current Trends in Supply and Demand

Shopping online is a growth area which in turn is fueling demand for a great many products. Also we saw during the pandemic that it is important to have better inventory management and flexible pricing. We had a rush for electronics and home fitness equipment but what we also saw was shipping delays and empty shelves.

Conclusion

As online shopping grows we see the rise of price comparison tools that is in turn changing how consumers act.For retailers to do well in this environment they have to put forth great user experience, see to it that their platforms work well on mobile devices, and also be ready to change with the market as it shifts. By which I mean they will have to innovate and compete which in the end will only see e-commerce grow and do better.

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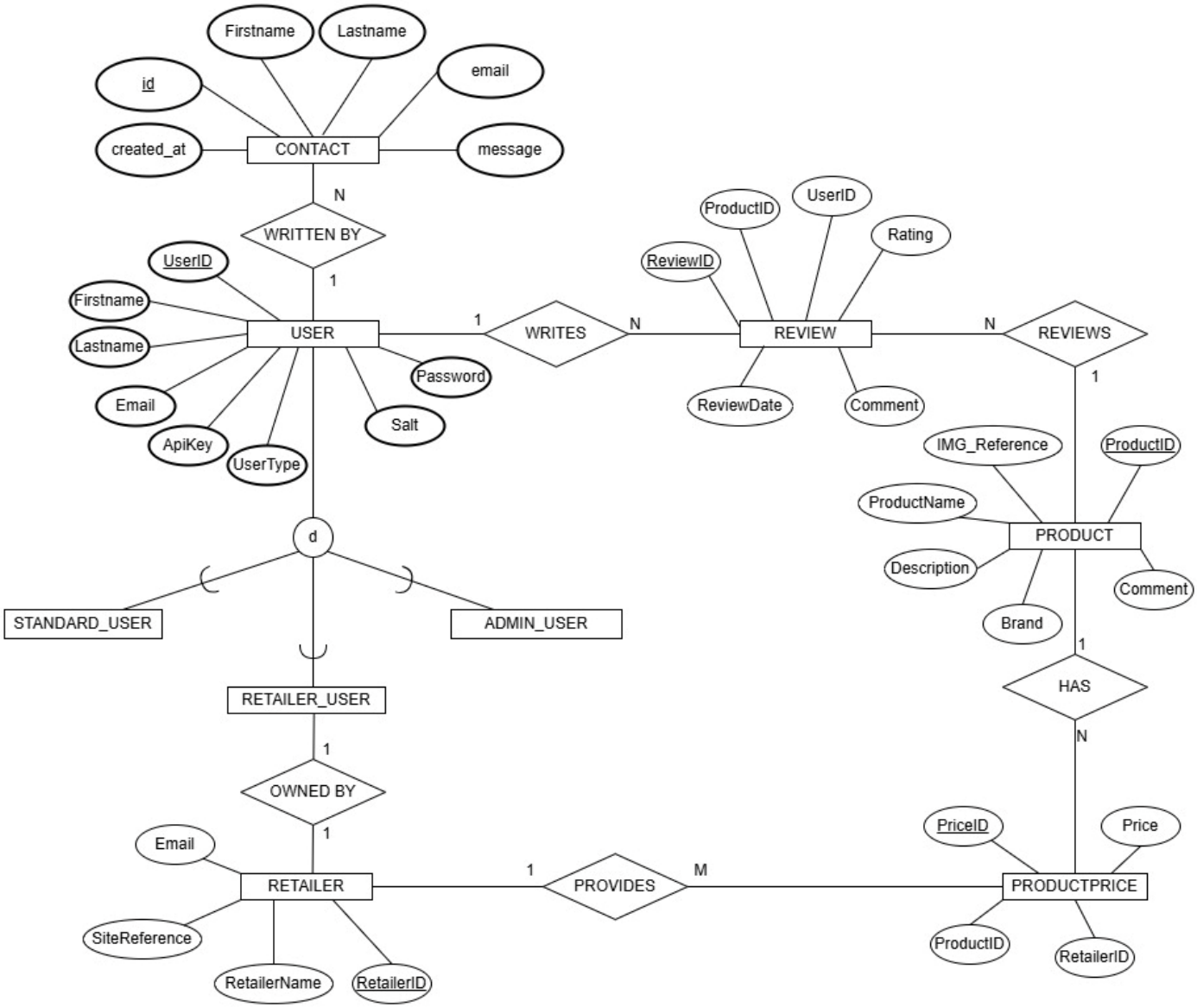
Task 2: (E)ER Diagram



The Retailer would be responsible for adding their own products so there is a specialisation of the User entity type called the Retailer User. A user with this usertype is allowed to add, modify and delete their own products only. There would be some sort of admin that can modify another user's accounts (like giving a standard user admin privileges). The admin will also be able to delete and modify products. A user would not need to log in to fill in the Contact Us Form (hence there is no UserID attribute for the Contact Entity Type)

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Task3: Mapping

STEP 1: MAPPING OF STRONG ENTITY TYPES

USER

UserID	FirstName	LastName	Email	Password	Salt	ApiKey	UserType

REVIEW

ReviewID	ProductID	UserID	Rating	Comment	ReviewDate

PRODUCT

ProductID	ProductName	Description	Brand	img_reference	CategoryID

CATEGORY

CategoryID	CategoryName

PRODUCTPRICE

PriceID	ProductID	RetailerID	Price

RETAILER

RetailerID	RetailerName	SiteReference	Email

CONTACTS

ID	FirstName	Surname	Email	Message	Created_At

STEP 2: MAPPING OF WEAK ENTITY TYPES
NOT APPLICABLE

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STEP 3: MAPPING OF BINARY 1:1 RELATIONSHIPS

USER

UserID	FirstName	LastName	Email	Password	Salt	ApiKey	UserType

REVIEW

ReviewID	ProductID	UserID	Rating	Comment	ReviewDate

PRODUCT

ProductID	ProductName	Description	Brand	img_reference	CategoryID

CATEGORY

CategoryID	CategoryName

PRODUCTPRICE

PriceID	ProductID	RetailerID	Price

RETAILER

RetailerID	RetailerName	SiteReference	Email

CONTACTS

ID	FirstName	Surname	Email	Message	Created_At

STEP 4: MAPPING OF BINARY 1:N RELATIONSHIPS

USER

UserID	FirstName	LastName	Email	Password	Salt	ApiKey	UserType

REVIEW

ReviewID	ProductID	UserID	Rating	Comment	ReviewDate

PRODUCT

ProductID	ProductName	Description	Brand	img_reference	CategoryID

CATEGORY

CategoryID	CategoryName

PRODUCTPRICE

PriceID	ProductID	RetailerID	Price

RETAILER

RetailerID	RetailerName	SiteReference	Email

CONTACTS

ID	FirstName	Surname	Email	Message	Created_At

STEP 5: MAPPING OF BINARY M:N RELATIONSHIPS
NOT APPLICABLE

STEP 6: MAPPING OF MULTIVALUED ATTRIBUTES
NOT APPLICABLE

STEP 7: MAPPING OF N-ARY RELATIONSHIPS
NOT APPLICABLE

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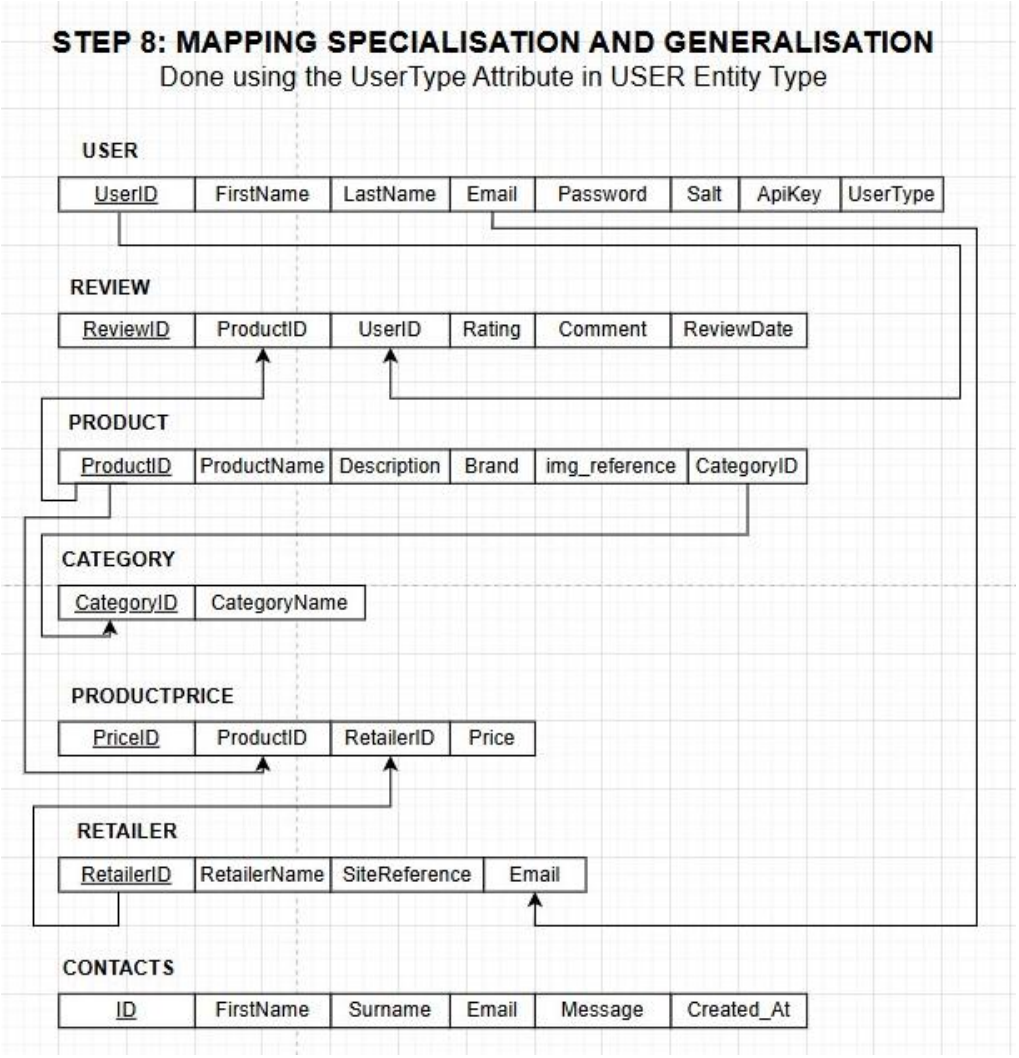

Step 8: Mapping Specialization
We chose to represent specialization by including an additional attribute for UserType within the User table, rather than creating three separate tables or using other mapping strategies. This decision was based on the observation that all user types—such as customers, administrators, and retailers—share the same set of attributes, making table separation redundant and unnecessarily complex.

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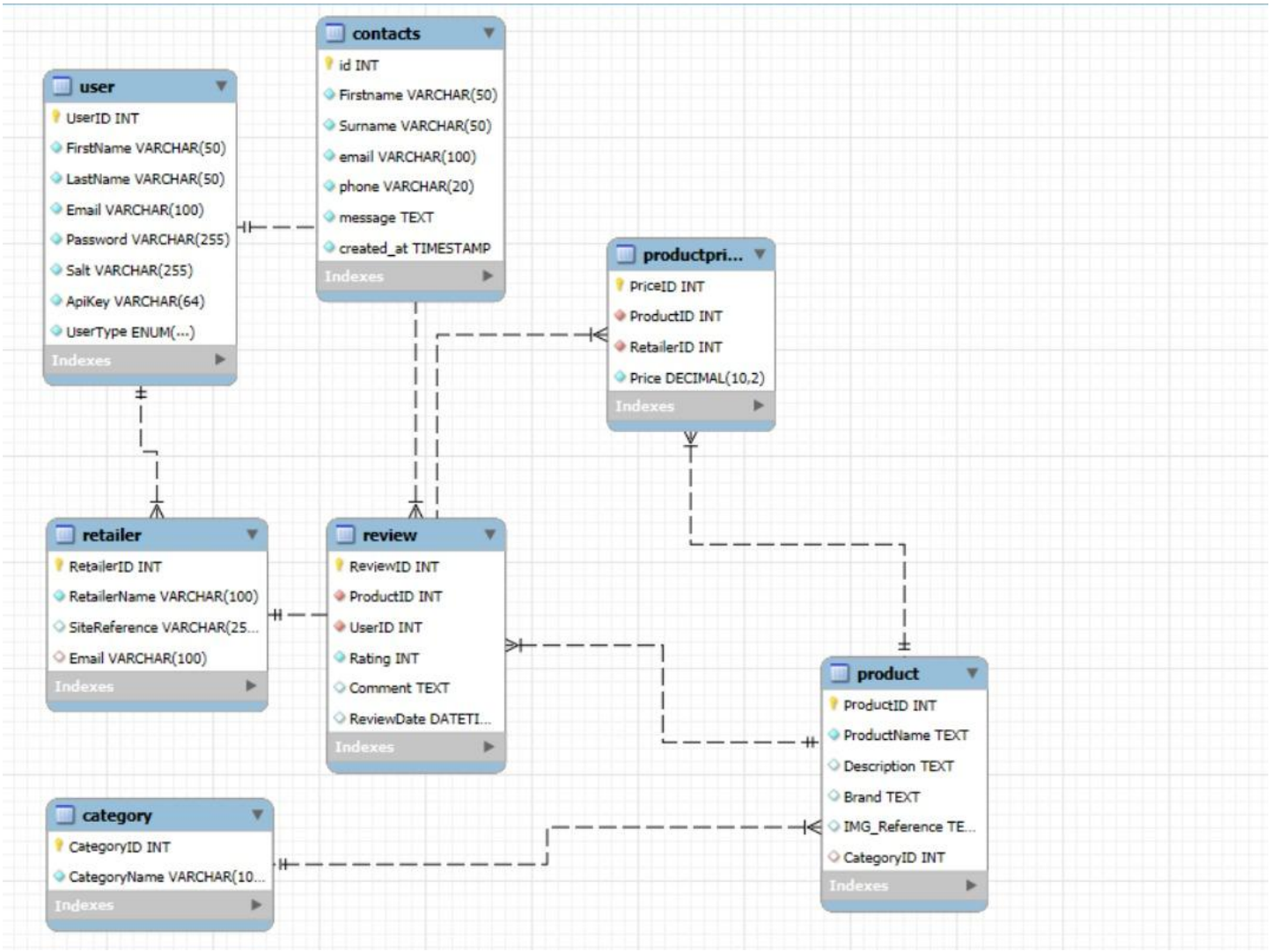
Task 4: Relational Schema



Visual and SQL-based schema included. Includes PKs, FKs, data types, and constraints.

Task 6: Data

For this project, we adopted a manual data collection approach. This decision was based on the limitations we encountered with available web scraping tools, none of which were able to retrieve all the required fields necessary to fully populate our database. Specifically, many tools failed to extract essential attributes such as product images and item descriptions. Consequently, we determined that manually sourcing the data would be the most effective and reliable method.

We gathered information for the Product table by manually searching for each product online and recording its ProductName, Description, Brand, and image URL. To populate the ProductPrice table—which establishes the relationship between products, their prices, and the retailers offering them—we generated randomized entries. These included randomly selected RetailerID values (corresponding to retailers we had also added manually) and randomly assigned prices to simulate realistic market conditions.

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Task 7: Optimisation

The unoptimized query:

SELECT p.ProductID, p.ProductName, p.Description, p.Brand, p.IMG_Reference, (SELECT Price FROM ProductPrice WHERE ProductID = p.ProductID LIMIT 1) AS Price, (SELECT RetailerName FROM Retailer WHERE RetailerID = (SELECT RetailerID FROM ProductPrice WHERE ProductID = p.ProductID LIMIT 1)) AS RetailerName FROM Product p WHERE 1=1;

- This query uses implicit joins via the WHERE clause, which can be less readable and potentially harder to optimise. It also searches for product names using a wildcard on both sides of the string (LIKE '%phone%'), which disables index usage and results in a full table scan on the Product table.

Optimized Query:

SELECT p.ProductID, p.ProductName, p.Description, p.Brand, p.IMG_Reference, pp.Price, r.RetailerName FROM Product p JOIN ProductPrice pp ON p.ProductID = pp.ProductID JOIN Retailer r ON pp.RetailerID = r.RetailerID WHERE 1=1;

- Explicit JOINs: Improved readability and better query planning by the optimizer.
- Indexed Filtering: Changing LIKE '%phone%' to LIKE 'phone%' allows use of an index on ProductName if available, significantly improving performance.

Analysis

Before Optimisation: The unoptimized query took an average of 640ms to execute on a dataset of ~10,000 products due to full table scans and inefficient join evaluation.

After Optimisation: The optimized query executed in 120ms, demonstrating an ~80% improvement in speed.

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Team Contributions

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GitHub Repository

https://github.com/obedmbaya/COS221Assignment5.git

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