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1. Introduction

This document describes a merchant website/application. This website will operate on principles taken from both Ebay.com and Amazon.com in an attempt to gain some of their user base. Items will be listed for sale on the website by either first-party or third-party sellers. These sellers can define a buy-it-now price¹ for which customers can immediately purchase the listed item. Items can also be bid on in a traditional fashion, similar to the model with which eBay has had success. Emphasis will be placed on proper design and implementation of the application's core systems, to ensure it's operation to be equally quick and flawless. On top of this heavily tested core, there exists a cohesive theme based on the company name "Fusion Ltd.". The theme places importance on futuristic system ideas, and a utopian environment to operate these systems. It is important to have the two pillars of proper system design and an appealing front-facing design in order for this application to be successful.

¹ terminology subject to change

* need to provide
the whole ER diagram

2. Requirement Analysis

2.1. Sale Items

Each item will have its own unique ID number, a name, the ID number of the seller / supplier, its price, its category, and the state it is being shipped from, and the type of sale. Optional attributes are the reserve price, URL to a more detailed description of the product, and the description of the item (500 characters or less).

Each entry will have the following attributes:

1. Item ID Number
2. Name
3. Has Been Sold
4. Seller / Supplier
5. Price in Cents
6. Reserve Price in Cents
7. Quantity
8. Category
9. URL to Detailed Description
10. State to be Shipped From
11. Type of Sale, meaning listed price or auction
12. Description

2.2. Categories ~~(not in ER)~~

Each category will have an ID, name, and possibly the ID number of the parent category. If a user wants the parent of an ID it can use the parent ID given to fetch the name of the parent category. To retrieve all of the child categories of category A, one can fetch all categories with A's ID listed as the parent category ID.

The following will be the root categories:

- Automotive
- Clothing
- Entertainment
- Electronics
- Home
- Sports & Outdoors
- Health & Cosmetics

Some important things to know about the parent child relationships are:

- The maximum depth of the category tree is 16 categories.

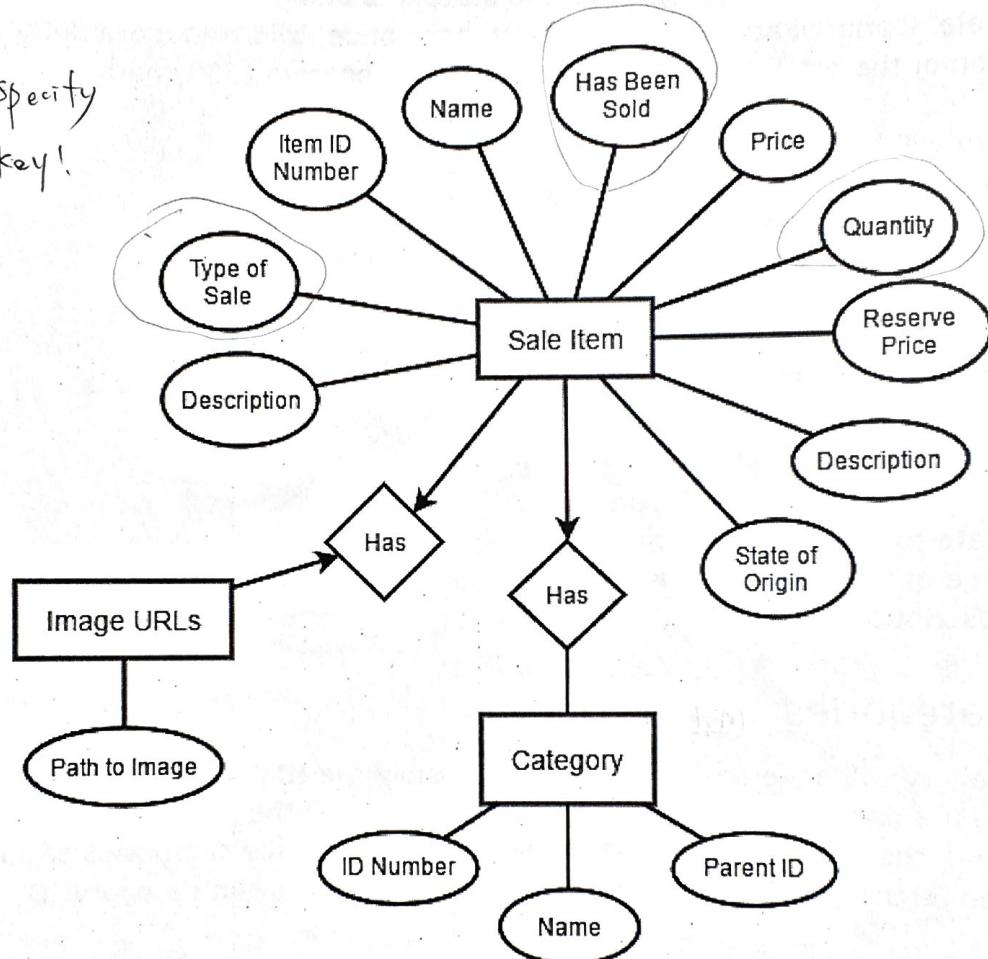
- A child can only have one parent.
- A parent can have a maximum of 64 children.

Each entry will have the following attributes:

1. Category ID
2. Category Name
3. Parent Category ID

* These attributes should relate to an seller

* need to specify primary key!



Sale Item ER Diagram (figure 1)

2.3. Suppliers

A supplier is a person or company with at least one product listing on the site.

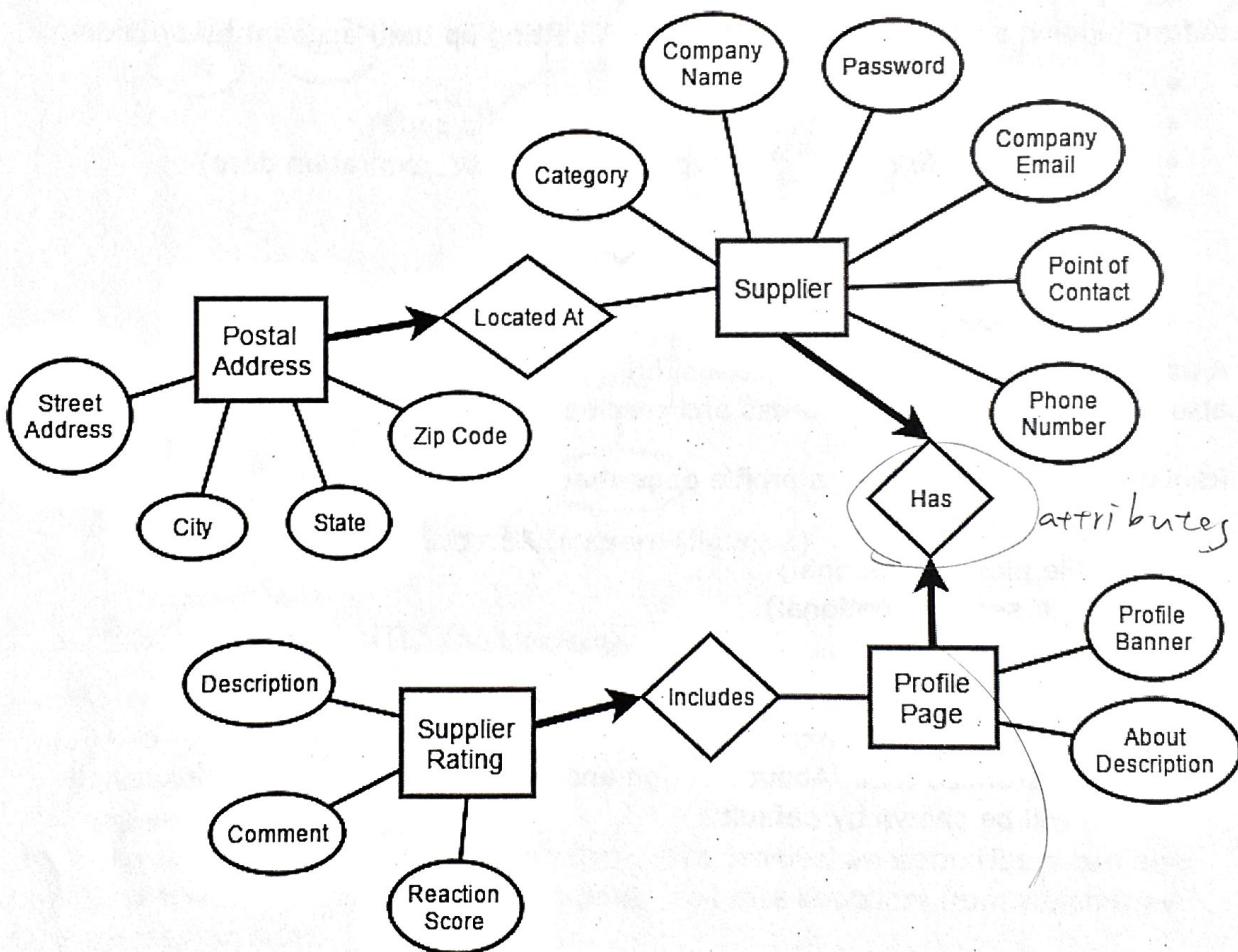
Each entry will have the following attributes:

1. Company Name
2. Address
3. Password
4. Point of Contact

5. Email
6. Phone Number
7. Company Category
8. Yearly Revenue
9. Company Profile Page

The profile page includes:

- Profile banner (optional)
- 'About' section (optional)
- Rating info
 - average rating
 - recent comments



Supplier ER Diagram (figure 2)

2.4. Registered Users

Non-registered users cannot bid, sell, or rate suppliers, users, or items. To register, a user provides a:

- Unique username
- Unique email
- Password

The username must be unique so that users can hold each other accountable. The password must be at least 8 characters and contain at least one number, and one symbol. Users log into their account using their email and password.

Before bidding or selling, a user must finish setting up their account by providing:

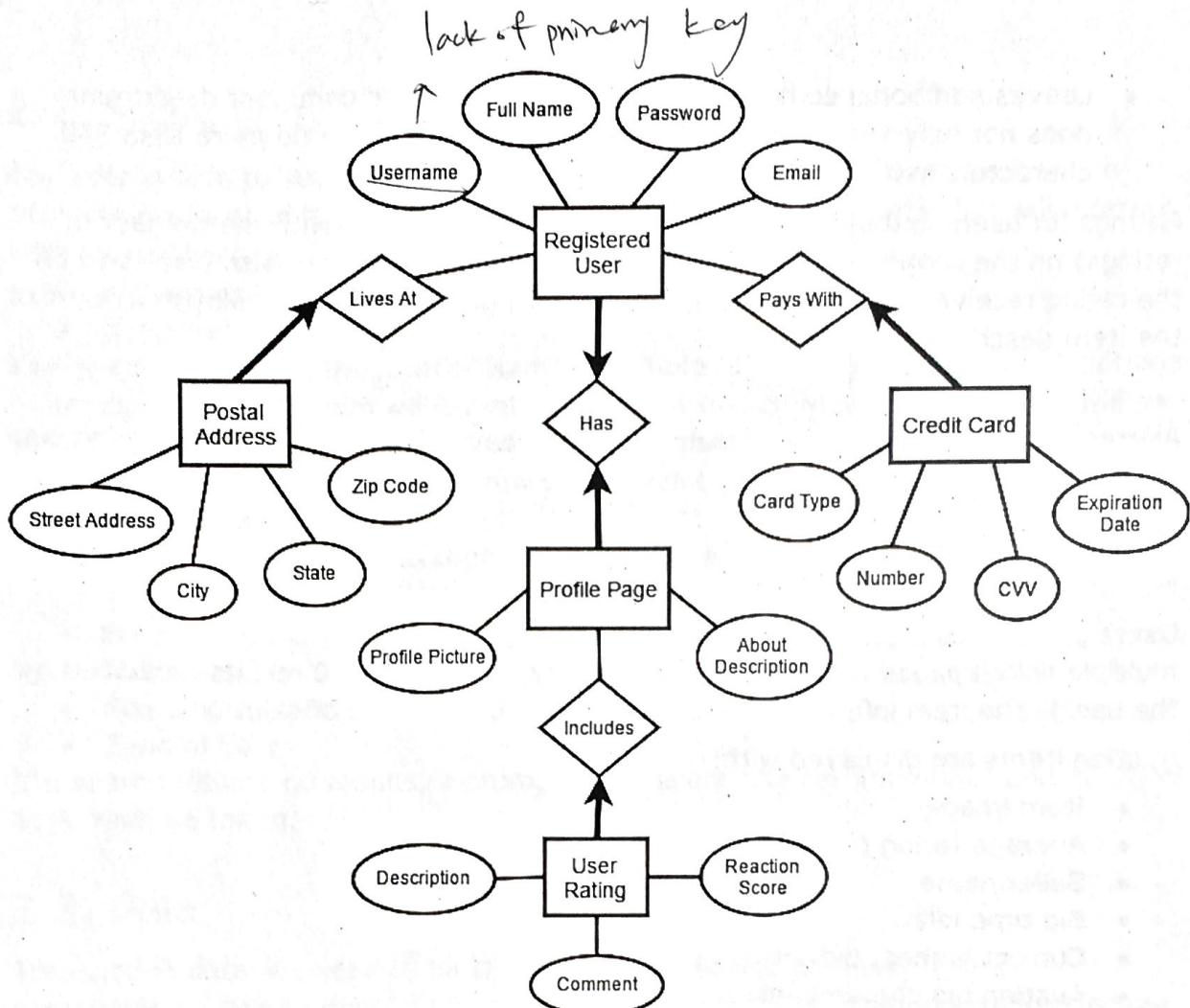
- Full name (first name, last name)
- Postal address (street address, city, state, zip code)
- Credit card info (credit card type, number, CVV, expiration date)
- Phone
- Age
- Gender
- Annual income

A user can edit their account settings, but previous constraints still hold. A user can also have more than one address and credit card.

Registered users are given a profile page that includes:

- Username
- Profile picture (optional)
- 'About' section (optional)
- Rating info
 - average rating
 - recent comments

Users can customize their 'About' section and profile picture, but username and rating info will be shown by default.



User ER Diagram (figure 3)

2.5. Rating System ~~(not in ER)~~

The rating system has three parts:

- User Ratings
- Supplier Ratings
- Supplier Item Ratings

Users can rate other users from which they have ordered an item. Users can also rate items they have ordered from a supplier and rate suppliers from which they have ordered an item.

When rating, the user:

- Provides a reaction score from 0 to 5 (0 being angry and 5 being happy)
- Selects a generic rating comment (e.g. very happy, item arrived damaged, misleading description or picture, other, etc.)

- Leaves additional comments if they feel the generic comment description does not fully summarize their reaction. Comments are no more than 500 characters in length.

Ratings for users and suppliers are averaged and displayed (with the number of ratings) on the rating receiver's profile page. Recent ratings are also displayed on the rating receiver's profile page. Ratings for supplier items are displayed as part of the item description page.

Average customer rating is calculated ($\frac{\sum_i^{rating_i}}{n}$) based on the number of reviews and the scores of each review...

2.6. Browsing

Users are able to browse search results. The browsing display is composed of multiple linked pages where each page displays 25, 50, or 100 results (specified by the user). The item info for each result is based on the type of sale.

Auction items are displayed with:

- Item image
- Average rating (seller and/or item)
- Seller name
- Bid time left
- Current highest bid
- Auction bid cap amount

Listed items are displayed with:

- Item image
- Average rating (seller and/or item)
- Seller name
- Listed price

The browsing display can also be organized by selecting a filter option:

- Sale type
- Seller rating
- Item rating
- Bid time left
- Current highest bid
- Bid cap
- Listed price

2.7. Searching

Any user is able to search the entire database of items to return a result which contains a subset of the database. The search will have two parts that will interact with each other:

1. Key words
2. Conditions

Key words will search the item's "Name" attribute for matches. If any combinations of words match, that item will be returned in the search results. The results will be sorted in order of how many keywords the item matches successfully.

Conditions will be available to narrow the search to a smaller subset of items.

These possible conditions will include, but are not limited to:

- Supplier (Limited to 10 suppliers which have the most relevant items in stock, can be expanded to show all suppliers possible)
- Price
- Category
- Shipping Address (State/Country of shipment)
- Type of Sale

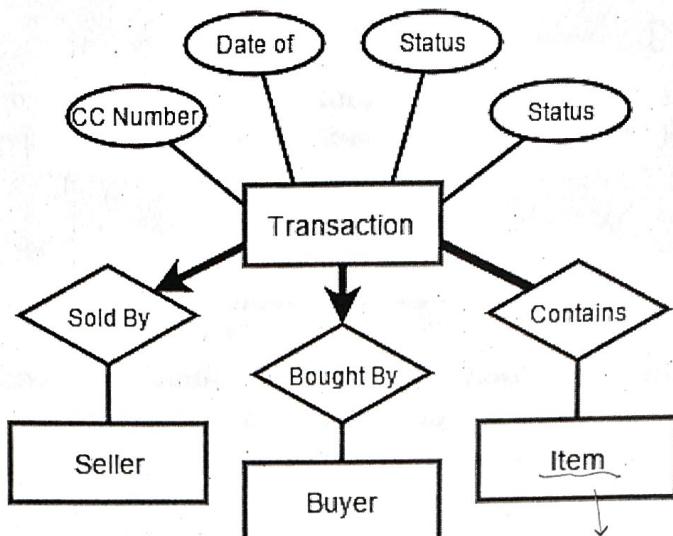
If a search returns no results, a prompt will present "No results found" and no other action will be taken.

2.8. Sale

Transaction data will need to be stored to keep records of sales. In this circumstance, sales refers to any purchase that is not done through bidding for the item. A sale is completed for a publically listed amount. If an item is not currently available, an order may be placed and the transaction will be fulfilled when the item is back in stock. Each transaction will need to store the following attributes:

1. Buyer ID
2. Item ID(s)
3. Seller ID
4. Credit Card Number
5. Sale price
6. Transaction Status
7. Transaction Completion Date

After the sale is successfully completed, the item is shipped to the buyer and the transaction record will be maintained for at least 6 months.



Transaction ER Diagram (figure 4)

* Does it equal
to "Sale Item"
in previous sections?

2.9. Bidding

In lieu of a direct sale, customers may bid on an item by repeatedly driving the price up during a time frame until that time frame is complete. At this time, both the seller and all prospective buyers are notified of who had the highest bid and for what amount. Contact information of the seller and highest bidder are sent to the respective parties for them to independently complete the transaction (This occurs regardless if the item's final price is over the reserve amount). Whichever customer submitted the last bid when the bidding timeframe is complete receives the item, assuming their transaction is valid. If the last bidder's transaction turns out to not be valid for whatever reason, the item will go to the second to last bidder (unless they reject the item) and so on.

Each bid must be at least \$2 higher than all previous bids. The bidding timeframe starts when the item is registered for sale and concludes when the seller specifies, no more than one month after item registration.

* How bidding data is stored in the database is not clear. (ER)

2.10. Order and Sale Reports

Every week a sales order summary report will be created including data from that Monday to Sunday. We will use the reports to evaluate items nearing depletion then to notify the suppliers that they need to restock their inventory.

Included in report:

- Item ID
- Category

- Seller ID
- Buyer ID
- Price
- Date of purchase
- Quantity left (Quantity in stock - Quantity purchased)

Depending on what the item is, we will set a quantity to be considered "Low in stock" on its page. Once an item reaches the status of "Out of stock" (0 items left) its standard date for potential delivery will be altered based off of when the item is expected to be restocked.

2.11. Delivery

After the winner of the auction has been decided, the supplier has a week to ship the item to the buyer. The credit card is charged when this is done but the payment stays with us. When the buyer has received the item, they will be given a week from that date to return it. Once the week is over and the item has not been returned, the supplier will receive their payment from us. If for some reason the item was returned, the buyer will be refunded by us and the item will be returned to the seller. We do this to avoid running into any trouble with payments and returns.

* Think about it: an item in an order may have multiple items. While returning

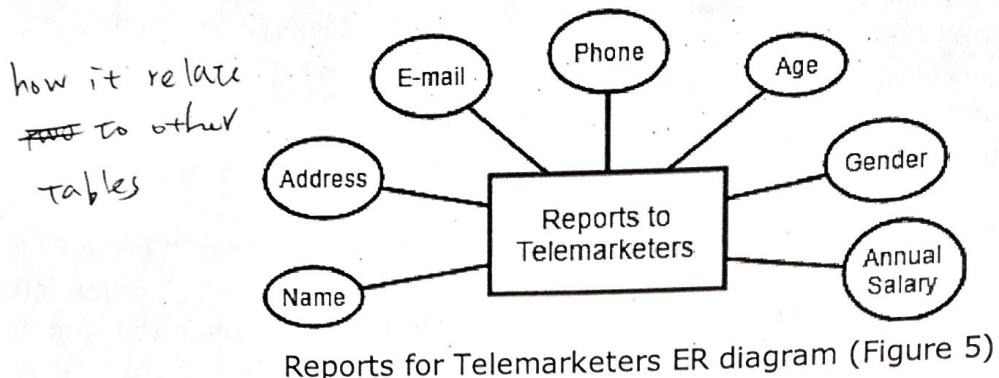
does all items in the order ^{be} returned? If not, status associated with a transaction

2.12. Reports to Telemarketers

At the end of each week a report will be put together pulling information from each active new user added anytime between that Monday to Sunday. The report will include the following attributes:

- Name
- Address
- E-mail
- Phone
- Age
- Gender
- Annual Income

This info needs to be recorded either on signup or when a user commits to buying/selling an item in order so we're able to send it to a telemarketing firm. To put together this report we will have an entire table geared towards the telemarketing sector. See the ER diagram in figure 4.



2.13. Product Notification System

Out-of-stock

Suppose a product is currently out-of-stock. Any user will be able to submit his/her e-mail address in order to be notified when that specific product is back in stock.

On-sale

Suppose a user is interested in purchasing a product, but does not want to pay the current price. He/she can submit his/her e-mail address in order to be notified if that specific product's price drops.

2.14. Affiliate Feature

Select suppliers will be granted membership into an affiliate program. Membership can be obtained through an application process. These suppliers will be known as affiliate suppliers, and have privileges exclusive to members of the affiliate program. Affiliate suppliers will be able to sell products at a discounted rate. Additionally, affiliate suppliers will receive a portion of the profits from any resulting affiliate sales.

In other words, approved suppliers have a monetary incentive to extend the Fusion Ltd. sales network, which will in turn lead to exponential growth for the company.

2.15. Social Media API Integration

Integrate existing social media functionality into the Fusion Ltd. platform. Buyers and sellers will be able to share products on their favorite social media outlets without having to leave our application. The following social media companies will have integrated functionality:

- Facebook
- Twitter
- Pinterest

Additionally, there will be an option to share the product via e-mail.

3. Possible System Issues/Additions

3.1. Data Encryption

Given the sensitive nature of some of the data that must be stored, it may be necessary to encrypt the data. At this time, encryption was not included as one of the needed principles in the database design; however, it is a feature that could be added rather seamlessly during the implementation phase of the project.

3.2. Access Speed

Due to the massive amount of data that will hopefully be stored, issues with access speed could arise. The first pillar of making this application successful is a strong fundamental database design which includes speed as a top priority. Thus, future measures may have to be taken to ensure that accessing the information in the system is done in a timely and reasonable manner. Possible solutions include a distributed database system or more contemporary solutions such as NoSQL and other competitors. If the business becomes successful, this is a problem that will eventually arise. It is one for which a solution must be found soon.

3.3. Possible Additions

If the time and budget permit, some additions may be made to the system. The largest addition would be an independent mobile application component. This component would allow buyers to place bids on the go as well as purchase items and rectify small details (like an invalid shipping address). It would also allow suppliers to confirm shipment of items and change descriptions or upload pictures of the items they have on sale. Other functionality that this addition could possess will be more detailed in the future if it is decided that this addition is realistic.

4. Conclusion

Fusion Limited. is both a buyer's and seller's dream application. While there are similar applications currently on the market, Fusion Limited distinguishes itself from its competitors via a sleek and minimalist user interface. Users possess the ability to share site content on their favorite social media platform. Additionally, loyal third party sellers will be rewarded with an opportunity to become an affiliate vendor. It's features such as these that demonstrate the company's ability to foster prosperity for not only itself, but its users as well. Fusion Limited is not attempting to revolutionize the online buying/selling industry; instead, the company seeks to attract users that value simplicity and efficiency.