

CPSC 471 - Database Management Systems

Final Report

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Abstract

In today's day and age, handmade businesses on street corners and malls are disappearing and the Covid-19 pandemic has only accelerated this process. Handmade businesses cannot afford the cost to sell in physical stores, but the demand for unique art items is growing, especially amongst younger generations who also shop online more frequently. A 2018 Statistic Canada report found that there has been a rapid growth in e-commerce, as 95% of Internet users between 25 to 34 years of age shop online [3]. The report further states that total spending of Canadian online shoppers reached \$57.4 billion in 2018, compared to \$18.9 billion in 2012; This is a 203.7% increase in just 6 years. Due to the pandemic, e-commerce sales reached a record, a whopping 99.3% increase in just one year [4]. Small handmade businesses should be a part of this shift and benefit from it.

Online third-party sellers and inventory management platforms have a history of charging many fees while providing rather minimal returns to small businesses. This project report proposes a user friendly database management system with the purpose of helping local businesses thrive in this new economy, through lower service costs and helpful built-in tools such as book-keeping and inventory management. The local business in primary focus for this project is ViVi Art Gallery, a small handcraft art business; however, these services may be offered to further businesses and entrepreneurs as the platform scales in the future and encourages newcomers to pursue their creative ideas without dealing with the complex features and overwhelming costs imposed by other platforms of similar nature.

Introduction

ViVi Art Gallery is a small handcraft art business recently established by a local husband and wife with the promise of a unique piece of art that would bring happiness and total satisfaction to its new owner. The art products, handcrafted by the wife from select material, may be made to order or made to stock depending on customer demand. In the meanwhile, all accounting and bookkeeping are taken care of by her husband. As an online startup, they solely use different third-party services for virtually all tasks associated with running and managing the business, which pose certain challenges in terms of productivity, sales, and building a brand.

The proposed solution is to build a website specifically catered towards managing and scaling ViVi Art Gallery as a remote start-up business. This system will be made more affordable for the business owner and provide features specifically geared towards managing all expenses associated with manufacturing and selling handcraft art through an interactive user interface. The system will generate analysis reports and financial statements as well as keep track of inventory. Lastly, clients may purchase and leave reviews for items on the website and subscribe to an automatic mailing list for updates on new items and promotions.

Problem Definition

As a recent start-up, the inventory and customer base are relatively small-scaled for the time being. Raw materials and supplies are purchased from both in-person and online suppliers such as Michaels, Alibaba, Amazon, and various stone shops. For marketing and advertising purposes, the shop owners have created social media accounts to promote their business on platforms like Instagram, Facebook, and Pinterest. The owners use Etsy as their main platform for selling to customers, conducting market research, and advertising their products and services. Etsy is a platform that many online shoppers frequently access to find unique items they can't find anywhere else. While it is proven to be simple and convenient for new users, it does pose certain challenges.

Due to the sheer volume of other sellers and businesses on the platform, startups like Vivi Art Gallery experience low sales volumes and increased competition, making it very difficult to build brand awareness. Etsy limits interaction with customers by not allowing shop owners to add customers to an email list or utilize an email marketing provider, and communication with the customer is limited. As a result, every sale is a one-off sale and communication with customers after a purchase is very limited if not non-existent. Customers also cannot leave reviews for items with the guest accounts they used to purchase such items. Secondly, there are no bookkeeping and accounting features provided by Etsy, which would have otherwise been extremely beneficial for business owners to properly assess the profits and losses of their business. Another big challenge is not being able to make profit due to all the costs associated with listing and selling products through Etsy as a third-party platform. Etsy charges \$0.20 to list an item on and listings are only active for 4 months. There is also a 5% transaction fee on every item, 3% + \$.25 payment processing fee, an additional 15% fee if the sale was the result of one of Etsy's paid ad placements, and an overall 8-23% of the revenue paid directly to Etsy.

There exist alternative solutions such as Amazon Handmade, ArtFire, and Zibbet. Similar to Etsy, all these platforms include overhead charges, however they do not provide enough services catered towards small handcraft art businesses like Vivi Art Gallery. Bookkeeping and accounting must be either managed manually or through third-party online services or softwares like CraftyBase which are very complex in terms of excessive features and similarly charge extra for their subscription packages. The market for inventory and accounting database management systems is very competitive, and as such, many systems vie to provide as many services as possible in lieu of simple and user-friendly features which would otherwise have been both easier and less costly for small family businesses.

Proposed Solution

The proposed solution is a holistic and tailored platform with the primary objective of providing a cheaper alternative to online shopping and inventory/accounting database management platforms by using PayPal as a medium for transactions and removing ads/listing fees. The next objective of this system is to service online startups and small local businesses like Vivi Art Gallery which often lack the resources necessary to make profit during their initial financial quarters. The proposed website will allow the business owner or partner to login as admin and directly manage their existing inventory, perform bookkeeping operations, and engage in customer outreach. These features will be provided through a relatively simple and easy-to-use interface.

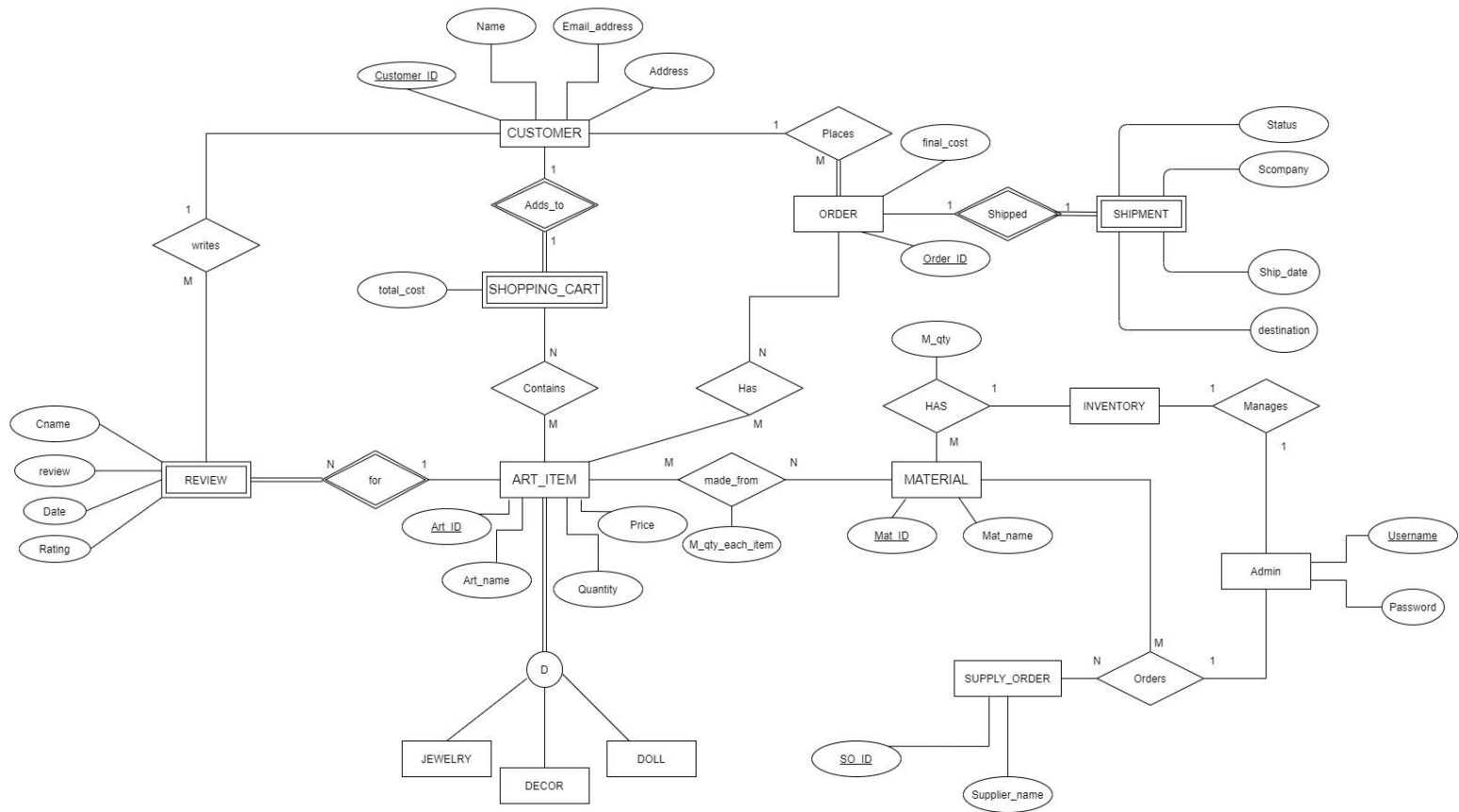
The most robust feature of this website will be the inventory management system, which will also include a book-keeping system for sales. The inventory system will not only allow the admin to easily access records of their materials, suppliers, and shipments, but also be informed when their stock is running low, so that they may manage customer requests in a more timely manner. It will also maintain records of order history and customer list. The bookkeeping feature involved generating useful financial statements such as cash flow statements and balance sheets, as well as ratio analyses which will be presented in an easy to understand format for the admin to become better equipped to make decisions to maximize their revenue and profit.

Lastly, this website will improve customer/seller relationships by keeping customers up-to-date with new products and promotions through an automatic email system customized by the shop owner. The customers, as another group of end-users, will not be required to create accounts to leave reviews for purchased products on the website. A tentative, nice-to-have feature would be to integrate social media plugins such as Instagram, Facebook, and Pinterest to help the admin advertise their products and attract a wider segment of their target demographic.

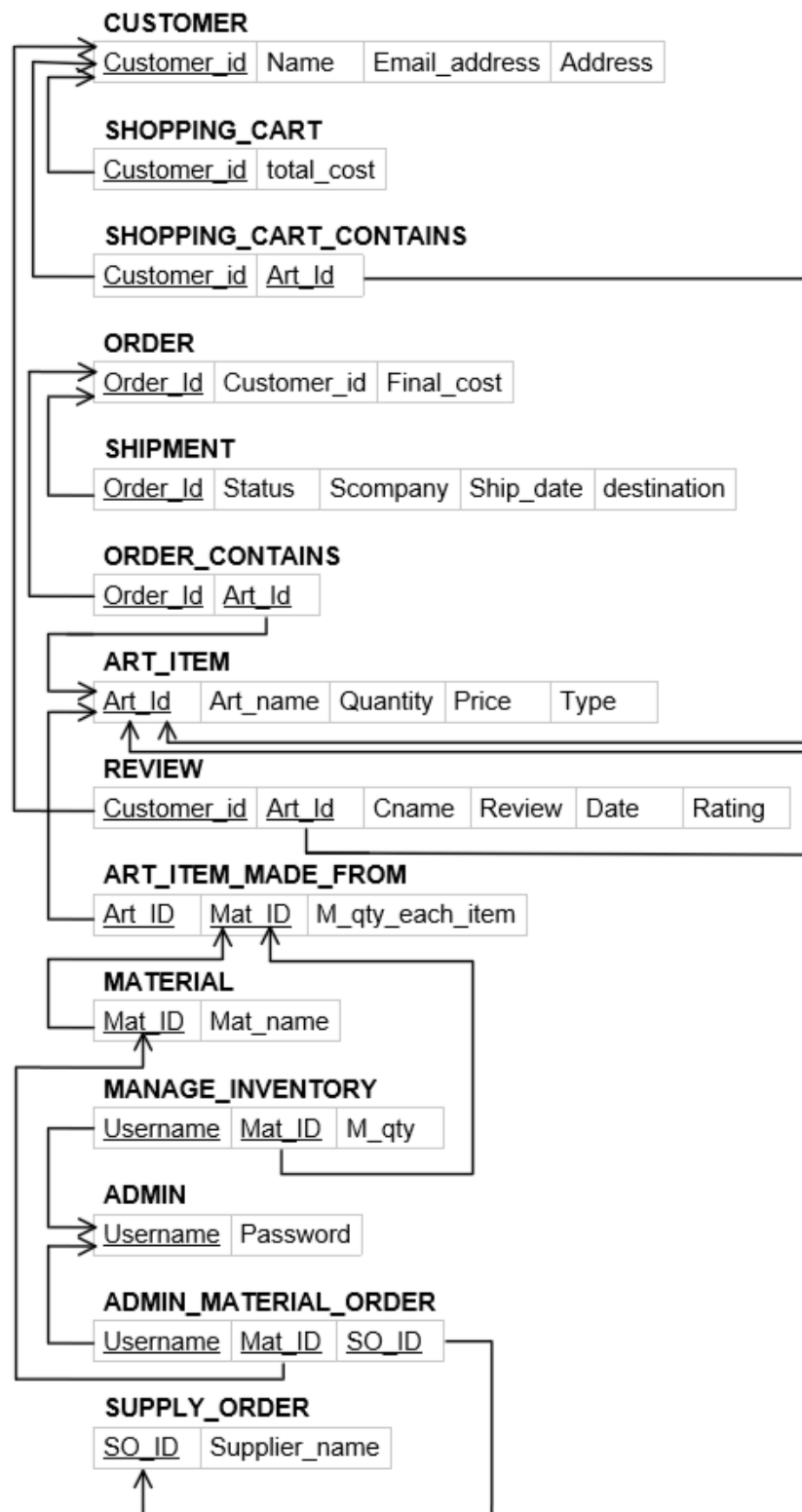
System Features

The database system built for this website provides data models and API endpoints for two types of users: the system administrator i.e. the online shop owner as well as customers. Firstly, an admin may manage their inventory of art items, place material orders from suppliers, and view a summary of customer orders and reviews. Customers may add art items to their virtual shopping carts to be purchased later, check the shipment status of their orders, and write reviews for their received items.

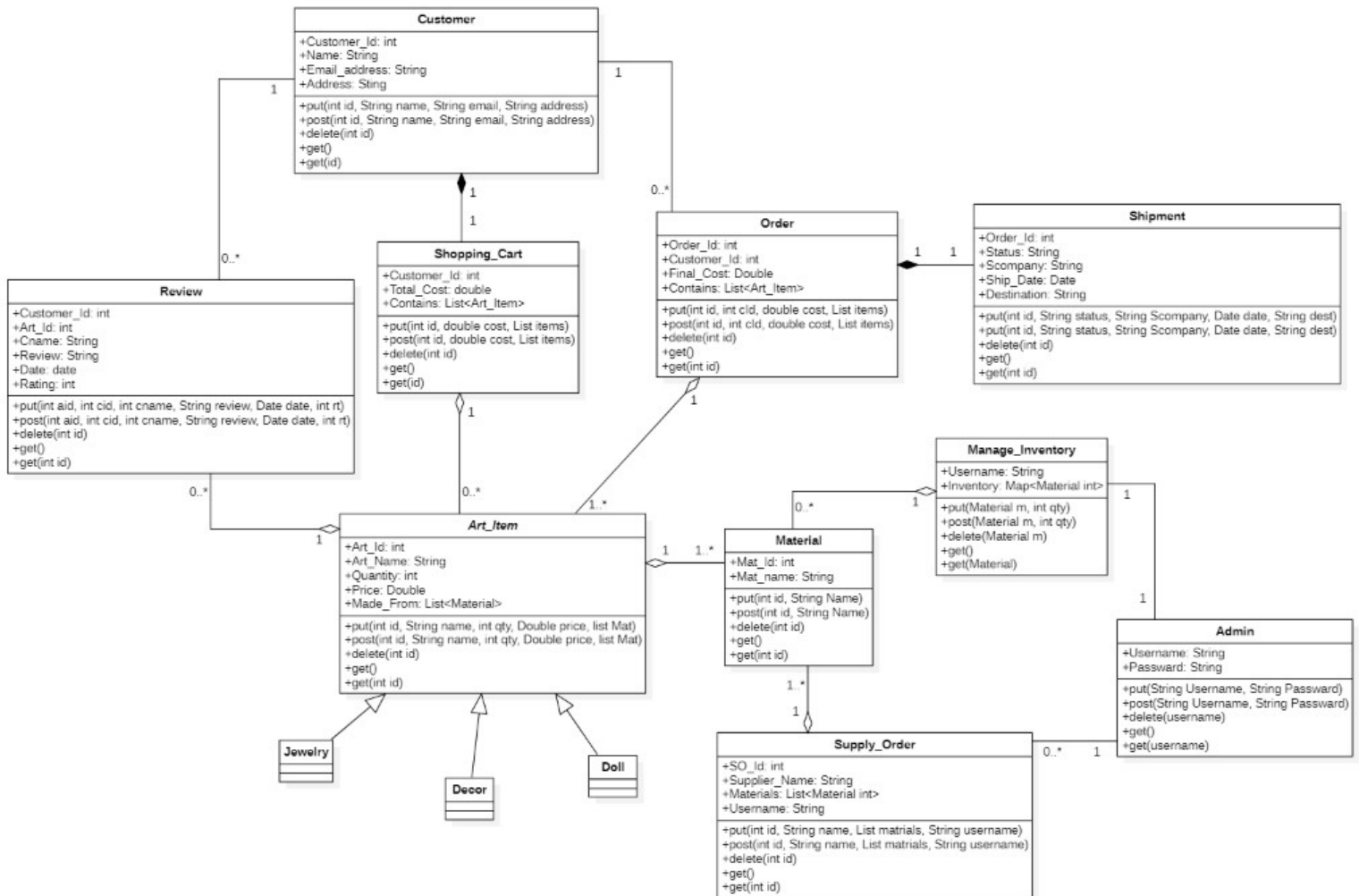
Extended Entity Relationship Diagram



Relational Model Diagram



Object-Oriented Model



SQL DBMS Implementation

The database and API methods for this project have all been implemented with php and tested on localhost through phpmyadmin provided by the Apache and MySQL servers.

The api methods have been implemented according to the following general queries, which are applicable to every relation in the ViVi Art Gallery database named “Online-Store-API”. The varying relation names, attribution names, and selection conditions are indicated by [table_name], [attribute_value], and [selection_condition] respectively, which may be overwritten for any particular API request.

Put:

```
UPDATE [table_name]
SET [attribute = value]
WHERE [selection_condition]
```

Post:

```
INSERT INTO [table_name]
VALUES [values_to_insert]
```

Delete:

```
DELETE FROM [table_name]
WHERE [selection_condition]
```

Get (with parameter):

```
SELECT [attribute]
FROM [table_Name]
WHERE [selection_condition]
```

Get (no parameters):

```
SELECT *
FROM [table_name]
```

API Documentation

The API documentation has been generated using the built-in API documentation feature provided by Postman. This API documentation has been exported from Postman as a JSON file by the name of “Online-Art-Gallery-API.postman_collection.json”, which includes a short description and expected parameters for every existing API endpoint in this DBMS.

User Manual

Access to the ViVi Art Gallery database requires installation of XAMPP, Apache Server, and MySQL Server on the C: drive. After running the latter two servers on the XAMPP Control Panel, a new database must be imported on localhost/phpmyadmin which may be loaded on any browser. There are two options for which file to import to the new database:

- “InitTables.sql” creates empty tables.
- “InitTablesWithData.sql” creates tables and populates them with sample data.

Next, all necessary php files must be saved in the “htdocs” folder located under the “xampp” folder on the C: drive. The php files are categorized in three directories:

- The “config” directory contains one file, “Database.php”, which is responsible for configuring the database.
- The “models” directory contains a file for each entity which is responsible for all the business logic associated with constructing tables and executing queries.
- The “api” directory serves as the microservice directory whose naming corresponds to “models” and contains multiple folders for each entity that it interacts with (e.g., Art_item, Customer, Shipment, etc.). Each of these folders contains a file for every general query: GET, GET_SINGLE, POST, PUT, and DELETE.

All testing and management of API requests has been done with the Postman API platform.

Sample API Requests for “Customer”:

- Get: to get all customers
`https://localhost/Online-Store-API/api/Customer/get.php`
- Get_Single: to get customer with Customer_Id = 11
`https://localhost/Online-Store-API/api/Customer/get_single.php?Customer_Id=11`
- Post: to create customer
`https://localhost/Online-Store-API/api/Customer/post.php`

```
{  
    "Customer_Id": "11",  
    "Name_": "Joe",  
    "Email_address": "joe@gmail.com",  
    "Address": "111 street Gotham City"  
}
```

- Put: to update customer with Customer_Id= 11 (will update name, email, and address)
<https://localhost/Online-Store-API/api/Customer/put.php>

```
{
    "Customer_Id": "11",
    "Name_": "Joe",
    "Email_address": "joe123@gmial.com",
    "Address": "22 ave Gotham City"
}
```
- Delete: delete customer with Customer_Id= 11
<https://localhost/Online-Store-API/api/Customer/delete.php>

```
{
    "Customer_Id": "11"
}
```

References

- [1] Etsy. (2020). *Where The Hands Can Inspire a Joy of Art Crafts by ViVi Art Gallery*. Retrieved from <https://www.etsy.com/shop/viviartgallery>
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- [4] Government of Canada, Statistics Canada. (2010, July 24). *Retail e-commerce and COVID-19*. Retrieved from <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00064-eng.htm>