Canadia-wide Book Selling Website

Group 34
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1. Requirement Analysis

1.1 Introduction

1.1.1 Purpose:
This application will store the information and constraints required to efficiently run a online book-selling website, which is able to categorize and sell books, and provide customer services such as tracking and reviews.

1.1.2 Scope and special requirements:
This application supports an online book-selling website. The website sells both printed books and e-books in Canada. We focus on customer's buying behavior. Our online book-selling website does not support products return, changing prices of products with time, any kind of special offers or online support, and customers can not sell books on this website. We also do not support cart function, any customer that want to buy books can buy via directly placing the order.

1.1.3 Terminology:
Book: The term refers to an entity set of all the releases of books we have in the inventory, instead of one paper book.
ISBN: A ISBN is assigned to each edition and variation (except reprintings) of a book. For example, an ebook, a paperback, and a hardcover edition of the same book would each have a different ISBN
Civic Address: A civic address consists of unit number (optional), civic number, civic number suffix (optional), street name and street direction (optional). Civic address is unique within a city.

1.1.4 Resources:
How to define ISBN: https://en.wikipedia.org/wiki/International_Standard_Book_Number
Canada Post Addressing Guideline on civic address:
https://www.canadapost.ca/tools/pg/manual/PGaddress-e.asp?ecid=murl10006450#1417752

1.2 Database description

Entities and their attributes

Books: An entry of book is-a printed book or is-a ebook. It has to be either a printed book or an e-book (covering constraint). An entry of book is associated with several attributes, including its author, name, price, release date, publisher, edtion and is identified by its primary key called ISBN（International Standard Book Number）
Customers: An entry of customer is someone who can make order, provide address and be interested in some categories of books. An entry of customer is associated with several attributes, including his or her name and is identified by its primary key called email.
E-books: An ebook type is a subclass of the book entity. It inherits all the features of a book and supports its own attribute, including the format of ebook(pdf, doc).
Printed books: A Printed book type is also a subclass of the book entity. Each printed book is related to many physical copies, and the number is represented by the attribute called quantity.
Categories: The category entity set has only one attribute called typename (Sci-Fi, Horror, Mystery), and this attribute is the primary key of this entity set
Cities: A city entity set has two attributes, province and city name, which are combined to be its primary key. Every city must be served by at least one depot. A metropolis may be served by several depots.
Address: Address is a weak entity of city. It stores all the address information of customers. Its attributes are civic address, postal code, receiver, phone number. The civic address is the partial key since civic address is unique within a city. An address has to be provided by at least one customer and can only be located in exactly one city. A customer can provide many addresses.
Depots: Depots are locations to store items. It has a key attribute called depot address and an attribute called status representing whether it is out of stock or not. Every depot has to serve at least one city.
Reviews: Review is an weak entity of book. It has 4 attributes, including index, date, rating and comment where index is its partial key. We only track the latest review made by a customer to a book.
Orders: Order entity has 4 attributes which includes orderID, date, payment information and total price, where orderID is its primary key. If a order only includes ebooks, it will not participate in the shipping relationship. Else, the printed books included in the order are indivisible and will be shipped to an address provided by customer from a depot.

Relationships
makes: A customer makes an order. The relationship is one to many with key and participation constraint on orders, because a customer can make multiple or no orders, and an order can only be made by one customer.
includes: An order includes a book. The relationship is many to many with participation constraint on order, because an order should at least include one book, and a book can be ordered by multiple times.
interested in: A customer interested in a category. The relationship is many to many, because a customer can be interested in multiple categories, and a category can be interested by multiple customers.
belongs to: A book belongs to a category. The relationship is many to many with a participation constraint on books, because a book should belong to at least one categories.

provides: A customer provides an address. The relationship is many to many with participation constraint on address, because one customer can provide multiple addresses, and an address should be provided by at least one customer.
shipping: The printed books in an order is shipped from a depot to an address. The relationship is one to many to many with key constraint on order. The order is indivisible. It can only participation in one shipping relation. An address can receive printed books multiple times on different orders. A depot can send printed books multiple times for different orders. The relationship has an attribute tracking number to track the shipment.
writes: A review is written by a customer. The relationship is many to one, because a review can only be wrote by one customer, but a customer can write multiple reviews.
related to: A review is related to a book. The relationship is many to one, because review is a weak entity set of books. A review can only be related to one book, and a book can have multiple reviews related to it.
stored at: Printed books are stored at depots. The relationship is many to many, because a single type of printed books can exist in many depots or out of stock, and a depot can have multiple or no printed books stored in it.
serves: A depot may serve several cities. The relationship is many to many with participation constraint on both sides. Every city has to be served by at least one depot, and every depot has to serve at least one city.
located in: An address is located a city. The relationship is many to one, because address is a weak entity set of city. An address can only physically existing in one city, and a city can have multiple addresses located in it.

1.3 Application analysis

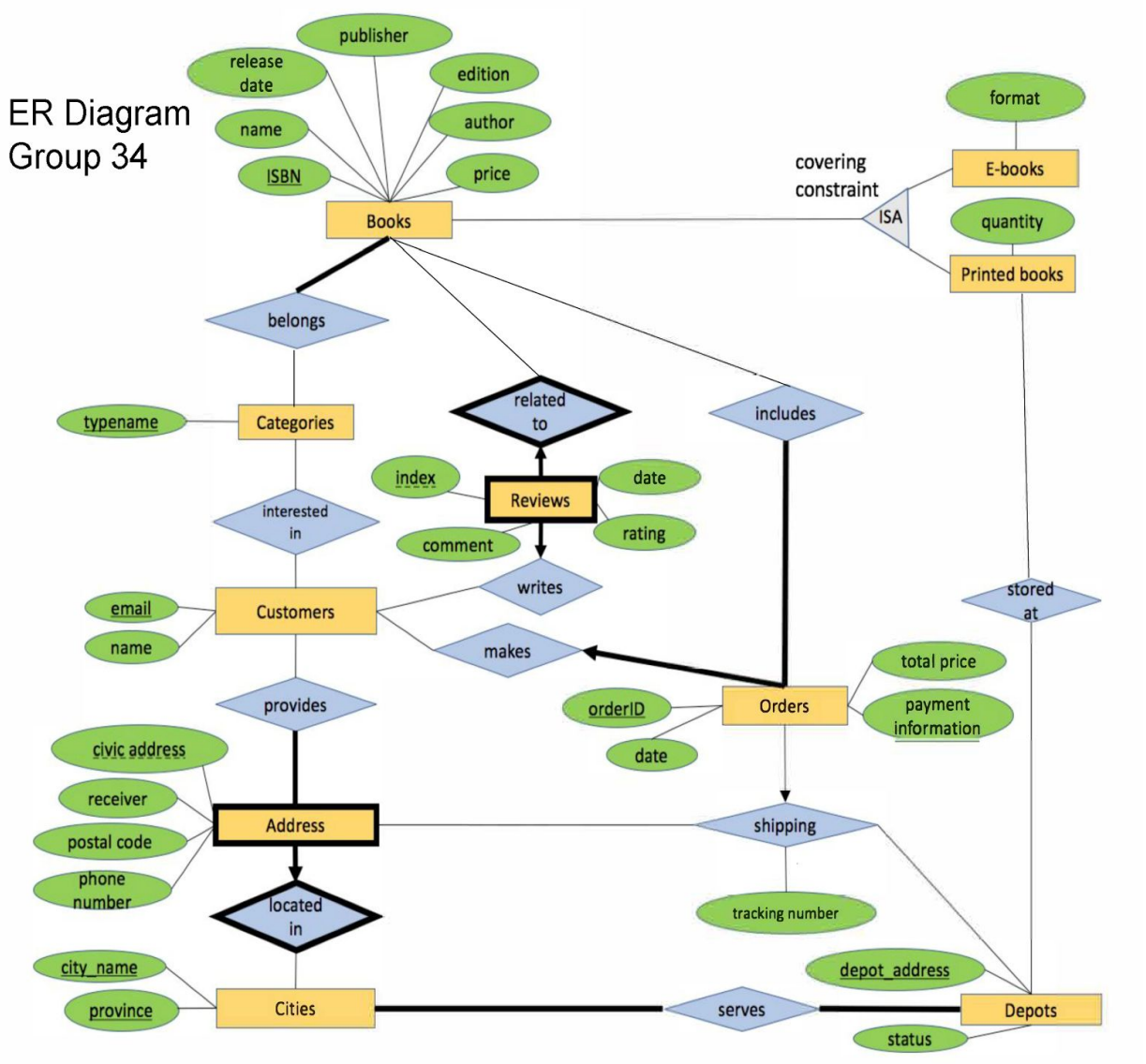
1.3.1 Overview:
The application seeks to calculate the proportion of people who are interested in each categories of the book.

1.3.2 Prelimitary calculations:
The algorithm first retrieves the amount of people of each corresponding interested category from the interestedIn relation table. Then we can get the total amount of people in the table. For each category of the book, we can calculate the proportion by dividing the amount of interested people by total amount of the people.

1.3.3 Function examples:
interestedRate(categories): this functions returns the percentage of customers who is interested in corresponding category.

1.3.4 Algorithm description:
The heart of the algorithm lies not in its preliminary calculations, but in how it will solve the problem of finding out the popularity of each category. It’s also helpful when deciding how many books of each category to restock in the future.

2 . ER Diagram


ER Diagram
Group 34
publisher
release date
edition
name
author
ISBN
price
Books
covering constraint
ISA
format
E-books
quantity
Printed books
belongs
related to
includes
typename
Categories
index
Reviews
date
rating
comment
interested in
writes
email
name
Customers
makes
stored at
total price
orderID
Orders
payment information
date
provides
civic address
receiver
postal code
phone number
Address
shipping
tracking number
located in
city_name
province
Cities
serves
depot_address
Depots
status

3. Relations

Translated from Entities:

Books(ISBN, book_name, author, price, edition, release_date, publisher)
//covering constraint. A book has to be either an e-book or a printed book.

E-Books(ISBN, format) (ISBN ref Book)

Printed_books(ISBN, quantity) (ISBN ref Book)

Customers(email, name)

Categories(typename)

Reviews(index, ISBN, email (not NULL), date, rating, comment) (ISBN ref Books) (email ref Customers)

Orders(order_ID, date, payment_info, total_price, ISBN (not NULL), email (not NULL)) (ISBN ref Book,) (email ref Customers)

Cities(city_name, province)

Depots(depot_address, status)

Address(city_name, province, civic_address, receiver, postal_code, phone_number) (city_name, province ref Cities)

Translated from Relationships:

belongs(ISBN,typename) (ISBN ref Books, typename ref Categories) //participation constraint on Books.

interestedIn(email, typename) (email ref Customers) (typename ref Categories)

provides(city_name, province, civic_address, email) (city_name, province, civic_address ref Address) (email ref Customers) //participation constraint on Address. An Address has to be provided by at least one customer.

serves(city_name, province, depot_address) (city_name, province ref Cities) (depot_address ref Depots) //participation constraint on both Depots and Cities. Every city has to be served by at least one depot and every depot has to serve at least one city.

includes(order_ID, ISBN) (order_ID ref Orders) (ISBN ref Books) //participation constraint on Orders. Every order must includes one or many books.

stored_at(ISBN, depot_address) (ISBN ref Printed_books) (depot_address ref Depots)

shipping(depot_address, order_ID, civic address, city_name, province, tracking_number) (depot_address ref Depots) (order_ID ref Orders) (city_name, province, civic_address ref Address) // If an order includes any printed book, it can only participate in one shipping relation.(key constraint)

The relationship sets with key constraints are included in table of the corresponding entity sets when translating. There is no opportunity to combine relations without introducing redundancy.

4. Short description of creativity:

Our application allows a customer to have multiple addresses.

In this project, there are two weak entity sets, one ISA hierarchy, one ternary relationship and 5 instances of key constraints.

5. Inspiration

As a successful book-selling website, amazon.ca inspired us on designing functionality of this application.