COMP 3005 Project Report

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# Conceptual Design (25%)

A close up of a map

Description automatically generated

Assumptions about cardinality:

1. A user will only have 1 cart. (draw.io would not allow me to require total participation and have an arrow for cardinality)
2. A cart will belong to only 1 user. (Same issue with draw.io not allowing an arrow with total participation)
3. A purchase will only have 1 shipping address.

Assumptions about participation type:

1. Authors, publishers, and genres can be added before a book linked to them is added. For example, we could add JK Rowling before adding any of the books she’s written.
2. The bookstore only sells books, therefore each purchase must have 1..\* books.
3. A user may ship a purchase to an address that is not associated with a customer.

# Reduction to Relation Schemas (20%)

* author(auth\_id, auth\_name)
* genre(genre\_id, genre\_name)
* book(ISBN, title, pub\_id, num\_pages, price, quantity, pub\_percent, year, summary)
* publisher(pub\_id, pub\_name, email, phone, addr\_id)
* address(addr\_id, country, province, city, street\_name, street\_num, postal\_code)
* purchase(order\_id, tracking\_num, cust\_id, addr\_id)
* customer(cust\_id, username, password, cart\_id)
* writes(auth\_id, ISBN)
* book\_genre(ISBN, genre\_id)
* published(pub\_id, ISBN)
* book\_purchased(ISBN, order\_id, quantity)
* customer\_shipping(cust\_id, addr\_id)
* customer\_billing(cust\_id, addr\_id)
* book\_in\_cart(cart\_id, ISBN, quantity)

# Normalization of Relation Schemas (20%)

* Author

auth\_id → auth\_name

auth\_id+ = R

Therefore, in BCNF

* Genre

genre\_id → genre\_name genre\_id+ = R  
genre\_name → genre\_id genre\_name+ = R

Therefore, in BCNF

* Book

ISBN → title ISBN → quantity ISBN+ = R  
ISBN → pub\_id ISBN → pub\_percent  
ISBN → num\_pages ISBN →year  
ISBN → price ISBN → summary

summary → ISBN summary → price summary+ = R

summary → title summary → quantity

summary → pub\_id summary → year

summary → num\_pages summary → pub\_percent

Therefore, in BCNF

* Publisher

pub\_id → pub\_name pub\_name → pub\_id email → pub\_id

pub\_id → email pub\_name → email email → pub\_name

pub\_id → phone pub\_name → phone email → phone

pub\_id → addr\_id pub\_name → addr\_id email → addr\_id

pub\_id+ = R pub\_name+ = R email+ = R

phone → pub\_id addr\_id → pub\_id

phone → pub\_name addr\_id → pub\_name

phone → email addr\_id → email

phone → addr\_id addr\_id → phone

phone+ = R addr\_id+ = R

Therefore, in BCNF

* Address

addr\_id → country addr\_id → street\_name

addr\_id → province addr\_id → street\_num

addr\_id → city addr\_id → postal\_code

postal\_code → country BREAKS BCNF

postal\_code → province BREAKS BCNF

To make BCNF:

Add a relation: postal\_area(postal\_code, province, country)

postal\_code → province

postal\_code → country

Address becomes: address(addr\_id, city, street\_name, street\_num, postal\_code)

* Purchase

order\_id → tracking\_num tracking\_num → order\_id

order\_id → cust\_id tracking\_num → cust\_id

order\_id → addr\_id tracking\_num → addr\_id

order\_id+ = R tracking\_num+ = R

Therefore, in BCNF

* Customer

cust\_id → username username → cust\_id

cust\_id → password username → password

cust\_id → cart\_id username → cart\_id

cust\_id+ = R username+ = R

Therefore, in BCNF

* Writes

auth\_id → ISBN ISBN → auth\_id

auth\_id+ = R ISBN+ = R

Therefore, in BCNF

* Book\_genre

ISBN → genre\_id

ISBN+ = R

Therefore, in BCNF

* Published

ISBN → pub\_id

ISBN+ = R

Therefore, in BCNF

* Book\_purchased

order\_id → ISBN

order\_id → quantity

order\_id+ = R

* Customer\_shipping

cust\_id → addr\_id

cust\_id+ = R

Therefore, in BCNF

* Customer\_billing

cust\_id → addr\_id

cust\_id+ = R

Therefore, in BCNF

* Book\_in\_cart

No FDs break it, so it’s in BCNF

# Database Schema Diagram (10%)

A screenshot of a social media post

Description automatically generated

# Implementation (25%)

[describe architecture, what modules there are and how they interact]

[architectural diagram, optional but encouraged]

# Bonus Features (up to 15%)

[list any bonus features implemented]

# GitHub Repo

[url to repo]