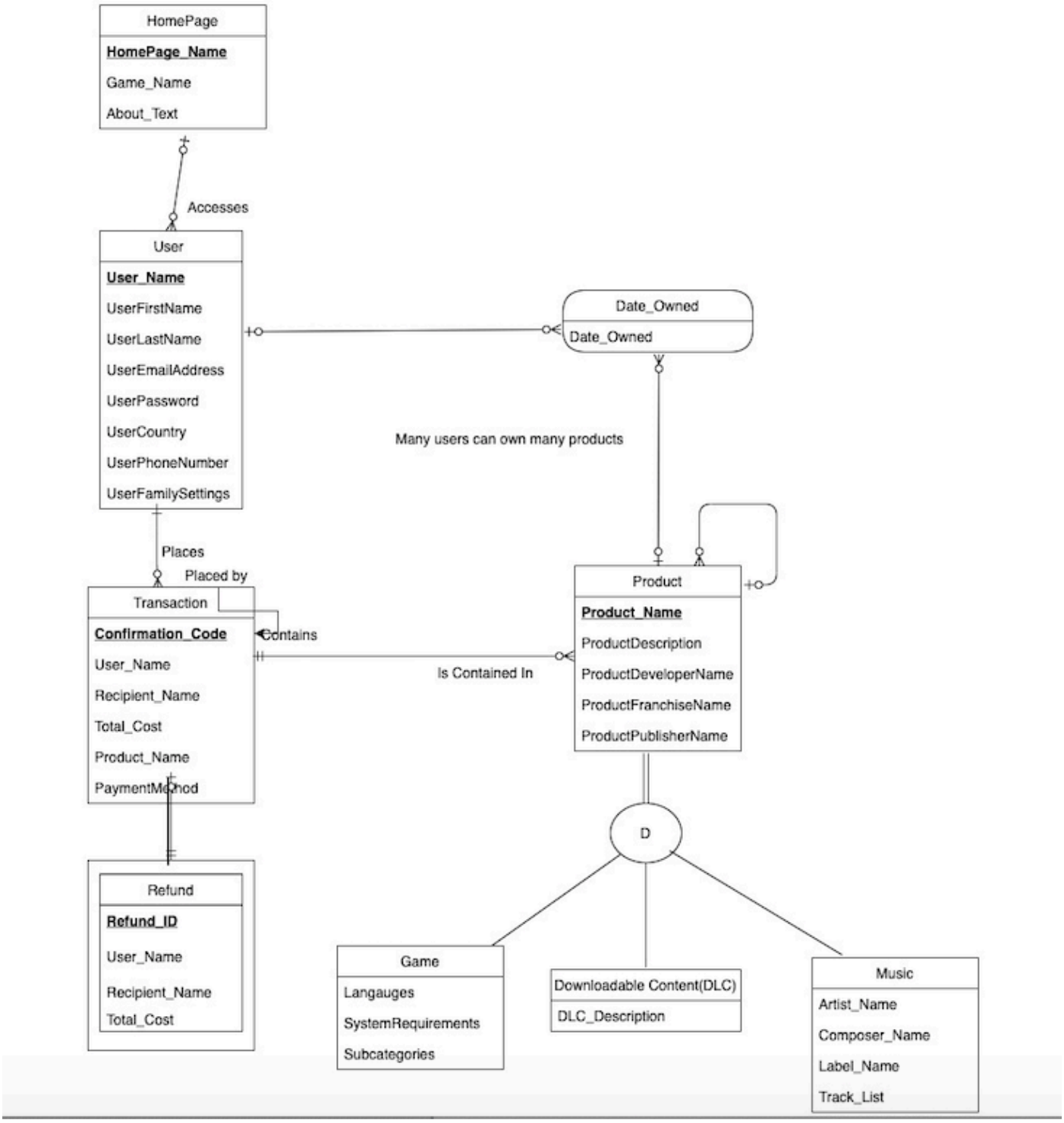
Database Design Assignment Part C

C. 1. Revised Business rules and assumptions (From part B)

1. An account is created when the user submits their email address, and country of residence and uses the CAPTCHA checkbox.
2. Every User is differentiated by a unique username selected by them, and they also must include their First and Last names, their email address, password, Country of residence and phone number.
3. Settings for the user to update for our security and privacy reasons include payment details, phone number, and family settings.
4. Payment of any items can only be proceeded after the user re-enters their passwords and by using ONE of the valid payment methods available
5. A customer can add as many items as they want into cart
6. A game can have many subcategories for the customer to filter
7. Every Home Page is uniquely identified by its name, and must contain information about the game including the game's name
8. Every Transaction can be uniquely identified by a Confirmation Code, and must have user names of the user who bought the product, and who is receiving the product. It also must include the cost of the product and the name of the product.
9. Every Product is uniquely identified by its name, and includes a description of the product. It can also have a Franchise associated with it, but must have a Developer and a Publisher associated with it. It can also have a product's name linked to a product for in game/other product purchases
10. The different games are uniquely differentiated name, and has information about what languages it comes in, and information about the system requirements to run the game.
11. DLCs are differentiated by their name, and they can have an additional description based on what the DLC is
12. The different music tracks/albums differentiated based on their name, and contain information about who made the cover art, who composed the songs, the label of the company who produced the music, and the list of tracks on the release.
13. All games, DLCs, and all music are subtypes of products and contain the attributes of products
14. Every User can access many home pages, but every home page can have only one user
15. Every User can have many transactions, but every transaction must have at least one User as purchasing a gift would involve two or more users
16. Games, Downloadable Content(DLC), and music are all types of products that can be purchased.

17. A refund is uniquely identified by a refund ID. It has the usernames of the users who purchased and received the product, it also includes the total cost of the transaction being refunded and the name of the product being refunded
18. A single transaction can be refunded at a time, but each refund must have one and only one associated transaction.
19. The refund entity is a weak entity of the transaction entity
20. Every User can own many Products, and each product can be owned by many users, so the relation is stored in with the date of purchase, the username, and the product's name to uniquely identify which user owns which products

C. 2. Revised ERD of Part B



C. 3. Relations

HomePage (HomePageName, Game_Name, About_Text, User_Name*)
FK (User_Name) REFERENCES User

User (User_Name, UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber)

Date_Owned (Date_Owned, User_Name*, Product_Name*)
FK (User_Name) REFERENCES User
FK (Product_Name) REFERENCES Product

Transaction (Confirmation_Code, PurchaserID, RecipientID, Total_Cost, Product_Name*)
FK (Product_Name) REFERENCES Product
Product (Product_Name, ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName)
Refund (Refund_ID, User_Name*, Recipient_Name*, Total_Cost*, Product_Name*, ConfirmationCode*)
FK (User_Name) REFERENCES User
FK (Recipient_Name) REFERENCES Transaction
FK (Total_Cost) REFERENCES Transaction
FK (Product_Name) REFERENCES Product
FK (ConfirmationCode) REFERENCES Transaction

Game (Product_Name, Languages, SystemRequirements)

Downloadable Content (Product_Name)

Music (Product_Name, Artist_Name, Composer_Name, Label_Name, Track_List)

C. 4. List of Functional Dependencies Related to Each Business Rules.

1. An account is created when the user submits their email address, address and country of residence and uses the CAPTCHA checkbox.

2. Every User is differentiated by a unique username selected by them, and they also must include their First and Last names, their email address, password, Country of residence and phone number.
   The following FD is determined based on BR1 and BR2:
   The related attributes are User_Name, UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber

   By having a value for User_Name, we can determine the values for UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber
   FD1: User_Name→ UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber

3. Settings for the user to update for our security and privacy reasons include payment details, phone number, and family settings.
   The following FD is determined based on BR3:
   The related attributes are User_Name, PaymentMethod, PhoneNumber, UserFamilySettings

   By having a value for User_Name, we can determine the values for PaymentMethod, PhoneNumber, UserFamilySettings
   FD2: User_Name→ PaymentMethod, PhoneNumber, UserFamilySettings

4. Payment of any items can only be proceeded after the user re-enters their passwords and by using ONE of the valid payment methods available
   The following FD is determined based on BR4:
   FD3: User_Name→ UserPassword, Payment Method

5. A customer can add as many products as they want into cart

6. A game can have many subcategories for the customer to filter
   The following FD is determined based on BR5, BR6:
   FD4: UserName, Product_Name→ Game, Subcategory

7. Every Home Page is uniquely identified by its name, and must contain information about the game including the game's name

The following FD is determined based on BR7:
FD5: HomePage_Name, Product_Name → Game_Name, About_Text

8. Every Transaction can be uniquely identified by a Confirmation Code, and must have user names of the user who bought the product, and who is receiving the product. It also must include the cost of the product and the name of the product

9. Every Product is uniquely identified by its name, and includes a description of the product. It can also have a Franchise associated with it, but must have a Developer and a Publisher associated with it. It can also have a product's name linked to a product for in game/other product purchases

   The following FD is determined based on BR9:
   FD6: Product_Name→ ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName

10. Every User can have many transactions, but every transaction must have at least one User as purchasing a gift would involve two or more users
    The following FD is determined based on BR8 and BR15:
    FD5: Confirmation_Code, User_Name, Recipient_Name→ Total_Cost, Product_Name

11. The different games are uniquely differentiated names, and have information about what languages it comes in, and information about the system requirements to run the game.

    The following FD is determined based on BR10:
    FD7: Product_Name→ Languages, SystemRequirements

12. DLCs are differentiated by their name, and they can have an additional description based on what the DLC is.

    The following FD is determined based on BR11:
    FD8: Product_Name→ DLC_Description

13. The different music tracks/albums differentiated based on their name, and contain information about who made the cover art, who composed the songs, the label of the company who produced the music, and the list of tracks on the release.
    The following FD is determined based on BR12:
    FD9: Product_Name→ Artist_Name, Composer_Name, Label_Name, Track_List

14. Every User can access many homepage, but every home page can have only one user

15. A refund is uniquely identified by a refund ID. It has the usernames of the users who purchased and received the product, it also includes the total cost of the transaction being refunded and the name of the product being refunded

16. A single transaction can be refunded at a time, but each refund must have one and only one associated transaction.

17. The refund entity is a weak entity of the transaction entity

    The following FD is determined based on BR17, BR18 and BR19:
    FD10: Refund_ID, User_Name→ Recipient_Name, Total_Cost

18. Every User can own many Products, and each product can be owned by many users, so the relation is stored in with the date of purchase, the username, and the product's name to uniquely identify which user owns which products

    The following FD is determined based on BR20:
    FD11: User_Name, Product_Name→ Date_Owned

C. 5. Normalization

1. FD1 : User_Name →UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber
   Relation: USER (User_Name, UserFirstName, UserLastName, UserEmailAddress, UserPassword, UserCountry, UserPhoneNumber)
   1NF: All user attributes are atomic, there are no derived attributes and there are no multivalued attributes.
   2NF: There are no partial dependencies on the key User_Name (single attribute key)
   3NF: There are no interdependencies between non-key attributes
   Highest Normal Form = BCNF, determinant User_Name is the key

2. FD2 : User_Name→ UserPassword, PaymentMethod, PhoneNumber, UserFamilySettings, Foreign Key (User_ID) references USER
   1NF: All user attributes are atomic, there are no derived attributes and there are no multivalued attributes.
   2NF: User_ID makes up a candidate key, therefore there are no partial functional dependencies, therefore this is 2NF.
   3NF: There are no interdependencies between non-key attributes

3. FD6: Product_Name → ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName
   Relation: PRODUCT (Product_Name, ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName)
   Foreign key (Product_Name) references PRODUCT
   1NF: There are no atomic attributes, no derived attributes, and no multivalued attributes
   2NF: There are no partial dependencies on Features_ID
   3NF: There are no interdependencies between non-key attributes
   Highest Normal Form = BCNF, determinant Product_Name is the key

4. FD5: Confirmation_Code, User_Name, Recipient_Name →Recipient_Name, Total_Cost, Product_Name
   TRANSACTION (Confirmation_Code*, User_Name, Recipient_Name, Recipient_Name, Total_Cost)
   Foreign key (Confirmation_Code) references TRANSACTION
   1NF: There are no atomic attributes, no derived attributes, and no multivalued attributes
   2NF: There are no partial dependencies on Confirmation_Code
   3NF: There are no interdependencies between non-key attributes

5. FD10: Refund_ID, User_Name →Recipient_Name, Total_Cost
   REFUND (Refund_ID*, User_Name, Recipient_Name, Total_Cost)
   Foreign key (Refund_ID) references REFUND
   1NF: There are no atomic attributes, no derived attributes, and no multivalued attributes
   2NF: There are no partial dependencies on Refund_ID
   3NF: There are no interdependencies between non-key attributes

6. FD11: User_Name, Product_Name→ Date_Owned
   PRODUCT (User_Name, Product_Name*, Date_Owned)
   Foreign key (Product_Name) references PRODUCT
   1NF: There are no atomic attributes, no derived attributes, and no multivalued attributes
   2NF: There are no partial dependencies on Product_Name
   3NF: There are no interdependencies between non-key attributes

7. FD7: Product_Name→ Languages, SystemRequirements
   Relation: GAME (Product_Name*, ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName, Languages, SystemRequirements)
   1NF: All attributes are atomic, and there are no derived attributes, there are no repeating attributes and there, and the primary key is Product_Name
   2NF: It is in 1st Normal Form. All of its non-key attributes are dependent on all parts of the key.
   3NF: It is in 2nd Normal Form. Removing the Transitive Dependencies would leave the relation in this state:
   GAME (Product_Name*, Languages, SystemRequirements)

8. FD8: Product_Name→ DLC_Desciption
   Relation: DOWNLOADABLE CONTENT(DLC) (Product_Name*, ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName, DLC_Description)
   1NF: All attributes are atomic, and there are no derived attributes, there are no repeating attributes and there, and the primary key is Product_Name
   2NF: It is in 1st Normal Form. All of its non-key attributes are dependent on all parts of the key.
   3NF: It is in 2nd Normal Form. Removing the Transitive Dependencies would leave the relation in this state:
   DOWNLOADABLE CONTENT(DLC) (Product_Name*, DLC_Description)

9. FD9: Product_Name→ Artist_Name, Composer_Name, Label_Name, Track_List
   Relation: MUSIC (Product_Name*, ProductDescription, ProductDeveloperName, ProductFranchiseName, ProductPublisherName, Artist_Name, Composer_Name, Label_Name, Track_List)
   1NF: All attributes are atomic, and there are no derived attributes, there are no repeating attributes and there, and the primary key is Product_Name
   2NF: It is in 1st Normal Form. All of its non-key attributes are dependent on all parts of the key.
   3NF: It is in 2nd Normal Form. Removing the Transitive Dependencies would leave the relation in this state:
   GAME (Product_Name*, Artist_Name, Composer_Name, Label_Name, Track_List)