



DOUGLAS COLLEGE

**Computing Studies and Information Systems
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Database I**

E-R model for the James River Jewelry (JRJ) database

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INTRODUCTION

The purpose of this assignment is to design a comprehensive Entity-Relationship (E-R) model for the James River Jewelry (JRJ) database. As JRJ continues to expand its business, an efficient database structure is essential for managing its diverse data requirements, including customer information, purchases, and inventory details. The initial phase of the database design will focus on organizing and structuring data to ensure ease of access, data integrity, and security. As part of requirements, the E-R model will incorporate referential integrity constraints.

Additionally, this assignment addresses JRJ's new requirements, including an awards program for customers and expanded tracking of artists and styles to enhance the customer experience. By structuring these elements within a E-R model, the database will support JRJ's evolving business processes, streamline data handling, and provide a reliable foundation for future expansion.

A. E-R Data Model for JRJ Database

James River Jewelry (JRJ) designs a database with the following tables:

- CUSTOMER (CustomerID, LastName, FirstName, Phone, EmailAddress)
- PURCHASE (InvoiceNumber, InvoiceData, PreTaxAmount, *CustomerID*)
- PURCHASE_ITEM(InvoiceNumber, InvoiceLineNumber, *ItemNumber*, RetailPrice)
- ITEM (ItemNumber, ItemDescription, Cost, ArtistLastName, ArtistFirstname)

With the referential integrity constraints are:

- CustomerID in PURCHASE must exist in CustomerID in CUSTOMER
- InvoiceNumber in PURCHASE_ITEM must exist in InvoiceNumber in PURCHASE
- ItemNumber in PURCHASE_ITEM must exist in ItemNumber in ITEM

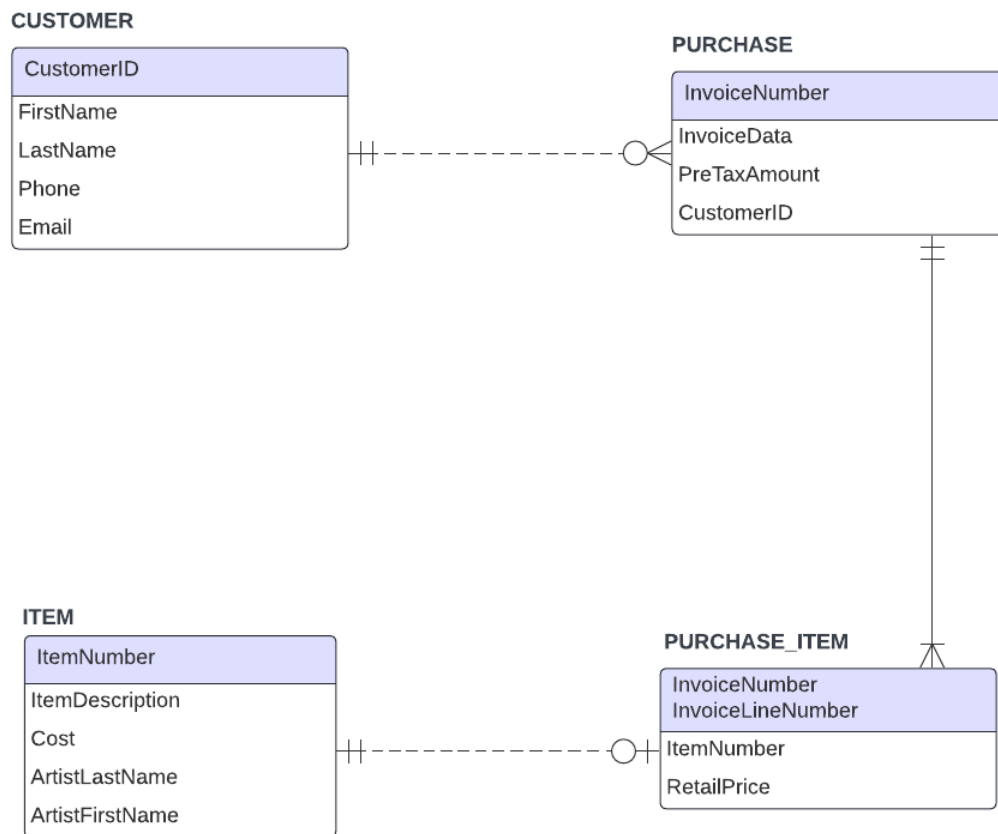
Based on that, the IR Crow's Foot E-R model for JRJ database scheme includes the following entities: CUSTOMER, PURCHASE, PURCHASE_ITEM, and ITEM. The relationships between these entities as follows:

- One customer can make many purchases, but each purchase is only made by one customer (1 to many relationship).
- One purchase can have one or more purchase items, and each purchase item is associated with only one purchase (1 to many relationship). In addition, PURCHASE_ITEM data cannot exist in a database unless PURCHASE data exists in the database. (ID-Dependent Entities).
- One item can have one or more purchase items, and each purchase item is associated with only one item (1 to 1 relationship).

Given that, the E-R Crow's Foot Model has the following cardinalities:

Relationship			Cardinality	
Entity1	Entity2	Type	MAX	MIN
CUSTOMER	PURCHASE	Strong	1:N	M-O
PURCHASE	PURCHASE_ITEM	ID-Dependent	1:N	M-M
ITEM	PURCHASE_ITEM	Strong	1:1	M-O

The picture below represents the E-R Crow's Foot Model for JRJ.



B. Extended E-R Model for the Awards Program

JRJ wants to maintain data on customers, purchases and awards. Considering that, the E-R data model for JRJ's award program has a new entity is AWARD (AwardID, AwardDate, Description). The relationships between entities as follows:

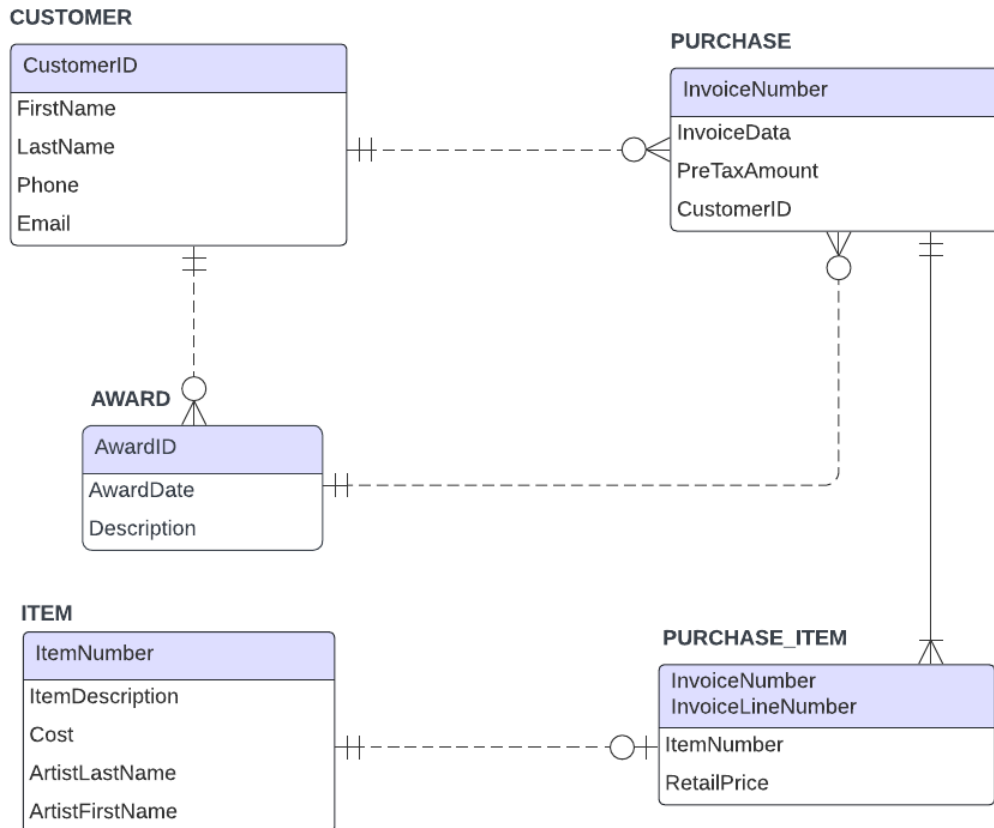
- One customer can have many awards, and each award can be given to one customer (1 to many relationship). Here a AWARD cannot logically exist without a CUSTOMER. Hence not only is the minimum cardinality one (on the side of CUSTOMER), but the AWARD is also existence-dependent on CUSTOMER. Thus, AWARD is a weak entity but is not ID-Dependent because it has its own unique identifier.

- One award can be associated with one or more purchases, and each purchase can only associate with one award. (1 to many relationship).

Given that, the E-R Crow's Foot Model has the following cardinalities:

Relationship			Cardinality	
Entity1	Entity2	Type	MAX	MIN
CUSTOMER	AWARD	Non ID-Dependent	1:N	M-O
AWARD	PURCHASE	Strong	1:N	M-O

The picture below extends and modifies the E-R Crow's Foot Model for JRJ's award program.



C. Further Extension to Track Artists and Styles

JRJ wants to record artists and styles and keep track of which customers are interested in which artists and styles. Considering that and the new requirements of JRJ, the database for JRJ has three new entities: ARTIST (ArtistID, Name, Phone, Email), STYLE (StyleID, Name,

StyleDescription), and ITEM_TERMS (ItemNumber, ArtistID, RetailPrice, BuyingStatus, ArtistPercentage).

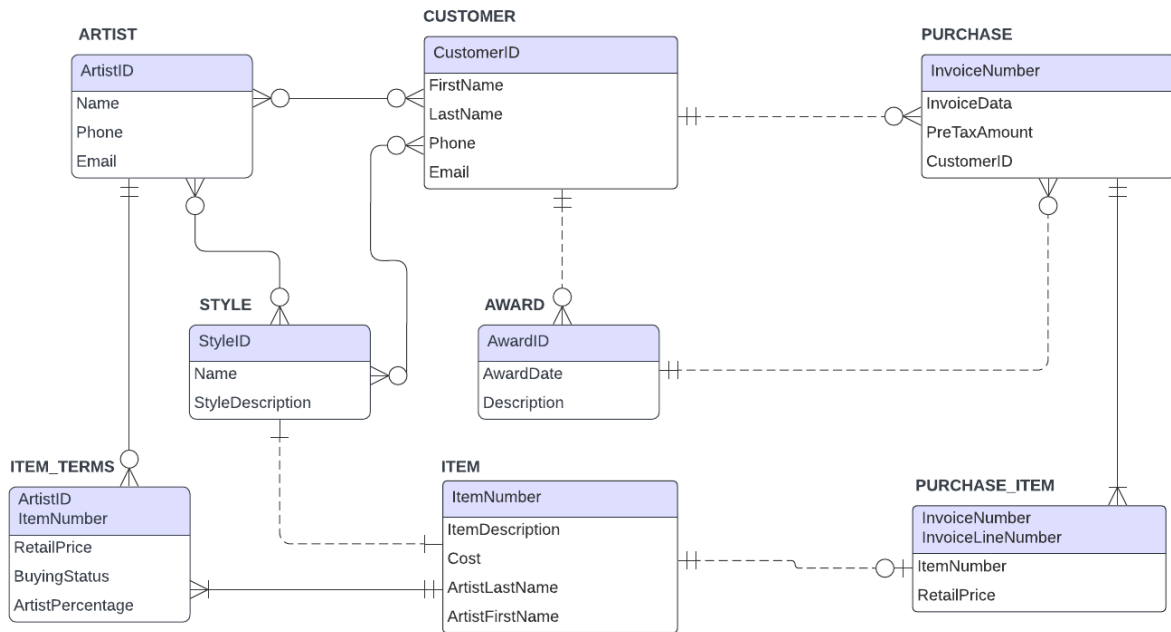
The relationships between entities as follows:

- One customer can be interested in many artists, and each artist can be of interest of many customers (many to many relationship).
- One customer can be interested in many styles, and each style can be of interest of many customers (many to many relationship).
- One artist can create many styles, and each style may be created by many artists many to many relationship).
- An artist may negotiate one or more item_terms for an item, and each item_terms can only be associated with one artist (1 to many relationship). ARTIST data may be entered before the artist has negotiated any item_terms.
- One item can have one or more item_terms, and each item_terms can only be associated with one item (1 to many relationship) because Artists and James River Jewelry personnel agree on the initial sales price at the time the item is brought to the shop.
- One item can have only one style, and each style can be associated with one item (1 to 1 relationship).

Given that, the E-R Crow's Foot Model has the following cardinalities:

Relationship			Cardinality	
Entity1	Entity2	Type	MAX	MIN
CUSTOMER	ARTIST	ID-Dependent	N:M	O-O
CUSTOMER	STYLE	ID-Dependent	N:M	O-O
ARTIST	STYLE	ID-Dependent	N:M	O-O
ARTIST	ITEM_TERMS	ID-Dependent	1:N	M-O
ITEM	ITEM_TERMS	ID-Dependent	1:N	M-M
ITEM	STYLE	Strong	1:1	O-M

The picture below extends and modifies the E-R Crow's Foot Model to meet JRJ's new requirements.



D. Validation of the Data Model

To ensure the reliability and effectiveness of the data model for James River Jewelry, a comprehensive validation process is essential. This validation involves a series of steps:

- Check for completeness, ensuring that all entities, attributes, and relationships are included in the data model.
- Check for consistency and accuracy, ensuring that the relationships between entities are consistent as well as the cardinalities are correct, and that the data model accurately represents the requirements of James River Jewelry.
- Check for normalization, eliminating data redundancy and enhancing data integrity.
- Test the data model by creating sample data and verifying that it meets the requirements of James River Jewelry.