STORE DATABASE MANAGEMENT SYSTEM

Course project for CSC775

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Section I: Project Description

Hawk Shield, Inc. is a security camera company located in Fresno, California owned by Mr. Zhang who wants to sell security cameras through two channels, both the brick and mortar store and online store. Mr. Zhang's cousin, AJ, is entrusted as the manager of the company and takes care of all company and store operations. AJ negotiated with some Chinese security camera suppliers who agreed to provide products for the company. All the products will be shipped from China by designated logistic providers and stored in the company warehouse, which will then be distributed for store sales. This database management system should help with the company and store operations by storing data for the company, departments, employees, customers, products, the supplier, etc. for future data manipulation, retrieval and management. For example, the manager can store departments, employees and their dependent information and can place orders for the products and the supplier can designate logistic providers for the product shipment; customers can purchase products directly in the brick and mortar store or purchase products online, which in that case, a warehouse clerk will fulfil the orders and arrange with the shipping company for the product delivery.

Section II: Use Cases

Use case for: Company

Use Case Title:	Company
Actors:	Business owner, company, person, manager, supervisor, regular employee, department, store, warehouse, store
Description:	Company has one business owner Mr. Zhang and he wants to sell security cameras in brick and mortar store and online store. Person who work for the company are managers, supervisors and regular employees. Company has different departments and each department has at least one supervisor and many employees. Employees will be assigned work for brick and mortar store, online store and warehouse but each supervisor and employee can only take on one role. Employee can have different dependents. The manager established cooperative relationships with Chinese security camera suppliers. All the products will be shipped from China and stored in company warehouse or store if some products are in urgent need.

Use case for: Product supplier

Use Case Title:	Product supply
Actors:	Supplier, request, manager, logistic provider, employee, product, warehouse, store

Description:	The use case starts after the manager placed requests for the products. The supplier designates a logistic provider and have them ship products from China to the company warehouse in Fresno, CA. Employees will check the products and have products stored in the warehouse first. However, if there is urgent need for the products in the brick and mortar store, some products will be moved to the brick and mortar store.

Use case for: Brick and mortar store

Use Case Title:	Brick and mortar store sale process
Actors:	Employee, store, customer, product, check out, payment type, credit bureau
Description:	A customer selects products in the store and employee checks out products for the customer. But the employee notices that sometimes the system shows no such product or no matching product description, or sometimes the company no longer carries the selected product, but it didn't get updated in the system. During the checkout process, customer's payment type, which is either credit card or bank account, and billing information will be verified and recorded by the Credit Bureau.

Use case for: Online store

Use Case Title:	Online purchase
Actors:	Customer, login account, product, image, review, product speciation, shopping cart, warehouse, credit bureau
Description:	The use case starts when the customer log into the online store account with registered email and password. Customer will select products based on information such as images, reviews and product specifications and add them to the shopping cart. Then the system calculates the total. The customer enters delivery information which includes first name, last name, address, city, state, country, zip code. Then customer is required to choose payment type and enters billing information. After the verification of the Credit Bureau, confirmed online order will be sent to the warehouse. But the customer notices that after placing the order, if for any reasons, they want to cancel the order, the system doesn't allow them to do so even though the system shows the order has not been shipped.

Use case for: Company warehouse

Use Case Title:	Ship order
Actors:	Employee, warehouse, order, shipping company, customer
Description:	This use case describes how employees get information on what orders to fill and the addresses for shipping. The use case starts when the employee receives the online order and starts to pick products, pack packages and arrange for package shipment. The system displays a list of all confirmed orders. An employee selects an order and pick products with right quantity. Then the system calculates postage due and prints a mailing label with the shipping address. The system sends a notice to the shipping company that packages are ready to be picked up. But the employee notices problems that some customer's shipping address are incomplete, also printer and shipping company are not available. Then the shipping company will deliver the packages for customers.

Section III: Database Requirements (Business Rules)

1. Business owner (Strong)
   a. A business owner shall have one unique BOID.
   b. A business owner shall have one or many companies.
   c. A business owner shall have one name.
   d. A business owner shall have one unique email.
   e. A business owner shall have one address.
   f. A business owner shall have one phone number.
2. Company (Weak)
   a. A company shall have one unique company ID.
   b. A company shall have at least one business owner.
   c. A company shall have many person.
   d. A company shall have many departments.
   e. A company shall have many stores.
   f. A company shall have many warehouses.
   g. A company shall have one name.
   h. A company shall have one unique email.
   i. A company shall have one address.
   j. A company shall have one phone number.
3. Person (Strong)
   a. A person shall work for one and only one company.
   b. A person is a supervisor or regular employee or manager.
   c. A person shall have one unique social security number.
   d. A person shall have one unique email.
   e. A person shall have one name.
   f. A person shall have one date of birth.

   g. A person shall have one join date.
   h. A person shall have a supervisor which is also a person.
   i. A person shall have zero or many dependents.
   j. A person shall be assigned to department, store or warehouse.

4. Supervisor (Strong)
   a. A supervisor shall belong to one and only one department, store or warehouse.
   b. A supervisor shall have one unique supervisor ID.
   c. A supervisor shall belong to one and only one social security number.
5. Regular employee (Strong)
   a. A regular employee shall work for one and only one department or store or warehouse.
   b. A regular employee shall have one unique employee ID.
   c. A regular employee shall belong to one and only one social security number.
   d. A regular employee shall select one confirmed online order at a time.
   e. A regular employee shall fill zero or many orders.
6. Manager (Strong)
   a. A manager shall manage many departments, stores and warehouses.
   b. A manager shall place zero or many requests.
   c. A manager has one unique manager ID.
   d. A manager shall belong to one and only one social security number.
7. Department (Weak)
   a. A department shall belong to one or many companies.
   b. A department shall be managed by one or many managers.
   c. A department shall have many supervisors.
   d. A department shall have many regular employees.
   e. A department shall have one unique department ID.
   f. A department shall have one name.
   g. A department shall have one phone number.
8. Store (Strong)
   a. A store shall belong to one or many companies.
   b. A store shall be managed by one or many managers.
   c. A store shall have many regular employees.
   d. A store shall have one unique store ID.
   e. A store shall have one address.
   f. A store shall have one phone number.
   g. A store is an online store or brick and mortar store.
9. Online Store (Weak)
   1. An online store shall have many shopping carts.
   2. An online store has one unique URL.
   3. An online store has many best sellers.
   4. An online store has many clearance items.
10. Brick and mortar store (Strong)
   a. A brick and mortar store shall have one unique BMID.

   b. A brick and mortar store shall store many products.
   c. A brick and mortar store shall have one address.
   d. A brick and mortar store shall have one phone number.

11. Warehouse (Strong)
   a. A warehouse shall have many regular employees.
   b. A warehouse shall be managed by one or many managers.
   c. A warehouse shall belong to one or many companies.
   d. A warehouse shall have one unique store ID.
   e. A warehouse shall have one address.
   f. A warehouse shall have one phone number.
   g. A warehouse shall arrange one or many shipping companies for product shipment.
   h. A warehouse shall receive confirmed online order from one shopping cart.
12. Dependent (Weak)
   a. A dependent shall have one unique dependent ID.
   b. A dependent shall belong to one and only one person.
   c. A dependent shall have one name.
   d. A dependent shall have one or many relationships with the employee.
   e. A dependent shall belong to one and only one social security number.
13. Request (Strong)
   a. A request shall be placed by many managers.
   b. A request shall be filled by many suppliers.
   c. A request shall have one unique request ID.
   d. A request shall belong to one and only one manager ID.
   e. A request shall have one request date.
14. Supplier (Strong)
   a. A supplier shall fill zero or many requests for one or many managers.
   b. A supplier shall provide products for many companies.
   c. A supplier shall have at least one logistic provider.
   d. A supplier shall have one unique supplier ID.
   e. A supplier shall have one company name.
   f. A supplier shall have one address.
15. Logistic provider (Strong)
   a. A logistic provider shall work for one or many product suppliers.
   b. A logistic provider shall ship one or many products to the warehouse or the store.
   c. A logistic provider shall have one unique logistic provider ID.
   d. A logistic provider shall have one company name.
   e. A logistic provider shall have one address.
16. Product (Strong)
   a. A product shall be shipped by at least one logistic provider.
   b. A product shall be selected by zero or many customers.
   c. A product shall belong to zero or many checkouts.
   d. A product shall have one unique product ID.
   e. A product shall have one unique product SKU.

    f. A product shall have one product name.
    g. A product shall be allowed to be added to zero or many shopping carts.
    h. A product shall have one or many images.
    i. A product shall have zero or many reviews
    j. A product shall have one or many product specifications.
    k. A product can be stored in zero or many brick and mortar store.
17. Customer (Strong)
    a. A customer shall select zero or many products in the store.
    b. A customer shall have one unique customer ID.
    c. A customer shall have one unique email.
    d. A customer shall have one shipping address.
    e. A customer shall have at least one payment type.
    f. A customer shall have zero or one login account.
    g. A customer shall have at least one delivery information.
    h. A customer shall have at least one payment type.
    i. A customer shall have at least one billing information.
    j. A customer shall have packages delivered by many shipping companies.
18. Order Product (Strong)
    a. An order shall be filled by one or many employees.
    b. An order shall have one unique order ID.
    c. An order shall have one payment date.
    d. An order shall belong to one and only one customer ID.
    e. An order shall have one total.
    f. An order shall have one and only one mailing label.
19. Checkout (Strong)
    a. A checkout shall have one or many products.
    b. A checkout shall belong to one and only one employee ID.
    c. A checkout shall have one total.
    d. A checkout shall have one unique checkout ID.
    e. A checkout shall be verified by one or many credit bureaus.
20. Login account (Strong)
    a. A login account shall belong to one and only one customer.
    b. A login account shall have one unique email.
    c. A login account shall have one unique account ID.
    d. A login account shall belong to one and only one customer ID.
    e. A login account shall have one password.
21. Payment type (Strong)
    a. A payment type is credit card or bank account.
    b. A payment type shall belong to zero or many customers.
    c. A payment type shall have one unique payment type id.
    d. A payment type shall have one billing address.
    e. A payment type shall have one name.
22. Billing info (Strong)

    a. A billing information shall belong to many customers.
    b. A billing information shall have one unique billing ID.
    c. A billing information shall belong to one unique payment type ID.

23. Credit card (Weak)
    a. A credit card payment type shall have one unique card number.
    b. A credit card payment type shall have one bank assignation code.
    c. A credit card payment type shall have one expiration date.
    d. A credit card payment type shall have one verification value.
24. Bank account (Weak)
    a. A bank account payment type shall have one unique account number.
    b. A bank account payment type shall have one bank code.
    c. A bank account payment type shall have one routing number.
25. Shopping cart (Weak)
    a. A shopping cart shall have zero or many products.
    b. A shopping cart shall belong to one online store.
    c. A shopping cart shall generate one confirmed online order at a time and send the order to one warehouse.
    d. A shopping cart shall have one unique cart ID.
    e. A shopping cart shall have many product IDs.
    f. A shopping cart shall have many products adding date.
26. Delivery (Strong)
    a. A delivery information shall belong to one or many customers.
    b. A delivery information shall have one unique delivery ID.
    c. A delivery information shall have one sending date.
    d. A delivery information shall have one delivery date.
27. Shipping company (Strong)
    a. A shipping company shall deliver packages for many customers.
    b. A shipping company shall deliver packages for many warehouses.
    c. A shipping company shall have one unique shipping company ID.
    d. A shipping company shall have one address.
    e. A shipping company shall have one phone number.
    f. A shipping company shall have one name.
28. Credit bureau (Strong)
    a. A credit bureau shall verify many checkouts.
    b. A credit bureau shall have one unique credit bureau ID.
    c. A credit bureau shall have one address.
    d. A credit bureau shall have one phone number.
    e. A credit bureau shall have one name.
29. Storage (Strong)
    a. A storage shall have one unique storage ID.
    b. A storage shall belong to one and only one store ID.
    c. A storage shall have many product IDs.
30. Credit verification (Strong)

a. A credit verification shall have one unique verification ID.

b. A credit verification shall have one date.

c. A credit verification shall have one status.

31. Image (Weak)

a. An image shall belong to one and only one product.

b. An image shall have one unique image ID.

c. An image shall have one size.

d. An image shall have one image path.

32. Review (Weak)

e. A review shall belong to one and only one product.

a. A review shall have one unique review ID.

b. A review shall have one review date.

c. A review shall have one reviewer.

33. Product specification (Weak)

f. A product specification shall specify one and only one product.

a. A product specification shall have one unique product specification ID.

b. A product specification shall have one name.

c. A product specification shall have one model.

Section IV: Detailed List of Main Entities, Attributes and Keys

1. Business Owner

a. BOID: key, numeric

b. Name: composite, multi-value, alphanumeric

c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country

d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number

e. Email: key, alphanumeric

2. Person

a. SSN: key, numeric

b. Name: composite, multi-value, alphanumeric

c. Email: key, alphanumeric

d. DOB: multivalue, timestamp

e. DateJoined: composite, date

3. Supervisor

a. SSN: weak key, numeric

b. SupervisorID: key, numeric

c. Name: composite, multi-value, alphanumeric

4. Regular Employee

a. SSN: weak key, numeric

b. EmployeeID: key, numeric

c. Name: composite, multi-value, alphanumeric

5. Manager

a. SSN: weak key, numeric

b. ManagerID: key, numeric
c. Name: composite, multi-value, alphanumeric

6. Warehouse
   a. WarehouseID: key, numeric
   b. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
   c. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
   d. Fax: numeric, multi-value, composite
   e. Email: key, alphanumeric
7. Request
   a. RequestID: key, numeric
   b. ManagerID: weak key, numeric
   c. RequestDate: composite, date
8. Supplier
   a. SupplierID: key, numeric
   b. CompanyName: composite, multi-value, alphanumeric
   c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
   d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
   e. Fax: numeric, multi-value, composite
   f. Email: key, alphanumeric
   g. URL: alphanumeric, multi-value, composite
9. Logistic Provider
   a. LogisticProviderID: Key, numeric
   b. CompanyName: composite, multi-value, alphanumeric
   c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
   d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
   e. Fax: numeric, multi-value, composite
   f. Email: key, alphanumeric
   g. URL: alphanumeric, multi-value, composite
10. Brick and Mortar Store
   a. BMID: key, numeric
   b. StoreID: weak key, numeric
   c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
   d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
   e. Fax: numeric, multi-value, composite
   f. Email: key, alphanumeric
11. Products
   a. ProductID: key, numeric
   b. ProductSKU: key,alphanumeric, multi-value, composite
   c. ProductName: composite, multi-value, alphanumeric

    d. UnitPrice: numeric
    e. QuantityPerUnit: numeric
    f. UnitSize: numeric
    g. UnitWeight: numeric
    h. UnitsInStock: numeric
    i. UnitsOnOrder : numeric
    j. ProductionDate: composite, date

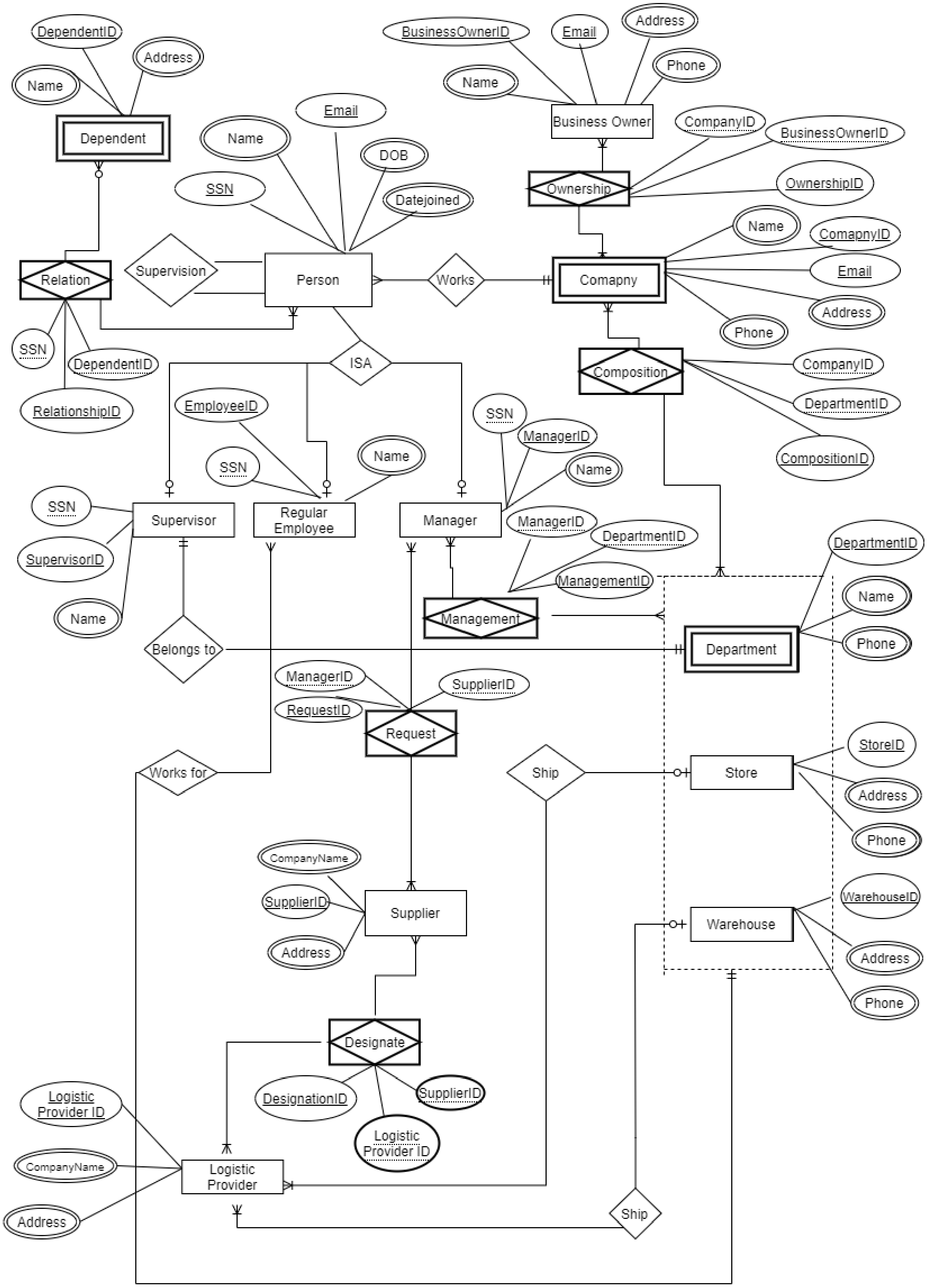
12. Customer
    a. CustomerID: key, numeric
    b. Name: composite, multi-value, alphanumeric
    c. ShippingAddress: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
    d. Email: key, alphanumeric
    e. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
    f. PaymentTypeID: weak key, numeric
    g. BillingAddress: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. Country
13. Order Product
    a. OrderID: key, numeric
    b. CustomerID: weak key, numeric
    c. PaymentTypeID: weak key, numeric
    d. PaymentDate: composite, date
    e. OrderDate: composite, date
    f. ShipDate: composite, date
    g. ShipperID: weak key, numeric
    h. TransactStatus: multi-value, alphanumeric
14. Billing Info
    a. BillingID: key, numeric
    b. CustomerID: weak key, numeric
    c. PaymentType: multi-value, alphanumeric
    d. Amount: numeric
15. Payment Type
    a. PaymentTypeID: key, numeric
    b. TypeName: composite, multi-value, alphanumeric
    c. BillingAddress: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. Country
16. Credit Bureau
    a. CreditBureauID: key, numeric
    b. Name: composite, multi-value, alphanumeric
    c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
    d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number

   e. Fax: numeric, multi-value, composite
   f. Email: key, alphanumeric

17. Credit Verification
    a. VerificationID: key, numeric
    b. VerificationDate: composite, date
    c. VerificationStatus: multi-value, alphanumeric
18. Shipping Company
    a. ShipID: key, numeric
    b. Name : composite, multi-value, alphanumeric
    c. Address: alphanumeric, multi-value, composite 1. street 2. zipcode 3. state 4. country
    d. Phone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
    e. Fax: numeric, multi-value, composite
    f. Email: key, alphanumeric
    g. ShippingMethod: multi-value, alphanumeric
19. Delivery
    a. ShipmentID: key, numeric
    b. SendingDate: composite, date
    c. DeliveryDate: composite, date
    d. DeliverName: composite, multi-value, alphanumeric
    e. DeliverPhone: numeric, multi-value, composite 1. country_code 2. area_code 3. phone number
    f. Cost: derived
20. Checkout
    a. CheckoutID: key, numeric
    b. Quantity: numeric
    c. UnitPrice: numeric
    d. Total: derived
21. Login Account
    a. AccountID: Key, numeric
    b. CustomerID: weak key, numeric
    c. Password: composite, multi-value, alphanumeric
22. Storage
    a. Storage ID: key, numric
    b. StoreID: weak key, numeric
    c. ProductID: weak key, numeric
    d. Quantity: numeric
23. Product Specification
    a. SpecsID: key, numeric
    b. Name: composite, multi-value, alphanumeric
    c. Model: composite, multi-value, alphanumeric
    d. Brand: composite, multi-value, alphanumeric
    e. OperationSystem: composite, multi-value, alphanumeric

24. Review
    a. ProductID: weak key, numeric
    b. ReviewedDate: composite, date
    c. ReviewBy: composite, multi-value, alphanumeric
    d. ReviewRating: numeric
    e. ProductCons: composite, multi-value, alphanumeric
    f. ProductPros: composite, multi-value, alphanumeric
25. Image
    a. ImageID: key, numeric
    b. ImagePath: composite, multi-value, alphanumeric
    c. Size: alphanumeric

Section V: Entity Relationship Diagram (ERD)


DependentID
Address
Name
Dependent
Relation
SSN
DependentID
RelationshipID
Supervision
Person
Name
Email
DOB
SSN
Datejoined
Works
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Email
Address
Name
Phone
Business Owner
CompanyID
BusinessOwnerID
Ownership
OwnershipID
Name
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Email
Address
Phone
Composition
CompanyID
DepartmentID
CompositionID
ISA
EmployeeID
SSN
Name
SSN
ManagerID
Name
Supervisor
Regular Employee
Manager
SSN
SupervisorID
Name
ManagerID
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ManagementID
Management
DepartmentID
Name
Phone
Department
Belongs to
ManagerID
SupplierID
RequestID
Request
Ship
Store
StoreID
Address
Phone
Works for
CompanyName
SupplierID
Address
Supplier
WarehouseID
Warehouse
Address
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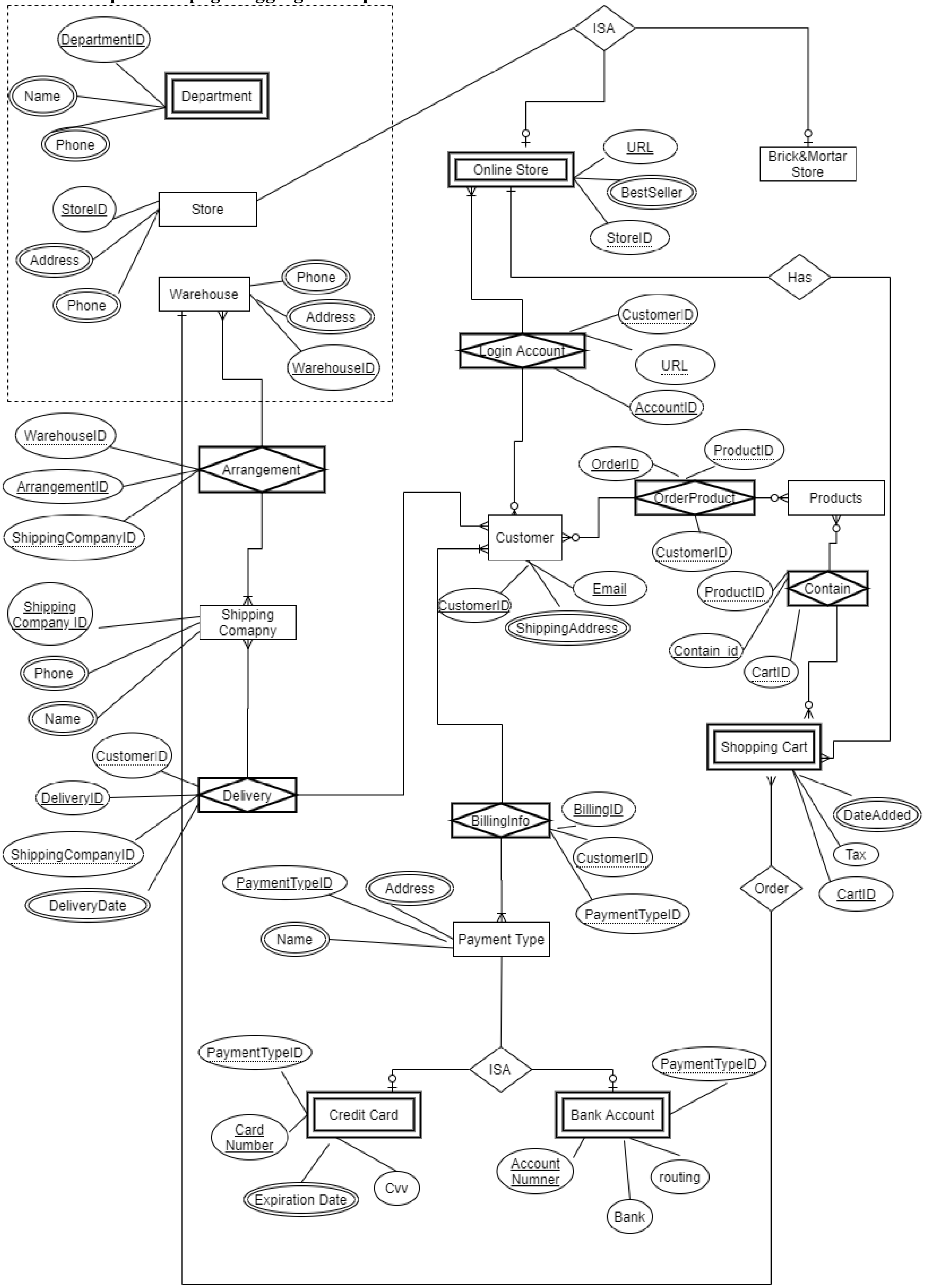
Address
Logistic Provider
Ship

Connects to previous page “aggregation” part



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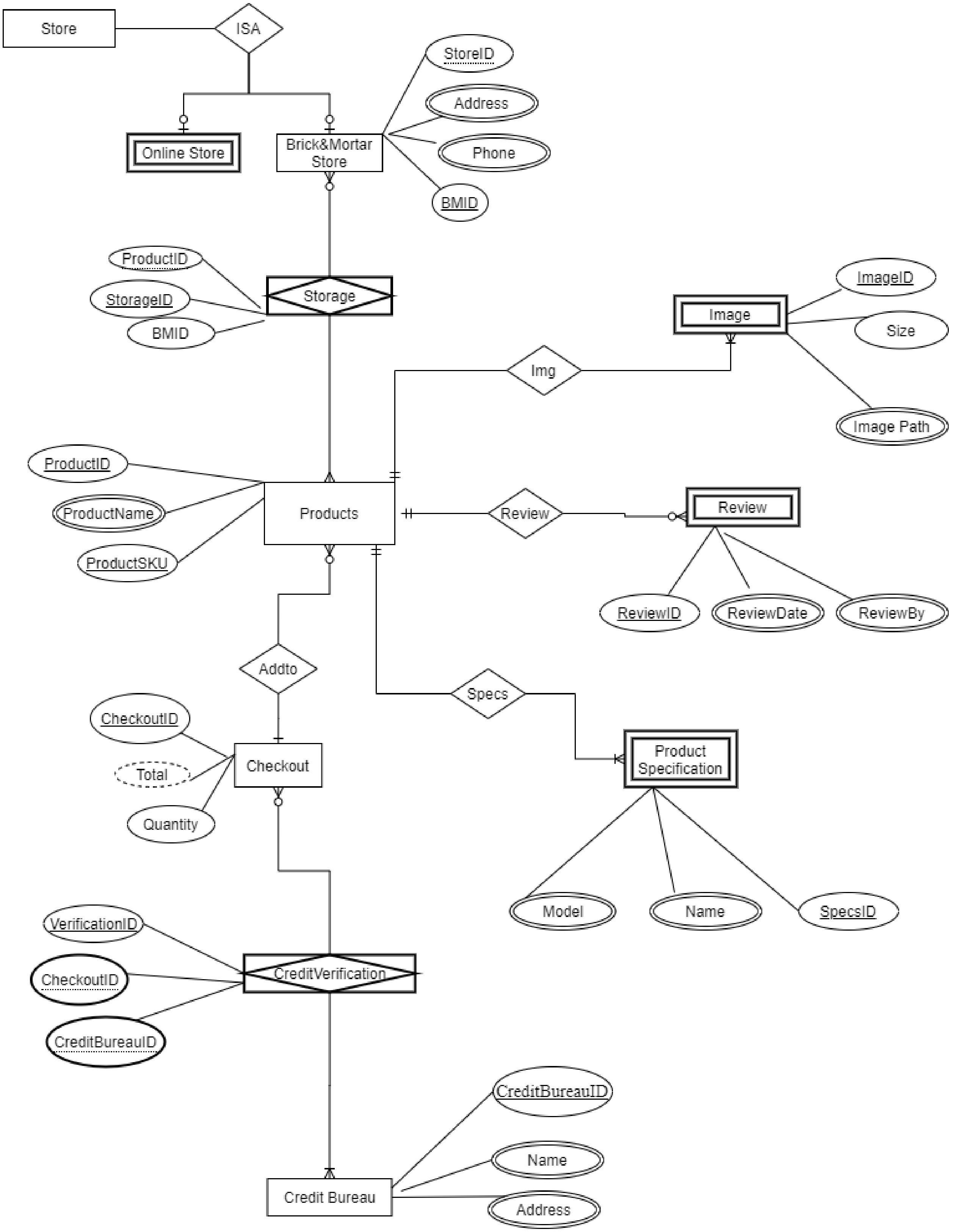


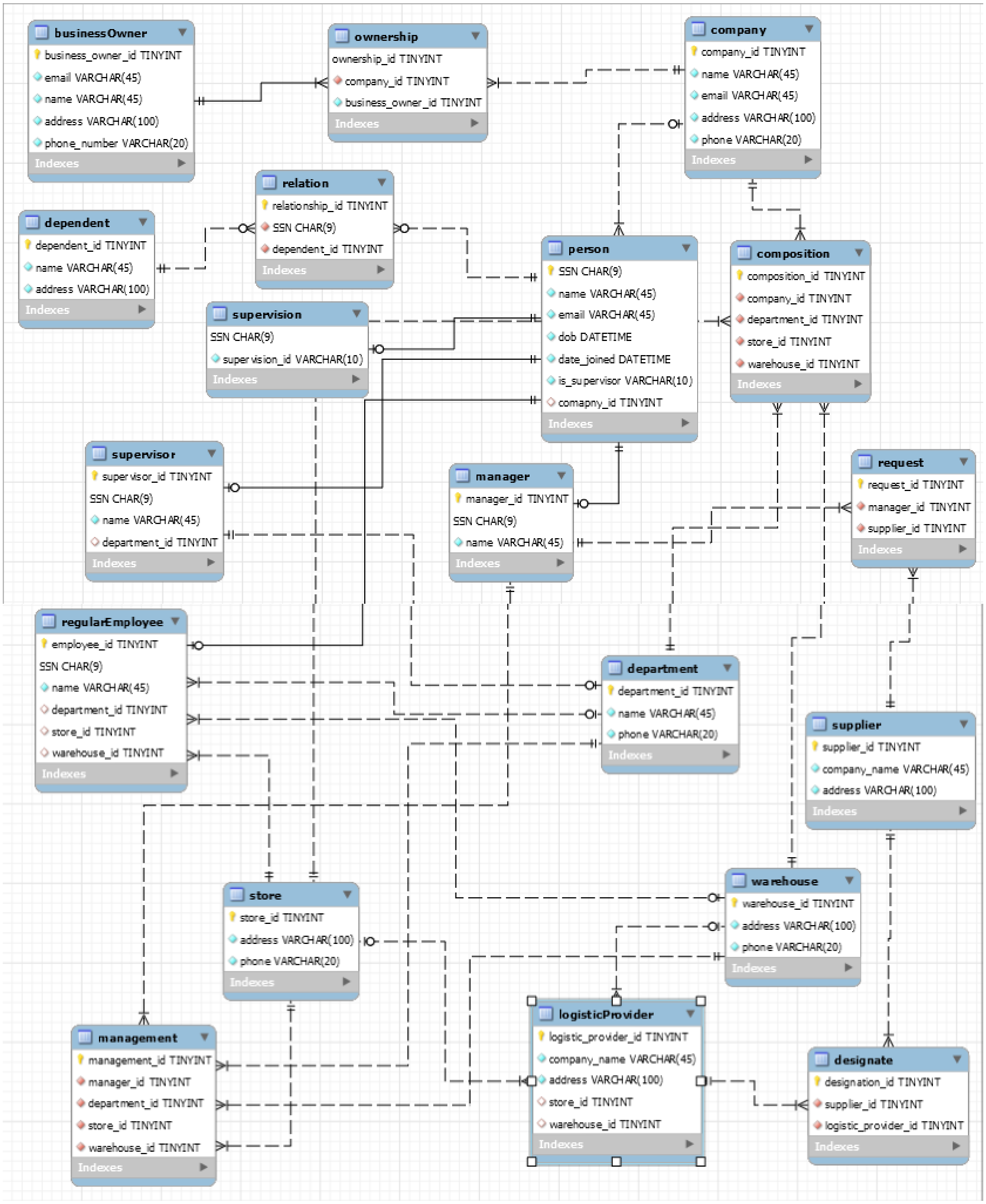
Section VI: Testing Table

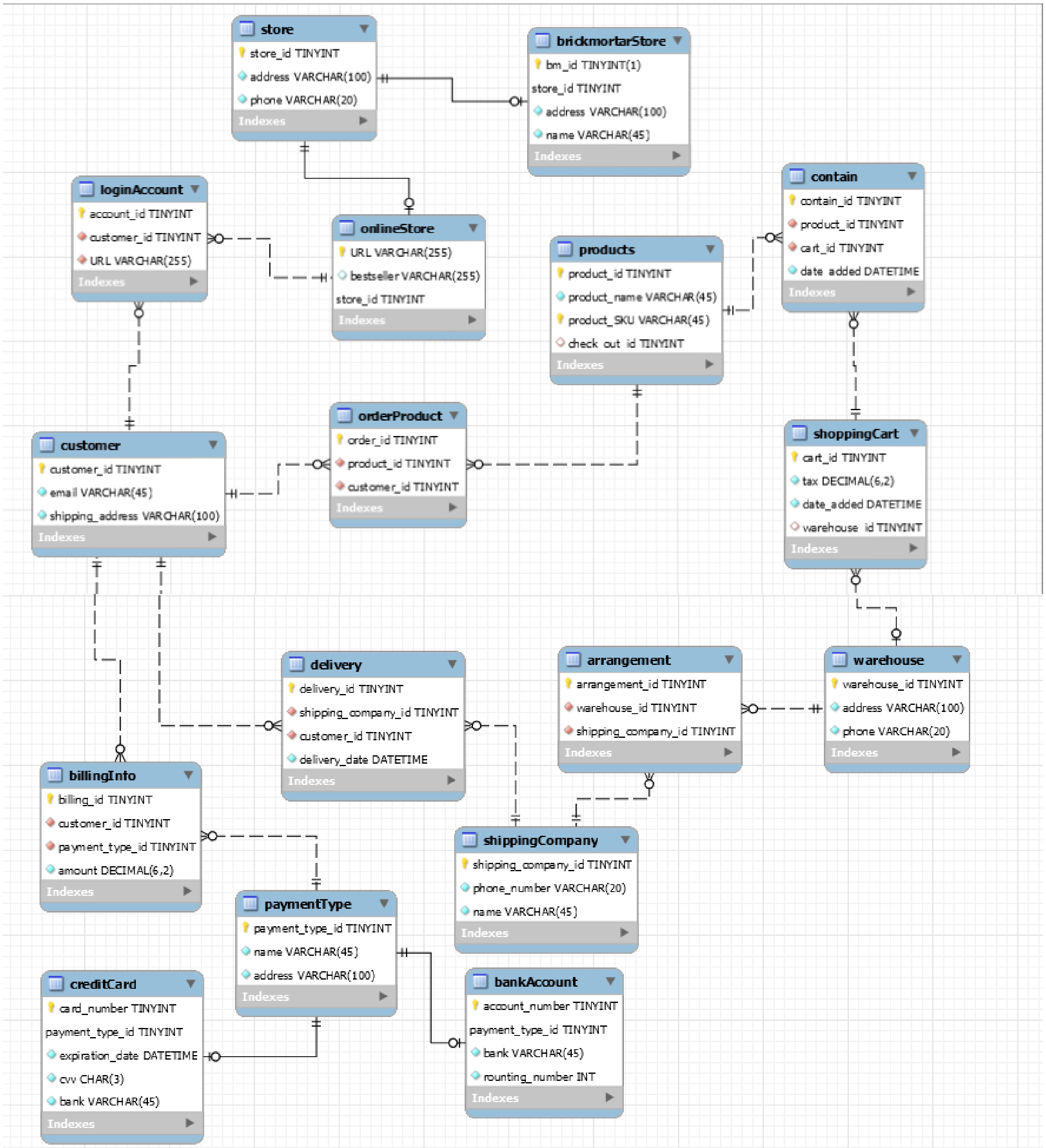
Rule	**Entity A**	**Relation**	**Entity B**	**Cardinality**	**Pass/Fail**	**Error Description**
1	Business owner	Owns	Company	M:N	Pass	None
2	Person	Works for	Company	M:1	Pass	None
3	Person	Is a	Supervisor, regular employee, manager	ISA	Pass	None
4	Company	Has	Department	M:N	Pass	None
5	Company	Has	Store	M:N	Pass	None
6	Company	Has	Warehouse	M:N	Pass	None
7	Person	Has	Supervisor	Recursive	Pass	None
8	Supervisor	Belongs to	Department	M:1	Fail	A department shall have one and only one supervisor.
9	Regular employee	Works for	Department, store, warehouse	M:1	Pass	None
10	Person	Has	Dependent	1:M	Fail	A dependent shall belong to one or many employees.

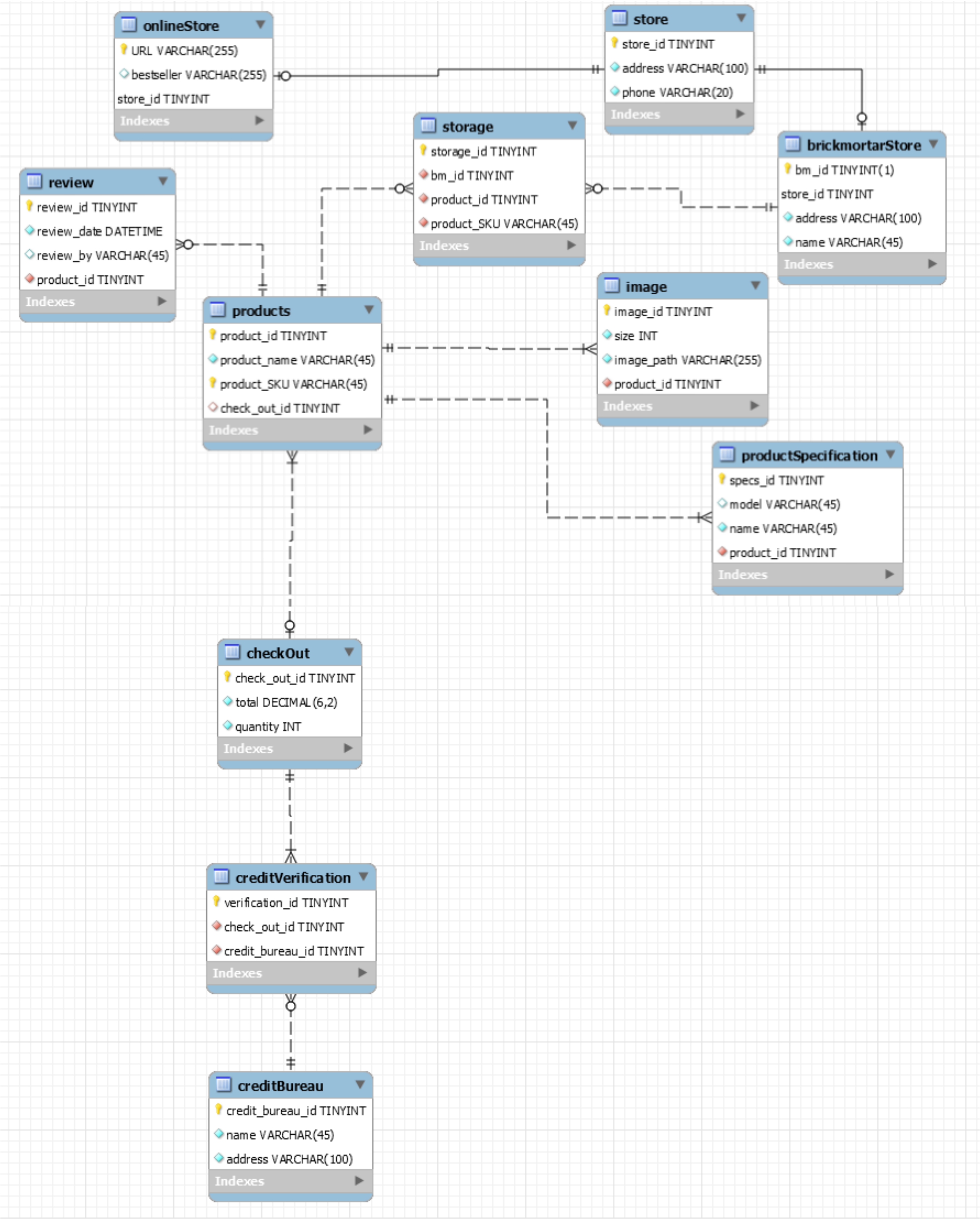
11	Manager	Manages	Department, store, warehouse	M:N	Pass	None
12	Store	Is a	Online store or brick and mortar store	ISA	Pass	None
13	Manager	Places	Request	M:N	Fail	A request shall be placed by one manager at a time.
14	Supplier	Fills	Request	M:N	Fail	A request shall be filled by one supplier at a time.
15	Logistic provider	Works for	Supplier	M:N	Pass	None
16	Brick and mortar store	Stores	Products	1:M	Pass	None
17	Online store	Has	Shopping cart	1:M	Pass	None
18	Customer	Selects	Products	M:N	Pass	None
19	Product	Belongs to	Checkout	M:N	Pass	None
20	Product	Added to	Shopping cart	M:N	Pass	None
21	Checkout	Verified by	Credit bureau	M:N	Pass	None

22	Customer	Has	Billinginfo	M:1	Fail	A billing information shall belong to one and only one customer.
23	Customer	Has	Payment type	M:N	Pass	None
24	Payment type	Is a	Credit card or bank account	ISA	Pass	None
25	Warehouse	Arrange	Shipping company	M:N	Pass	None
26	Shopping cart	Sends order to	Warehouse	1:1	Fail	A warehouse shall receive orders from many shopping carts.
27	Customer	Has	Login account	1:1	Pass	None
28	Shipping company	Deliver packages for	Customer	M:N	Pass	None
29	Employee	Fills	Order	M:N	Pass	None
30	Delivery information	Belongs to	Customer	M:N	Pass	None
31	Person	Assigned to	Department, store, warehouse	Aggregation	Pass	None

Section VII: Database Model




store
store_id TINYINT
address VARCHAR(100)
phone VARCHAR(20)
Indexes
brickmortarStore
bm_id TINYINT(1)
store_id TINYINT
address VARCHAR(100)
name VARCHAR(45)
Indexes
loginAccount
account_id TINYINT
customer_id TINYINT
URL VARCHAR(255)
Indexes
onlineStore
URL VARCHAR(255)
bestseller VARCHAR(255)
store_id TINYINT
Indexes
products
product_id TINYINT
product_name VARCHAR(45)
product_SKU VARCHAR(45)
check_out_id TINYINT
Indexes
contain
contain_id TINYINT
product_id TINYINT
cart_id TINYINT
date_added DATETIME
Indexes
customer
customer_id TINYINT
email VARCHAR(45)
shipping_address VARCHAR(100)
Indexes
orderProduct
order_id TINYINT
product_id TINYINT
customer_id TINYINT
Indexes
shoppingCart
cart_id TINYINT
tax DECIMAL(6,2)
date_added DATETIME
warehouse_id TINYINT
Indexes
delivery
delivery_id TINYINT
shipping_company_id TINYINT
customer_id TINYINT
delivery_date DATETIME
Indexes
arrangement
arrangement_id TINYINT
warehouse_id TINYINT
shipping_company_id TINYINT
Indexes
warehouse
warehouse_id TINYINT
address VARCHAR(100)
phone VARCHAR(20)
Indexes
billingInfo
billing_id TINYINT
customer_id TINYINT
payment_type_id TINYINT
amount DECIMAL(6,2)
Indexes
shippingCompany
shipping_company_id TINYINT
phone_number VARCHAR(20)
name VARCHAR(45)
Indexes
paymentType
payment_type_id TINYINT
name VARCHAR(45)
address VARCHAR(100)
Indexes
creditCard
card_number TINYINT
payment_type_id TINYINT
expiration_date DATETIME
cvv CHAR(3)
bank VARCHAR(45)
Indexes
bankAccount
account_number TINYINT
payment_type_id TINYINT
bank VARCHAR(45)
rounting_number INT
Indexes



onlineStore
- URL VARCHAR(255)
- bestseller VARCHAR(255)
- store_id TINYINT

store
- store_id TINYINT
- address VARCHAR(100)
- phone VARCHAR(20)

storage
- storage_id TINYINT
- bm_id TINYINT
- product_id TINYINT
- product_SKU VARCHAR(45)

brickmortarStore
- bm_id TINYINT(1)
- store_id TINYINT
- address VARCHAR(100)
- name VARCHAR(45)

review
- review_id TINYINT
- review_date DATETIME
- review_by VARCHAR(45)
- product_id TINYINT

products
- product_id TINYINT
- product_name VARCHAR(45)
- product_SKU VARCHAR(45)
- check_out_id TINYINT

image
- image_id TINYINT
- size INT
- image_path VARCHAR(255)
- product_id TINYINT

productSpecification
- specs_id TINYINT
- model VARCHAR(45)
- name VARCHAR(45)
- product_id TINYINT

checkOut
- check_out_id TINYINT
- total DECIMAL(6,2)
- quantity INT

creditVerification
- verification_id TINYINT
- check_out_id TINYINT
- credit_bureau_id TINYINT

creditBureau
- credit_bureau_id TINYINT
- name VARCHAR(45)
- address VARCHAR(100)

Itemized description of all the tables that implement ON DELETE AND ON UPDATE and all their possible constraints (CASCADE, SET NULL……).

Table name	Constraint name	Foreign key	References	Constraints	Reason
Ownership	fk_ownership_businessOwner	ownership_id	business_owner_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update business owner table, we need to delete/update ownership table because it's a weak key.
	fk_ownership_company	company_id	company_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the company table, we need to delete/update ownership table because it's a weak key.
composition	fk_composition_company	company_id	company_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the company table, we need to delete/update the composition table because it's a weak key.
	fk_composition_store	store_id	store_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the store table, we need to delete/update the composition table because it's a weak key.
	fk_composition_warehouse	warehouse_id	warehouse_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the warehouse table, we need to delete/update the composition table because it's a weak key.
person	fk_person_company	company_id	company_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the company information, we will need to delete/update the according company information on the person table.
relation	fk_relation_person	SSN	SSN	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the person table, we need to delete/update

					relation table because it's a weak key.
	fk_relation_dependent	dependent_id	dependent_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the dependent table, we need to delete/update relation table because it's a weak key.
supervisor	fk_supervisor_person	SSN	SSN	ON DELETE CASCADE ON UPDATE CASCADE	Supervisor is a person. If we delete/update the person table, we will need to delete/update supervisor table.
	fk_supervisor_department	department_id	department_id	ON DELETE SET NULL ON UPDATE CASCADE	If we delete the department, we can't delete supervisor table because they can also be supervisor for a department in another company. If we update the department table, we will need to update the department information for supervisor.
regularEmployee	fk_regularEmployee_person	SSN	SSN	ON DELETE CASCADE ON UPDATE CASCADE	Regular employee is a person. If we delete/update the person table, we will need to delete/update regular employee table.
	fk_regularEmployee_department	department_id	department_id	ON DELETE SET NULL ON UPDATE CASCADE	If we delete the department, we can't delete regular employee because they can also be regular employee works for departments in other companies. If we update the department table, we will need to update the regular employee table.
	fk_regularEmployee_store	store_id	storei_d	ON DELETE SET NULL ON UPDATE CASCADE	If we delete the store, we can't delete regular employee because they can also

					be regular employee works for other stores. If we update the store table, we will need to update the regular employee table.
	fk_regularEmployee_warehouse	warehouse_id	warehouse_id	ON DELETE SET NULL ON UPDATE CASCADE	If we delete the warehouse, we can't delete regular employee because they can also be regular employee works for other warehouses. If we update the warehouse table, we will need to update the regular employee table.
manager	fk_manager_person	SSN	SSN	ON DELETE CASCADE ON UPDATE CASCADE	Manger is a person. If we delete/update the person table, we will need to delete/update manager table.
management	fk_management_manager	manager_id	manager_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the manager table, we will need to delete/update the management table because it's a weak key.
	fk_management_department	department_id	department_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the department table, we will need to delete/update the management table because it's a weak key.
	fk_management_store	store_id	store_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the store table, we will need to delete/update the management table because it's a weak key.
	fk_management_warehouse	warehouse_id	warehouse_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the warehouse table, we will need to delete/update the management table

					because it’s a weak key.
logisticProvider	fk_logisticProvider_store	store_id	store_id	ON DELETE CASCADE ON UPDATE CASCADE	A store can have one or many logistic providers, store_id is a foreign key in logistic provider table. If we delete/update the store table, we will need to delete/update the store information in the logistic provider table.
	fk_logisticProvider_warehouse	warehouse_id	warehouse_id	ON DELETE CASCADE ON UPDATE CASCADE	A warehouse can have one or many logistic providers, warehouse_id is a foreign key in logistic provider table. If we delete/update the warehouse table, we will need to delete/update the warehouse information in the logistic provider table.
request	fk_request_manager	manager_id	manager_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the manager table, we will need to delete/update the request table because it’s a weak key.
	fk_request_supplier	supplier_id	supplier_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the supplier table, we will need to delete/update the request table because it’s a weak key.
designate	fk_designate_supplier	supplier_id	supplier_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the supplier table, we will need to delete/update the request table because it’s a weak key.
	fk_designate_logisticProvider	logistic_provider_id	logistic_provider_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the logistic provider table, we will need to delete/update the request table because it’s a weak key.
onlineStore	fk_onlineStore_store	store_id	store_id	ON DELETE CASCADE ON UPDATE CASCADE	Online store is a store. If we

					delete/update the store table, we will need to delete/update the online store table.
loginAccount	fk_loginAccount_customer	customer_id	customer_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the customer table, we will need to delete/update the loginAccount table because it's a weak key.
	fk_loginAccount_onlineStore	URL	URL	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the onlineStore table, we will need to delete/update the loginAccount table because it's a weak key.
products	fk_products_checkOut	check_out_id	check_out_id	ON DELETE CASCADE ON UPDATE CASCADE	One checkout can have one or many products, checkout_id is a foreign key in the products table. If we delete/update the checkout table, we will need to delete/update the products table.
order	fk_order_customer	customer_id	customer_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the customer table, we will need to delete/update the order table because it's a weak key.
	fk_order_products	product_id	product_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the products table, we will need to delete/update the order table because it's a weak key.
shoppingCart	fk_shoppingCart_warehouse	warehouse_id	warehouse_id	ON DELETE SET NULL ON UPDATE CASCADE	A warehouse can receive order from many shopping carts, warehouse_id a foreign key in the shopping cart table. But if we delete one warehouse, we can't delete the shopping cart because it can still exist and send

					order to another warehouse. If we update the warehouse table, we will need to update the shoppingCart table.
add	fk_add_products	product_id	product_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the products table, we will need to delete/update the add table because it's a weak key.
	fk_add_shoppingCart	cart_id	cart_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the shoppingCart table, we will need to delete/update the add table because it's a weak key.
billingInfo	fk_billingInfo_customer	customer_id	customer_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the customer table, we will need to delete/update the billinginfo table because it's a weak key.
	fk_billingInfo_paymentType	payment_type_id	payment_type_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the paymentType table, we will need to delete/update the billinginfo table because it's a weak key.
creditCard	fk_creditCard_paymentType	payment_type_id	payment_type_id	ON DELETE CASCADE ON UPDATE CASCADE	Credit card is a payment type. If we delete/update the paymentType table, we will need to delete/update the creditCard table.
bankAccount	fk_bankAccount_paymentType	payment_type_id	payment_type_id	ON DELETE CASCADE ON UPDATE CASCADE	Bank account is a payment type. If we delete/update the paymentType table, we will need to delete/update the bankAccount table.
arrangement	fk_arrangement_warehouse	warehouse_id	warehouse_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the warehouse table, we will need to delete/update the arrangement table.

	fk_arrangement_shippingCompany	shipping_company_id	shipping_company_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the shipping company table, we will need to delete/update the arrangement table because it's a weak key.
delivery	fk_delivery_shippingCompany	shipping_company_id	shipping_company_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the shipping company table, we will need to delete/update the delivery table because it's a weak key.
	fk_delivery_customer	customer_id	customer_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the customer table, we will need to delete/update the delivery table because it's a weak key.
brick&mortarStore	fk_brick&mortarStore_store	store_id	store_id	ON DELETE CASCADE ON UPDATE CASCADE	Brick&mortar Store is a store. If we delete/update the brick&mortarStore table, we will need to delete/update the online store table.
storage	fk_storage_products	product_id product_SKU	product_id product_SKU	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the products table, we will need to delete/update the storage table because it's a weak key.
	fk_storage_brick&mortarStore	bm_id	bm_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the brick&mortarStore table, we will need to delete/update the storage table because it's a weak key.
creditVerification	fk_creditVerification_checkOut	check_out_id	check_out_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the checkOut table, we need to delete/update the creditVerification table because it's a weak key.
	fk_creditVerification_creditBureau	credit_bureau_id	credit_bureau_id	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the credit_bureau table, we will need to delete/update the creditVerification

					table because it’s a weak key.
image	pk_image_products	product_id	product_id	ON DELETE CASCADE ON UPDATE CASCADE	A product can have one or many images, product_id a foreign key in the image table. Image is a weak key. If we delete/update the product table, we will need to delete/update the image table.
review	fk_review_products	product_id	product_id	ON DELETE CASCADE ON UPDATE CASCADE	A product can have zero or many reviews, product_id a foreign key in the review table. Review is a weak key. If we delete/update the product table, we will need to delete/update the review table.
productSpecification	fk_productSpecification_products	product_id	product_id	ON DELETE CASCADE ON UPDATE CASCADE	A product can have one or many product speficications, product_id a foreign key in the productSpecification table. ProductSpecification is a weak key. If we delete/update the product table, we will need to delete/update the productSpecification table.
supervision	fk_supervision_person	SSN	SSN	ON DELETE CASCADE ON UPDATE CASCADE	If we delete/update the person table, we will need to delete/update the supervision table.

Section VIII: Testing Table

Entity	SQLQuery	OK/Failed	Error Description	Possible Solution
businessOwner	Delete	OK	None	None
businessOwner	Update	OK	None	None
store	Delete	OK	None	None
store	Update	OK	None	None
warehouse	Delete	OK	None	None
warehouse	Update	OK	None	None
person	Delete	FAIL	Logical error, need to set ON DELETE SET NULL because if we delete the company table, we can't delete the person because they can work for other companies.	Reset ON DELETE from ON DELETE CASCADE to ON DELETE SET NULL
person	Update	OK	None	None
supervisor	Delete	FAIL	Logical error, need to set ON DELETE SET NULL because if we delete the department table, we can't delete the supervisor because they can supervisor for another department in another company.	Reset ON DELETE from ON DELETE CASCADE to ON DELETE SET NULL
supervisor	Update	OK	None	None
regularEmployee	Delete	FAIL	Logical error, need to set ON DELETE SET NULL for foreign key in store, department and warehouse table because if we delete the department table, we can't delete the supervisor because they can supervisor for	Reset ON DELETE from ON DELETE CASCADE to ON DELETE SET NULL for fk_ regularEmployee_store, fk_regularEmployee_department,

			another department in another company.	fk_regularEmployee_warehouse,
regularEmployee	Update	OK	None	None
manager	Delete	OK	None	None
manager	Update	OK	None	None
supplier	Delete	OK	None	None
supplier	Update	OK	None	None
logisticProvider	Delete	Fail	Logical error, if we delete the store or warehouse, we can’t delete the logistic provider because they can be logistic provider for stores and departments in other companies.	Reset ON DELETE from ON DELETE CASCADE to ON DELETE SET NULL for fk_logisticProvider_store and fk_logisticProvider_warehouse.
logisticProvider	Update	OK	None	None
customer	Delete	OK	None	None
customer	Update	Fail	Duplicate primary key	Change the primary key in UPDATE command to customer_id=4
checkOut	Delete	OK	None	None
checkOut	Update	OK	None	None
products	Delete	Fail	Logical error, if we delete the checkout table, we can’t delete the products because not all products need be checked out.	Reset ON DELETE from ON DELETE CASCADE to ON DELETE SET NULL for fk_products_checkOut.
products	Update	OK	None	None
paymentType	Delete	OK	None	None
paymentType	Update	OK	None	None
shippingCompany	Delete	OK	None	None

shippingCompany	Update	OK	None	None
brickmortarStore	Delete	OK	None	None
brickmortarStore	Update	OK	None	None
creditBureau	Delete	OK	None	None
creditBureau	Update	OK	None	None
supervision	Delete	OK	None	None
supervision	Update	OK	None	None