



# CityTech Retail Management System (CRMS)

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# Objective

To communicate and showcase the implementation of the Database Management System (DBMS) for CityTech Retail

# Overview

**Enhance Customer Experience:** Access detailed customer information, feedback, and purchase history for personalized interactions and targeted marketing.

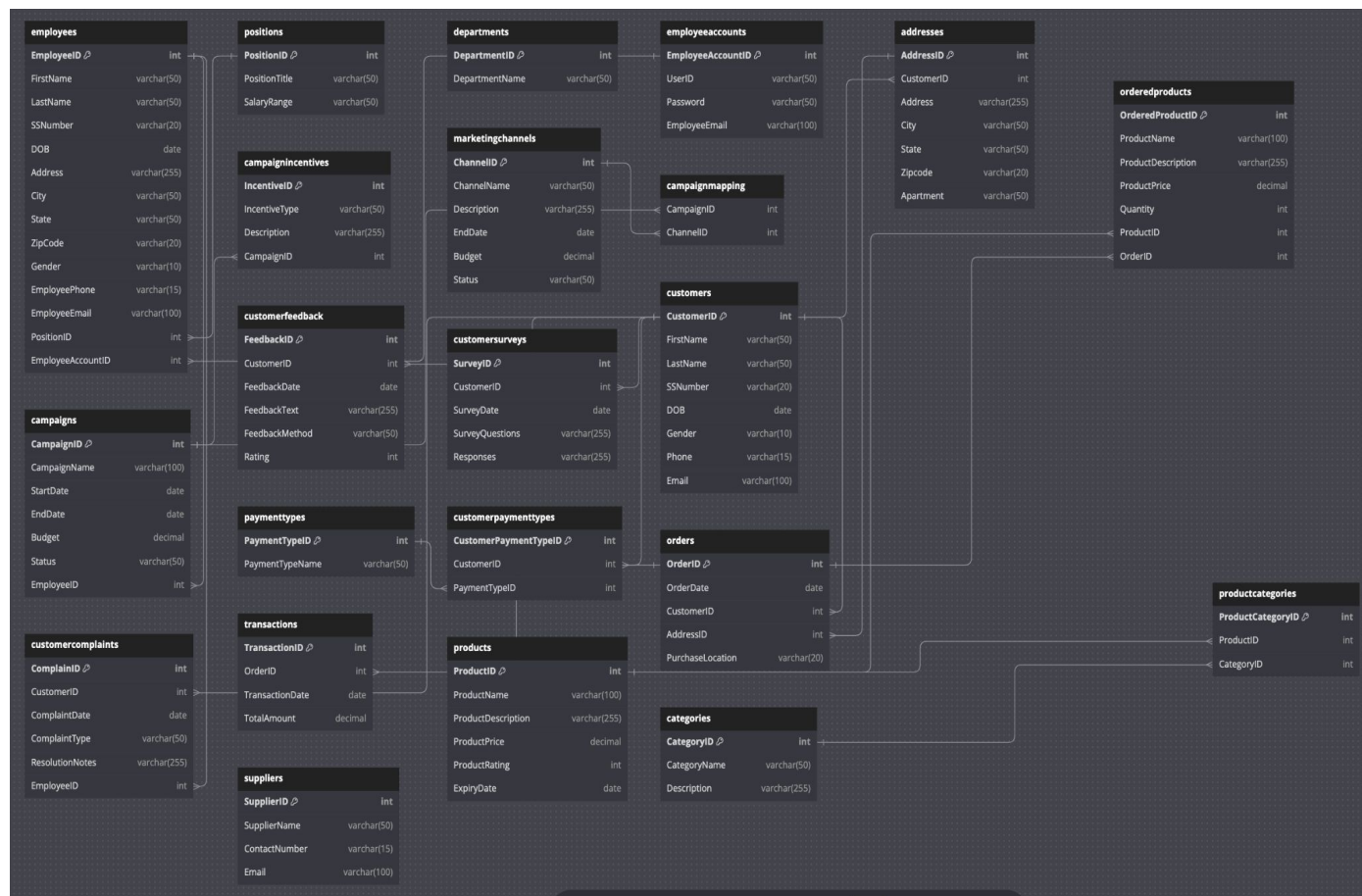
**Empower Marketing Strategies:** Analyze customer demographics, and tailor marketing efforts based on real-time data.

**Business Rules/Processes:** help streamline various aspects of the retail business

**Ensure Data Security:** Protect sensitive information such as customer details, financial transactions, and employee records through secure access controls and encryption.

**Data Retention Policy:** Essential for managing database storage

# Logical Model (CRMS)



## Sale Trend Analysis

Insights into the sales trends of a specified product category within CityTech Retail.

	CategoryName	TransactionYear	TransactionMon...	ProductCount	TotalQuanti...	TotalRevenue
	Sporting Goods	2025	6	1	1	199.99
	Toys	2025	5	1	1	39.99
	Home Appliances	2025	4	1	1	69.99
	Groceries	2025	3	1	2	3.98
	Shoes	2025	2	1	1	29.99
	Clothing	2025	1	1	1	59.99
	Music	2024	12	1	1	179.99
	Furniture	2024	11	1	1	179.99
	Sporting Goods	2024	10	1	1	24.99
	Toys	2024	9	1	1	34.99
	Home Appliances	2024	8	1	1	129.99
	Groceries	2024	7	1	2	9.98
	Shoes	2024	6	1	1	69.99
	Clothing	2024	5	1	1	79.99
	Music	2024	4	1	1	149.99
	Furniture	2024	3	1	1	249.99
	Sporting Goods	2024	2	1	1	19.99
	Toys	2024	1	1	1	29.99
	Home Appliances	2023	12	1	1	89.99
	Groceries	2023	11	1	2	7.98
	Shoes	2023	10	1	1	59.99
	Clothing	2023	9	1	1	14.99
	Music	2023	8	1	1	199.99
	Furniture	2023	7	1	1	299.99
	Sporting Goods	2023	6	1	1	89.99
	Toys	2023	5	1	2	39.98
	Home Appliances	2023	4	1	1	79.99
	Groceries	2023	3	1	3	8.97
	Shoes	2023	2	1	1	49.99
	Clothing	2023	1	1	1	39.99

## Top Selling Products

lists the top-selling products based on sales volume.

	ProductName	CategoryName	TotalQuantityS...	
	Pasta	Groceries	3	
	Building Blocks	Toys	2	
	Snacks	Groceries	2	
	Rice	Groceries	2	
	Cereal	Groceries	2	
	Lego Set	Toys	1	
	Air Fryer	Home Appliances	1	
	Chess Set	Toys	1	
	Tennis Racket	Sporting Goods	1	
	Yoga Mat	Sporting Goods	1	
	Basketball	Sporting Goods	1	
	Bicycle	Sporting Goods	1	
	Sofa	Furniture	1	
	Dining Table	Furniture	1	
	Bookshelf	Furniture	1	
	Guitar	Music	1	
	Keyboard	Music	1	
	Violin	Music	1	
	Board Game	Toys	1	
	Jeans	Clothing	1	
	Microwave O...	Home Appliances	1	
	Blender	Home Appliances	1	
	Coffee Maker	Home Appliances	1	
	Sandals	Shoes	1	
	Hiking Boots	Shoes	1	
	Running Shoes	Shoes	1	
	Sneakers	Shoes	1	
	Jacket	Clothing	1	
	Dress	Clothing	1	
	T-Shirt	Clothing	1	

# Customer Demographic Analysis

Analyzing customer demographics, locations, and purchasing patterns.

	CustomerID	FirstName	LastName	Address	City	State	Zipcode	TotalOrders	TotalProductsPurchas...
	16	Geoff	Pierri	1377 Pine Dr	New York	New York	10001	1	1
	30	Goober	Rodder	2831 Cedar Blvd	San Francisco	California	94101	1	1
	29	Gianina	Barabich	2720 Oak St	Portland	Oregon	97201	1	1
	28	Caro	McCoid	2609 Pine Dr	Denver	Colorado	80201	1	1
	27	Everett	Jeavons	2498 Spruce Ct	Seattle	Washington	98101	1	2
	26	Scarlett	Holbury	2387 Walnut Dr	Austin	Texas	78701	1	1
	25	Seamus	Deering	2276 Birch Ln	San Jose	California	95101	1	1
	24	Hadlee	Dahmel	2165 Cedar Blvd	Dallas	Texas	75201	1	1
	23	Tiffani	Pembury	2054 Oak St	San Diego	California	92101	1	1
	22	Fidel	Dickinson	1943 Pine Dr	San Antonio	Texas	78201	1	1
	21	Mada	Glasheen	1832 Spruce Ct	Philadelphia	Pennsylva...	19101	1	1
	20	Salmon	Alwin	1721 Walnut Dr	Phoenix	Arizona	85001	1	1
	19	Jillene	McTeggart	1610 Birch Ln	Houston	Texas	77001	1	2
	18	Geralda	Blaasch	1599 Cedar Blvd	Chicago	Illinois	60601	1	1
	17	Bjorn	Creeboe	1488 Oak St	Los Angeles	California	90001	1	1
	1	Dinnie	Fussen	123 Main St	New York	New York	10001	1	1
	15	Staci	MacSke...	1266 Spruce Ct	San Francisco	California	94101	1	1
	14	Royall	Proppers	1155 Walnut Dr	Portland	Oregon	97201	1	1
	13	Reynold	Franzel	1043 Birch Ln	Denver	Colorado	80201	1	1
	12	Berton	Breacher	929 Cedar Blvd	Seattle	Washington	98101	1	1
	11	Mendie	Rogez	818 Oak St	Austin	Texas	78701	1	2
	10	Aldis	Been	707 Pine Dr	San Jose	California	95101	1	1
	9	Cecelia	Giacometti	606 Spruce Ct	Dallas	Texas	75201	1	1
	8	Kipp	Lawlee	505 Walnut Dr	San Diego	California	92101	1	1
	7	Alard	Tolomei	404 Birch Ln	San Antonio	Texas	78201	1	1
	6	Leanna	Paulucci	303 Cedar Blvd	Philadelphia	Pennsylva...	19101	1	1
	5	Pate	Grinston	202 Maple Ave	Phoenix	Arizona	85001	1	2
	4	Netti	Willard	101 Elm St	Houston	Texas	77001	1	1
	3	Courtney	Trevascus	789 Pine St	Chicago	Illinois	60601	1	3
	2	Claudell	McCarle	456 Oak St	Los Angeles	California	90001	1	1

## Business Rules/Processes - automated by the database

### 1. **Order Processing -**

Business Rule: Automatically generate a unique OrderID for each customer order.

**Implementation:** The Orders\_ProfG\_FP table's OrderID is set as the primary key and is auto-incremented for each new order.

### 2. **Inventory Management -**

Business Rule: Track product stock levels and update them with each sale or return.

**Implementation:** The OrderedProducts\_ProfG\_FP table's Quantity field is updated with each sale or return, reflecting real-time inventory levels.

### 3. **Campaign Management -**

Business Rule: Monitor and manage marketing campaigns, including incentives and channels.

**Implementation:** The Campaigns\_ProfG\_FP, CampaignIncentives\_ProfG\_FP, MarketingChannels\_ProfG\_FP, and CampaignMapping\_ProfG\_FP tables collectively handle campaign details, incentives, channels, and their associations.



#### 4. **Payment Processing -**

Business Rule: Associate payment types with customer orders for secure and varied payment options.

**Implementation:** The CustomerPaymentTypes\_ProfG\_FP table links customers to payment types, allowing flexibility in payment methods.

#### 5. **Product Categorization -**

Business Rule: Categorize products into specific groups for better organization and analysis.

**Implementation:** The ProductCategories\_ProfG\_FP table associates products with categories, aiding in product grouping and analysis.

# Data Security (View)

Information is masked by default when a Query is executed.

```
1  •  USE S23552271;
2
3  -- view to mask sensitive information
4  •  CREATE VIEW MaskedCustomer AS
5  SELECT
6      CustomerID,
7      FirstName,
8      LastName,
9      CONCAT('****-**-****', SUBSTRING(SSNumber, 12)) AS MaskedSSN,
10     CONCAT('****', SUBSTRING_INDEX(Email, '@', -1)) AS MaskedEmail,
11     CONCAT('***-***-', SUBSTRING(Phone, 7)) AS MaskedPhone,
12     CONCAT('****-**-**', SUBSTRING(DOB, 11)) AS MaskedDOB
13 FROM customers;
14
15 -- Grant permissions to use the view
16 •  GRANT SELECT ON database_name.MaskedCustomer TO user;
17
18 -- Flush privileges to apply changes
19 •  FLUSH PRIVILEGES;
20
```

	CustomerID	FirstName	LastName	SSNumber	DOB	Gender	Phone	Email
	1	Dinnie	Fussen	313-45-8909	2023-05-19	Genderqueue	438-553-5893	dfussen0@dedecms.com
	2	Claudell	McCarle	787-72-4812	2023-08-18	Male	131-783-4740	cmccarle1@nytimes.com
	3	Courtney	Trevascus	250-21-2434	2023-05-02	Female	623-132-2755	ctrevascus2@odnoklassniki.ru
	4	Netti	Willard	198-94-6041	2023-05-22	Female	329-943-0135	nwillard3@google.de
	5	Pate	Grinston	592-83-2202	2023-01-17	Male	763-742-3138	pgrinston4@ezinearticles.com
	6	Leanna	Paulucci	376-17-6989	2023-05-18	Female	590-924-8630	lpaulucci5@myspace.com
	7	Alard	Tolomei	281-89-4426	2023-09-19	Male	147-458-8624	atolomei6@homestead.com
	8	Kipp	Lawlee	392-35-9211	2022-12-15	Male	545-622-0471	klawlee7@zimbio.com
	9	Cecelia	Giacometti	138-24-3595	2023-08-23	Female	861-580-9958	cgiacometti8@ebay.com
	10	Aldis	Been	133-50-9507	2023-12-01	Male	812-998-2952	abeen9@java.com

	CustomerID	FirstName	LastName	MaskedSSN	MaskedEmail	MaskedPhone	MaskedDOB	
	1	Dinnie	Fussen	****_**_****	****dedecms.com	***_***-3-5893	****_**_**	
	2	Claudell	McCarle	****_**_****	****nytimes.com	***_***-3-4740	****_**_**	
	3	Courtney	Trevascus	****_**_****	****odnoklassniki.ru	***_***-2-2755	****_**_**	
	4	Netti	Willard	****_**_****	****google.de	***_***-3-0135	****_**_**	
	5	Pate	Grinston	****_**_****	****ezinearticles.com	***_***-2-3138	****_**_**	
	6	Leanna	Paulucci	****_**_****	****myspace.com	***_***-4-8630	****_**_**	
	7	Alard	Tolomei	****_**_****	****homestead.com	***_***-8-8624	****_**_**	
	8	Kipp	Lawlee	****_**_****	****zimbio.com	***_***-2-0471	****_**_**	
	9	Cecelia	Giacometti	****_**_****	****ebay.com	***_***-0-9958	****_**_**	
	10	Aldis	Been	****_**_****	****java.com	***_***-8-2952	****_**_**	

# Database Performance Issues

1 - **Complex Queries** - Reports often involve complex queries that retrieve and aggregate a large amount of data which increases process time.

2 - **Lack of Indexing** - Inefficient or missing indexes make query execution slower

3 - **Inadequate hardware resources** - CPU, memory, or disk I/O

# Resolution

## Indexing -

- Identify High-Usage Columns
- Analyze the reports causing performance issues and identify the columns frequently used in WHERE, JOIN, or ORDER BY clauses.
- Add Indexes to High-Usage Columns
- For each identified column, add an index to speed up data retrieval.

**Example** - "TransactionDate" column in the Transactions\_ProfG\_FP table is frequently used in reports. Therefore, we can create an index

```
Code - CREATE INDEX idx_TransactionDate ON  
Transactions_ProfG_FP(TransactionDate);
```

**Example** - For Queries involving multiple columns, we can create composite indexes to cover the combinations used in the queries

```
Code - CREATE INDEX idx_Order_Customer ON Orders_ProfG_FP(OrderID,  
CustomerID);
```

# Data Retention Policy

Essential for managing database storage because data is kept indefinitely which can increase storage costs and security issues

## **Resolution -**

- Data Archiving Strategy
1. Identify Archivable data - Historical and less frequently accessed data
  2. Create Archive Table - Corresponding to original tables whose data is being stored.
  3. Implement purging mechanism - based on company policies decide for how long to retain data before permanently deleting it

**Benefits** - Improved Query Performance, Reduced Storage Costs, Compliance with Data Privacy Regulations

# Conclusion

## Achievements:

**Enhanced Customer Experience:** Access to detailed customer information for personalized interactions. Targeted marketing strategies based on real-time data.

**Empowered Marketing:** In-depth analysis of customer demographics for tailored marketing efforts.

**Automated Business Processes:** Streamlined order processing, inventory management, and campaign monitoring.

**Data Security:** Implemented robust access controls and encryption for sensitive information.

**Data Retention Policy:** Introduced a data archiving strategy for efficient storage management.

**Performance Optimization:** Addressed database performance issues through indexing strategies.



## **Future Considerations:**

**Advanced Analytics:** Explore advanced analytics for deeper insights into customer behavior and market trends.

**Real-time Reporting:** Implement real-time reporting mechanisms to ensure up-to-the-minute data availability.

**User Training:** Conduct user training sessions to maximize the utilization of the implemented system.

**Security Audits:** Regularly conduct security audits to ensure ongoing compliance with data privacy regulations.