CONESTOGA

Connect Life and Learning

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SECTION – 10

ASSIGMENT TITTLE: Task 2 – Functional Dependencies (A)

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- **Section A**

1. For the CustomerOrder table, identify and list out each of the functional dependencies that exist.

In the given CustomerOrder table, functional dependencies can be determined by examining how the attributes (columns) depend on each other. A functional dependency exists when one attribute uniquely determines another attribute in the table. Based on the provided data, the functional dependencies in the CustomerOrder table can be identified as follows:

1. OrderID → (CustomerID, PaymentID, OrderStatusID, ShipmentMethodID, ShippingAddressID, SubTotal, Tax, TotalPaid, DatePaid, EstDateShipped, ActualDateShipped, DateModified)
- OrderID distinctively determines all other columns in the table for all the records.

2. CustomerID → (PaymentID, OrderStatusID, ShipmentMethodID)
- CustomerID uniquely determines PaymentID, OrderStatusID, and ShipmentMethodID for all customers.

3. PaymentID → (SubTotal, Tax, TotalPaid, DatePaid)
- PaymentID uniquely determines SubTotal, Tax, TotalPaid, and DatePaid for all the payments.

4. OrderStatusID → (EstDateShipped, ActualDateShipped, DateModified)
- OrderStatusID uniquely determines EstDateShipped, ActualDateShipped, and DateModified for a specific order status.

5. ShipmentMethodID → (EstDateShipped, ActualDateShipped, DateModified)
- ShipmentMethodID uniquely determines EstDateShipped, ActualDateShipped, and DateModified for a specific shipment method.

Remark: The functional dependencies are determined based on the provided data, and the actual dependencies might vary depending on the real-world scenario and the constraints of the application using this database.

2. List out the primary key(s), foreign key(s) and candidate key(s) for the CustomerOrder table.

Based on the provided data and the identified functional dependencies, we can determine the primary key(s), foreign key(s), and candidate key(s) for the CustomerOrder table as follows:

1. Primary Key:
   - ✓ OrderID

   - Each row in the CustomerOrder table can be distinguished by its OrderID. This table's primary key is it.

2. Foreign Key:
   - ✓ CustomerID

   - CustomerID appears to be a foreign key corresponding to the CustomerID in another table (not provided in the data). It represents the customer who placed the order.

   - ✓ PaymentID

   - PaymentID appears to be a foreign key corresponding to the Payment table where payment details are stored.

- ✓ OrderStatusID

- OrderStatusID appears to be a foreign key corresponding to an OrderStatus table where information about the status of the order is stored.

- ✓ ShipmentMethodID

- ShipmentMethodID seems to be a foreign key corresponding to a Shipment Method table, indicating the method used for shipping the order.

- ✓ ShippingAddressID

- ShippingAddressID could potentially be a foreign key corresponding to an Address table, representing the shipping address details associated with the order.

3. Candidate Key:

- ✓ OrderID
  - OrderID is a candidate key because it is unique for each order and can be used as a primary key.

- ✓ (CustomerID, PaymentID)
  - The combination of CustomerID and PaymentID could be a candidate key if a customer is allowed to have multiple orders with the same PaymentID. This combination is unique for each order in the given data.

Remark: The specific database schema and corporate standards provided in the data can influence how foreign and candidate keys are determined precisely. Idealized definitions of foreign and candidate keys ought to be based on the relationships and specifications of the database schema.

3. List all multivalued dependencies within the CustomerOrder table utilizing the following format:

- **Attribute ->-> Attribute**

The CustomerOrder table contains no explicit multivalued dependencies based on the data provided.

Multivalued dependencies occur when one column determines another attribute in a way that is unaffected by all other attributes in the table, which is not apparent in the given dataset. As a result, there are no multivalued dependencies to list in the format specified for the CustomerOrder table.

4. Transform the CustomerOrder entity [table] into the 4th Normal Form utilizing the following format:

- **Entity (PrimaryKey, ForeignKey, Attribute)**
- **Underline the Primary Key(s)**
- **Italicize the Foreign Key(s)**

CustomerOrder1 (OrderID, Payment, CustomerID, Subtotal, Datepaid, Estdateshipped, Actualdateshipped, Datemodified)

Payment (PaymentID, OrderstatusID, ShipmentmethodID, ShippingaddressID)

Subtotal (Subtotal, Tax, Totalpaid)

- Original Entity:

CustomerOrder→ (OrderID, CustomerID, PaymentID, OrderStatusID, ShipmentMethodID, ShippingAddressID, SubTotal, Tax, TotalPaid, DatePaid, EstDateShipped, ActualDateShipped, DateModified)

- Decomposed Entities:

- Orders→(OrderID, CustomerID,PaymentID, ShippingAddressID, SubTotal, Tax, TotalPaid, DatePaid)
  - Primary Key: OrderID
  - Foreign Key: CustomerID, PaymentID
  - Attributes: ShippingAddressID, SubTotal, Tax, TotalPaid, DatePaid

- OrderStatuses→ (OrderID,OrderStatusID, EstDateShipped, ActualDateShipped, DateModified)
  - Composite Primary Key: (OrderID, OrderStatusID)
  - Foreign Key: OrderID
  - Attributes: EstDateShipped, ActualDateShipped, DateModified

- ShipmentMethods→ (OrderID, ShipmentMethodID, EstDateShipped, ActualDateShipped, DateModified)
  - Composite Primary Key: (OrderID, ShipmentMethodID)
  - Foreign Key: OrderID
  - Attributes: EstDateShipped, ActualDateShipped, DateModified

- Payments→(PaymentID, SubTotal, Tax, TotalPaid, DatePaid)
  - Primary Key: PaymentID
  - Attributes: SubTotal, Tax, TotalPaid, DatePaid

- Customers→CustomerID
  - Primary Key: CustomerID

- ShippingAddresses→ (ShippingAddressID)
  - Primary Key: ShippingAddressID

Section B

Assume that you are contracted as a Business Analyst consultant with the client organization from the narrative.

1. **If you were to take on the task of updating the organizations database, enforcing the entity [table] structure changes you indicated in the previous question(s), what questions would you want to ask the resident database Administrator, or Business Manager, for clarification? Keep the following concepts in mind while drafting your questions:**

- **Scope: Keep a tight constraint on the topic(s) you are covering and ensure only value-added material is being elicited.**

It is important to obtain accurate and relevant data from the local database administrator or business manager before updating the organization's database and enforcing table structure changes. Here are some specific questions to ask for clarification to maintain a strict focus on the subject and extract only valuable information:

1. Business Process Understanding:
- What are the primary business processes that the database supports?
- Could you describe a typical workflow involving the CustomerOrder table? What are the key steps?

2. Integration with External Systems:
- Does the CustomerOrder data need to be integrated with any external systems or third-party applications?
- What data formats and structures are expected by these external systems?

3. Data Validation and Constraints:
- What kind of validation rules are applied to the CustomerOrder data (e.g., data formats, range checks, uniqueness constraints)?
- Are there any specific constraints or rules that should be enforced when processing orders?

4. Performance and Scalability:
- How many orders are processed on average per day/month?
- Are there any performance bottlenecks or scalability concerns related to the current structure of the CustomerOrder table?

5. Data Usage and Requirements:
- How is the data in the CustomerOrder table currently being utilized by different departments or applications?
- What specific information do different teams require from the CustomerOrder data?

6. Reporting and Analysis:
- What kind of reports or analyses are regularly performed using the CustomerOrder data?
- Are there specific metrics or calculations derived from the CustomerOrder table that are critical for decision-making?

7. Data Retention and Archiving:
- What is the data retention policy for customer orders?
- Is there a need to archive or purge old orders from the database?

8. Historical Data and Audit Trails:
- Is there a need to maintain historical data for customer orders or track changes made to orders over time?
- Are there any audit trail requirements for the CustomerOrder table?

9. Security and Access Control:
- Who should have access to different parts of the CustomerOrder data?
- Are there any specific security or privacy requirements related to customer orders and payment information?

10.Future Changes and Growth:
- Are there any upcoming changes in business processes that might impact the structure of the CustomerOrder table?
- What is the expected growth rate of customer orders soon?

Your database updates will be closely aligned with business needs. They will add the most value if you ask these specific questions to get a clear understanding of the organization's requirements and limitations.

- **Audience: Understand who you are speaking to and write for that audience and level of knowledge.**

Undoubtedly, effective and clear communication depends on knowing the audience and adapting the message to suit their level of education. The language should be technical enough to convey knowledge but understandable for everyone when discussing database changes and structures with an audience that includes database administrators, business managers, and other technical staff. In perspective with the audience, the following is one way to frame the questions:

1. Business Process Understanding:
- What are the primary business processes that rely on the CustomerOrder data?
- Can you walk us through a typical workflow involving the CustomerOrder table, highlighting key steps?

2. Historical Data and Audit Trails:
- Is there a need to maintain historical data for customer orders or to track changes made to orders over time?
- Are there any audit trail requirements for the CustomerOrder table, and if so, what level of detail is needed?

3. Integration with External Systems:
- Does the CustomerOrder data need to be integrated with any external systems or third-party applications?
- What formats and structures are expected by these external systems to ensure smooth data exchange?

4. Data Retention and Archiving:
- What is the organization's policy on data retention for customer orders?
- Do we need to consider archiving or purging old orders from the database, and if so, what criteria should we follow?

5. Data Usage and Requirements:
- How is the data in the CustomerOrder table currently utilized across different departments or applications?
- What specific information do different teams need from the CustomerOrder data for their tasks?

6. Reporting and Analysis:

- What types of reports or analyses are regularly conducted using the CustomerOrder data?
- Are there specific metrics or calculations derived from the CustomerOrder table crucial for decision-making processes?

7. Security and Access Control:
- Who should have access to different sections of the CustomerOrder data, considering security and privacy concerns?
- Are there any specific security or privacy requirements related to customer orders and payment information that we need to uphold?

8. Performance and Scalability:
- What are the average daily/monthly order processing volumes, and are there any performance or scalability concerns regarding the current structure of the CustomerOrder table?
- Are there specific performance metrics we should aim to optimize?

9. Data Validation and Constraints:
- Could you outline the validation rules currently applied to the CustomerOrder data (e.g., data formats, range checks, uniqueness constraints)?
- Are there specific constraints or rules that should be enforced when processing orders to maintain data integrity?

10. Future Changes and Growth:
- Are there any upcoming changes in business processes that might impact the structure of the CustomerOrder table?
- What is the expected growth rate of customer orders in the near future, and how can the database accommodate this growth effectively?

Make sure that what is being discussed is technically accurate and understandable to all participants by answering these questions specifically tailored to the audience's level of expertise.

- **Write your work to appeal to the target audience.**

It is essential to create communication that appeals to the target audience. It's crucial to balance technical accuracy, clarity, and relevance when speaking to a knowledgeable audience that includes database administrators, business managers, and technical staff. The questions and explanations can be worded in the following manner to appeal to this audience:

1. Business Process Understanding:
- To optimize the database structure, could you provide insights into the core business processes relying on CustomerOrder data? Understanding these processes in detail will guide our structural decisions effectively.

2. Data Validation and Constraints:
- Understanding validation rules is crucial for data accuracy. Could you elaborate on the existing validation rules? Knowing these rules will help us maintain data integrity effectively.

3. Performance and Scalability:

- Optimizing performance is key. Could you provide insights into current performance metrics and any concerns regarding scalability? This information will guide our efforts to enhance database efficiency.

4. Data Retention and Archiving:
- Data retention policies impact database size and performance. Could you share the organization's policies on data retention and archiving? This will influence our strategies for managing historical data.

5. Data Usage and Requirements:
- To tailor the database structure effectively, it's essential to comprehend how various teams utilize CustomerOrder data. Could you elaborate on the specific data requirements for each team? This information will streamline our approach.

6. Reporting and Analysis:
- To enhance decision-making, I'd like to delve into the types of reports and analyses conducted using CustomerOrder data. Understanding the key metrics derived from this data will help us structure it in a way that facilitates insightful reporting.

7. Security and Access Control:
- Ensuring data security is paramount. Could you provide insights into who needs access to different parts of CustomerOrder data? Understanding security requirements will guide our access control strategy.

8. Historical Data and Audit Trails:
- Maintaining historical data and audit trails is vital for integrity. Could you share the specific requirements for historical data and the level of detail needed in audit trails? This will influence our data retention policies.

9. Integration with External Systems:
- To ensure seamless integration, I'm keen to understand the formats and structures expected by external systems. This knowledge will guide our data transformation processes.

10. Future Changes and Growth:
- Considering future changes is essential for a scalable structure. Are there upcoming business process changes or anticipated growth rates? This information will guide our long-term database design.

By addressing the questions with a focus on understanding their specific needs and concerns, we can ensure that the communication resonates with the audience, making the conversation more engaging and productive for everyone involved.

- **Language: Professional level of written English skills goes a long way to ensure that no ambiguity or vagueness exists.**

To avoid ambiguity and ensure adequate understanding, written communication must maintain high professionalism and clarity. Use precise language and well-structured sentences when speaking to a professional audience, such as database administrators and business managers. The questions and explanations can be improved in the following ways to adhere to a formal standard of written English:

1. Business Process Understanding:
- In order to optimize the database structure, could you kindly provide comprehensive insights into the fundamental business processes reliant on CustomerOrder data? A detailed understanding of these processes is imperative to guide our structural decisions effectively.

2. Data Usage and Requirements:
- To tailor the database structure effectively, it is essential to gain a profound understanding of how various teams utilize CustomerOrder data. Could you please elaborate on the specific data requirements for each team? This detailed information will enable us to streamline our approach efficiently.

3. Reporting and Analysis:
- In our pursuit to enhance decision-making processes, I would appreciate a detailed overview of the types of reports and analyses conducted using CustomerOrder data. Understanding the key metrics derived from this data will empower us to structure it in a manner conducive to insightful reporting.

4. Security and Access Control:
- Ensuring data security is paramount. Could you kindly provide insights into who requires access to different parts of CustomerOrder data? Understanding these security requirements will guide our access control strategy effectively.

5. Historical Data and Audit Trails:
- The maintenance of historical data and detailed audit trails is vital for data integrity. Could you kindly share specific requirements for historical data and the level of detail needed in audit trails? This knowledge will significantly influence our data retention policies.

6. Integration with External Systems:
- To ensure seamless integration, I am keen to understand the formats and structures expected by external systems. This information is crucial in guiding our data transformation processes to meet external requirements effectively.

7. Data Validation and Constraints:
- Understanding the existing validation rules is pivotal for maintaining data accuracy. Could you please elaborate on the validation rules currently applied? This information will help us uphold data integrity effectively.

8. Performance and Scalability:
- Optimizing performance is of paramount importance. Could you provide insights into current performance metrics and any concerns regarding scalability? This knowledge will guide our efforts to enhance database efficiency.

9. Data Retention and Archiving:
- Data retention policies significantly impact database size and performance. Could you kindly share the organization's policies on data retention and archiving? This information will influence our strategies for managing historical data effectively.

10. Future Changes and Growth:
- Considering future changes and anticipated growth is essential for a scalable database structure. Are there upcoming business process changes or expected growth rates? This information is invaluable for guiding our long-term database design strategies.

We ensure that the communication is clear, succinct, and ambiguity-free in these inquiries by using formal and precise language, which makes it easier for the professional audience to understand and collaborate.

2. **Identify at least two (2) Potential issues found within any of the 4 tables of the Orders schema (CustomerOrder, ShipmentMethod, OrderStatus, ProductSelecTIon). Be sure to clearly state what the issue is and how you would address these issues.**

Of course.

Let's point out two potential problems with the Orders schema's tables and talk about how to fix them:

- *Issue 1: Inconsistent Date Formats*

- Table(s) Affected: CustomerOrder, ShipmentMethod, OrderStatus, ProductSelection
- Issue: The DateModified column in all four tables appears to have inconsistent date formats. Some dates are in 'YYYY-MM-DD' format, while others include timestamps ('YYYY-MM-DD HH:MM:SS.XXXXXXX').
- Resolution: To ensure data consistency and ease of querying, it's important to standardize date formats across all tables. You can choose a single date format, such as 'YYYY-MM-DD,' and convert all dates in the tables to this format. This standardization will make it easier to work with date data in queries and reports.

- *Issue 2: Lack of Foreign Key Constraints*

- Table(s) Affected: CustomerOrder, ProductSelection
- Issue: There don't appear to be explicit foreign key constraints defined in the tables. For example, in the ProductSelection table, there is a ProductID column, but it's not clear if it's a foreign key referencing a Product table. Similarly, in the CustomerOrder table, there are several columns (e.g., CustomerID, PaymentID) that are likely foreign keys, but the references to other tables are not specified.
- Resolution: To maintain data integrity and enforce referential integrity, foreign key constraints should be defined in the database schema. You should clarify the relationships between tables by explicitly specifying which columns are foreign keys and their references to the primary keys in other tables. This ensures that data consistency is maintained and prevents the insertion of invalid data

By addressing these problems, the database schema's data consistency, integrity, and query capability will be improved.