COMM051 Database Systems

Assignment – Sem 1, 2019/20

The **purpose** of this assignment is to gain practical experience of designing Database Systems and business intelligence solutions in the context of a realistic case study where you work with real data.

The Assignment carries **50% of the overall mark** for the module.

Assignment Scenario

MumsNet was founded in 2003 and has grown over the last years to become a UK leading specialist brand for mothers-to-be and mothers of babies and pre-school children.

They offer a collection of maternity clothes, nursery equipment, accessories and toys for babies and toddlers, as well as baby clothes from new-born to 3 years old.

MumsNet markets and sells its products through its own retail stores and online via its own website MumsNet.com. The company launched its online store at the start of 2005 and has done significantly well as online sales have grown every year since then.

The management team at MumsNet would like to make improvements to its existing IT system to ensure that it meets the increasing volume of sales transactions and customer registrations.

You are part of a team of database designers which has been contracted by Mumsnet to carry out a review of the SQL Server database tables supporting the online sales application and implement improvements where you see fit (more in Deliverable D1 on the next page).

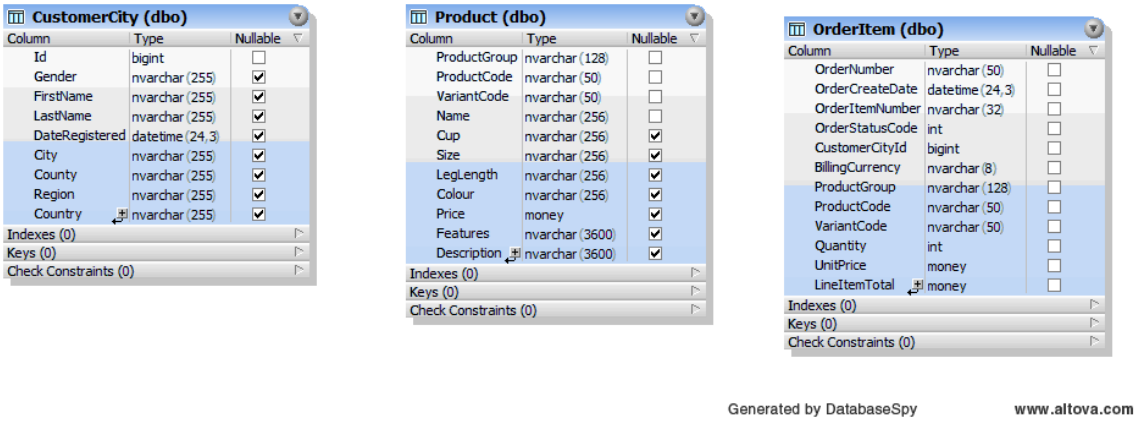
In addition, the management team at MumsNet would like to introduce a new business intelligence platform to their organisation. They would like to start analysing the data collected from the online store as they are increasingly convinced that this analysis would provide an immediate benefit to their business.

Your team has just been also been contracted to work on the new business intelligence platform for MumsNet (more in Deliverable 2 on page 4 of this document).

Assignment Deliverables

Deliverable D1

The following three tables have been given to you by the Mumsnet Systems Administrator from the production environment and contain historic order, product and customer information from January 2005 until December 2009.



CustomerCity (dbo)

Column	Type	Nullable
Id	bigint	☐
Gender	nvarchar (255)	☑
FirstName	nvarchar (255)	☑
LastName	nvarchar (255)	☑
DateRegistered	datetime (24,3)	☑
City	nvarchar (255)	☑
County	nvarchar (255)	☑
Region	nvarchar (255)	☑
Country	nvarchar (255)	☑

Indexes (0)
Keys (0)
Check Constraints (0)

Product (dbo)

Column	Type	Nullable
ProductGroup	nvarchar (128)	☐
ProductCode	nvarchar (50)	☐
VariantCode	nvarchar (50)	☐
Name	nvarchar (256)	☐
Cup	nvarchar (256)	☑
Size	nvarchar (256)	☑
LegLength	nvarchar (256)	☑
Colour	nvarchar (256)	☑
Price	money	☑
Features	nvarchar (3600)	☑
Description	nvarchar (3600)	☑

Indexes (0)
Keys (0)
Check Constraints (0)

OrderItem (dbo)

Column	Type	Nullable
OrderNumber	nvarchar (50)	☐
OrderCreateDate	datetime (24,3)	☐
OrderItemNumber	nvarchar (32)	☐
OrderStatusCode	int	☐
CustomerCityId	bigint	☐
BillingCurrency	nvarchar (8)	☐
ProductGroup	nvarchar (128)	☐
ProductCode	nvarchar (50)	☐
VariantCode	nvarchar (50)	☐
Quantity	int	☐
UnitPrice	money	☐
LineItemTotal	money	☐

Indexes (0)
Keys (0)
Check Constraints (0)

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D1.1: Your team has reviewed the MumsNet.com database tables and has made the observation that the OrderItem, Product and Customer tables are not normalised to the third normal form (3NF).

a) All three tables need to be normalised to 3NF and existing data migrated to the new data structure. Also ensure primary and foreign keys are defined in the resulting (normalised) database schema to safeguard the data integrity of the database.

b) There is a business requirement that an Order Group entity/relation is introduced in the database schema with the following attributes and relationships:

i) OrderNumber: A string attribute that contains the order number. You observe that this is an existing attribute in the OrderItem table in the database schema. An order number has the format OR\DDMMYYYY\NN, where NN is a sequential number from 01 to 99, for example OR\01012006\04.

ii) OrderStatusCode: A string attribute that contains the status code of the order. You observe that this is an existing attribute in the OrderItem table in the database schema. The OrderStatusCode attribute contains the following order status codes:

0: This is a new order
1: This an abandoned order
2: This is an unfulfilled order due to out of stock item(s)
3: This is an order that have been cancelled by the customer
4: This is a fulfilled order; the goods have been shipped to the customer

iii) OrderCreateDate: The order creation date. You observe that this is an existing attribute in the database schema (an attribute of the OrderItem table, in particular).

iv) BillingCurrency: The billing currency of the order. You observe that this is an existing attribute in the database schema (an attribute of the OrderItem table, in particular).

v) TotalLineItems: The total number of items ordered. You observe that this is a new attribute in the database schema.

vi) SavedTotal: The total order value. You observe that this is a new attribute in the database schema.

vii) The Order Group entity may contain zero or more order items.

<20 marks>

D1.2: Your team has also been asked to develop new stored procedures to deliver order processing functionality for the new Order Group Entity:

a) Develop the stored procedure **prCreateOrderGroup**; the execution of this program will create a new order based on the parameter values supplied below:

```
-OrderNumber: nvarchar(32)
-OrderCreateDate: datetime
-CustomerCityId: int
```

b) Develop the stored procedure **prCreateOrderItem**; the execution of this program will create a new order line based on the parameter values supplied below:

```
-OrderNumber nvarchar(32)
-OrderItemNumber nvarchar(32)
-ProductGroup nvarchar(128)
-ProductCode nvarchar(255)
-VariantCode nvarchar(255)
-Quantity int
-UnitPrice money
```

The new stored procedures must contain error handling and transactional support to ensure that the data consistency is maintained during successful and unsuccessful program execution. Implement indexes to improve order processing performance.

<10 marks>

Deliverable D2

Your team has been asked to deliver a 'proof of concept' business intelligence platform using Microsoft SQL Server 2018 Analysis Services (SSAS/SSDT) to satisfy the following data requirements:

- Number of cancelled orders
- Percentage of orders cancelled by the customer
- Sales value of cancelled orders
- Number of unfulfilled basket orders due to out of stock item(s)
- Percentage of all unfulfilled basket orders
- Percentage of abandoned basket orders
- Percentage of fulfilled orders
- All percentage calculations are against total orders placed
- All order calculations should be broken down, by product, by customer, by day
- Sales and quantity sold by product, by customer, by day
- Ordered stock quantity by product, by ordered day
- Customer rolls into city, which rolls into region, which rolls into country
- Product rolls into product group
- Day rolls into month, which rolls into quarter, which rolls into year
- All product calculations must be broken down to product variant level

<20 marks>

Assessment Criteria

The technical deliverables of this project will be assessed based on the following criteria:

Concept	Assessment
Normalisation	Appropriate creation of normalised table structures
Relational Model Constraints	Appropriate use of primary and foreign keys
SQL Optimisation	Appropriate use of indexes based on SQL query usage to improve database performance
Error Handling	Appropriate use of TRY/CATCH statements
Concurrency Control	Appropriate use of BEGIN TRAN / COMMIT / ROLLBACK statements
Data Source View design	Appropriate use of Data Source Views
Cube Measures and Dimensions design	Appropriate use of measures and dimensions to produce required calculations

Submission

The coursework should be submitted electronically **via SurreyLearn** as a zipped file before the deadline of **Tuesday 17 December (Week 11)** at **4pm**.

The zipped file should contain

- the latest version of the developed Business Intelligence solution, i.e., all SSAS project files and
- the modified coursework database as a backup file (.bak)

One zipped file should be submitted **by each group**.

The **name** of the file **should start with the group number**.
For example, the submission of group 4 should be a zipped file named as ‘ Group4_coursework.zip ‘