Contents

Introduction:

The traditional relational database management systems have limitations in handling the complex and varied nature of data in the food and drinks industry. The key to this kind of condition is storage information about food and drink store products of all types of the suppliers and the nearby market besides one must develop the solutions that are also must be flexible and scalable. The document model of NoSQL simplifies the process for semi-structured data which will make it the most suitable solution for the proposed database. This database will tend to be part of the generation of analytic insights in the food and beverages industry that will get closer to the mission of the local food organizations that aim to promote sustainable food. The food and beverage sector acts as a big sector of the economy of a country, culture, and well-being of its citizens. This industry is connected to a country's economic conditions, people's cultural beliefs as well as the everyday health of people. Among others, the movement intent is to highlight sustainable procedures and to increase knowledge of food that is sourced and produced locally and a local coalition of food organizations has taken the job of seeing about this particular mission. The task is to build a platform where no barriers are set to food products and services, promoted and sold with consideration of the environmental features of England. The data analytics team is allied with an inspection into whether to incorporate NoSQL document scheme and database. The assignment is proposes to build a solution that can easily capture and appliance the large number of data coming from different sectors of the food and drink industry in England. The data analytics will support the greening of the food system by the provision of information to regional consumers about locally produced and sourced food (Vera et.al, 2015).

Objectives:

- Scrutinize the actual application of a NoSQL document database for the creation of analytical insights about the food and drinks sector in the UK.
- Document solution and database of the local food organization whose main reason is to support sustainable food practices.
- To evaluate the choice of a NoSQL document model over an RDBMS to store details of food and drinks retailers and their product lines, suppliers as well as the local markets.
- The scalability and performance of NoSQL document database up to big data usage is to be assessed.

The goal of the proposed document is to deliver a circulation-friendly and time-saving technique for storage and analysis of data of the food and drink industry of England. The data tech analytics

must showcase its contribution to the promotion of sustainable food practices and more information availed to people from local food production and associations.

1. Requirement Gathering:

- Requirement ID: REQ001
  Name: Data Storage for Food and Drink Entities
  Description: The NoSQL database will efficiently store information about all entities.

- Requirement ID: REQ002
  Name: Scalability
  Description: The database will be scalable to handle increasing volumes of data without compromising performance.

- Requirement ID: REQ003
  Name: Querying Capabilities
  Description: The proposed database aims support complex queries to retrieve and analyse data efficiently.

- Requirement ID: REQ004
  Name: NoSQL Document Model
  Description: Implement a NoSQL document model to handle semi-structured data effectively to allow flexibility in data representation.

- Requirement ID: REQ005
  Name: Analytics Support
  Description: The database should provide capabilities to generate analytical insights for local food that will be aligned with the mission of local food guide.

- Requirement ID: REQ006
  Name: Security

Description: The database will support robust security measures to protect sensitive data from unauthorized access.

- Requirement ID: REQ007
  Name: Performance
  Description: The NoSQL database has to give high performance to read and write operations with large datasets to support real-time reporting.

- Requirement ID: REQ008
  Name: Reliability
  Description: To ensure data integrity and minimize downtime through fault tolerance mechanisms for ensuring continuous availability of the database.

- Requirement ID: REQ009
  Name: Flexibility
  Description: There will be flexible schema to accommodate evolving data requirements and facilitate ease of integration with available systems.

- Requirement ID: REQ010
  Name: Usability
  Description: The database will provide an interface for developers to interact with the database that will facilitate ease in data manipulation.

Requirement Analysis:

- Purpose and Scope:
  This project is aimed at taking the steps for investigating the implementation of what is known as a NoSQL document model and database for use in the development of a scalable big data solution. Within the remit of the current research, it is the aim to create a database that would store such pieces of data as the names of food and beverage retailers, their products, suppliers, local markets as well as other related entities within England. The planned database will accelerate the development of the food and drinks analytical insights that are in line with our

organizational mission, purpose and goals. The program sets a goal to build a culture where people of all kinds who live in England and even tourists have a chance to receive information about the sustainably grown, produced, processed, distributed, structured, and sold food (Gupta et.al, 2017).

- Stakeholders:

  The project crisscrossed several interests of stakeholders who have various responsibilities and roles. It is the work of the development team to implement the database solution. Data Analytics stands at the forefront of being the initiator of our project. The local producers constitute the target group of the food non-profits, who expect information that would help them develop sustainable food patterns. People as well as the tourists get indirect beneficiary in case the availability of information regarding the sustainable food option is increased.

- Functional Requirements:

  It includes successful storage of varied data structures related to food and drink items, scalability to manage the growing amount of data and the ability to perform complex queries to retrieve and process information. NoSQL document model has to be employed in order to process the data with a semi-structured nature. This database should have a built-in tool for finding analytical references about the industry, and this can support the mission of local food organizations. The function of document database according to the proposed solution must be versatile and able to fulfill all functional requirements.

- Non-Functional Requirements:

  These non-functional constraints are the factors that facilitate the implementation of the proposed project. The database should come up with high performance during both read and write operations to be able to response quickly even with large datasets Reliability is as important as integrity and fault tolerance that means implementing measures on integrity of data and mechanisms of fault tolerating to minimize downtime. Vital security protections should be implemented to ensure that confidential information is not accessed unlawfully or distributed through cyber-attacks. Scale serves as a foundation for the future and flexibility is necessary to anticipate and redesign a working schema to fit evolving data needs. The

affordances of good usability are two-fold: they provide a friendly user interface to developers and analysts. Besides that, data protection standards and regulations have to be followed.

- Constraints:

  The obstacles like technology problems and conforming with available systems. Another critical matter is the budget limits and the availability of tools needed for the development and keeping up of the websites. The examination of the investigation with an allotted timeframe is vital to make plans and actions efficiently.

- Assumptions:

  There are some workers' availability having the necessary skills like programmers and analysts to deploy the solution in an effective manner. During the investigation and implementation phase of the pilot program, we require the ongoing support from stakeholders and assume to have access available hardware and infrastructure resources.

- Dependencies:

  The main integration requirements are: the integration of with the existing data sources and systems for the data ingestion. Separate from internal runtime dependencies outside sources can be involved in a project for the sake of specific functionalities.

- Risks:

  The enterprise solution may potentially encounter a list of risks that could lead to the failure of the project technical drawbacks such as the configuration and optimization of the NoSQL document database. In the implementation and migration phases, operational disruptions such as technical glitches that may lead to data breaches and legal or regulatory to non-compliance are serious threats.

- Acceptance Criteria:

  One of success indicators is a good implementation and integration of the NoSQL document database solution. Furthermore, showed scalability, performance, and reliability using anticipated workloads as well as adherence to security and regulatory requirements and

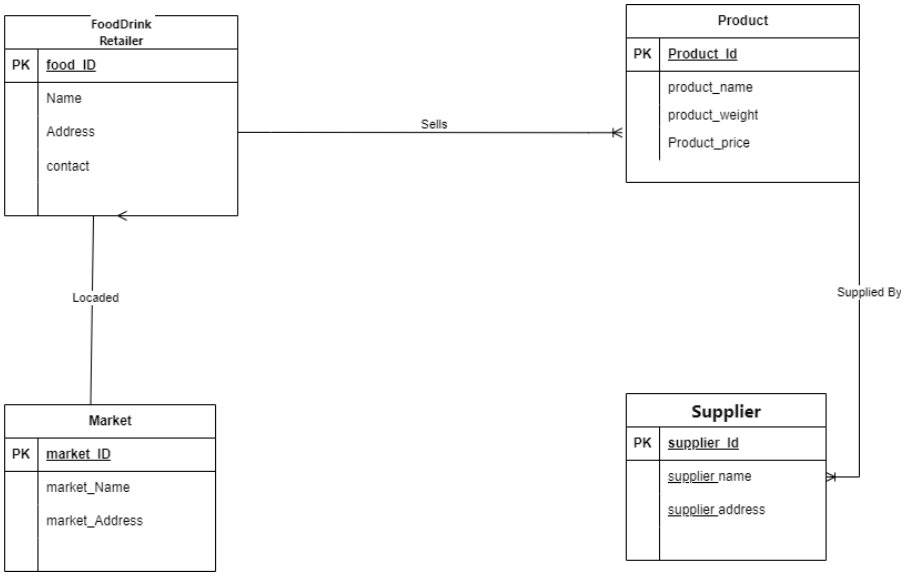
compatibility with the mission of local food organizations was among the key acceptance criteria to the proposed project.

- Future Considerations:

  The most critical part is ongoing monitoring and optimization of the database for performance and scalability. The iterative improvements based on feedback from users and stakeholders, and exploration of additional analytics capabilities to enhance insights into the food and drinks industry are critical considerations for future iterations of the database solution (Mason, 2015).

2. Conceptual ER Diagram

The prospsed ER model is designed to support scalability, flexibility, and analytics which fascilitate the efficient storage, retrieval, and analysis of data related to the food industry.



The conceptual Entity Relationship model for the new database encompasses four main entities which are FoodDrink Retailer, Product, Supplier, and Market. Each entity is defined by its unique set of attributes and relationships between entities are established to reflect their connections in the real world. As demonstration RetailerSellsProduct relationship signifies that a retailer can sell multiple products and each product can be sold by only one retailer. The ProductSuppliedBySupplier relationship indicates that a product can be supplied by multiple

suppliers but each supplier supplies only one product. The RetailerLocatedMarket relationship illustrates that multiple retailers can be situated within a single local market

3. JSON Model:

The designed JSON document model provides a denormalized representation of the data which facilite efficient storage, retrieval, and manipulation of information in a document-oriented database.

- Each entity such as retailers, suppliers, and LocalMarket is represented as an array containing JSON objects.
- Each JSON object represents a single entity instance that contain its attributes as key-value pairs.
- Relationships between entities are represented as nested objects or arrays within the parent entity object such as each retailer object contains a nested Products array that has list of the products sold by that retailer.
- Each supplier object contains a nested ProductsSupplied array that lists the products supplied by that supplier also each local market object contains a nested Retailers array that contain the lists of the retailers located at that market.

Proposed JON Code:

```
{
  "FoodAndDrinkRetailers": [
    {
      "RetailerID": "R001",
      "Name": "Greenfield Grocers",
      "Address": "123 Greenfield Avenue",
      "Phone": "+1234567890",
      "Email": "greenfield@example.com",
      "Products": [
        {
          "ProductID": "P001",
          "Name": "Organic Apples",
          "Description": "Fresh organic apples",
          "Price": 2.99,
          "Stock": 100
        },
        {
          "ProductID": "P002",
          "Name": "Free-range Eggs",
          "Description": "Organic free-range eggs",
          "Price": 3.99,
          "Stock": 50
        }
      ]
    },
    {
      "RetailerID": "R002",
      "Name": "Fresh Harvest Market",
      "Address": "456 Harvest Lane",
      "Phone": "+0987654321",
      "Email": "freshharvest@example.com",
      "Products": [
        {
          "ProductID": "P003",
          "Name": "Organic Milk",
          "Description": "Fresh organic milk",
          "Price": 1.99,
          "Stock": 200
        }
      ]
    }
  ],
  "Suppliers": [
    {
      "SupplierID": "S001",
      "Name": "Farm Fresh Farms",
      "Address": "789 Oak Street",
      "Phone": "+1122334455",
      "Email": "farmfresh@example.com",
      "ProductsSupplied": [
        {
          "ProductID": "P001",
          "Name": "Organic Apples"
        },
        {
          "ProductID": "P002",
          "Name": "Free-range Eggs"
        }
      ]
    }
  ],
  "LocalMarkets": [
    {
      "MarketID": "M001",
      "Name": "City Farmer's Market",
      "Address": "789 Elm Street",
      "Contact": "+1122334455",
      "Retailers": [
        {
          "RetailerID": "R001",
          "Name": "Greenfield Grocers"
        },
        {
          "RetailerID": "R002",
          "Name": "Fresh Harvest Market"
        }
      ]
    }
  ]
}
```

4. Database and Document Query:

Following core steps will be followed to create and query the document.

- Create a Database and Collection
- Insert Data into the Collection
- Query the Database

Queries:

1. db.retailers.find() will provide all documents in the retailers collection
2. db.retailers.find({ "RetailerID": "R001" }) will provide the document with the specified RetailerID.

Proposed code:

```
//Connection MongoDB server
use food_and_drinks;

// Create a collection for retailers
db.createCollection("retailers");

// Insert retailer document
db.retailers.insertOne({
    "RetailerID": "R001",
    "Name": "Greenfield Grocers",
    "Address": "123 Greenfield Avenue",
    "Phone": "+1234567890",
    "Email": "greenfield@example.com",
    "Products": [
      {
        "ProductID": "P001",
        "Name": "Organic Apples",
        "Description": "Fresh organic apples",
        "Price": 2.99,
        "Stock": 100
      },
      {
        "ProductID": "P002",
        "Name": "Free-range Eggs",
        "Description": "Organic free-range eggs",
        "Price": 3.99,
        "Stock": 50
      }
    ]
  });

// retailers collection to find all documents
db.retailers.find();

// specific retailer by RetailerID
db.retailers.find({ "RetailerID": "R001" });

```

Conclusion:

The document database MongoDB aimed to be a good solution for the proposed project due to its ability to handle semi-structured and unstructured data effectively. MongoDB flexibility of document database allows for easy adaptation to evolving data requirements that align well with the diverse information storage needs of food and drink entities, suppliers, and local markets. The denormalization capabilities of document databases simplify data retrieval and enhance performance that make it suitable for generating analytical insights into the food and drinks industry. The document database also offer horizontal scalability which ensures continued support for the objectives and prompt sustainable food practices and improving access to information about locally sourced and produced food. There should be consideration given to data consistency and

transaction complexity which will require careful planning and evaluation to ensure the suitability of a document database.

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