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STAFFORDSHIRE UNIVERSITY

BSc (Hons) in Computing

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COMP5004 – Database and Data Structures-1

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Project Name: Automation of Business Process of Hair Care products

1. Executive Summary

The business case is intended to suggest business process automation for a Sri Lankan Organization Lavenders which manufactures and retailer of Hair care products. By using Information Technology (IT) to streamline operations and boost efficiency, the organization hopes to gain a competitive edge over rivals. The creation of a database system that combines production, inventory managements, sales, and online marketing is the suggested solution. Furthermore, this document will give a high-level overview of the project, Its goals, anticipated advantages, and requirements.

2. Introduction

Lavenders is a manufacturing and retailing organization which based in Sri Lanka. The main products they manufacture, and sell are, hair shampoo, hair conditioner, and hair cream. Moreover, they do own Online shop and three international branches located in New York, United states, Changi, Singapore and Madrid, Spain to promote and gain attention to their product globally. With development in the technology and business strategies the organization recognized the importance of automating the existing business processes within the company. However, Organization aims to improve operational efficiency, increase customer satisfaction, reduce errors, and stay head of the competition in the market by implementing an automated system.

3. Objectives

Main Objectives of the Organization, by implementing automates solution are, Automation of manual business processes can help the organization to replace manual and repetitive tasks. For instance, the organization can streamline the data entry, updated and retrieval through an automated database rather than manually entering the order details, customers details, product details int spreadsheets and paper-based methods. Moreover, this will minimize the possibility of occurring the human errors.

Possibility of manual data entry subject to make errors like typos, flawed calculations, and missing data is high. In contrast data can be gathered and stored automatically by using a system in a structured manner, additionally to ensure the data is accurate, consistent, and complete the system can also include validation rules and data integrity checks.

Furthermore, another objective is database automation can reduce the need for manual work which will save time and effort. For instance, it generates reports, analyze data, retrieve information fast and efficiently. Also, employee productivity and efficiency are improved. Can devote time and skills to more fulfilling work by eliminating manual and repetitive tasks.

Lavenders can improve their organization’s customer satisfaction. For instance, it is much simpler to access and update customer information. Allow effective order

processing , personalized communication. Moreover, the system can provide pee inventory management, providing availability of the products. The final objective is that organization can deliver goods more effectively its rivals by streamline process. This may result in reduced costs, better customer retention.

4. Scope in scope out scope

In scope

Organization Lavenders wants to improve operations by putting in place an automated database. A thorough study of the present manual inventory management procedure is part of the scope. Moreover, a solid system will be created to automate inventory management, order processing, and customer management. To facilitate effective data sharing, the database system will effortlessly interact with current systems like Customer relationship management. Additionally, the system will offer insightful insights and analytics for decision making, finally, hopes to increase organizations productivity, accuracy, and overall performance by using the automated database.

Out of scope

Concentrate on providing E-commerce platform where customers can order products. Integration with international shipping, financial accounting and pay roll administration, third party marketing platforms, staff management, tracking business processes in other branches located outside of the Sri Lanka are outside of the project's scope.

5. Assumptions

Assume that organization have one branch in Sri Lanka which is the head branch.
Assume that organization sells only shampoo, conditioners, and hair cream.
Organization manufactures the products.
Assume that beginning the process where the products are already finished, so no need for suppliers or supplies.
Data in existing system which is spreadsheets and paper-based methods can migrate to the new system.
Assume that organizations is down to support the project by providing necessary infrastructure facilities.
Assume that organization have 3 international branches.

6. Functional Requirements

Data managements
For the Lavenders that manufactures and sell their products, effective data management is essential to maintain accurate information across the entire organization. It should consist of storing , organizing various data types , including customer and product information, inventory, and supplier details, international shipping. Furthermore, database should be able to retrieve data, insertion, updating and deletion records.

Order Management
The organization can streamline the order process, from order placement to fulfilment, by using an automated database. The system can manage shipping and delivery information, track order status, generate invoices, responsible store location, and payment details.

Customer Management
The proposed database gets customer data, including customer details, Personal details, Contact details, purchase history, and preferences. Furthermore, database should support and provide data authentication and authorization.

Inventory management
To meet the customer demands and minimize shortages and surplus in stock inventory management is crucial. It can track of product delivery, inventory levels of products all the 4 branches, product quantities, locations , availability status. This guarantee that the business can reduce carrying costs, inventory efficiency, and provide customers with available products.

Reporting and analysis
It may produce a variety of reports and offer insights customer behaviors inventory levels sales performance. It makes data analysis easier, including trend identification, demand forecasting. The organization may make data driven decisions , pinpoint areas for improvement, and optimize business plans by utilizing reporting and analytics.

7. Non-Functional Requirements

Performance
High performance should be exhibit by the automated database system to effectively manage massive amounts of data. Quick data retrieval, updates, and respond answers should be provided. Should satisfy user experience even during times of high demand. and adjust to lower latency.

Security
Data security is of utmost importance to the organization. To prevent unauthorized access, security breaches and data loss, the database should consist of strong security measures. Including data encryption, safe authentication methods, role-based access limits and allow frequent security updates.

Scalability
The database system is ought to be built to support expansion and growing data needs in the future. It must be capable of large user numbers, data volumes , transaction loads, without losing it performance. Scalability of the database should be gained through proper database design, hardware, infrastructure, and software.

The most important details are that the database should provide high availability, data integrity, integration with other systems, and maintenance and support. It should also

provide robust documentation and support resources to assist administrators in managing the database effectively.

8. Benefits

Advantages of using an automated database system in the Organization includes better operational effectiveness and productivity. The business may simplify operations, lower human error rates, and boost processing tasks. The quicker turnaround time for jobs is a result of the increased accuracy and efficiency. Employee productivity increases with reduced procedures, which leads to speedier reaction times and better customer delivery. Orders from customers can be handled quickly, inventory updates can be made in real times, and customer questions may be answered quickly. As a result of the increased response and quickness, customers are more satisfied and are more likely to remain loyal. The firm has a competitive advantage over rivals thanks to the adoption of an automated database. The business may streamline process , enhance customer service, and react more quickly to market needs by utilizing technology properly. This distinguishes the company from rivals that continue to use manual and antiquated procedures. Furthermore, the firm saves money thanks to the automated database system. The business may deploy resources more effectively and increase cost effectives by minimizing manual work and getting rid of paper-based operation. Amore sustainable and ecologically friendly strategy also benefits from the removal of human data input and paperwork.

9. Risk and Mitigation

Risk: system failure
Contingency: To maintain continue business processes in the case of system interruption, the company should have backup plan.
Mitigation: Having redundant servers or backup systems in place. The risk of system failures should be reduced by performing regular system maintenance and upgrades. Also, should be strategies for disaster recover so that system can be restored in the event of any unexpected problem. To prevent data loss in case of system failure.

Risk: data breach
Contingency: the firm should have policies in place to minimize data security breaches and secure sensitive data. Isolating the impacted systems and conducting investigation and alerting the appropriate parties and authorities.
Mitigation: To reduce the danger of a data security breach, the business should put strong security measures in place to safeguard the database system, including encryption, firewalls, and access restrictions. To find and fix such gaps , regular security audits and vulnerability assessments should be carried out.

Risk: Lack of Scalability
Contingency: the company should have a strategy in place to deal with scalability difficulties if the database system cannot scale adequately to handle expanding data

volumes and increased usage. This can entail deploying more servers, entail deploying more servers, enhancing database design , or updating hardware.
Mitigation: the company should regularly plan for capacity growth and test performance to foresee future expansion and make sure the database system can support rising demand. Finally, database should be built making use of tools that make data dissemination and expansion simple to assess system performance and anticipate scalability issues.

Risk: Resistance to change
Contingency: the company should create a change management strategy that address workers' concerns, emphasizes clear communication, and provide training.
Mitigation: The company should explain to staff all the advantages get when having automated database. Moreover, this involves describing how the new database would enhance efficiency, streamline processes.

10. Cost and Timeline

Estimated budget including the software hardware, development and integration, training and support, data migration, maintenance, and upgrades would be approximately 20,000,000 LKR.

Timeline for the project would be
Starting from 11th April 2023 project planning, development and testing, data migration ,training will do and project will hand over by 11th June 2023

11.ER diagram

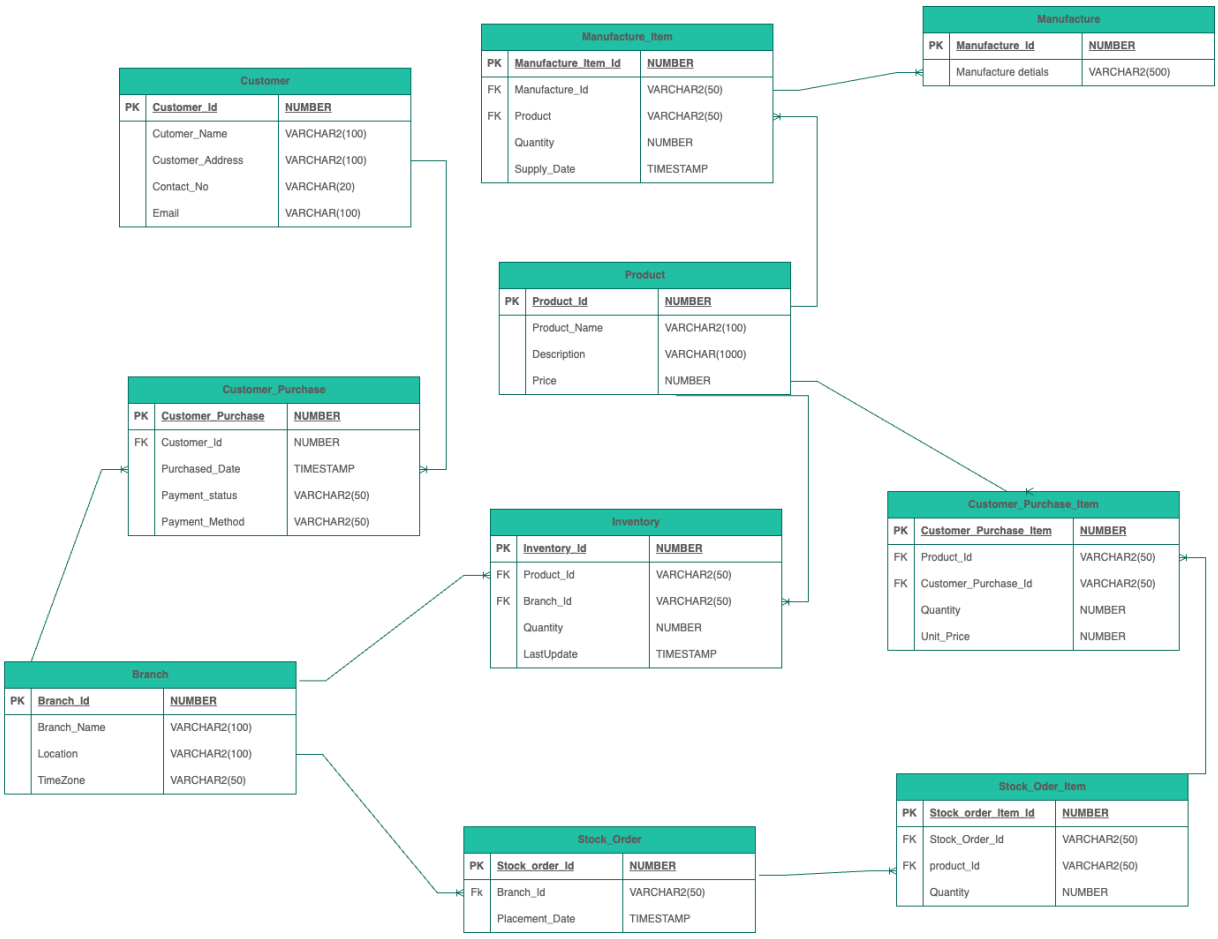

Figure 1: ER Diagram

Key constraints:
Product entity has the primary key constraints on the Product_Id likewise.
Customer → Customer_Id
Branch → Branch_Id
Manufacture → Manufacture_Id

Participation constraints
Inventory → Branch_Id
Customer_Purchase → Customer_Id

Mapping ER diagram to relational schema involves translating entities, relationships, and attributes. Primary keys in the ERD will be the primary key constrain n the

Entity diagram
Customer (customer_id, name, email.address. contact_no)
Product (Product_Id, Product_Name, Price)
Branch (batch_Id, Location,Timezone)
Inventory (Inventory_Item, Product_Id, Branch_Id, Quantity, Update _Date)
Manufacture (Manufactuer_Id, Manufacture_details)
Manufacture_Item (Manufacture_Item_Id, manufacture_Id, product_id

Relational Schema
Customer (customer_id [Pk], name, email.address. contact_no)
Product (Product_Id [PK], Product_Name, Price)
Branch (batch_Id [PK], Location,Timezone)
Inventory(Inventory_Item[PK], Product_Id[FK],Branch_Id[FK],Quantity,Update _Date)
Manufacture (Manufactuer_Id[PK], Manufacture_details)
Manufacture_Item (Manufacture_Item_Id[PK], manufacture_Id[FK], product_id[FK], quntitiy, supplied_date)

12. Test Logs

Test	Result
Duplicate Data	Error starting at line : 1 in command - INSERT INTO Manufacture (Manufacture_ID, Manufacture_Details) VALUES (1, 'Manufacturing details for product 1') Error report - ORA-00001: unique constraint (SYSTEM.SYS_C007975) violated
Add Negative values	Error starting at line : 1 in command - INSERT INTO H_Product (Product_ID, Name, Description, Price) VALUES (1, 'Product A', 'Description for Product A', -9.99) Error report - ORA-00001: unique constraint (SYSTEM.SYS_C007977) violated

Add a record with incorrect data type	Error starting at line : 1 in command - INSERT INTO H_Product (Product_ID, Name, Description, Price) VALUES (1, 'Product A', 'Description for Product A',ggjhfbj) Error at Command Line : 2 Column : 53 Error report - SQL Error: ORA-00984: column not allowed here 00984. 00000 - "column not allowed here" *Cause: *Action:
Add a record with missing value	Error starting at line : 1 in command - INSERT INTO H_Product (Product_ID, Name, Description, Price) VALUES (1, 'Product A', 'Description for Product A',) Error at Command Line : 2 Column : 54 Error report - SQL Error: ORA-00936: missing expression 00936. 00000 - "missing expression" *Cause: *Action:
Add a record with non-existing value	Error starting at line : 1 in command - INSERT INTO Manufacture (Manufactur_ID, Manufacture_Details) VALUES (1, 'Manufacturing details for product 1') Error at Command Line : 1 Column : 26 Error report - SQL Error: ORA-00904: "MANUFACTUR_ID": invalid identifier 00904. 00000 - "%s: invalid identifier" *Cause: *Action:

Sales perfomance

```
SELECT DATE_TRUNC('month', sale_date) AS month,
      SUM(sale_amount) AS total_revenue
FROM sales
WHERE product_category IN ('shampoo', 'conditioner', 'hair cream')
  AND EXTRACT(YEAR FROM sale_date) = EXTRACT(YEAR FROM
CURRENT_DATE)
GROUP BY month;
```

Product performance

```
SELECT product_category,
      SUM(units_sold) AS total_units_sold,
      SUM(sale_amount) AS total_revenue
FROM sales
WHERE product_category IN ('shampoo', 'conditioner', 'hair cream')
  AND sale_date >= DATE_TRUNC('quarter', CURRENT_DATE) - INTERVAL '3
months'
```

```
GROUP BY product_category;
```

Market analysis

```
SELECT competitor_name,
    SUM(sale_amount) / (SELECT SUM(sale_amount)
                FROM sales
                WHERE product_category IN ('shampoo', 'conditioner', 'hair cream')
                  AND sale_date >= DATE_TRUNC('month', CURRENT_DATE) -
INTERVAL '6 months'
                ) * 100 AS market_share_percentage
FROM competitors
WHERE competitor_name IN ('Competitor A', 'Competitor B', 'Competitor C')
GROUP BY competitor_name;
```

Customers

```
SELECT age_group,
    gender,
    COUNT(*) AS customer_count
FROM customers
WHERE customer_id IN (SELECT customer_id
              FROM sales
              WHERE product_category IN ('shampoo', 'conditioner', 'hair cream')
                AND sale_date >= DATE_TRUNC('year', CURRENT_DATE) -
INTERVAL '1 year'
              )
GROUP BY age_group, gender;
```

Product return

```
SELECT product_category,
    reason,
    COUNT(*) AS return_count
FROM returns
WHERE product_category IN ('shampoo', 'conditioner', 'hair cream')
  AND return_date >= DATE_TRUNC('month', CURRENT_DATE) - INTERVAL '6
months'
GROUP BY product_category, reason;
```

13. Possible database security issues

Oracle databases are a popular option for business contexts because of their well-known for their powerful features and security capabilities. To protect the database of the organization and the sensitive data, however, it is a must to have proper safety precautions in place and be aware of any possible security risks. The following are a few typical security issues with Oracle databases and suggested solution.

SQL Injections

Insufficient input validation leaves databases vulnerable to SQL injection attacks, in which erroneous code is introduced into queries. Protect variables and parameterized queries, which prevent SQL injection by isolating data from the query structure, however this should be used by developers to reduce this risk. Applying input validation and sanitization procedures aids in the detection and rejection of malicious input, maintaining the database's integrity.

Privilege Escalation
The database's security get jeopardized when an attacker gets illegal access to higher-level privileges,. It is critical to assess user roles and privileges on a regular basis to verify that access rights are suitable and matched with job duties. Putting in place auditing and monitoring procedures enables firms to notice and track suspicious activity, allowing for rapid response and mitigation.

Patching and updating insufficiently
Failure to deploy patches and updates in a timely way exposes the database to known security vulnerabilities. Companies must have a systematic method to applying Oracle patches on a regular basis. Important fixes should be prioritized to resolve high-risk vulnerabilities as soon as possible. Establishing a timetable for assessing and installing fixes aids in maintaining the database's security posture.

Weak authentication and authorization techniques
These techniques provide a significant security risk. Attackers commonly use weak passwords or default ones to gain unauthorized access. Businesses can create stringent password policies that mandate ongoing password updates to counteract this. Also, enabling multi-factor authentication is a good practice. The notion of least privilege should be used to assign user roles and privileges, ensuring that users only have access to information that is necessary.

14. Conclusion

To conclude, above documents highlights needs of organization lavenders which is having an automated database system to handle their daily business processes locally and connecting with other branches located out side of Sri Lanka. For this expected to improve customer satisfaction.

The main objectives of the organization are to automate manual business processes to replace manual and repetitive tasks, reduce the need for manual work, improve employee productivity and efficiency, improve customer satisfaction, and deliver goods more effectively than rivals. Automation can reduce the need for manual work, generate reports, analyze data, retrieve information fast and efficiently, and improve employee productivity and efficiency.

The scope of the project includes a thorough study of the present manual inventory management procedure, creating an automated database system to automate inventory management, order processing, and customer management, and providing an E-commerce platform for customers to order products. Similarly, out of scope includes

providing an E-commerce platform, integration with international shipping, financial accounting and pay roll administration, third party marketing platforms, staff management, and tracking business processes in other branches located outside of Sri Lanka. However, the most important details in this text are the functional requirements of an automated database system for an organization that sells shampoo, conditioners, and hair cream. These requirements include data management, order management, customer management, inventory management, reporting and analysis, performance, security, and scalability.

Furthermore, document contains a Diagram which help to understand the database architecture. Similarly, helps in implementing process. Moreover, it include test logs to get the clear understanding of the database and data types and finally, it includes explains selected queries and security problems of the dtabase.

Overall, the automated database system saves money and increases cost effectives by minimizing manual work and eliminating paper-based operation. Risk and mitigation include backup plan, redundant servers, disaster recovery strategies, and strong security measures to safeguard the database system. Regular security audits and vulnerability checks are also needed to find and fix gaps.