

Final Project Report - Inventory Management System

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Introduction

Title: Inventory management system

Scenario: An online manufacturing business finds it challenging to effectively track and manage its large inventory. The company sells a variety of products under various brand names, and managing inventories manually has grown labour-intensive, prone to mistakes, and detrimental to the general efficiency of the organization.

Business Challenge: The current manual inventory management system is leading to inaccuracies, stockouts, overstock situations, and inefficiencies in the supply chain. This results in lost sales opportunities, increased carrying costs, inconsistent production and a poor customer experience due to delayed or unavailable products.

The company needs a solution that provides real-time visibility into its inventory, automates key processes, and streamlines the overall supply chain with proper reports.

Four primary user types are included in inventory management systems.

Users:

1. **Administrators:** The employees or division in charge of overseeing all business operations are known as administrators. Majorly they enter and maintain products and brands in the database. This user type has complete access to the database through the website's backend portal.
2. **Customer:** Consumers are another important source of data for the database system since they build and update their profiles and use the website to make purchases.
3. **Inventory management staff:** This user type oversees the company's supply chain and is in charge of tasks including order processing and inventory control. This kind of user has restricted access to the database; while they can add or edit specific tables, they are unable to remove anything from the database.
4. **Customer care representative:** This user type is in charge of helping customers by responding to their inquiries on the company's behalf. They have access to a restricted database, such as just a customer table.

Business Analysis

I plan to construct a database that is integrated with the e-commerce website. With its own manufacturing facility, this business operates in the health and wellness sector. Within this corporation, they have four registered brands, each of which has a large number of products. I chose this project because, when I worked for a company in the past, they encountered similar inventory management issues. I therefore decided to build my project on that issue.

Since the administrator is in charge of listing brands and related goods on the website through the backend, they have complete access to the database, and here is where the process begins. Please be aware that product availability will depend on demand from customers and only the admin has the authority to delete anything from the database.

The inventory will now be added to the database by the dispatch/inventory management departments based on the stock levels of the various products.

Customers can sign up (for new users) or sign in (for current users) using the website. Following this, end users, or consumers, will purchase things based on their needs, contributing to the database in the process.

Finally, customer service agents would be able to follow the products' shipment and obtain customer information. They are in charge of responding to inquiries from clients on the company's behalf.

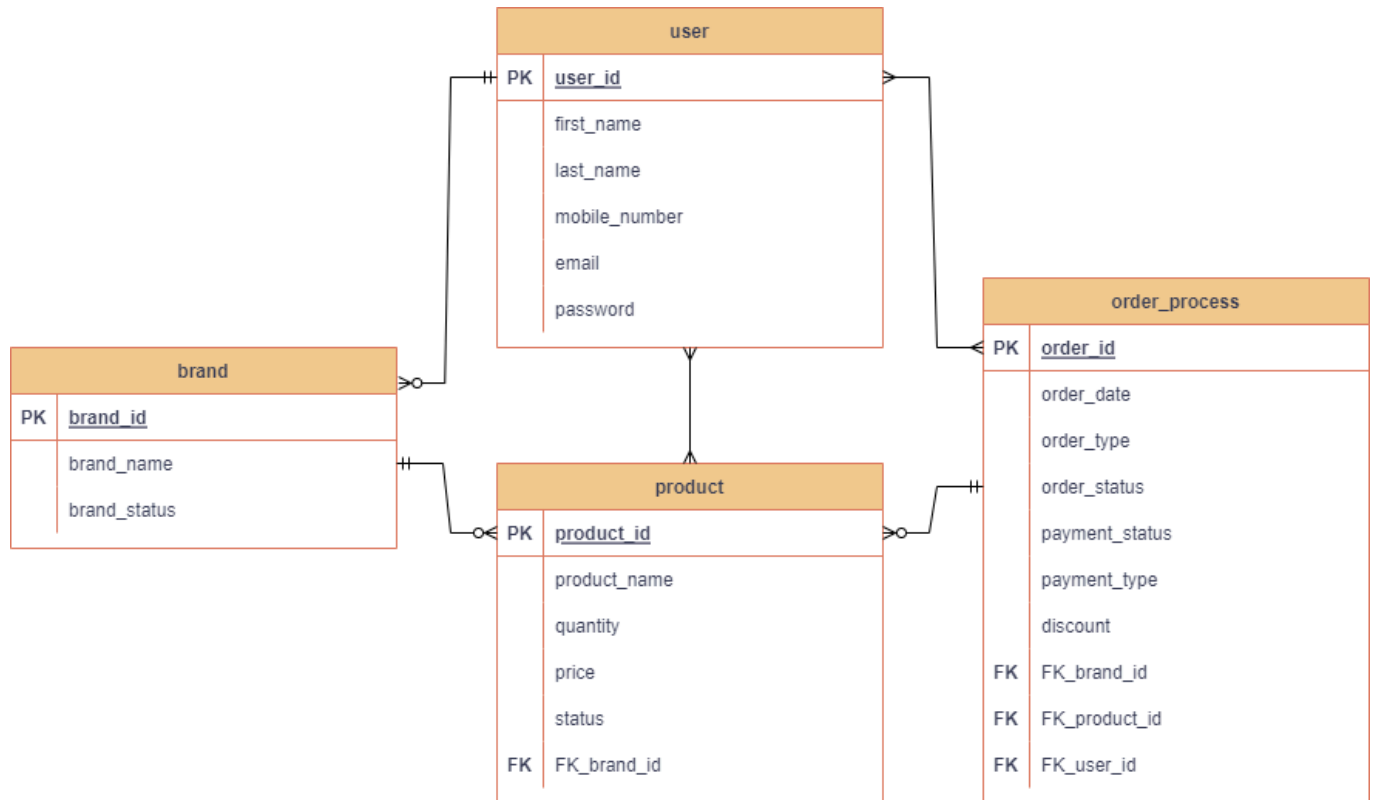
This is an ongoing process that will be beneficial to the company to a large extent. Some of the major benefits are listed below:

1. Administration can produce sales reports to monitor the organization's growth.
2. By creating reports on inventory and product sales, organizations may readily determine the demand for their products and adjust production in accordance with the analysis.
3. Because the system alerts the administrator and inventory management department beforehand to a specific low number of products, things won't appear to be out of stock on the website.
4. Because it will be automated and shipping tracking will be simple, there will be fewer human mistakes.

Overall, the company will benefit greatly from this inventory management system project, which will also streamline and improve the organization's user experience and supply chain. Along with easing production through appropriate reporting and tracking, it will address the issue of bad inventory.

Table Design and Analysis

ER Diagram of an inventory management system



Business rules:

1. A user (customer) can place multiple orders
2. Each brand consists of multiple products
3. Orders are associated with products
4. A user (Administrator) is responsible for managing all brands
5. A user (Administrator/Dispatch department) is responsible for managing all products
6. A user (Dispatch department) is responsible for processing the orders

Database Implementation

Five unique SELECT statements that each pull data from two or more tables

1. What number of clients still have outstanding orders?

1	-- 1) How many customers are there who's order is still pending?
2	
3	SELECT user.first_name, user.last_name, order_process.order_id,
4	order_process.order_status, product.product_name
5	FROM user
6	JOIN order_process
7	ON order_process.user_id = user.user_id
8	JOIN product
9	ON product.product_id = order_process.product_id
10	WHERE order_status = "Pending"
	first_name last_name order_id order_status product_name
1	Patricia Moore 104 Pending Tri Conditioner
2	Jessica Lopez 105 Pending Lac Shower Gel

2. Amount of cash on delivery orders received by customers?

12	-- 2) Amount of cash on delivery orders received by customers?
13	
14	SELECT user.first_name, user.last_name, order_process.order_id,
15	order_process.payment_type, product.product_name
16	FROM user
17	JOIN order_process
18	ON order_process.user_id = user.user_id
19	JOIN product
20	ON product.product_id = order_process.product_id
21	WHERE payment_type = "cod"
	first_name last_name order_id payment_type product_name
1	Steev Williams 101 cod Tri Shampoo
2	Robert Miller 103 cod Jimmy pain killer
3	Patricia Moore 104 cod Tri Conditioner

3. How many clients used express delivery when placing an order?

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22  -- 3) how many customers placed order via express delivery
23  SELECT user.first_name, user.last_name,
24  order_process.order_id, order_process.order_type
25  FROM user
26  JOIN order_process
27  ON order_process.user_id = user.user_id
28  WHERE order_type = "express delivery"

```

	first_name	last_name	order_id	order_type
1	Petty	Anderson	102	express delivery
2	Jessica	Lopez	105	express delivery

4. Which brand and product is unlisted?

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30  -- 4) Which brand and product is unlisted?
31  SELECT brand.brand_name, brand.brand_status, product.product_name
32  FROM brand
33  JOIN product
34  ON brand.brand_id = product.brand_id
35  WHERE brand_status = "unlisted"

```

	brand_name	brand_status	product_name
1	PNG	unlisted	PNG Face Oil

5. Which product did the consumer purchase that was discounted by more than 10%?

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37  -- 5) Which product did the consumer purchase that was discounted by more than 10%?
38  SELECT user.first_name, user.last_name, order_process.discount, product.product_name
39  FROM user
40  JOIN order_process
41  ON order_process.user_id = user.user_id
42  JOIN product
43  ON product.product_id = order_process.product_id
44  WHERE discount > 10

```

	first_name	last_name	discount	product_name
1	Steev	Williams	30	Tri Shampoo
2	Robert	Miller	45	Jimmy pain killer

Analytics, Reports, and Metrics

Here are some examples of analytics that could be conducted on an inventory management system database:

1. Inventory Turnover Analysis:
 - Calculating the inventory turnover ratio to assess how efficiently inventory is being managed and sold over a specific period. This analysis helps in optimizing stock levels and identifying slow-moving items.
2. ABC Analysis:
 - Categorizing inventory items into A, B, and C categories based on their value and usage. This analysis helps in prioritizing inventory management efforts and identifying critical items that require closer attention.
3. Stockout Analysis:
 - Analyzing instances of stockouts to identify patterns, reasons, and the impact of stockouts on sales and customer satisfaction. This analysis can guide better inventory forecasting and purchasing decisions.
4. Supplier Performance Analysis:
 - Evaluating the performance of different suppliers based on factors such as delivery times, product quality, and pricing. This analysis helps in optimizing supplier relationships and negotiating better terms.
5. Demand Forecasting:
 - Using historical sales data to forecast future demand for different products, enabling proactive inventory management and procurement planning.
6. Shrinkage Analysis:
 - Analyzing inventory shrinkage due to theft, damage, or administrative errors to identify areas for improvement in security, handling, and record-keeping processes.

Reports:

1. Inventory Valuation Report:
 - Provides a summary of the total value of inventory on hand, broken down by individual items and categories.
2. Stock Movement Report:
 - Tracks the inflow and outflow of inventory over a specific period, highlighting key trends and patterns.
3. Expiry Date Report:
 - Lists items approaching their expiry dates, enabling proactive management of perishable goods to minimize wastage.
4. Reorder Recommendations Report:
 - Generates recommendations for items that are approaching or have fallen below their reorder points, facilitating timely restocking decisions.

Security Concerns

As a data expert, I am aware of several security and privacy concerns related to the data stored and processed within the inventory management system database. These concerns revolve around the following points:

Data Sensitivity:

1. Personally Identifiable Information (PII):
 - The system may store sensitive customer information such as names, addresses, and contact details for order fulfillment and customer management.
2. Financial Data:
 - Financial records, including transaction details and payment information, need to be protected to prevent unauthorized access and potential fraud.
3. Inventory Data:
 - Information about inventory levels, supply chain partners, and procurement details could be sensitive, especially if it includes proprietary or confidential business information.

Compliance and Legal Considerations:

1. Data Protection Regulations:
 - Compliance with data protection regulations such as GDPR, CCPA, or other local privacy laws must be ensured, especially when handling customer data.
2. Data Retention and Deletion:
 - Proper procedures for data retention and deletion need to be in place to ensure that data is not kept longer than necessary and is removed securely when no longer needed.

Security Measures:

1. Access Control:
 - Implementing role-based access control to restrict access to sensitive data based on job responsibilities and the principle of least privilege.
2. Encryption:
 - Utilizing encryption for sensitive data at rest and in transit to prevent unauthorized access and data breaches.
3. Audit Trails:
 - Maintaining detailed audit logs to track access to sensitive data and changes made to the database.
4. Data Masking:
 - Applying data masking techniques to hide portions of sensitive data from users who do not need to see the complete information.

Communication with Stakeholders:

1. Regular Security Reviews:
 - Collaboration with the security team for regular security reviews and risk assessments to identify and mitigate potential vulnerabilities.
2. Privacy Impact Assessments:
 - Conducting privacy impact assessments to evaluate the potential effects of the inventory management system on the privacy of individuals and to ensure compliance with privacy regulations.
3. Training and Awareness:
 - Providing training and awareness programs for employees handling sensitive data to ensure they understand the importance of data security and privacy.

By being aware of these potential security and privacy concerns, the organization can take proactive measures to protect sensitive data and comply with relevant regulations, thereby ensuring the integrity and confidentiality of the information stored within the inventory management system database.

Architecture

The architecture for the inventory management system would be a cloud-based solution designed for scalability and security to handle increased traffic and user demand. This architecture aligns with best practices for building secure and scalable cloud-based applications and incorporates key considerations for designing for scalability, ensuring cloud security, and boosting performance.

Hosting and Scalability:

The inventory management system will be cloud-based and designed to leverage the scalability benefits of the cloud. The architecture will be built to handle increased traffic and user demand without compromising performance or availability.

Cloud-Based Security Services:

Leveraging cloud-based security services such as Identity and Access Management (IAM), Security Information and Event Management (SIEM), and Web Application Firewalls (WAF) will be essential to protect the application and data in the Cloud.

Scalability Design Best Practices:

The architecture will incorporate best practices for designing for scalability, such as using a microservices architecture, implementing load balancing, utilizing auto-scaling, and designing for horizontal scaling to ensure the system can handle increased traffic and user demand.

Data and Application Consistency:

Global consistency will be a priority, ensuring that the inventory management system can track and deliver accurate stock information to users in real-time, regardless of geographical location.

Geographical Scalability and Ease of Use:

The system will be designed to be geographically scalable to enhance customer experience and reduce system complexity, while also being relatively easy to use to minimize internal costs associated with building and managing the system

Project Wrap-up and Future Considerations

Key learnings from the project include:

1. Understanding business requirements is crucial for tailoring data analytics and reporting solutions to meet specific operational needs.
2. Data sensitivity and security are paramount in managing inventory data, necessitating robust security measures to protect sensitive information.
3. Designing for scalability and optimal performance, particularly in cloud-based solutions, is essential to handle increased traffic and user demand.
4. Compliance with data protection regulations and the inclusion of privacy considerations are vital in the design and implementation of data analytics solutions.
5. Effective communication with stakeholders, including collaboration with security, legal, and privacy teams, is essential to address data security and privacy concerns effectively.
6. Continuous learning and adaptation are necessary to keep pace with evolving technologies, best practices, and industry standards in data analytics and system architecture.

These learnings will guide future projects, ensuring that the solutions developed are not only technically robust but also aligned with specific business needs, security requirements, and compliance considerations.

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