

Automated Inventory Management with Stock Optimization System

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Abstract— This project is aimed at developing a web-based portal named as automated inventory management with stock Optimization system for handling the stock system of any retail organisation. The stock management with stock Optimization device refers back to the machine and tactics to control the inventory of enterprise. This system can be used to keep the info of the inventory, stock renovation, update the inventory primarily based on the income information, generate income and inventory file each day or weekly based, generating invoice and also sending notification or mail earlier than expiry date of a product for giving it priority. In this system we are solving different problem affecting to sales management and purchase management. Automated Inventory Management with Stock Optimization System is important to ensure quality control in businesses that handle transactions revolving around consumer goods. Without proper inventory control, a large retail store may run out of stock on an important item. A good inventory management with stock optimization system will alert the wholesaler when it is time to record. Inventory Management with Stock Optimization System is also an important means of automatically tracking large shipment. An automated Inventory Management with Stock Optimization System helps to minimize the errors while recording the stock.

Keywords— Stock Optimization, Inventory Management, Application, Web-based, Expiry date

I. INTRODUCTION

This project is aimed at developing a portal named Automated Inventory Management with Stock Optimization System. An Inventory Management System where businessperson may keep the records of purchase, sales & expiry product. The traditional system is very hard as well as time consuming for the vendors and the clients. It is difficult for keeping records, finding out proper transaction, creating bill and generating invoice efficiently in manual system. The owner does not get any information properly without presenting in the business centre physically. So, a new system will be needed to solve these difficulties. Good inventory management helps with: (1) Customer experience: Not having enough stock to fulfil orders you've already taken payment for can be a real negative. (2) Improving cash flow: Putting cash into too much inventory at once means it's not available for other things - like payroll or marketing. (3) Avoiding shrinkage: Purchasing too much of the wrong inventory and/or not storing it correctly can lead to it becoming 'dead', spoiled, or stolen. (4) Optimizing fulfilment: Inventory that's put away and stored correctly can be picked, packed, and shipped off to customers more quickly and easily. This inspires us to develop a web-based application named Inventory Management with Stock Optimization System to address these issues.

The implementation of this system can make the activities within the company very easy, and it can also improve the

efficiency and productivity in the company. This will save important time of employees and customers. An online based inventory management system is widely used for maintaining all the operations like purchasing, restocking, sales and checking the stock levels before ordering more products. This website can be accessed at any time by multiple users like the admin and different cashiers. In this project, we will implement the Stock Optimization System with the help of HTML, CSS, Bootstrap, JavaScript, MySQL, NodeJS.

The further paper is assembled as follows, Section II contains related work, Section III explain the methodology with flow chart, Section IV describes results and discussion, and Section V concludes research work with future directions.

II. RELATED WORK

In paper [1], P. Khobragade, R. Selokar, R. Maraskolhe and Prof.M. Talmale discussed how old manual inventory system where storeowner keeps the records of sales and purchase was very faulty. Mismanaged inventory means disappointed customers, too much cash tied up in warehouses and slower sales. This project eliminates the paperwork, human faults, manual delay and speed up process. This project will have the ability to track sales and available inventory, tells a storeowner when it's time to reorder and how much to purchase. This is a windows application developed for Windows operating systems

which focused in the area of Inventory control and generates the various required reports. So, these applications helped us to gain some of the unknown techniques that we have used in our project.

In paper [2], Rafat Ara, Md. Abdur Rahim proposed an inventory management system software which is used effectively in printing business. In this system the manual activities of printing business are altered into computerized system. The system originates various essential reports automatically. It reduces paperwork, human errors as well as speeds up the whole system. The proposed system is tested at SIGNBD (a Bangladeshi printing company) and gained satisfactory result. It can run in any operating system. Incremental model is used for developing the system. The backend of the system is developed using PHP, MySQL. The front end of the system is designed & developed using html, CSS, JavaScript and jQuery.

In paper [3], Varalakshmi G S, Asst Prof. Shivaleela S discussed how Inventory Management System is extremely beneficial to business owners, as they allow shops to properly store sales and purchase records. When inventory is mismanaged, it leads to dissatisfied consumers, slower sales, too much cash on hand, and warehouses. This inventory system reduces manual work, human mistake, and manual delays while simultaneously speeding up the process. This inventory management system will be able to track sales information as well as inventories.

In paper [4], M. Mascarenhas, A. Lamani, C. Matkar, A.R. Dessai and A. Kotharkar proposed a to create a web-based system which will contain basic modules for tracking of inventory levels, re-ordering of items, issuing and report generation of refreshment items, organizing inventory data, status alerts, and printing reports. The system analyses the total sale of menu items and proportionately deducts appropriate amount from the resource database. Then it compares the current available resource with the threshold level of each ingredient. If particular ingredients are below the threshold, It generates a purchase order(printable) for those items(s) and sends an email to the manager(admin) for approval. It also generates and display monthly/yearly report in form of statistics and graphs. Apriori clustering algorithm is used to find frequently issued items to various units.

In paper [5], I. Jayanth, V. Sampathkumar discussed how Construction materials comprises over half of the aggregate cost of the task. Proficient materials administration assumes a key part in the effective consummation of the task inside evaluated cost and time. The cost, quality and time are essential target of material administration. Stock administration includes capacity, distinguishing proof, recovery, acquirement, and transport and development techniques. Each is permanently connected to wellbeing, profitability and calendar execution. Propel material obtainment or deferred both can influence cost, quality and time.

In paper [6], Prof. V. Shinde, A. Singh, K. Wayal, V. Vadhavinde discussed how Inventory Management is the very important aspect of big business & private owned organizations, especially where there is a lot of orders are being placed every day & there are a lot of materials & the maintenance is really important which the system will do & also will record the time taken to process an order. The software or web app is designed with all the features of the GST pattern. The system can also generate Reports, Customer Alerts. This feature keeps track of any upcoming occasions (i.e. function to send the offers and messages to the customer and their clients, and special events that may influence inventory needs for the upcoming day, balance reports (i.e. outstanding bills).

In paper [7], E S Soegoto and A F Palalungan proposed use of a web-based online inventory system to maximize human performance in the work process in companies. This study used descriptive method by reading related literatures. From this research, show about web-based online inventory system is an innovation in facilitating the management of goods, helping to make complicated things easier, this is good news for large companies in running their businesses, no wonder many companies are using online inventory systems to help work. Companies that use online inventory systems are competing in developing their existing inventory systems so they can better support the company's work.

In paper [8], Khalid, F. A., & Lim, S. R. discussed how Inventory exists in almost every organization, it is crucial for an organization to have good understanding and strategy about inventory management. Inventory management has significance for an enterprise in an inventory intensive manufacturing industry (Rajeev, 2008). In this research, the researcher aimed to know the relationship between inventory management and organizational performance of manufacturing company in Melaka. Thus, the researchers identified three inventory management strategies, Vendor Managed Inventory (VMI), Material Requirement Planning (MRP), and Just-In-Time (JIT), as the independent variables to investigate the research questions. In order to collect the data and information needed, the researcher used qualitative method as the research methodology.

III. METHODOLOGY

The system has been divided into three major parts, i) Frontend of the user interface, ii) Database Management, iii) Backend or the Backbone part of the system. So, to have a great interface and a clean UI, different Frontend Technologies used like HTML, CSS and a Frontend Framework like Bootstrap is used. To make user interface more interactive Vanilla JavaScript is used, i.e., the user will have a different experience as compared to other monitoring interfaces.

For database, in PhpMyadmin we can easily create database and tables inside them. It is critical to establish

tables in order to store information in a logical and orderly manner. We have to create tables for the newly established database. We can create tables by clicking the ‘Structure’ tab in the newly formed Database. The user will see a ‘Create Table’ option near the end of the tables list. Fill in the “Name” and “Number of Columns” fields, then click the “Go” button. Or we can also create tables in SQL tab by SQL command.

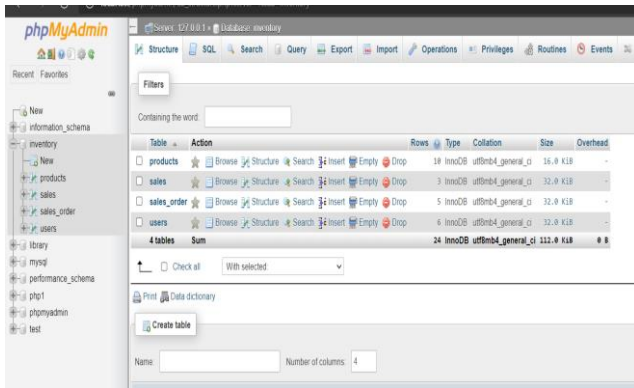


Figure 0.1. Inventory database and all the tables in the database

| Options | Id | supplier | productCode | brandName | productName | productUnit | quantity | cost | srp | dateDeli | dateExp |
|--------------------------|----|----------|-------------|-----------|------------------------|-------------|----------|-------|-------|------------|------------|
| <input type="checkbox"/> | 1 | Samsaung | s123 | Samsung | Galaxy 40 | piece | 99 | 50000 | 49999 | 2022-05-17 | 2144-05-05 |
| <input type="checkbox"/> | 2 | Realme | Realme123 | Realme | Realme buds 1.0 | piece | 500 | 5000 | 5000 | 2022-02-02 | 2564-02-02 |
| <input type="checkbox"/> | 3 | Colgate | Colgate123 | Colgate | Colgate toothbrush | piece | 198 | 50 | 50 | 2022-04-05 | 2023-04-05 |
| <input type="checkbox"/> | 4 | Colgate | Colgate564 | Colgate | Colgate toothpaste | pack | 200 | 125 | 125 | 2022-02-05 | 2022-05-30 |
| <input type="checkbox"/> | 5 | Bisleri | bisleri123 | Bisleri | Bisleri water 1.0 | pack | 50 | 30 | 30 | 2022-05-05 | 2022-05-05 |
| <input type="checkbox"/> | 6 | Dettol | Detto2556 | Dettol | Dettol Hand Wash | pack | 200 | 90 | 90 | 2022-02-05 | 2022-05-05 |
| <input type="checkbox"/> | 7 | Suthol | Suthol | Suthol | Suthol chandan | pack | 299 | 60 | 60 | 2021-01-02 | 2022-06-02 |
| <input type="checkbox"/> | 8 | Lifeboy | Lifeboy | Lifeboy | Lifeboy Hand Sanitizer | pack | 10 | 100 | 100 | 2020-09-07 | 2022-05-18 |
| <input type="checkbox"/> | 9 | Boroline | Boroline | Boroline | Boroline 2260 | piece | 19 | 30 | 30 | 2021-06-15 | 2024-04-14 |
| <input type="checkbox"/> | 10 | Vaseline | Vaseline | Vaseline | Vaseline Body Lotion | pack | 33 | 300 | 300 | 2020-06-05 | 2022-07-05 |

Figure 0.2. Product table in inventory database

Some of the backend as well as database have been implemented using NodeJS and MySQL which are used to manipulate all the records of products, cashiers, customer as well as admin. Different NPM (Node Package Manager) packages have been used such as express, ejs, MySQL, bcrypt, cookie-parser, jsonwebtoken.

Express Package which provides mechanism to: write handlers for requests with different HTTP verbs at different URL paths (routes). EJS (Embedded JavaScript Templating) is one of the most popular template engine for JavaScript. For building connection between our system and database MySQL driver for NodeJS is used. The bcrypt NPM package is a JavaScript implementation of the bcrypt password hashing function that allows you to easily create a hash out of a password string. Cookie-parser is a middleware which parses cookies attached to the client request object. JsonWebToken is used for stateless authentication mechanisms for users and providers, this means maintaining session is on the client-side instead of storing sessions on the server.

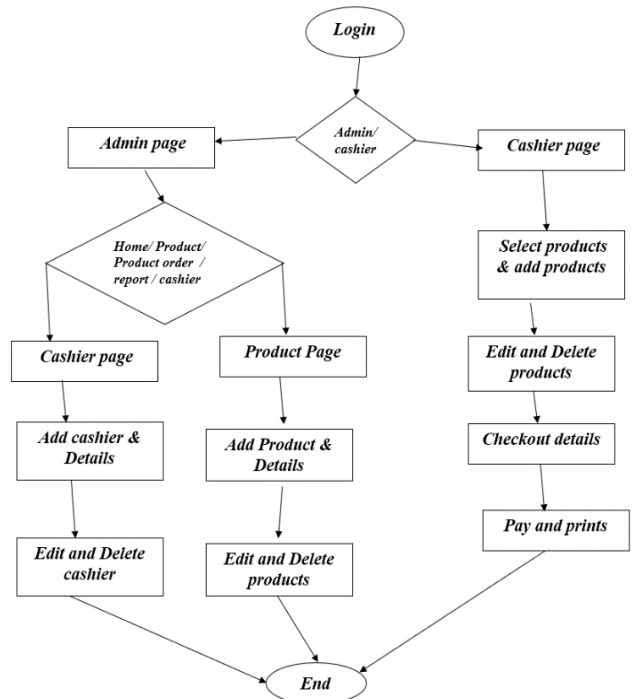


Figure 0.3. Proposed model for designing of “Automated Inventory Management with Stock Optimization System” application

The Login Page is capable of full authentication functionality where admin and cashier can login with their own username and password.

In the admin end, in the home page we can see all the items which will be expired within one month. Next the product page, where admin can add new items in the database and can view all items, Edit and Delete Functionality is included for each item. The Expired Product page helps admin to sort out the expired product and let the admin know about the total loss suffered. Under Reports, in the Sales Report Page, admin can view which customer has bought how much amount of product with respective cashier name, here print bill and delete functionality is also included for each customer. In the Cashier Page, admin can give cashier role to other user by adding that user with respective username and password, apart from this admin can add user respective personal details, here edit and delete functionality is also included, if admin want to remove any cashier for that delete functionality is useful.

In the Cashier end, a Payment page opens up where full authority has given to cashier to the add respective item in the bill ordered by customer. Here cashier can view all items name with respective quantity and can apply VAT and discount for the product. After all the items have been added in the bill, next process is the checkout process where all necessary details of the customer must be included. After a successful checkout, cashier can view the automated generated bill and also can print it, if customer wants.

IV. RESULTS AND DISCUSSION

Thus, we have developed a prototype which consists of three parts i.e., the frontend whose pictures have been shown below in which we can clearly identify the Login Page, Admin Dashboard, Product Page, Cashier Page and also the Cashier Dashboard. The Dashboards show different features provided to different entities of this system. The second part is the Database Management part. The third part is the backend part.

Some of the features of the systems are: (1) Easy Access: It is an online based system. So, user can access the system from anywhere anytime. Businessperson can see overall report at a glance. So, they can be conscious about their business. (2) Total stock: Salesperson can see the inventory according to product category. If stock is about to finish, notification will be shown. (3) Invoice Generator: An invoice number will be created automatically after filling up the form of selling information. This unique number will be needed for further use. (4) Report: Necessary reports will be generated like provider wise report, daily purchase report, sales report, profit/loss, challan, defaulter list and so on. (5) Purchasing: Helps manage all suppliers and purchase orders for quick and easy stock replenishment. (6) Expiry Date: Notify store manager/Admin about the products that will expired soon.

1. A login page is used to authenticate users for security purpose and preventing unauthorized access. You can login in the system either as an admin or a cashier. Figure 1.0. shows the login form for the system.

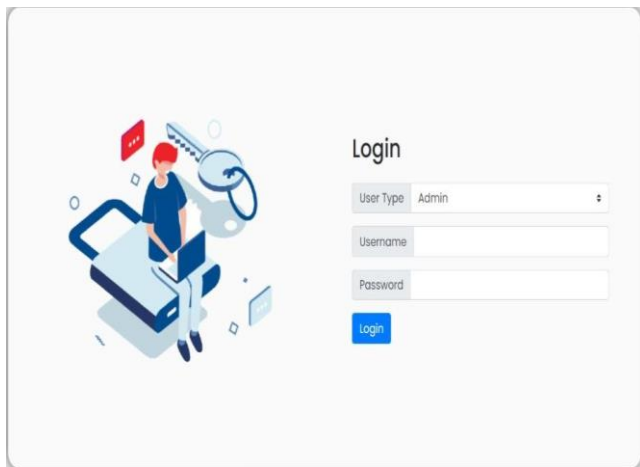


Figure 1.0. login form for inventory management system

2. After login into the system using username and password as a admin, a dashboard of the system is opened. All the menus & modules of dashboard are well organized so that anyone can access the system easily. In the admin dashboard there is products, purchases, reports and cashier options are there. Figure 2.0. shows the amin dashboard as well as add product page.

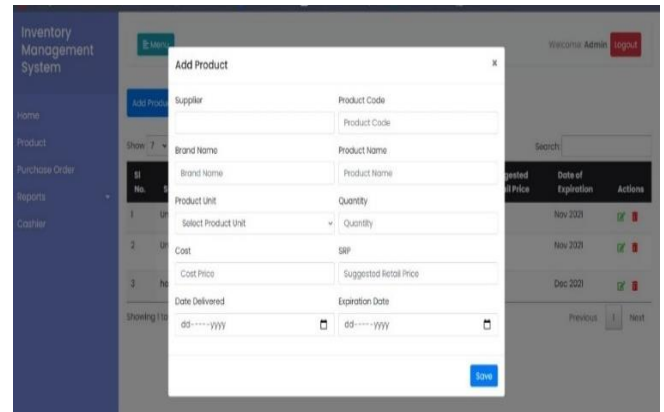


Figure 2.0. Admin Dashboard Page/ Add Product Page

3. In the product module we can see all the products in the stock, and we can also add products, remove products. Businessperson can easily understand the present scenario of the stock. Figure 3.0. shows the product information.

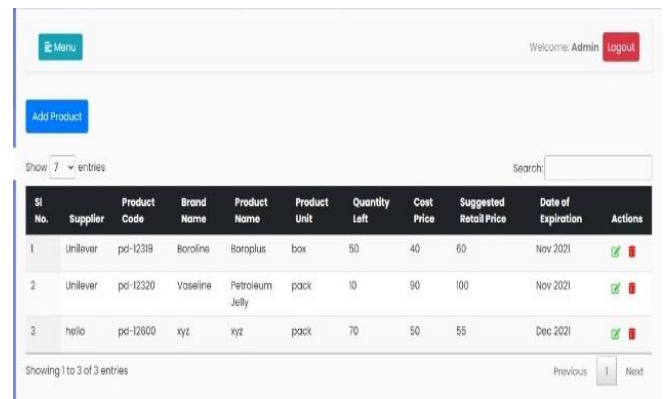


Figure 3.0. product page

4. We can also add and remove cashier detail in admin panel so that cashier can handle that how many products they have. Figure 4.0. show the details of cashier adding.

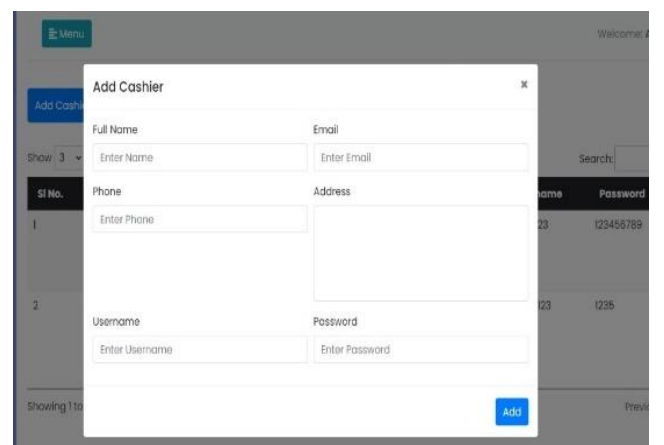


Figure 4.0. show the details of cashier adding.

5. All the products that are expiring soon will be displayed in the home page of the admin dashboard. Figure 5.0. shows the soon to be expired products.

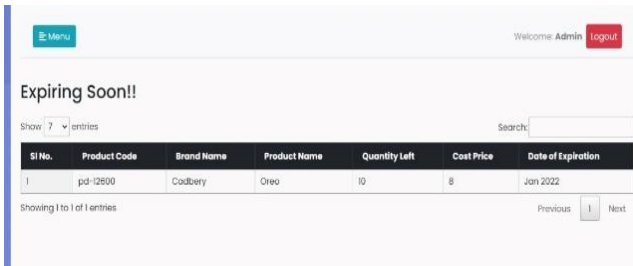


Figure 5.0. shows the soon to be expired products.

6. A report can be generated of individual provider about purchasing detail within fixed date. All purchasing products are viewed in purchase order module. Figure 6.0. showing the report page.

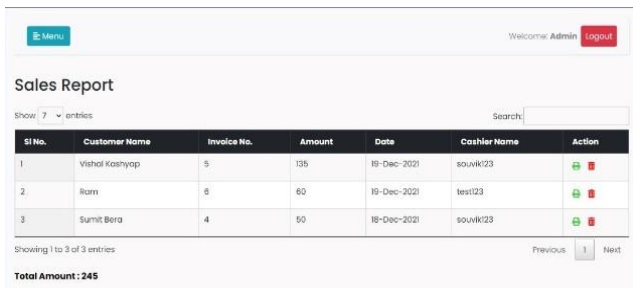


Figure 6.0. showing the report page.

7. This is the cashier panel where cashier can add customer details, products, quantity on the receipt. That will also update the stock. Figure 7.0. showing the cashier panel.

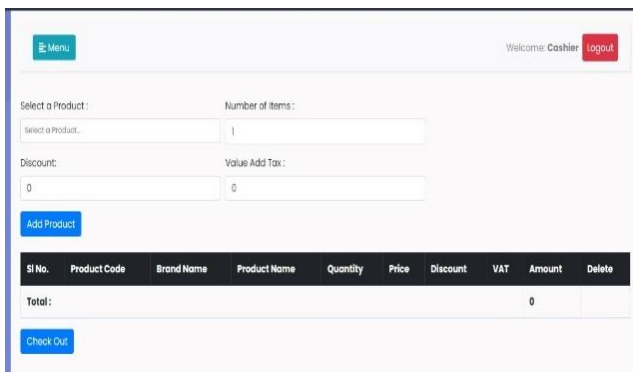


Figure 7.0. showing the cashier panel.

8. The bill will be generated after filling all the details in the cashier dashboard. So that cashier can download the bill as well as print the bill. Figure 8.0. printing the bill

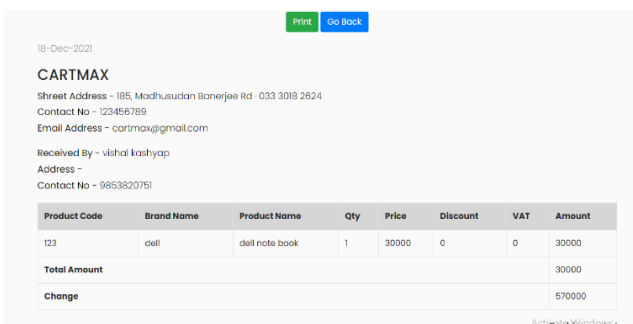


Figure 8.0. printing the bill

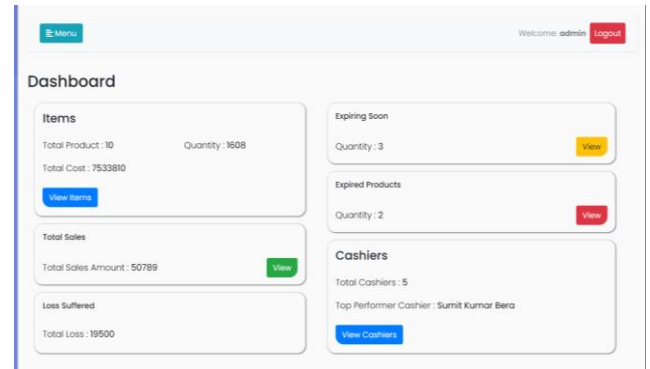


Figure 9.0. Admin Dashboard

V. CONCLUSION AND FUTURE SCOPE

This paper represents the online based Inventory Management with Stock Optimization System for managing the inventory system of any retail business. As we can see from the web portal made by us for inventory management, is very easy to use, anybody can use it very easily. This system lessens the difficulties related to inventories, invoices, reports, expired products. It increases productivity & sales. It also minimizes the cost and increases profitability. This system has been developed keeping all the points in mind and every possible feature is tried to be included for giving service to the user accurately and efficiently to reduce their manual effort. We can add more advanced facilities on the website. We can implement backup mechanism for taking backup of codebase and database on regular basis on different servers. There is currently no Online payment or card payment option in the system. We can add online payment system. Security is very important for the system So, making the system more secure and flexible in any type is very important. Finally, the frontend, backend and the database part are to be merged seamlessly to develop a fully functional interface. So, the future work should involve overcoming most of the limitations as mentioned above to make the system highly interactive in the market.

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