



## SMART CANTEEN

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**Abstract :** The Canteen System is being digitalized in this study. Both the customers and canteen's workloads will be reduced as a result. This technique ensures that the food is served in safest and a most efficient manner possible. It also saves a lot of time and minimizes the amount of labour that humans have to do. A lot of Paper work is avoided as a result of this system. Basically this system allows users to order food online using an E-menu card, which is then displayed on the chef's screen after that payment is done via UPI or credit/debit card. This method is quite useful in both canteens and hotels

**Keyword:** Canteen Management system, Automatad canteen, Food recommendations, Food ordering, online payment, Cashless payment

### I. INTRODUCTION

Canteens can be found in schools, colleges, and institutions. However, because to the use of currency and tokens, practically all of them have a fundamental problem: the system is inefficient and slow. This leads to a slew of issues, including overcrowding, lengthy wait times in lines and payment issues. To address this issue, we created a system that allows users to place orders online without having to wait in a long line or cope with a complicated currency and token system.

Aside from that, a significant amount of food is thrown out on a daily basis, which is harmful not only for the environment but also for the economy. Rather than dumping it, we might give it to others who are hungry. Keeping this in mind, we'd like to leverage data from previous order history and analyze it to estimate the approximate quantity of resources required on the daily basis in order to reduce the food wastage.

We intend to use online payment platforms, API'S, debit/credit cards, and other methods to tackle the sluggish cash payment and token concerns. This will save time and help you to deal with customers who refuse to pay even after they've eaten.

### II. OBJECTIVE

- To quickly place food order.
- It is designed to be Convenient for folks who have a limited amount of time.
- Paperwork reduction.
- Order and billing system that is computerized.
- Food Donation and waste Reduction.

### III. RELATED WORK:

In 2021, Tejas Raibagi, Ashwin Vishwakarma, Jahnvi Naik, Rutuja Chaudhari, Geetanjali kalmay et al.

[1] Proposed a system was A cross-platform AI program is being created to automate cafeteria tasks. The AI Recommender is the most distinctive feature of this software. Users can get customized recommendations with the functionality. Their applications' three main functional areas are administration, canteen management, and users.

In 2021, Xiaojun feng et al. [2] created the HACCP system for canteens, a safety management system in the canteen was recommended to decrease food poisoning and the food accidents. HACCP is a quality control approach for the manufacturing of safe food and the analysis of raw materials. The HACCP approach (hazard analysis and critical control point) looks at all potentially dangerous components that could result in food contamination in the food preparation system.

In 2020, Zixuan Xu, Zhenhua Zhuang, Xuhao Zhao, Jiaqi Wang, Zhiyu Tian et al. [3] proposed a layout for the college canteen's nutrition ordering system. Data entry and user registration, creation and implementation of a healthy diet, meal preparation and notification, and assessment feedback and adjustment are the four main components of this system. Based on the genetic algorithm, the system generated a database to store the data and gave instructions to design the diet standard formula.

In 2020, Ding Hongyu, Lin Lizong, Qian Dixin, Ouyang Baibing et al. [4] proposed a college canteen ordering system based on CORTEX-A9 and ANDROID. They used an android platform and a cloud server to construct an app. To provide users more

sophisticated and networked ordering options, they deployed two ordering modes. The zig-bee protocol is utilized for communication, while SQL is used to store the data.

In 2020, M.Ambika, Saravana kumar R, Sandhya S nair, Ranjithh kumar S et al.[5] proposed a cashless canteen management system in 2020 to automate the canteen's current manual cash method. Students and faculty will save time at the cash register as a result of this.

They used HTML5, JavaScript and Bootstrap in the frontend of the website. Payment, Recharge, refund these procedures are conducted on the decrypted values. The values are re-encrypted and stored in the database after the operation is completed. For encryption 2048-bit key is utilized. SSL is used to safeguard data transfer on the website.

In 2019, Nikhil sahani, darshan kadam, Athrwa Kulkarni, Saurabh shahapure, Prof. Tejal shinde et al.[6] Proposed the android –based canteen management system. The method employed is a top-down strategy that focuses on what comes first and the procedures for progressing to higher levels of detail. The system is designed at the block level in the main phase. The blocks are built using the information gathered during the problem identification process. Different blocks are developed for various functions, with the goal of reducing information flow between them. As a result, the tasks that demand greater interaction are grouped together.

In 2018, Monik shah, shalin Shah , Mohd danish shaikh, Kaustubh tiwari et AL [7] Proposed a canteen automation system based on android, web development and database, among other things. This method truly gives people the ability to order the food over the internet. They created the application, which is divided into these several things. In the initial step, challenges and meal ordering projects are studied. Then there is design step, which was done with the help of the computer program created in the visual studio.

In 2015, Tomasz karyjak et al. [8] proposed a method for shapes & colors recognition of the dishes of meals that may be used to automate canteen self-services. For shape recognition, three essential components were used: object segmentation, geometric invariant moment, and SVM classifier. For color recognition, they employed a Gaussian model. This system has 95% accuracy level.

#### IV. MATHEMATICAL MODEL

A mathematical model for smart canteen automation can be represented using various variables and equations. Here's a simplified example:

Variables:

Demand (D): The number of food items or meals requested by customers.

Inventory (I): The number of available food items or meals in stock.

Replenishment Rate (R): The rate at which new food items or meals are added to the inventory.

Consumption Rate (C): The rate at which food items or meals are consumed by customers.

Time (t): The time period under consideration.

Equations:

1. Inventory Balance Equation:

$$I(t) = I(t-1) + R(t) - C(t)$$

This equation represents the balance between the initial inventory, replenishment rate, and consumption rate. The current inventory at time t is equal to the previous inventory at time t-1 plus the replenishment rate at time t minus the consumption rate at time t.

2. Demand Equation:

$$D(t) = f(t)$$

This equation represents the demand for food items or meals as a function of time. The demand may vary based on factors such as time of day, day of the week, or season.

3. Replenishment Rate Equation:

$$R(t) = g(t)$$

This equation represents the replenishment rate of food items or meals as a function of time. The replenishment rate may depend on factors such as supplier availability, production capacity, or delivery schedules.

Note: The functions f(t) and g(t) would be specific to the particular canteen and its operational dynamics. They can be determined through historical data analysis, customer surveys, or other relevant factors.

By analyzing and solving these equations, one can optimize the replenishment process to ensure that the canteen has sufficient inventory to meet the expected demand, minimize wastage, and avoid stockouts.

It's important to note that this is a simplified mathematical model, and the actual implementation of smart canteen automation may involve additional variables and complexities specific to the system being developed.

V. Litratue Survey:

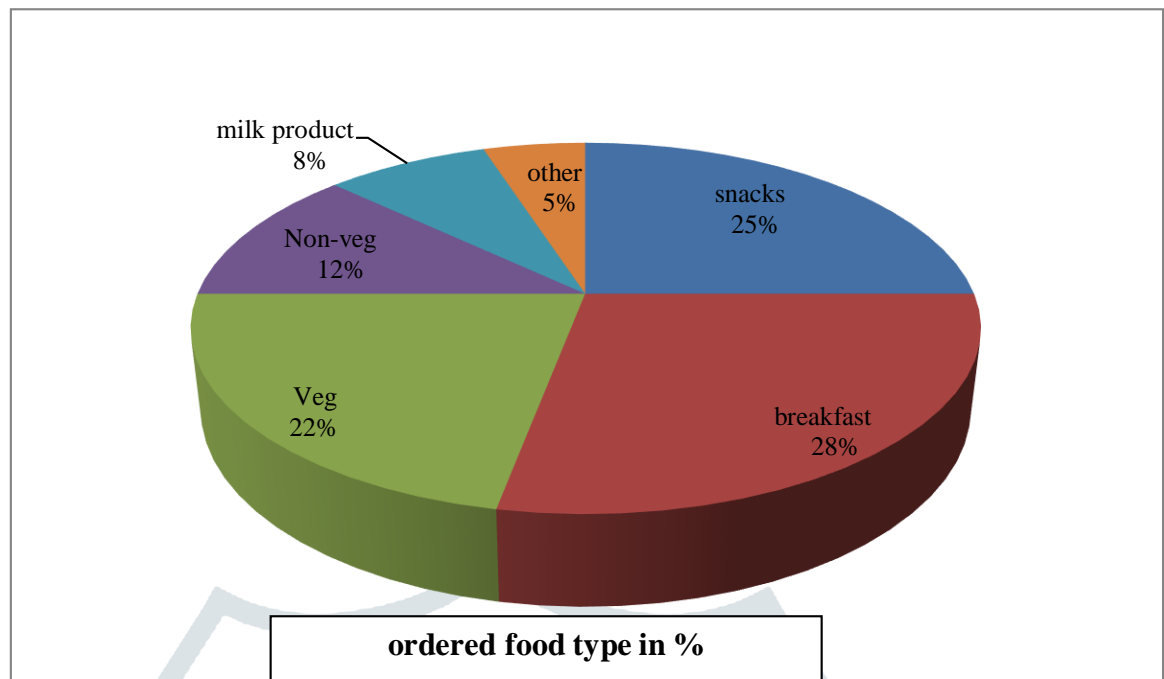
Sr.No.	Year/ Publication	Name	Summary	Future scope
	2021 IEEE	Orde-rista AI-based food ordering application.	They create an AI-based program to handle everyday Canteen operations. For a better result, they applied AI recommendations. They presented a system with three key domains: administration, canteen management and users. To construct this system, they used flutter as front end and node js, postureSQL as the backend.	They can work on waste food management in the future as well as offer features to their apps such as premium memberships in canteens or hotels for VIP users.
	2021 IEEE	Construction of Safety management system of students canteen based on haccp.	The system uses hazard analysis and critical control points (HACCP) to reduce food poisoning and hazardous activities while preparing meals.	Customers also can receive weekly diet plans to help them maintain their health.
	2020 IEEE	The design of nutrition ordering system without queue in college canteens.	They proposed a technique for ordering nutritious food. User registration, meal preparation and feedback using these strategies. Data structure is made transparent, straightforward, and independent using relational technology.	Payment must be made in variety of ways. There is now no system in place for the handling of waste food; however, they can incorporate waste food management into this program.

	2020 IEEE	Design of college canteen order system based on cortex- A9 & android.	They used cortex-A9 and ANDROID to create projects. They created a canteen management application using the cloud infrastructure and the android platform. The system consists of two components: a client and local terminal. The cortex A9 development board is the hardware and operating platform for this system, as well as the software application. To create android apps and web system applications, Android development 2.2.3 is utilized.	It is also possible to manage the data of the personnel who work in the canteen, as well as they can provide the digital menu cards.
	2020 IJITEE	Cashless canteen management system	They used react and nodejs to create a cashless canteen management system application. They used the stripe for the payment method. Because this system was built entirely at the administrative level, only the administrator has guaranteed access to the system. To safeguard the transmission of data in the system, various software's are utilized.	They can offer nutrition- based food ordering system and concentrate on making User interface more user-friendly.
	2019 IJIRT	Canteen automation system using android.	They created an android application to automate the school canteens. This application was created using Net Beans IDE 8.2 and Android studio. MySQL also plays a significant role in the system's	They have the ability to make payment processes more secure and convenient.

			operation. There are three types of logins in this system: administrator, user, and staff.	
	2018 IRJET	Canteen automation system	They presented a system few people to order food online using web development, Android development and Databases. The applications user interface is user-Friendly, and the application's maintenance costs are low when compared to competing apps.	The payment system can be improved in the future. They can also concentrate on waste food management.
	2015 IEEE	Shape and colors recognition of dishes for the purpose of Customers services process automation in self-services canteens.	They created a software for shape and color recognition of dishes in the canteen to automate self-service using object segmentation, shape recognition, and color recognition using various software's such as SVM classifier and Gaussian model.	We can make the canteen system fully automated and user friendly for clients by utilizing contemporary technology. We can also utilize GPS instead of form color recognition to determine exact location.

## VI. Literature review

A method for form and color recognition of food serving utensils was put forth by Tomasz Karyjak in 2015 with the potential to automate canteen self-services. Following this, in 2016, Monik Shah developed the canteen automation system using a variety of technologies, including android, web development, and databases. To make it better the android-based canteen management system was launched by Nikhil Sahani in 2019. It adopts a top-down approach that emphasizes what comes first and the steps for moving up to higher degrees of detail. In the primary phase, this system is designed at the block level. In order to automate the canteen's present manual cash process and enhance the canteen management system, M. Ambika adopted a cashless canteen management system in 2020. Then, in 2020, Ding Hongyu unveiled a CORTEX-A9 and ANDROID-based college canteen ordering system. They made an app with the aid of a cloud server and the Android platform, which helps to improve the functionality of the current system. 2020 will be the year that canteen nutrition is improved. A design for a nutrition ordering system for the campus canteen was put forth by Zixuan Xu. In order to improve the security and safety of the current system, Xiaojun Feng developed the HACCP system for canteens in 2021. To reduce food poisoning and food accidents, a safety management system in the canteen was advised. Tejas Raibagi proposed a technology to automate cafeteria tasks in 2021, and an AI-based cross-platform application is being developed.



## VI. CONCLUSION

The suggested solution includes a web application that automates daily cafeteria functions and reducing crowding in canteens. This system allows consumers to register, select food from E-menu, and place orders without having to wait in lines. Through his admin login, the admin may simply monitor and maintain the application. He would be able to effortlessly manage his firm as a result of this. This method works in both small and large canteens.

The application interface is user-friendly, so users don't need a lot of experience to utilize it; they can easily navigate it. Users can also choose their diet plan through the system. This system also solves the problem of waste food management, as a result canteens become smarter and more automated by utilizing this program.

## VII. REFERENCES

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