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Canteen Automation System

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Abstract: Organization's success depends upon the management of the services offered by them as well as the flexibility of the existing system according to different kind of working situations. These two factors are very inadequately handled by the current traditional systems, and thus should be addressed with existing modern technologies. This study focuses on the management of canteen, the flaws in their traditional system of implementation as well as the possibilities of development that can be exploited with the use of modern infrastructure. This paper presents a full- fledged Canteen Automation System implementation model for the management of canteen systems, and focuses on the benefits this system provides in the areas of analytical management of everyday data and the flexibility of the services that the canteen can provide. As a result from this research, a proper method is paved, which can be undertaken for implementation of any other Management System considering their respective contexts.
Index Terms: Canteen Automation System, analytical management, flexibility.

I. INTRODUCTION

The major aspect which controls the popularity and the usage of a system is the spontaneity and the easiness through which that system is accessible to the normal users. The system in consideration faces a major issue with respect to these requirements. Due to the ever increasing population, the demand at the canteen centers seems to be ever increasing with passing years, which intensifies the usage of the canteen resources to the fullest. If these resources are not used economically, it creates a lack of management and thus results in decreased profitability of the canteen systems.

Traditional systems tend to take longer amount of time for catering the requests of the consumer throughout the whole ordering process. This performance delay causes the system to overload and thus yield poor results leaving the canteen resources underutilized. The Canteen Automation System thus provides a way to properly manage the canteen's resources and thus manage the overall load of the system. In a heavy-load situation, this kind of a managed system would lead to better accessibility of the system for the consumers as well as the better utilization of the canteen's resources by the organization. Another point of consideration in the canteen systems is that of the possibility of a human error. Human errors can be categorized and trained accordingly by the management in traditional systems, but they incur educational costs as well as performance costs for the system. This issue can be avoided with the reduction of human intervention in these systems, or a better management of these resources with the help of modern infrastructures.

II. LITERATURE SURVEY

Following are the different ways through which the existing systems are implemented:

A. Self Service System

This system characterizes the ordering process at the can- teen desk. These orders would then be communicated to the canteen staff by the administrator through direct commands. This system usually implements the record keeping of the customer's order on a hand-written paper based token, or a system generated token. The assignment of the canteen resources is done by the administrator and the head of the cooking staff. As soon as the order is ready for dispatch, the token number is announced and the user is expected to collect their particular order by validating their token number.

B. Traditional On-Spot Ordering System

This system consists of waiters which serve the task of collecting the order from the customers as well as delivering the ready product to them. This is a well-organized method, but can't serve the conditions for heavy load efficiently enough. The management here is also done through pen-paper based system, but does not incorporate the need of a token system, instead utilizes a table-numbering system.

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C. Traditional Delivery System

The user in this system is not physically present in the proximity of the canteen and requires the canteen staff to deliver their order to their required destination. The ordering process involves the placing of order through a communication medium, such as a telephone. The canteen administrator receives this order, and proper canteen resources are assigned to process the order as well as deliver the order to the required address. The allotment is based on random selection of the delivery staff. The in-kitchen process still incorporates the pen- paper based system for record-keeping.

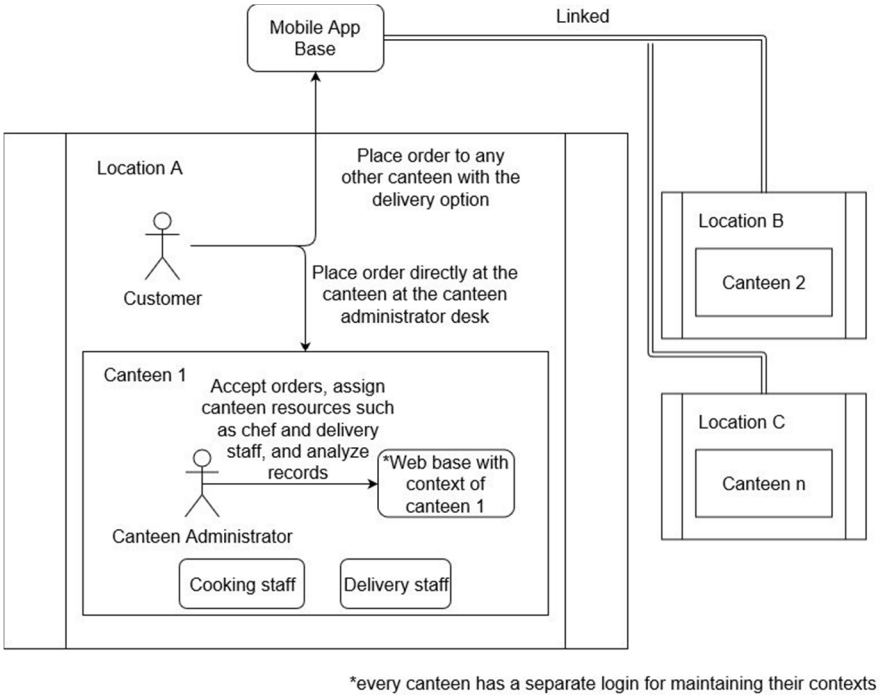


Fig. 1: Higher Level Proposed System

III. PROPOSED SYSTEM

This section describes the high level methodology that is to be followed for the implementation of the system. The methodology for a canteen system requires the clarification of the entities that are involved in the system.

A. Entities involved

1) *Canteen Administrator:* The main entity that would be handling the confirmation of the orders, assignment of the canteen staff to different orders as well as the entity that would be taking business decisions based on the analysis given by the automation system.
2) *On-Spot User:* The class of users that would be ordering at the administrator's desk, similar to the self-service methodology described above. This also includes the class of user ordering from the mobile interface provided, and collecting their order on the spot.
3) *User expecting delivery of their order:* The class of user that would be ordering their items through a mobile interface that would be provided by the system, and would be expecting their items to be delivered by the canteen staff to their desired locations. Example, in figure 1, the customer ordering food from Canteen 2 which is located at Location B and expecting a delivery at Location A.
4) *Cooking staff:* This class of user would be provided with an interface where the pending orders would be displayed as well as appropriate functions would be given which can change the status of the order preparation. These changes then would be reflected in the entire system.
5) *Delivery staff:* This class of user would be responsible for delivering the prepared items to their appropriate locations.

The delivery person would be appointed by the canteen administrator. The status changes would also be done by the canteen administrator once the delivery is complete. No interface is to be provided to the delivery person yet, but can be included in the future scope for navigating the person to the required location with the aid of a map.

B. Working

The entities described in the section above would be interconnected by the system in a specific form, based on the kind of order that the user is expecting. This generates three different flows by the system.

1) Flow 1 (User ordering at the administrator desk):

a) *Step 1:* The user places the order at the administrator's desk. The user needs to be manually present at the time of placing the order.

b) *Step 2:* The canteen administrator confirms the order, enters the items into the web base interface, collects the cash and generates a unique token for that particular user.

c) *Step 3:* The changes in the system are reflected at the interface provided for the canteen staff. Here the status of the order is "In Kitchen "in the database.

d) *Step 4:* The canteen staff prepares the order and then changes the status of the same through the interface provided to them. The status is now changed to "Order Ready".

e) *Step 5:* The User then shows the token that is given to him by the canteen administrator and then collects his order. Thus, the status of the order is changed to "Order delivered".

2) Flow 2 (User ordering through app without delivery option)

a) *Step 1:* The user places the order through a mobile application. The user needs to select items for his order and also pay through methods that are made available by the system. The status of the order thus changes to "Order placed".

b) *Step 2:* The canteen administrator confirms the order and a unique token is then generated for that particular user by the system. In case of rejection by the canteen administrator, the money would be refunded by the system to the user. The status of the order thus changes to "Order confirmed "or "In kitchen".

c) *Step 3:* The changes in the system are reflected at the interface provided for the canteen staff. Here the status of the order is "In Kitchen "in the database.

d) *Step 4:* The canteen staff prepares the order and then changes the status of the same through the interface provided to them. The status is now changed to "Order Ready".

e) *Step 5:* The User then shows the token that is appointed by the system and then collects his order. Thus, the status of the order is changed to "Order delivered".

3) Flow 3 (User ordering through app with delivery option)

a) *Step 1:* The user places the order through a mobile application. The user needs to select items for his order and also pay through methods that are made available by the system. Also the user needs to specify the address for the delivery of his order. The status of the order thus changes to "Order placed".

b) *Step 2:* The canteen administrator confirms the order. In case of rejection by the canteen administrator, the money would be refunded by the system to the user. The status of the order thus changes to "Order confirmed "or "In kitchen".

c) *Step 3:* The changes in the system are reflected at the interface provided for the canteen staff. Here the status of the order is "In Kitchen "in the database.

d) *Step 4:* The canteen staff prepares the order and then changes the status of the same through the interface provided to them. The status is now changed to "Order Ready".

e) *Step 5:* The canteen administrator now appoints a delivery person for the delivery of the product with the help of the interface provided to him. After the return of that delivery person, the canteen administrator changes the status of the order to "Order delivered".

IV. IMPLEMENTATION DETAILS

The system implementation required three phases of independent development. Therefore these activities were carried out simultaneously by different teams.

A. Database Implementation

The database system considered for the implementation was MongoDB, which is based on NOSQL data-structures. For the implementation of the system, higher level model of the complete system was represented in a tree structure, with necessary attributes for each of the entities. This higher-level model was then instantiated on Google Firebase Database Service. The steps for instantiating the schema on firebase were pretty straightforward, consisting of registering the user's account for that service.

Though, for integration of the service with the app system, the SHA certificate needs to be inserted in the project created in the user's account. For web integration, a snippet would be provided which needs to be inserted in the functions which need the database access.

B. Mobile App Implementation

The application was implemented using Android Studio. Hardware requirements for the same was limited to devices required for testing of the system. The development was carried out in a incremental sense, which first focused on the basic functionality that are required for the rudimentary flow of the system. Other functionality were added on succession as the project developed. The major application screens are represented in figures 3, 4, 5.

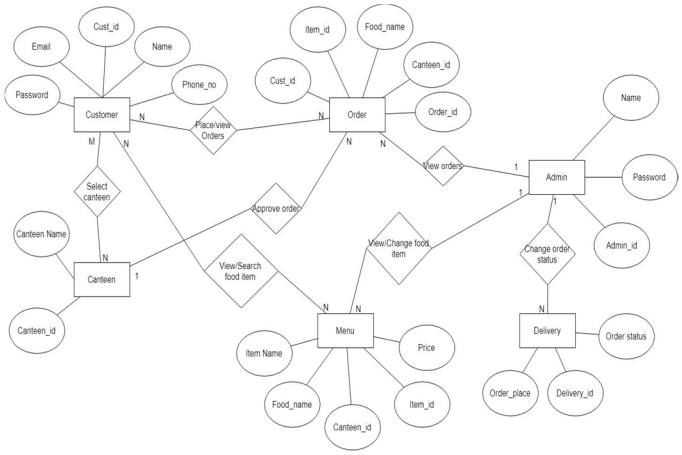
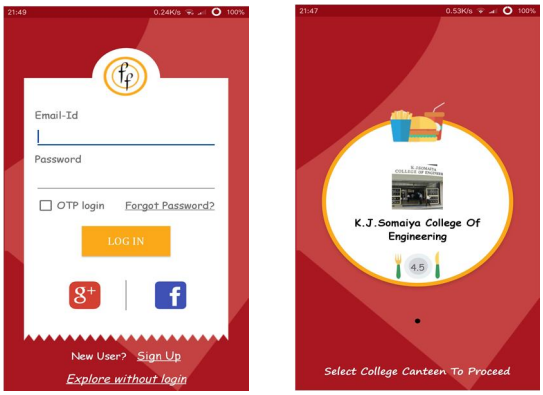


Fig. 2: ER diagram



(a) Login Screen (b) Select Canteen Screen

Fig. 3: Initial screens for the application

Figure 3 gives an insight to the basic screens for the mobile application. Figure 3a shows the login screen presented with various methods for gaining access to the system by the user. Figure 3b is presented to choose a particular canteen from a list of recommended canteens according to the location of the user.

Figure 4 covers the major screens that are in the application. Figure 4a displays the overall menu of the canteen which is chosen by the user. Figure 4b shows the final amount of the items that the user selected. Additional promotional offers can be attached in this section. Figure 4c is displayed when the order is a delivery order. In this case, the user needs to select from one of the addresses or enter a new one. Figure 4d covers the payment aspect of the system. For this system, Paytm API has been integrated for the payment process.

Figure 5 focuses on the delivery of the product. Figure 5a screen is responsible for the first two flows that were discussed earlier. An animation is also added on the token, thus the delivery guy can authenticate the token easily. Figure 5 is responsible for indicating the status of the order. The status changes by the entities are reflected in this section of the application.

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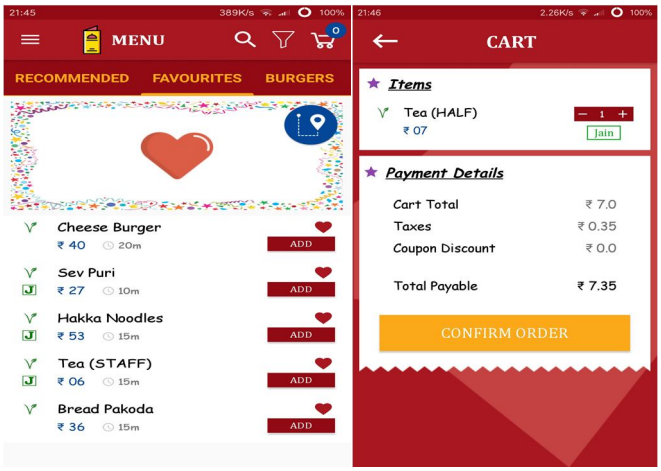
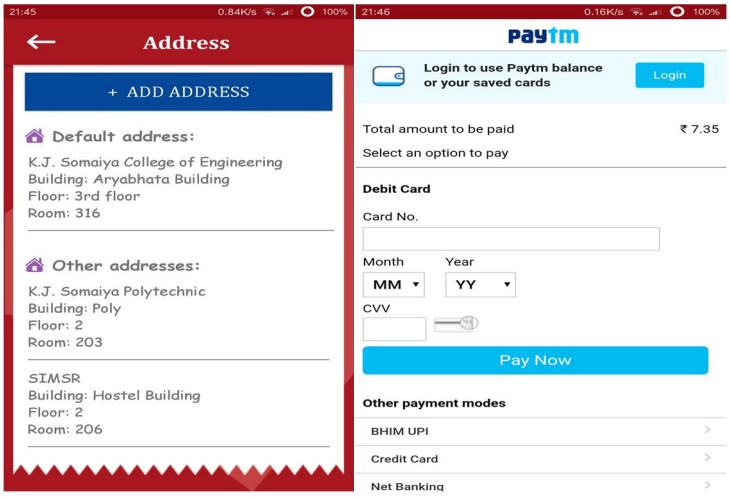
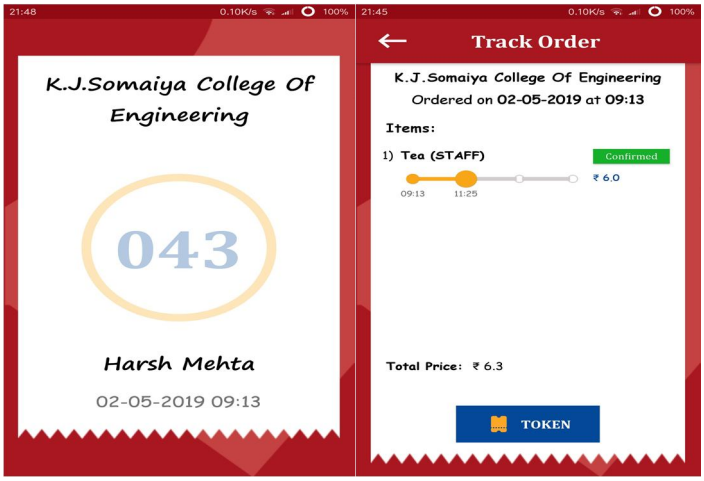


(a) Menu (b) Cart



(c) Address selection (d) Payment screen

Fig. 4: Main screens of the application



(a) Token (b) Order Status

Fig. 5: Order Tracking Screens

C. Website Implementation

Website implementation required the task of deciding the frameworks, the language that the back-end system would be based on and other specifications. For better results, the designs were not started from scratch, there was reference from certain well known templates. The template after consideration and comparison was selected. Precautions of copyright issues were also considered while selecting the template for production uses. The major website interaction screens are represented in figures 6, 7, 8.

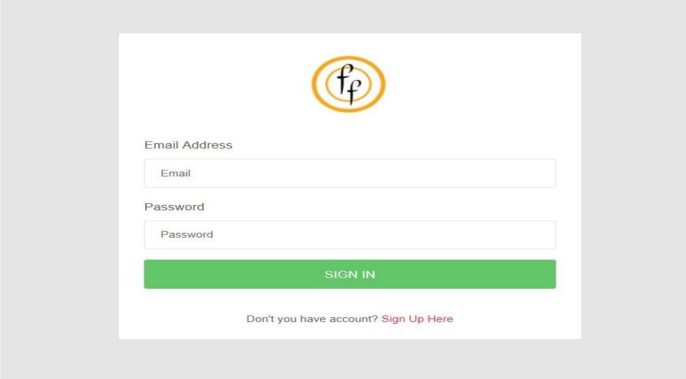


Fig. 6: Login Screen

Figure 6 represents the initial screen for the interface for both the administrator user as well as the kitchen staff user. Proper validation is achieved for a proper login system.

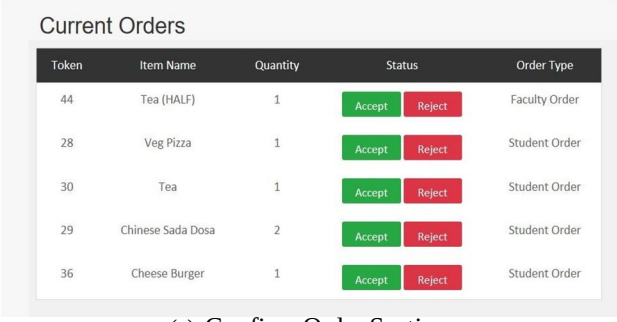
Figure 7 shows all the screens that are available at the canteen administrator's interface. Figure 7a gives the admin the control over the orders through the app, if the canteen wants to accept those orders at the moment or not. Figure 7b is required to add the order at the desk as described in the flow 1. Figure 7c shows the orders that are ready for delivery, but yet to assign a delivery person, on clicking on the assign button, figure 7d pops up, which asks for specific details about the delivery person.

Figure 8 shows the interface that would be provided to the In-Kitchen staff for processing of the orders. Figure 8a represents the interface that would be responsible for changing of the status of the orders as per the progress of that particular order in the kitchen. A kitchen staff can change the status of the order to “In kitchen “or “Prepared”. Figure 8b shows the interface for the staff that would be dispatching the orders at the desk, as discussed in flow 1 and 2. If the person has collected their order, the staff would then click on the delivered button to confirm the complete process of the order delivery to the consumer.

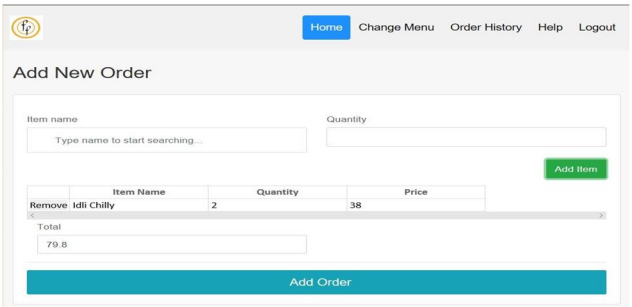
V. COMPARISON WITH TRADITIONAL SYSTEMS

1) *Better management during peak hours:* In a traditional system, the resources are usually overloaded with due works during the peak hours of the operation time of the canteen, and usually these resources are not utilized efficiently. The introduction of more defined system for management makes the utilization of these resources more effective, and also lessens the complexity of handling the system through a User-friendly interface.
2) *Higher Flexibility:* In today's world, due to the changing tax-rates, the canteen system usually takes a toll on getting up-to date to such changes. A completely autonomous system would inflict these changes internally on its own and the system would not need to focus on such changes, thus avoiding such loss of time intervals.
3) *Less paperwork:* Considering the scenario of traditional systems, the orders are maintained through a pen-paper based systems, which grows in-reliable with growing crowd at the canteen place. Orders can be misplaced, the paper can be lost or forged by the user, thus resulting in a loss for the canteen organization. In the system that is proposed by our paper, such misplacing, forging or loss of order cannot be experienced as it runs on a robust environment. Security measures are also ensured for the restriction of database access to certain individuals or entities within the system.
4) *Ease of customer access:* In traditional systems, for placing an order through the 3 flows that are described in the section above required the individual to be present manually at the canteen, or have some physical co-ordination with the canteen administrator regarding the delivery of the order to the destination. This method is usually cumbersome in case of high load situations, and can make a negative impact on the reviews about the canteen. Giving easier options for customers to interact with the canteen system would yield a higher profitability due to ease of ordering by the customer. This not only increases the profits of the organization, but also creates a positive impact of better customer service by the management.

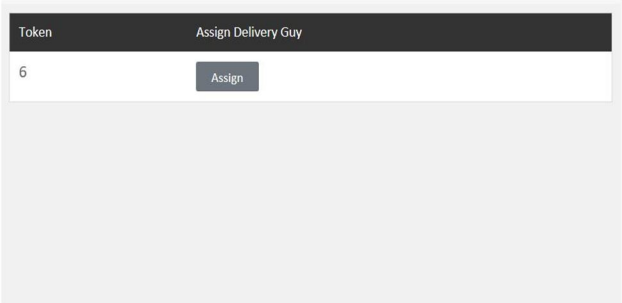
5) *Better scope for analysis for business prospects:* Considering that traditional systems maintain all the data through paperwork, it is difficult to have a cumulative understanding of the data for deciding certain business prospects. The canteen management has to go piles of pages to discover useful information from the data that they get through everyday ordering. Having an autonomous system store the data results in a defined way of collection of essential information. A proper schema would thus result in easier understanding and representation of data using data statistical methods as well as data-mining algorithms to uncover patterns of relevant information.



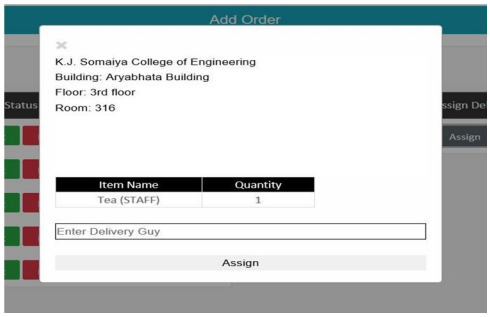
(a) Confirm Order Section



(b) Add Order Section

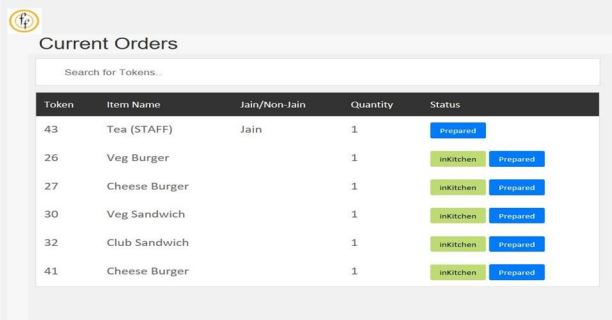


(c) Assigning Delivery person

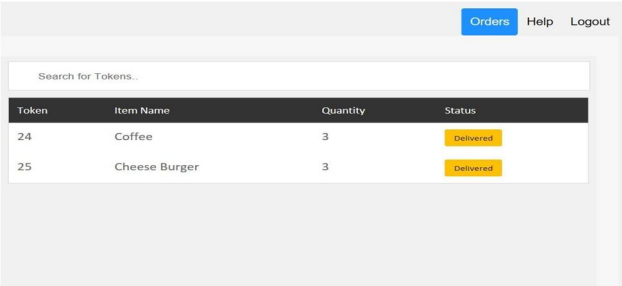


(d) Details entry

Fig. 7: Canteen Administrator screens



(a) In Kitchen Interface 1



(b) In kitchen interface 2

Fig. 8: Kitchen staff interface screens

VI. CONCLUSION

Thus, having a deep insight into the comparisons of the two systems, namely traditional and completely autonomous system for canteen management, it is easy to point out the major advantages that the new system brings in, better usability, user-friendly interface, flexible system as well as having a scope in helping in the business decisions for an organization.

This paper looked upon the general implementation methods that should be followed to achieve such a system, and also looked upon the implementation of a particular model and its benefits compared to the previous systems. This paper strives to pave a way for implementation of similar models of systems through the process that the particular implementation has gone through, namely defining the entities that would be present in the system, their interaction with each other and then focusing about the particular database, application and other low-level implementations of the model. Following such a method resulted in faster development of the entire system, as well as better way to understand the system completely.

VII. FUTURE SCOPE

The implementation that was described in the paper formulated a general implementation system. The system can be modified to support high user-ordering through implementation of a recommendation system, which would boost the kind of items that would be bought by users according to the likes of the user, their peak-load specialties and based on other user's reviews.

The implementation can also be modified in an organization-centric way, by giving more power of control to the canteen administrator regarding analysis of past orders, most sold items of the week and similar factors based on which business decisions are based on. These factors would also help in boosting the sales of that particular canteen system and would yield better reviews about the automation system.

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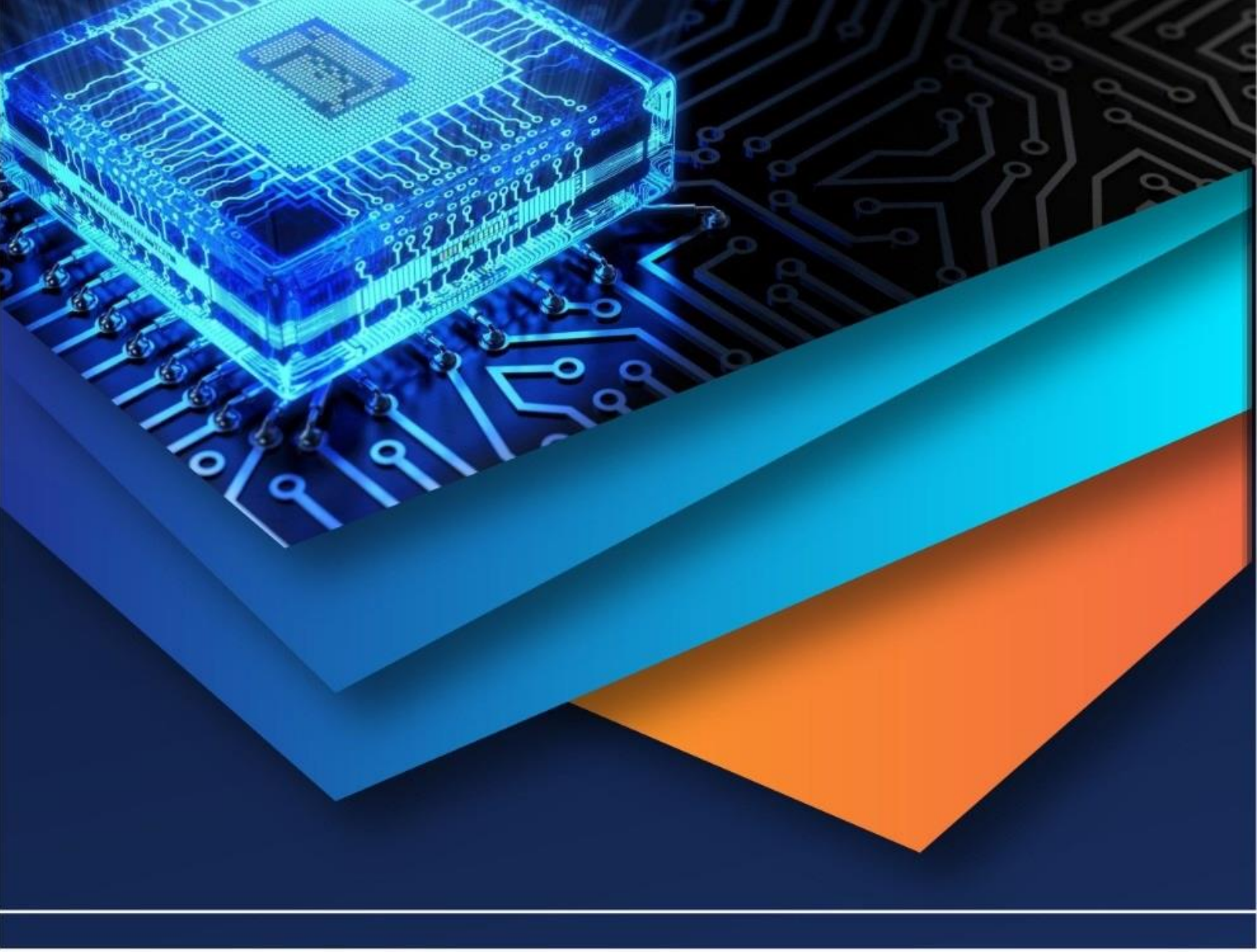

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