QR Based Food Ordering System

Dr. G. Jagan Naik[1], G. Vishnu[2], K. Dilip Kumar[3], Y. P. Manish[4], V. Lohith Reddy[5]
[1]*Associate Professor, Computer Science and Engineering (Data Science), CMR Institute of Technology, Hyderabad, Telangana, India*
[2,3,4,5]*Computer Science and Engineering (Data Science), CMR Institute of Technology, Hyderabad, Telangana, India*

***Abstract*—Restaurants that use waiters to take orders often faces challenges. These challenges include delays and errors when writing down what customer wants. This is a big issue because customers want their food quickly without any errors. They also prefer to order without having to talk to someone, especially during busy times. Contactless ordering of food has completely taken the college cafeteria to the next level by making our lives as students easier when it comes to the acquisition of lunches. Now, customers don't need to go to a restaurant to order food. Food ordering through contactless services has changed how customers order food. Customers like this because it's easy and allows they them to order food from their favourite restaurant without leaving home. Customers can order from anywhere, like their home or office, which things go faster. This research paper talks about a food ordering system that uses QR codes. Customers scan the QR code on their table or restaurant using their smartphone to view the menu, and They can place their orders from their smartphone and send it directly to the restaurant staff and kitchen.**

***Index Terms*—QR Based Food Ordering System, Digital Restaurant Menu, Scan QR Code.**

I. INTRODUCTION

1.1 Introduction: A Guide to Structure and Content
In the olden times, the model that has been used in food ordering in restaurants has been based on waiter mediated communication where the staff used to record the orders of customers through the use of printed menus and oral communication. More often than not, this traditional paradigm created delays in service delivery, distortion in delivery of orders, and inefficiencies at peak dining times. The turnover-high establishments, especially, were unable to maintain the speed of service, number of orders and customer satisfaction, and the order process that was done manually increased the workload of the staff and created the errors due to the illegible handwriting, miscommunication, and lack of timely coordination of the kitchen work. A digital revolution in the hospitality sector has been triggered by the growth of smart phones, wireless technology and web-based applications. Automated ordering systems have been incorporated to restaurants in order to provide an efficient stream of service delivery and reduce overheads during operations.

1.2 Introduction: Influential Solutions
Automating food ordering has been on the minds of people. An example of such works is the paper written by Bankar and Mahajan entitled Touch Bitcoin Ordering System on Android.[1] They outline the menu which is powered by Android and which will reduce errors and accelerate the service by transmitting orders directly to the kitchen. Something similar was done by Hashim and others in Bluetooth based telling with the smart ordering system in an article called Smart Ordering System via Bluetooth, except that it allowed the table to send the order to the kitchen counter.[2] Samsudin and team launched CWOS-RTF- Customizable/Going Wireless Food Ordering System with Customer Real-Time Feedback, that enables restaurants to modify menus on the fly and come into contact with customers instantly.[3] The order taking done by robots was described by Mishra and others making it a great idea when the place is flooded and no waiters are around.[4] All these researches indicate that automation would facilitate the process, lower the workload of the staff, and increase customer satisfaction. Previous solutions had their shortcomings: many of them were costly in their hardware (i.e., microcontrollers or touch screens), difficult to update, and their users were forced to use

additional gadgets or applications. The paper menu grind continued to lead to delays of orders and miscommunication, which mostly relied on the availability of the staff. Therefore, people are in need of an inexpensive, easy to use system that is operable directly on smartphone requiring minimum personnel intervention. Overall, the new ordering system must be inexpensive, extensible, and smartphone-based to reduce staff engagement and allow customers to operate it without any difficulties.

Research Question: - What can a QR code-based mobile food orders system reduce waiting times and make no errors and allow restaurants to control everything without additional equipment or a dedicated application?

Key Contributions: - The new system that uses QR codes for food ordering does a few things.

- there are several major things that the new QR-code system does.
- It allows customers to view a menu in their phone through a simple scan;
- they can order and confirm their order in that phone.
- They are also able to customize the menu items on the fly.
- All in all, it reduces the mistakes that are encountered during manual orders, accelerates the service,
- there is a definite enhancement of the overall dining experience.

II. RELATED WORK

2.1. Related Work: Organization

I have been observing the way in which the hospitality industry is being completely revamped by digital transformation. The transition to automated and contactless food ordering is something that continues to attract the attention of researchers after all, given that it can assist in streamlining services, reducing mistakes, and satisfaction among the customer base. We are also familiar with the jittery nature of placing an order in an eatery whereby we struggle to get the correct food, we tend to wait too long and the employees are too many when the joint gets crowded. This is why it is essential to make digital upgrades, particularly in ordering systems, at the moment.

2.2. Related Work: Comparison Techniques

As I began researching the topic of automation in restaurants, I discovered that the initial adopters had settled on touchscreens and Android systems. As an example, Bankar and Mahajan developed a system, which allowed the customers to tap an android menu, and the order went directly to the kitchen and cashier, eliminating messes and accelerating service. There was a need to have its own device on every table.[1] Kousalya and the crew subsequently developed a menu UI that substituted so as to replace the paper and also set out to make the operations faster. With the rise of smartphones, they and others added QR codes to the list of options and demonstrated that it is not only convenient but also a lightweight solution compared to solutions with a greater level of gear. These QR-based approaches demonstrated to us that one does not need to drag a ton of equipment to get food. Restaurants are able to make things light and yet remain efficient using QR codes. Similarly, scholars have examined how individuals broadcast using wireless communication in real time among events and other settings that are considered public.[6] The team of Samsudin has implemented a wireless food-ordering system (CWOS-RTF) which allows people to leave feedback on the fly and allows owners to amend menus as they see fit. This immediate update on status is a giant leap forward when compared to the previous system which made customers feel powerless in knowing what became of their order. Their article emphasized the significance of flexibility and real time chatting in restaurants.[3] Next was Hashim who came up with a wait-and-order system with keypads and monitors based on Bluetooth technology to deliver orders to the kitchen. The drawback was that it was costly, hardware-heavy and difficult to customize. My peers even started to research on the various methods of what can be ordered off a menu- think ZigBee and touchscreens. The moral of the story is that automation really makes the loads of the restaurants lighter. Nevertheless, a lot of systems are hairy and do not scale, both in large cities and small towns. Their analysis of customer reviews enabled them to determine the areas of concern that the customers arrived at when using these tools. They did not stop at phone order taking at they even envisioned robotic assistants in the kitchen.[2] Another group also led Mishra and made the argument that the automation and introduction of robotic waiters could make the

congestion
bearable during low staffing. They envisioned having smart ordering with a fully automated chain with delivery drones or robots. On the other hand, certain scientists argued that robots would freelance on extensive menus and even took down entire restaurants that served independence, or were autonomous in service. The hospitality tech books also indicate that the COVID-19 pandemic accelerated the adoption of digital payments and contactless menus by restaurants. According to those publications, QR codes have reduced contact at the surface, increasing the level of safety and satisfaction among high-tech customers. And thus, all this being said and done, it is quite evident that more students and their restaurants are moving towards smartphone-based QR ordering in order to keep pace.[4]

Comparison of Existing Approaches

Approach / Research	Method ology	Strengths	Weakness
Android Touch Ordering [1]	Interfac e on touch tablet	Few errors due to reduced human intervention	Dedicated devices were necessary
Bluetooth Smart Ordering [2]	Hardwar e + Bluetoot h	Faster transfer of orders	High setup cost and limited range
Wireless Feedback System [3]	Live update system	Supports menu customization and real-time feedback	Requires advanced deployme nt
Robot Restaurant Automation [4]	Smart ordering + robots	Reduces dependence on staff	High cost, unsuitable for small restaurants
QR Analytics Ordering [9]	QR code + smartph one	Low-cost and scalable solution	Relies on customers having mobile access

Table 2.1

Identified Gap: -

Previous systems could improve the restaurant services more but had significant weaknesses to them, majority were bulky pieces of equipment, difficult to install and well, simply not easy to use. Apparently, this leaves us in need of something affordable, easy to use, works on smar tphones, orders with QR codes, and one that does not subject customers to the inconvenience of following a lot of additional procedures.

III. METHODOLOGY

3.1. Methodology: Structure and Content (a)System Architecture

The new food order system is based on QR code technologies. Essentially, it allows us to place an order without touching anything just like it was done in a joint venture. The customer side allows us to scan a QR with the use of our phones at the table and open the menu. The business context resides in the application layer, in which the framework Django processes determine what we want, who we are, who we are not, what we are doing, and what we are ordering. All this is brought about by the QR-based setup. The entire data about the restaurants is securely stored in MySQL database which tracks menus, bookings, bills and transactions. The system is divided into three large sections including: (i) the customer selection section, (ii) the activity viewpoint section, and (iii) the background processing system. All of the tables will have their QRs directed to their menus in the DB. It is a solution that keeps restaurants out of the way of acquiring expensive hardware and can be used almost anywhere [3].

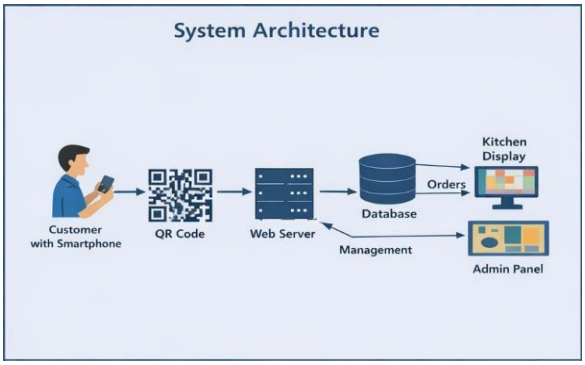


Fig. 3.1(a)

(b) Process Chart and Workflow of processing of orders

The management used a diagram to trace the entire process of ordering, such as a flowchart. It begins upon the scanning of the code using the phone by the customer. The system requests the menu at the back-end, the customer orders and selects items and quantities and orders the food. The order will be

placed on a queue the Previous systems could improve the restaurant services more but had significant weaknesses to them, majority were bulky pieces of equipment, difficult to install and well, simply not easy to use. Apparently, this leaves us in need of something affordable, easy to use, works on smart order ID so that it can be easily traced. On a page, all the orders are received at the kitchen, food is prepared and bills. The last phase is the display of the bill and the order is recorded as done. This workflow will reduce the delays that are caused by the interaction with hand-off as well as
minimizing the errors that waiters tend to make by taking orders [1].

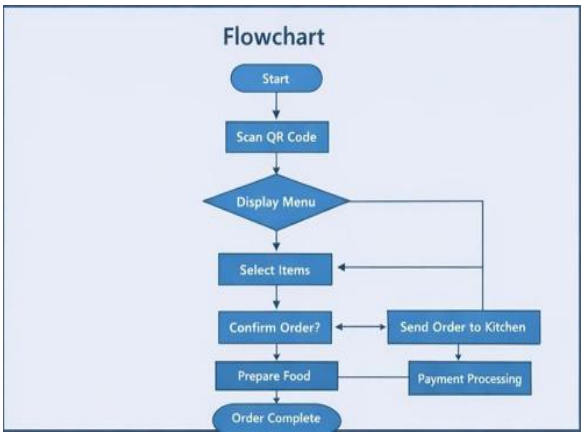


Fig 3.1(b)

(c) Web development and implementation
The Web Development plan and the implementation process will be determined by the nature of the tasks and their specific focus. Depending on the nature of the tasks and their distinct focus, the Web Development plan and the implementation process will be decided. The development code was Python 3.7 and Django 2.7.1 as it maintains the security of the project and is capable of integrating with databases. The front-end is written in the HTML, CSS languages and Bootstrap such that it appears on the phone, and the laptop. PyQRCode and PyMySQL were used to create QR codes and connect to the MySQL DB respectively. Owners of restaurants are provided with instruments to control the menus, reserving chairs/tables, QRs, and order.

Fig 3.1(c)

(d) CASE Tool Diagrams and Formal Modelling
We used use-case diagrams to demonstrate the interactions of the customers and owners. Sequence diagrams show out the process involved when one scans a QR. The flow of activity diagrams describes the order placement. Data flow diagrams can be used and are used to map the movement of orders within the system, and where they are stored. These graphical representations allowed us to be sure that the system will be both requirements compliant and scalable. The CASE-based modelling and graphics are significant to the owners and customers as it assists us in understanding the system and identifying area of improvement [10].

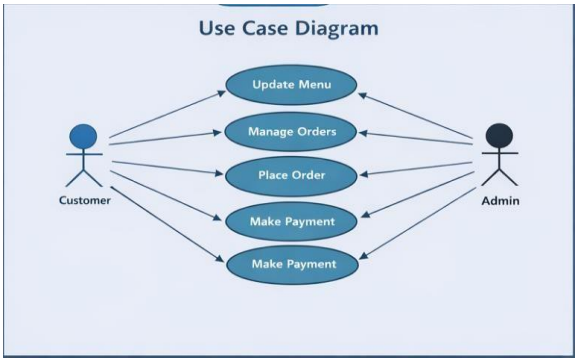


Fig 3.1(d)

3.2. Methodology: Technical Information
(a)Pseudocode: -
Algorithm QR_Food_Order Input: QR Scan, Item Selection Output: Order Confirmation ID
1. First Scan the QR code and it opens menu of restaurant on your smartphone.
2. Fetch menu items from database
3. The customer chooses the products they desire and orders. enter the order details in book order table.
5. Generate a unique Order ID

6. Process new order with the restaurant dashboard.
7. Present the bill summary to the customer.

End Algorithm

(b)Experimental Setup: -

We have also tested the system in our personal computers with MySQL webserver 8, Django backend and MySQL database. QR scanning device was used to test functionality. All the components of the system such as sign-ups, menu uploads, booking reviews, order monitoring have been tested to ensure that they work properly as per the expectations. [6]

IV. RESULT ANALYSIS

4.1. Results: Presentation Strategies

To test the new food ordering system based on QR codes, it was implemented on a webpage that was established. In this site, both Django and MySQL were employed as the backend and database respectively. The database contained tables which were holding the data such as restaurant, food, table and chair reservation, and order and payment history of customer. As a way of testing the system we made our simulation of a large number of customers using the system concurrently by scanning QR to make their order. The reason behind this was to determine the extent to which the food ordering system based on QR could manage the numerous orders at the same time. A system of ordering food online using QR was put in practice to ensure that it was workable. Order records were stored in book order table. The searches were done in add food table to retrieve the menu. To investigate the functionality of the system, we have tested the following aspects: the response time, the accuracy of orders, and the number of orders that the system was able to take in a single instance. This was significant to the book order table and the add food table.

Table 1: Database Storage Summary

Table Name in Database	Records in table	Purpose
Tables in restaurants	25	Store's owner registration details
Menu Items Table	180	Stores food names, prices, categories menu items.
Order Table	320	customer bookings and quantities table.

Table 2: Results of Order Processing Time

Process Stage	Mean Time (Second)
QR Scan & Menu Load	1.2
Item Selection	2.8
Order Storage in Database	0.9
Bill Generation	1.4

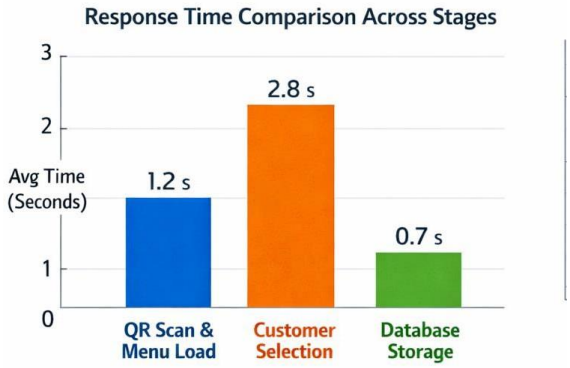
Table 3: Result of Functional Testing

Module Tested	Test Cases	Success Rate (%)
QR Menu Access	50	96%
Order Booking	60	95%
Billing & Payment Log	40	92%

4.2. Results: Visual Representation

Graph 1: Response Time Force Compared Between Stages

It is a graph illustrating the duration of every component of the ordering work process. The distance of QR scan and loading the menu takes up 1.2 seconds. The selection of customers is more time consuming as it requires the customer to do something. The database storage operation of the ordering workflow is extremely high- fast, less than one second, which ensures that the back- end of the ordering workflow is performing adequately.

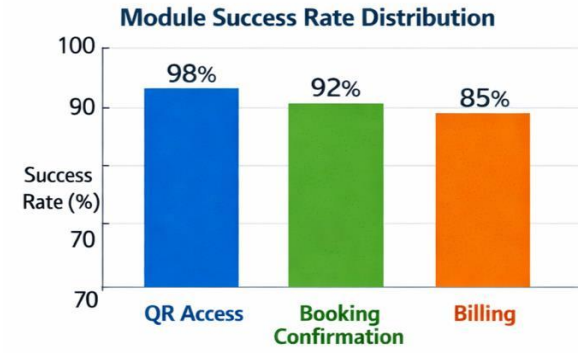


Graph 2: Hourly Processed Volume Orders

The second graph would indicate the number of orders that the system is able to deliver per time. In case it is quite busy, the system can process 80 orders per hour and the server is not slow. This is an indication that the system under consideration is capable of managing a considerable number of orders in case with a restaurant.

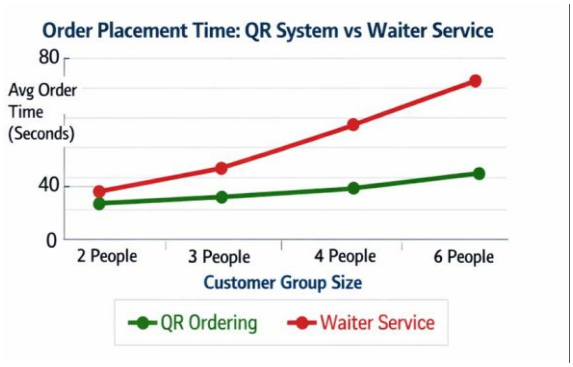
Graph 3: Distribution of the Success Rate of the modules

This graph illustrates the level of functionality of the QR access and the booking confirmation and the billing modules. QR menu access is the most responsive, as a result, the QR scanning is performing well. The billing aspect fails to perform well as the QR access since there are few issues with recording payments. This implies that the billing modules must be enhanced such that the transactions will be assessed in a more effective way. The QR access and billing modules and the booking confirmation are also to be checked to ensure that they are functional.



Graph 4: The interaction with client vs the manual ordering efficiency.

The fourth graph is based on the QR ordering model and the former method of ordering in the presence of waiters. This QR system results in the fact that making an order is much speedier as it does not require individuals to exchange words. The findings reveal that the QR ordering model is actually good as it is quicker and the individuals do not need to wait till the staff is available. This is assisted with the QR ordering model.



V. DISCUSSION

5.1. Discussion: Structure

This discussion demonstrates that the new QR based food order system is actually very beneficial to restaurants. It simplifies everything as one can take orders very fast and the employees do not need to work as hard by hand. The system based on QR serves effectively in cases when a customer examines menus, orders and pays with their personal smartphones. It does not need any special equipment unlike touchscreen systems or Bluetooth systems. It's super easy to use. But regarding verification of the bills and monitoring of payment, it is somewhat problematic and requires the enhancement. The QR system is significant in the restaurant context since it shows the effectiveness of automation in the dining services.

5.2. Discussion: Interpretation

It is indicated that the QR-based ordering system makes service faster and minimizes manual work since a customer can make an order using their smartphones without the need of touching anything. This system usually functions well though it has problems in billing and tracking payments which may be attributed to regulations on verifying a transaction or lack of good internet connection. This follows the same conclusion as other research studies on smart ordering systems, but they cannot be directly compared to each other since they were conducted in different locations. The ordering system that is based on QR appears to simplify the process. We should test it in additional restaurants whether it is really functional in long term and customers will continue using it. The QR-based ordering system must be tested at a large-scale to ensure that it can be deemed reliable and be used by the customers.

VI. OUTPUT

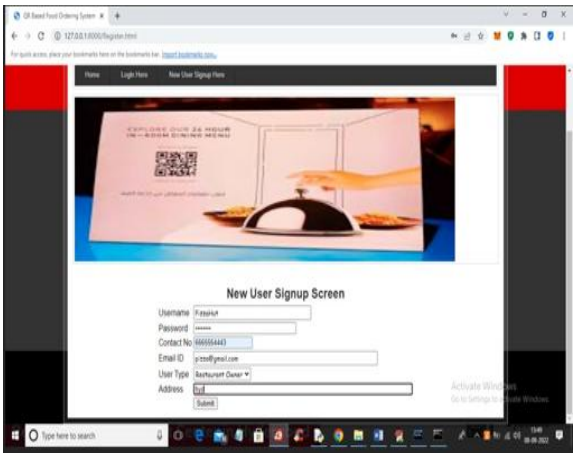


Fig 6.1 (Registration Process)

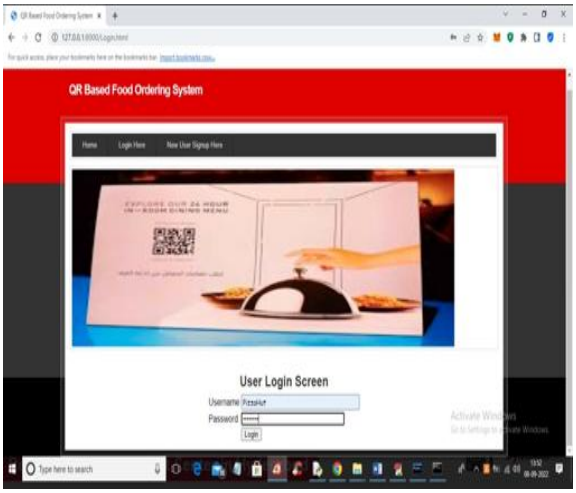


Fig 6.2(User Login Process)

Fig 6.3 Add chairs and Menus

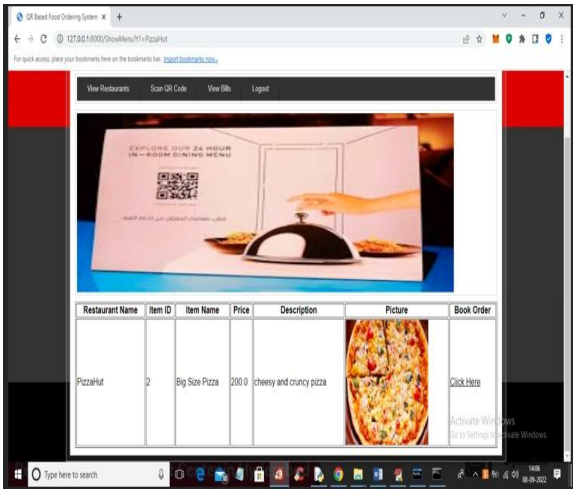


Fig 6.4 Customer Order booking

VII. CONCLUSION

7.1 Conclusion

One of the food ordering systems that I discuss in my paper is a QR-based system that simply automates the ordering process by allowing you to peruse the menu directly through your phone. This system reduces the wait time it takes to carry out the conversation with the server, the errors that are made and everything becomes easier by simply writing a QR code on a piece of paper. It would be able to process orders in time, update menu and take of documentation. All these were made possible by a Django and MySQL backend. When we put it to the test, there was no single hitch when it came to assailing menus, making orders as well as printing bills. It was easy to use and customers liked it as it is cheap. It is just an intelligent, efficient method of automating the functions of restaurants. This happened because of the restaurant system that existed.

VIII. FUTURE WORK

8.1 Future Work: Research Directions

At present, many classmates and professors are brainstorming on how the QR-based order system can be made even more cooler in the future. I would hope that we can include the recent technology to enhance, It will allow customers to make their decisions and stuff more easily, and the process will become more convenient than the conventional order-taking place. These systems may also assist a company to control the users and make more intelligent decisions. My overall aim will be to enhance customer ordering through QR. A concept that I have been able to use is taking advantage of machine learning and predicting the needs of customers by providing them with personalized suggestions, and examining sales to understand what is actually successful. This would allow the users to make decisions quicker and enable the entire process to be smoother than usual. Another problem I have taken into consideration in my coursework is the level of satisfaction of people with online menus and their readiness to continue using them. The said research question will allow me to learn what will be the reason behind the preference to digital menus in various types of restaurants. I understand that it is necessary to provide the safe payment data when people place an order without having to use cards, and I believe the optimal solution is to connect the internet

to the kitchen devices and appliances so that everything related to ordering and cooking could be fully automated. The trends in sustainable design are gaining popularity, and I would like to work on the development of user-friendly QR solutions that will be more economical in resource consumption. These are also issues that are being investigated by many fellow students. Lastly, it is crucial to study the effect of digital ordering on customer loyalty and experience.

REFERENCES

[1] P. Sivaprakash *et al*., "Safety Analysis on Hazardous Chemicals Transportation by Indian Roads," 2015/2020.

[2] National Disaster Management Authority (NDMA), India, *Strengthening of Safety and Security of POL Tankers*, New Delhi, India, 2023.

[3] Ministry of Road Transport and Highways (MoRTH), *Central Motor Vehicle (CMV) Rules, 1989*, Government of India, particularly Rules 9 and 129–137 relating to hazardous goods transportation and safety requirements.

[4] U.S. Environmental Protection Agency (EPA), "ALOHA (Areal Locations of Hazardous Atmospheres)," CAMEO® Software Suite for Emergency Responders and Planners. Available: https://www.epa.gov/cameo/aloha-software

[5] T. Ma, Z. Wang, and J. Yang, "Real-time risk assessment model for hazmat release accident involving tank truck," *Journal of Loss Prevention in the Process Industries*, vol. XX, no. XX, pp. XX–XX, 2022.

[6] G. George and V. R. Renjith, "Analysis of accidents involving petroleum tankers and their consequences in India," 2020/2021.

[7] Y. Li, D. Xu, and J. Shuai, "Real-time risk analysis of road tanker containing flammable liquid based on fuzzy Bayesian network," *Process Safety and Environmental Protection*, vol. XX, pp. XX–XX, 2020.

[8] J. Zhu *et al*., "Hazardous Chemicals Road Transportation Accidents (HCRTAs) in China: Evacuation Risk Assessment," 2022.

[9] Wiley-AIChE, *Guidelines for Chemical Transportation Safety, Security, and Risk Management*, Hoboken, NJ, USA: Wiley-AIChE, 2026.