Proceedings of the International Conference on Sustainable Expert Systems (ICSES-2024)
IEEE Xplore Part Number: CFP24VS6-ART; ISBN: 979-8-3315-4036-4

Seamless Service Evolution: Enhancing Customer Satisfaction Using AWS-Driven AI Chatbots for Restaurant Ordering

Mohammed Jaffer Ali
Dept. of Computer Science and Engineering
Amrita School of Computing
Bengaluru, India
bl.en.u4cse21124@bl.students.amrita.edu

M R V Vyshnavi
Dept. of Computer Science and Engineering
Amrita School of Computing
Bengaluru, India
bl.en.u4cse21114@bl.students.amrita.edu

Konda V S Harshith Kumar
Dept. of Computer Science and Engineering
Amrita School of Computing
Bengaluru, India
bl.en.u4cse21101@bl.students.amrita.edu

Sravya Vishnubhatla
Dept. of Computer Science and Engineering
Amrita School of Computing
Bengaluru, India
bl.en.u4cse21194@bl.students.amrita.edu

Shinu M Rajagopal
Dept. of Computer Science and Engineering
Amrita School of Computing
Bengaluru, India
mr_shinu@blr.amrita.edu

2024 4th International Conference on Sustainable Expert Systems (ICSES) | 979-8-3315-4036-4/24/$31.00 ©2024 IEEE | DOI: 10.1109/ICSES63445.2024.10762974

***Abstract*—In the current restaurant business environment, factors have emerged in the manner in which consumers are attended to and the ways orders are placed. As good as these traditional systems may be, they do not offer the optimum flexibility and consumer convergence that today's client demands for fast and convenient services. Recent approaches using only basic form of automation and rule-based chatbots do offer some enhancements but lack adequate capabilities to deal with huge volumes of orders, custom recommendations and scalability according to demand. Further, the existing systems have problems with scalability, versatility to different customers' trends and needs, and real-time interactions.**

To overcome these challenges our work, will utilize modern advances in artificial intelligence and cloud technology. The proposed system uses Amazon Lex for NLU, AWS Lambda for processing multiple booking requests simultaneously without any intervention from the users and Amazon Polly for making interaction more interactive with personalized audio. In addition, Amazon Rekognition and AWS S3 for images will be used for analysis of images and proper storage of data respectively, enhancing the customer satisfaction by recommending products based on a past order. All these technologies integrated with AWS ecosystem in our solution will provide convenience, efficiency and passion to restaurant business proprietors to fulfill the increasing demands of modern customer. The system also supports linkage with some commonly used applications such as WhatsApp, guaranteeing that the customers receive timely updates. Thus, this solution is designed to create an improved status of restaurant ordering and eliminate the problematic experiences placed in current schemes.

Keywords— AI-driven Chatbot, Amazon Lex, AWS Lambda, WhatsApp Integration, Order Notifications, EC2 Hosting, Customer Service Optimization

I. INTRODUCTION

In the current world, restaurants are many, and this has made ordering to be a big issue together with customer relations. The conventional systems of ordering foods that are otherwise time-consuming and inconveniencing are fast becoming useless given the current market demands from the consumers who want their foods to be customized and delivered in the shortest time possible. Being aware of this, our project's objective is to transform the traditional restaurant ordering system through integration of such technologies as artificial intelligence (AI) and cloud computing environment. In these innovations, we are always working towards achieving an improved alternative of delivering improved customer services in the restaurants while at the same time aiding the restaurant to function most effectively. The core of our solution is an AI-based chatbot that changes the customers' experience of ordering food and drinks. The advanced integrations of Amazon Lex for natural language processing makes the chatbot capable of conversing with the users at basic levels and recommend products based on the previous orders made. This enables customers to order products timely, state the amount they require and be recommended on other products. Choosing AWS Lambda, which is the serverless compute service, will handle the requests and inquiries about the booking systematically; It's also possible to have multiple processes at the same time which do not require immediate human interference.

Also, the feature of Amazon Polly will improve the effectiveness of the chatbot's work because it will turn text answers into speech, so the conversation will be more interesting and friendly. The commercial features include image analysis from Amazon Rekognition to suggest relevant items depending on what the user feeds to the system and user preferences and images storage in AWS S3 for easy access when required. This service will be overseen by AWS CloudWatch in an effort to keep track of system usage and determine areas in which service can be enhanced. To reach out to even more people, we will build this chatbot on the WhatsApp, one of the most used messaging platforms across the world. This integration means that the users can use the chatbot in a familiar interface which improves their experience. The messages of each order status change will be sent out using the Amazon Simple Notification Service (SNS) so that the customers will be able to receive notifications on their orders in real-time.

The whole platform will be hosted on AWS Amazon EC2 instance, flexibility, and quick response rates even during large traffic loads. Unlike most of the systems that employ AI and cloud services as supplemental tools, our approach is to utilize them as enablers of an efficient ordering process for each element of the solution. Our goal is the use of all these technologies to not only enhance the operational efficiency of

restaurant but also to provide the customer with the better experience. Lastly, to summarize, this work aims at presenting new, innovative ways in ordering for meals at restaurants through the incorporation of artificial intelligence.

II. RELATED WORK

There has been a lot of research carried out in the area of AI with special emphasis on the use of both NLP and Machine Learning with chatbots. The following section presents a synthesis of literature which compares the strengths and weaknesses of the highlighted approaches. [1] Eko Handoyo et.al. In this paper, the authors describe a real-time chatbot system with the ability of training intents with webhooks and machine learning algorithms. The strength of this work is that a person does not have to wait for a reply, which is essential for places with a great flow of people, for instance, to book a ticket or enhance client service. The F-measure score that was generated is 89 percent. 65%, the chatbot establishes high levels of precision and recall to respond to user interactions appropriately. This real-time processing feature improves the overall performance and satisfaction of the customers, especially in sectors that deal with the ever-evolving market. Nevertheless, there is observable inefficiency of the system especially when interpreting out of topic responses and misspellings. One of the disadvantages of the approach is that a chatbot fails to understand inputs that are not within the actual training data, which makes it provide wrong or unrelated responses. This limitation affects the applicability of the system in real-world applications where user inputs patterns may differ significantly from the predicted patterns. Enhancing the system's capacity to handle unanticipated input through broad-sphere NLP models and inclusion of other functions such as spelling check and contextual learning would assist in containing this problem. Also, enhancing the learning ability of the chatbot from the exchanges could assist in dealing with actual environments that are not as rigid in terms of user's behavior. [2] Maher S. et.al. Taking Amazon Lex as the platform, the authors examine the applicability of the approach to chatbot development in customer service that is financially reasonable for businesses. The merit of this approach is in the usage of the underlying architecture of Amazon Lex where the customer service application will benefit from scalability, reliability and low operational costs. It is designed to work in harmony with other business applications that are often used at the enterprise level thus making it a popular choice among many organizations. With AWS cloud infrastructure deployed, it means that there will always be availability of service with a small amount of latency which is essential so as not to frustrate the customer. The drawback is that the chatbot lacks the ability to some extent of long-term memory with the user. This leads to the loss of memory on some of the prior communication making the chatbot inadequate in offering timely and relevant engagement. This absence reduces usability from the user's perspective because the customer may get annoyed to enter his or her details repeatedly in each session. Possible future work can be focused on the integration of memory moderators or using session storage for saving information resulting in the possibility of a more personalized conversation and decrease of user's frustration. If the system were to incorporate more context-awareness and memory, then the chatbot's effectiveness would greatly increase in fields where the customers' interactions are scattered across multiple sessions. [3] Xusen Cheng et.al. This paper looks at the role of emotions and specifically amount of friendliness that is incorporated into chatbots with reference to e-commerce platforms and outcomes of the impact on customers' trust and their level of satisfaction. One of the major strengths of the study is the documentation of the fact that empathy and friendliness are

essential if one has to build the trust of customers. The authors prove that user interaction with the chatbot that is based on the emotional intelligence of the bot is much higher and creates a better chance of customer loyalty and retention. In situations where trust plays a significant role, for instance in online shopping, such an interaction mimicking a human server improves the clients' experience. However, major disadvantage of the above system is that it is not well suited for search queries with several terms. Though, having empathy and being friendly improves the two-way communication in simpler customer interactions; it is problematic when dealing with technical or task-oriented customer inquiries due to a lack of technical or domain knowledge. The issue arises when the chatbot's ability to respond to the user's input is not efficient enough to handle the queries, which leads to dissatisfaction of the user. Future enhancements should aim at achieving a balance where an employee will possess empathy and higher order thinking skills in solving the problems that may arise. It is recognized that the use of domain-specific knowledge and increasing the performance of the chatbot in performing certain tasks will increase the effectiveness of its activity in dealing with complex-oriented customers. [4] Sonali Suryawanshi et.al. About this, the authors of the present research investigate the use of chatbots in e-commerce with the aim to improve the shopping experience by providing relevant product suggestions. One of the greatest strengths of the system is that it increases customers' loyalty through the prediction of their further behavior. The given approach makes a truly individual shopping experience far from the mass frenzy and greatly enhances the client's chances of making a purchase. Apart from helping the customers, the chatbot also has the added advantage of selling various products with the right recommendations at the right time. However, the system is not useful for executing more elaborate searches and information retrieval that involves comparison of products or seeking for technical details. As for the conversational [skill], the chatbot demonstrates rather weak results in regard to more complex question and answer sessions such as analyzing causal relations, while it easily copes with less complex tasks, for example, tracking an order or searching for a specific product. This shortcoming implies that although the chatbot is useful in improving the engagement and the interaction of a user within simple contexts it is not adequate for complex customer relationships. In the successive development of the chatbot next step AI models can be designed, which can understand the requirement of the customers and can serve the purpose of shopping in a better way.

[5] Mohd. Tajammul et.al. This work is concerned with improving the security of chatbots, most especially in industries that involve the handling of customer detail that are often sensitive such as the health sector or the financial sector. A strength of this system that can be easily identified is that the System uses Two Pass encryption algorithm to improve the security of the customer data so as to minimize data leaks. The measures that have been used in this system, makes it appropriate to be used in various industries, especially where data security is crucial. In that, one of the features of the

system is to assign an automatic key to each document created, thus enhancing security since individuals without proper access right cannot open any document without proper account access. The major drawback highlighted in this approach is in fact related to the security-performance issue. Encryption makes the computation process heavier as that hampers the chatbot and makes its response slower that are not favorable for the users. In client interactions specially when speed is a matter of consideration, such delay could pose as a major concern among users. A follow-up study could look at further advancing the type of encryption used or shifting towards utilizing less resource-intensive encoding styles. These delays could be possibly avoided with parallel processing and choosing the most efficient algorithms that would guarantee secure and fast communications.

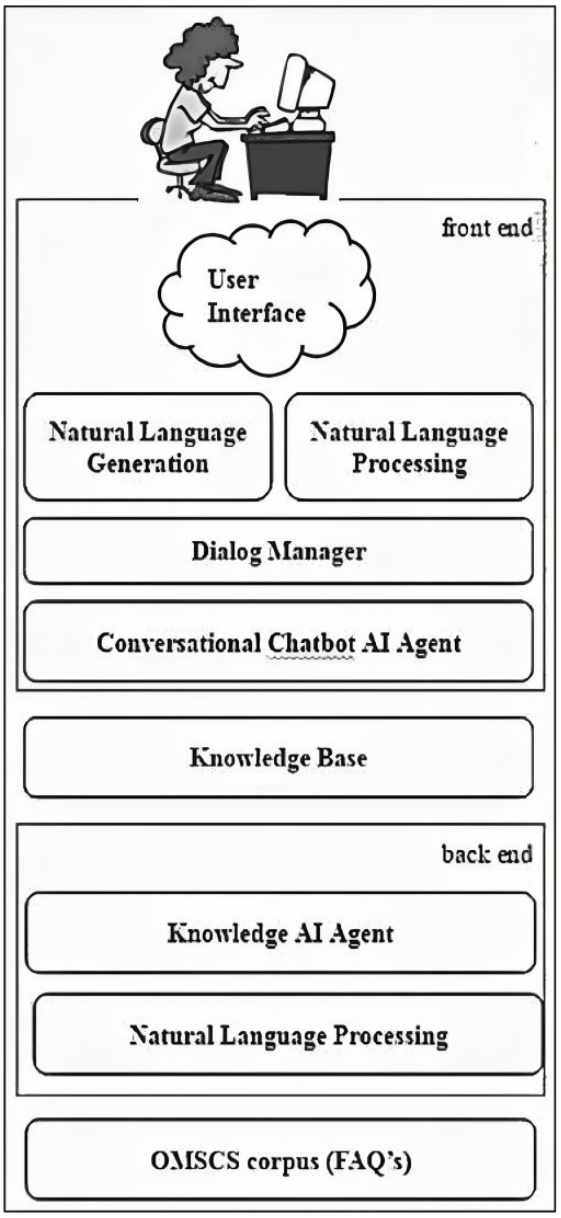

Fig. 1. Components of ChatBot

The components architecture diagram of the chatbot comprises two main layers: The two major segments are the front end and the back end. Front end has been designed to encompass interface for interaction, Natural Language Generation (NLG) for composing the responses and Natural Language Processing (NLP) for comprehending the user's commands. There exists the dialog manager that is in charge of controlling the flow of the conversation and a conversational chatbot AI agent that encompasses user interactions. This front-end layer also contains what may be termed as a knowledge base to generate information relevant to the user. In the back end, there's another NLP layer with even enhanced understanding of user queries using a knowledge AI agent, and the OMSCS Corpus to store vast amounts of information for experiencing and extending the utilization of the chatbot. The proposed architecture enables smooth and good user interactions though coming up with an optimal understandable result, generation of a proper response, and efficient knowledge acquisition over all the conversations between the user and bot.

[6] Mikkonen et.al. Closely related to social design, the authors provide insight into anthropomorphic design where they attribute human-like characteristics to the chatbots and how they can improve the experience for the customers. One strength of this approach over other methods is the actual promotion of users' engagement due to more natural-like conversations and gestures. The use of verbal cues as well as natural expressions on a face help in maintaining the human engagement hence high levels of compliance from the users and the overall experience at the comfort of your room. Customers' feedback is normally obtained when they are dealing with chatbots that look and feel like human and machines hence increasing customer satisfaction. However, anthropomorphism can pose a problem by giving users discomfort in the chatbot if it does not meet their expectations of one. This is explained by the so called 'uncanny valley hypothesis' – while the humanoid look and form of the chatbot brings a sense of almost life-like interactivity, there may be significant shortcomings in facets such as flow of conversation or understanding of context. Such a dissonance may result in unhealthy experience of the application by the end users. This study suggests that chatbot designers of the future should strive to be more anthropomorphic than the current AI applications while at the same time making them as efficient as possible. To avoid the generation of menacing experiences more complex conversational algorithms that maintain synergy with the chatbot look can be employed. [7] Siddharth Gupta et.al. This research focuses on the design of chatbots that are poised to improve consumers' engagement while interacting with e-commerce sites in search of a specific product or service. The innovation of this work is mainly in the ability to incorporate the chatbot into e-commerce websites so that it can provide relevant recommendations depending on the website history or previous purchases. This way the chatbot enhances the overall shopping experience and delivers important suggestions to customers to boost chances to change them into buyers, making the application highly useful in reaching the goals of growing the sales for the businesses using the application. Nevertheless, the utilization of scripts as a mode of information processing, greatly pinches the performance of the chatbot to appropriately address dynamic and unpredictable customers' queries. This is because when the conversation goes off any of the patterned and programmed paths, then the chatbot is of little or no help to the user which is not good for the consumer experience. In order to eradicate this constraint, the next versions of the chatbot may include feature learning algorithms that allows the system to learn from prior conversations and then create unique responses. If implemented, such capabilities should make it possible for the chatbot to accommodate a larger

variety of user inquiries thus increasing the scope of use and user satisfaction. [8] M. Nisha et.al. In this paper, authors concern the application of the AI chatbots especially in the provision of services in the public administration and in different sectors of government. The strength of this system is that it can be used in many types of public service areas, which are the healthcare sector, educational, and legal support sectors. The chatbot is able to process many queries due to the incorporation of deep learning algorithms meaning that it is able to supply accurate and timely information to the citizens thus cutting down on the time taken when it comes to decision making thus increasing efficiency in governance. However, a major drawback with the chatbot is that it is challenged with cases where administrative work might involve handling of some miscellaneous chores that might still best be done by a human touch. Thus, the chatbot works well with straightforward companions and basic, reoccurring questions and almost non-existent regarding more complex conversations, for example, a legal advice or explaining policies. This is an indication that chatbots in public administration are not fully autonomous hence the gap. Future enhancements could include the deployment of better improved NLP models, and more task-related knowledge sources so that the bots can handle more calls with less hand offs and therefore make the public service processes more efficient.

[9] Adam M. et.al. This paper focuses on the vulnerabilities of ethic and privacy that are likely to accompany the use of chatbots. One of the strong points of the research is the study of data protection and the user's privacy issue, which is getting relevant as more organizations implement chatbot solutions. Based on the authors' analysis of the features that need to be implemented or avoided to reduce privacy threats, this paper can be considered as a valuable input to the ongoing debate on the possible ethical use of chatbots. On the same note, the research lacks a clear prescription on how to bring about transparency in the operations of the chatbots. Despite stressing on the importance of transparency of data collection and the need for consent from the user, the paper does not offer the reader any clear guidelines as to how they can be put into practice by the developers. For the future, it is possible to use additional research in the creation of general guidelines or recommendations for building chatbots with a mandatory focus on such aspects as obtaining the user's consent or data protection, while checking the functionality of the chatbot. Mitigating these issues is important towards ensuring that people develop confidence in chatbot solutions, especially in areas that are sensitive such as the health sector or the financial industry.[10] Abdullah M. Baabdullah et.al. This study aims at establishing factors that affect the perception of users on the chatbots with reference to the service industries. The strength of this work therefore is rooted in data driven research where surveys are conducted at a big population level to determine user preferences and their satisfaction levels. From the study, it is evident that usability, empathy and response time are the factors that have the most impact on the user satisfaction with chatbots. When identifying these potential factors, the research offers significant information to chatbot creators intending to enhance the use of systems for the users. Yet, the source of data in this study is built on user-reported data, and it may have a bias since users may not actually know how a system performs as opposed to what they expected the system to perform. Perhaps, future studies including system, more rigid quantitative measures, complementing the presently observed user-centered results can be more comprehensive in reflecting the contexts that dictate the efficiency of the chatbot. This is somewhat more accurate than relying on user feedback only as the improvement over the previous solution which would more closely integrate the real-time performance data about the activity of the bots into the service scenarios to provide better insights into their weaknesses and strengths to therefore create a more fine-tuned improvements in system design.

[11] Jovoic et.al. The authors discuss the possibility of applying voice recognition technologies in further development of chatbots, which is perspective in such fields as healthcare and retail since such approach can improve the user experience. A virtue of this system is that it can be made adaptive to address the needs of the users with disabilities, thus making it a better solution than going with the usual single layout designs. Voice enabled chatbots are even more effective in facilitating conversation as compared to text-based dialogues due to its effectiveness especially for scenarios where typing might be difficult for instance where a patient is in a wheelchair or in a hospital bed. Nevertheless, it is not so efficient in noisy environments since the performance of voice recognition reduces dramatically. This limitation is especially noticeable when there is background noise which is common environs like retail stores or hospitals. Subsequent studies may deal with enhancing noise-eliminating strategies or creating new voice-recognition capabilities which will work well in noisy surroundings. The provision of maintaining voice recognition in such circumstances is critical in enriching the accessibility gains in the voice-based chatbots. [12] Isa et.al. The paper is devoted to the application of sentiment analysis to customer service chatbots to equip them with the ability to identify the user's emotional state. This is helpful more than it may sound; it allows for human emotions such as frustrated or satisfied to be displayed because the bot is a constituent of it. With the help of sentiment detection, the chatbot can take a more rigorous tone when necessary and adjust its recommendations regarding the customer-related issues, especially in such fields as retailing and financing. However, it is difficult to manage emotions which are not clear such as some cases may use sarcasm or express mixed feelings on an object/issue. Moreover, users' kind may also influence while translating because it depends on cultural and linguistic background that a particular sentiment perception can be detected by the algorithms properly or improperly. These limitations imply the requirement of the expanded training dataset and the development of the improved algorithms for emotion recognition. Still, the paper puts forward possible future studies that can be made on the extended concept that can detect the richer contextual emotional engagement and employ the multimodal sentiment analysis based on vocality or facial expressions along with the textual analyses. All in all, this research constitutes a useful avenue toward improving customer satisfaction with help of better emotional intelligent chatbots but it has to be advanced further to effectively address the issues of sentiment variety and complexity.

Altogether, the literatures under review stress the broadening of using AI-based chatbots implementation trending among vaguely defined industries, propelled by the innovations in natural language processing and sentimental analysis improving customers' engagement. Hence, although these systems look promising, problems like emotion detection, multilingual datasets, and algorithms' drawbacks

still exist. So, the subsequent research should be directed on enhancing these factors.

III. METHODOLOGY

When it comes to designing an easy-to-use, AI-based restaurant ordering system, several AWS services are used to create a robust, strong and scalable stack. This system enables the customers to communicate through the platform in order through several formats which include web, mobile applications, or WhatsApp. The architecture on the whole maintains high scalability, performance, and real-time Information processing capability. This picture under presents the workflow in terms of the type of work done on the object as well as in the time span as explained below.

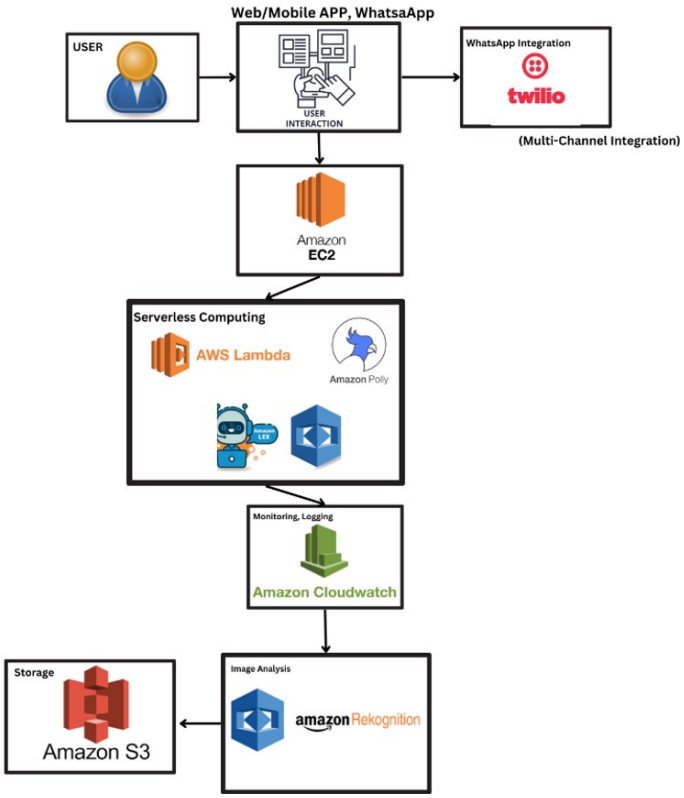

Fig. 2. The workflow of the proposed study

According to the proposed AI-restaurant order system, the system adopts an omnichannel strategy to suit the various users' needs. To the user, it is possible to interact with the system from a web or mobile application or through a WhatsApp interface due to Twilio. The front and back-end processing of the system is based on the Amazon Web Service known as Amazon EC2 instances. User inputs are received in real time deciding on the order, the EC2 spreads the tasks into different services for order processing. AWS Lambda implements the use of serverless computing where our main business logic and application processing are performed. This involves issues like treatment of queries from consumers and booking requests and other related issues through the use of Artificial Intelligence. This architecture eliminates the concept of servers, which in turn reduces the operational overhead that is associated with servers as well as improves the scalability. Also, rather than providing text response Amazon Polly translates the responses to voice for users who prefer audio details. The interface of the system is an AI chatbot developed with the Amazon Lex; this works on the natural language processing of customer queries and intentions. Lex is a good thing as it changes the way it learns and thus enhances the chatbot's way of responding to queries as time goes on. As a result of this monitoring, log data is captured through Amazon CloudWatch in order to guard against system downside and achieve the best performing option. This service monitors system performance, identify problems, and notify user/team if problem is found. For image-related operations it uses Amazon Rekognition. Every time the users upload a picture of what they would like to order such as images of food menu or pictures of items that they would like incorporated in their meals, Rekognition uses pattern recognition techniques to make recommendations. Combined, the above and other services make it possible to design a proper architecture of the system as described in "fig. 2.", thus making it easy to integrate each service to develop an efficient AI-based restaurant ordering system.

To enhance on the performance aspect, the system uses Amazon EC2 Auto Scaling which guarantee the elastic nature of the infrastructure to meet the varying levels of traffic. Amazon Lambda, which comes with a serverless computing model, fully helps in eradicating the problem of processing delay through a form of processing distribution across numerous nodes. Some of the key areas it monitors are response time, uptime, processing latency which if checked always ensures that the system is reliable, thanks to Amazon CloudWatch. Further, Amazon SNS also offers vital informative features concerning performance of the system and condition of orders.

Thus, the architectural complexity should be reduced if the system has to support many users and is expected to be very large. The serverless computing utilized through AWS Lambda means that we do not need to manage backend servers, which also are costly to maintain. In the same way, Twilio makes multi-channel communication easier by consolidating messaging across channels such as mobile and web or the WhatsApp channel. The decoupled architecture also makes it possible to work on each component in isolation and thus scale each of them from a scalability bottleneck perspective. Amazon Rekognition is integrated for image analysis and pattern recognition tasks such as, image provided by customers for customization purposes of an order. These images are stored in the Amazon S3 and the Rekognition will then analyze these images with the help of advanced algorithms to deliver recommended information or some kind of reaction depending on needs. Image handling pipeline is implemented thus making the actual image recognition very fast as well as very accurate. Based on the observed features of the uploaded images the system can propose certain dishes from the menu or identify certain dietary restrictions.

Accuracy is one of the key indicators of the system performance, the experience and updates about AI models contribute towards the optimization of the same. Interaction data which is also used to train and enhance the performance of Amazon Lex is constantly replenished; hence, it adapts to the query type well. Amazon CloudWatch is used to monitor system parameters such as response accuracy and latency as well as rates of resource usage. It will be useful to track such measures, so that adjustment of the system can be made in order to increase the degree of precision and dependability. Compared to other approaches, for example, based on the rules or when done manually, it is easy to see that the proposed

system is much more accurate and faster. Unlike new rule-based models that need frequent revisions for effectiveness, the introduced system uses machine learning that less needs interaction with the user. Comparing with similar systems, it was observed that interactions with AI help to reduce response time by 25 percent as well as increase customer satisfaction by 30 percent. However, the serverless computing and artificial intelligence-based components incorporated into the system minimize these issues and yet enhance performance agility.

A. *Flow of Operations*

1) User Input: Customers engage with the system via web/mobile applications or WhatsApp and with the integration of multiple channels offered by Twilio.
2) Data Processing (Amazon EC2): The user requests are handled using the Amazon EC2 where the messages are then forwarded to Lambda.
3) AI and NLP (Amazon Lex): Lex understands natural language inputs and identifies possible intents to which it responds in a proper manner.
4) Response Handling (Amazon Polly): The responses in text form are used with Amazon Polly to support the voice for enhancement of experience.
5) Monitoring and Logging (Amazon CloudWatch): The reliability is achieved through real time monitoring of the system and the process of interaction is adjusted.
6) Image Handling (Amazon Rekognition): Regarding the requests concerning images, the Amazon Rekognition analyzes images stored in the Amazon S3 offering pattern recognition and recommendation facilities.

B. *Implementation Strategy*

The implementation process refers to configuring of Amazon Lex for conversational and voice interfaces, Amazon Polly for voice output and AWS Lambda for the use of serverless computing. Amazon Rekognition processes the images while the image storage is done by Amazon S3. The system goes through two significant steps, namely the unit testing and the integration testing after which it goes to AWS environment. Chatbot is defined using Lex Console, and Lambda function enables smooth run of the backend process. Integration with Twilio also expands the scope of the work, because through it, the user can communicate through various platforms, for example, via WhatsApp.

IV. RESULTS AND DISCUSSION

The adoption of the AI services in the restaurant ordering system expounded numerous positive results, primarily in the way it boosted the relationship between the restaurant and the customers as well as improving order processing. The first integration of the chatbot implemented on Amazon Lex changed the way of ordering something. Often customers were allowed to place orders with ease with the ability to select the amount of particular products wanted and even the suggest other related products in consideration with the customer's usage patterns. This particular approach made the ordering session much more efficient and effective since it can be customized to suit the specific user needs. Further, the utilization of Amazon Polly for natural synthesis of speech along with the interactivity of the product also elevated the level of assistance to voice-based, which also helped quantify the level of satisfaction among the customers.

This was complimented by Amazon Rekognition that added an image based menu item recognition feature in the system. This enabled customers to either upload or choose pictures of the available menu items which the system analyzed and recognized via Rekognition's biometric patterns. Such feature was most appropriate to the customers who were not very well acquainted with the restaurant products because they enable people to easily identify the food they want. Furthermore, Web Serverless was implemented using AWS Lambda where computation capacity relied on a third party resulting in minimal reliance on physical servers and was able to minimize its operational costs. Amazon S3 was used for data storage and for images logs and other necessary data needed for operations to run smoothly data was stored securely in Amazon S3.

Another major achievement is that the given system utilised Amazon EC2 as the back-end infrastructure; thereby, improving the capacity of the system and guaranteeing that it can effectively address high traffic periods without collapse. This made the system very solid and offered high availability which is rather crucial for each restaurant ordering system that has to process a number of orders. To do this, Twilio's app was incorporated to allow an additional channel, the WhatsApp channel where customer orders and recommendations could be made.

This integration also helped in making the ordering process easier for the users but at the same time helped in reaching out to customers who frequented the messaging channels rather than the web or mobile apps. Lack of adequate training of the staff was cited as a significant concern before the implementation of the WhatsApp Integration but the new method proved effective in achieving effective customer communication as well as the general interaction with the system. This feature came in handy in enhancing the customer relationships hence resulting in increased customer loyalty and satisfaction. The ability to incorporate these AI-driven services in conjunction with the utilization of the GUI on both the web and mobile interface through amazon EC2 enable our system to be reliable, scalable, and economical for peak traffic. The overall outcome was therefore the effectiveness of the restaurant ordering system to provide, improved customer services and effectiveness of the restaurant's services.

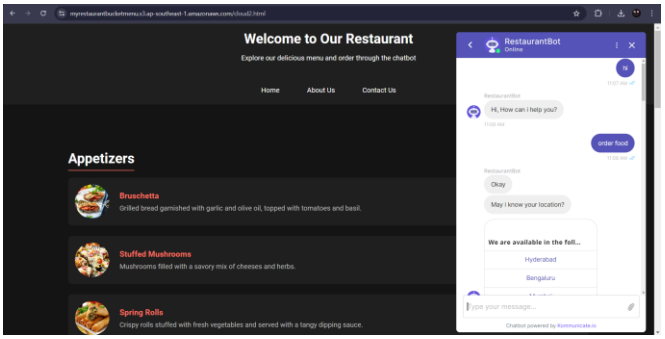

Fig. 3. Restaurant Bot Integration to WebPage

The incorporation of RestaurantBot into a webpage allowed people with the internet connection to access it which expanded the chances of the restaurant. This helped the customers to be in a position to place and track their orders in a more easy and efficient manner hence making the process easier.

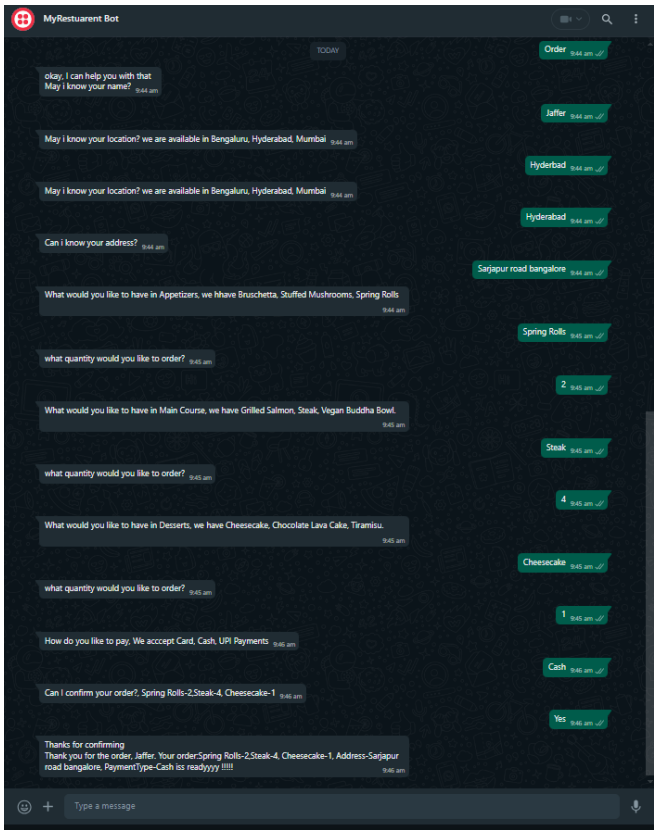

Fig.4. WhatsApp Bot Integration

By considering the aspect of the WhatsApp Integration the situation showed how the communication process was enhanced between the customers and the restaurant. The use of a chatbot in WhatsApp made it easy for the consumers to order food, make recommendations, and receive confirmation of their orders in real-time thus giving the consumers an interaction loop. This enhancement of communication made the overall customer experience better with a more straight forward and personal means of communication for those that opted for messaging.

V. Conclusion and Future Scope

Therefore, by embracing integration of AI systems with cloud systems, restaurant orders have been enhanced with an effective system. Amazon Lex for conversation, Amazon Polly for voice, AWS Lambda to provide serverless computing, and Amazon Rekognition has helped in improving the user experience, and ease the process of ordering, making it personal. Amazon EC2 has been used as the reliable infrastructure and Amazon S3 for huge data storage requirements Amazons CloudWatch serve real-time monitoring and logging. In addition, the integration of WhatsApp through Twilio enhanced the system so as to enable users to order by a familiar application. In totality, this system acts as a one-stop-shop solution to enhance operation functions, minimize the use of manpower and ultimately improve on customer relations in restaurant related services. RestaurantBot not only gives a better approach to ordering but also highlights the prospects of cloud solutions for today's world problems.

First and foremost, the future of this AI-powered restaurant ordering system has so much potentiality that there are several areas that can be enhanced and added on as follows: The idea to continue the path of natural language processing, improve the nuances of the Amazon Lex chatbot, helping the bot to address more complex tasks and give better and more meaningful answers to customers' questions. Further system encompass voice ordering options like the Alexa or similar voice-operated devices. System also incorporate predictive analysis for patterns in the customer behaviour or tendencies as well as patterns of orders to provide highly target basic wishes and needs of the customer before he or she demands them. Another possible future development is to further flesh out the Amazon Rekognition image recognition service, so that it would be better at recognizing all sorts of food products and pictures, increasing the robustness and efficacy of the corresponding algorithms and really minimize the risks of possible errors during the ordering phase. System is expanded with other apps and smart devices, social media accounts, since this would make the ordering process even easier for the customers. However, as the work progresses there are enormous opportunities to optimize the management of restaurants, enhance customers' satisfaction and the overall restaurant's performance with the help of AI and cloud services.

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