Journal of Information Systems and Informatics
Vol. 5, No. 2, June 2023 e-ISSN: 2656-4882 p-ISSN: 2656-5935
DOI: 10.51519/journalisi.v5i2.502 Published By DRPM-UBD

GoPrintBot: An Interactive E-Commerce for Online Printing Services

Nur Izhatie Aisyah Ishak[1], Nahdatul Akma Ahmad[2]

[1,2]College of Computing, Informatics and Media, Universiti Teknologi MARA, Perak Branch, Tapah Campus, 35400 Tapah Road, Perak, Malaysia.
Email: [1]izhatieaisyah@gmail.com, [2]nahdatul@uitm.edu.my

Abstract

GoPrintBot is an innovative endeavor focused on creating an interactive e-commerce chatbot tailored specifically for online printing services. The primary objective is to enhance the customer experience by offering a seamless and efficient ordering process, eliminating the need for customers to navigate complex websites or wait for customer service representatives. This study addresses common issues encountered in traditional e-commerce platforms, including unintuitive navigation, ineffective search and filter systems, and slow response times for customer inquiries. The proposed solution involves developing a chatbot system that will revolutionize the online printing industry, significantly improving the customer experience and operational efficiency. The methodology employed encompasses comprehensive requirements gathering, followed by the design and development of the chatbot system using established System Development Life Cycle (SDLC) methodologies. GoPrintBot serves as a prototype, showcasing the potential of chatbots to streamline the online printing process and provide personalized and efficient services. The findings of this study have significant implications for businesses that prioritize customer satisfaction and aim to optimize their online printing services.

Keywords: E-Commerce, Natural language processing, Online Printing Services, Chatbot, Question Answering

1. INTRODUCTION

E-commerce revolutionized the way products are bought and sold, enabling customers to conveniently make purchases and payments through electronic platforms like websites and mobile apps. This method of commerce offered time and cost savings for customers, facilitated by electronic devices and internet connectivity [1]. However, ordering printed materials remained a challenge for many customers. Navigating websites or contacting customer service representatives to place orders for printed products proved difficult, especially for those unfamiliar with the online ordering process.

This work is licensed under a Creative Commons Attribution 4.0 International License.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

To address these challenges, the study aimed to develop GoPrintBot, an interactive e-commerce platform catering to online printing services. GoPrintBot was designed to assist customers in ordering customized items like business cards, brochures, and banners through a conversational interface. The chatbot seamlessly facilitated the ordering process, eliminating the need for customers to navigate websites or interact with customer service representatives. Moreover, it provided continuous support throughout the ordering journey, including product and pricing inquiries and real-time order updates.

The study highlighted the significance of question answering systems (QASs), which could analyze and comprehend natural language queries from users, retrieve relevant information, and provide accurate responses. QASs typically comprised three modules: question analysis, information retrieval, and response production [2]. Chatbots, being programs that simulate human-to-human communication using natural language, gained popularity in customer-oriented businesses [3]. Building chatbots relied on data from previous human conversations, which posed challenges related to data scale and privacy [4]. Predictions indicated that, by 2020, up to 85% of customer service interactions in e-commerce would be powered by automated systems utilizing human-machine conversational interactions facilitated by machine learning and natural language processing engines [5].

In the development of chatbots, information retrieval played a crucial role. Information retrieval (IR) systems were software tools that enabled users to access and manage documents. As a subfield of Natural Language Processing (NLP), IR focused on the process of searching for relevant information within a collection of documents. This encompassed manual document searching, searches using descriptive metadata, and queries in databases containing text, images, or sound [6]. IR systems were closely connected to database systems, working together to deliver efficient and accurate search results to users. In the context of chatbot development, IR techniques were utilized to enable the chatbot to comprehend and interpret user queries, retrieving the pertinent information required to provide accurate responses. This formed an integral part of the chatbot's question answering system (QAS), which consisted of three primary modules: question analysis, information retrieval, and response production [2].

Natural Language Processing (NLP) empowers computers to analyze vast volumes of language data from diverse sources. NLP developers have the ability to enhance chatbot capabilities for a wide range of tasks, including text analysis, stemming, text summarization, automatic summarization, topic extraction, text mining, speech recognition, translation, segmentation, and automatic question answering [7]. This study is centered around the following objectives: first, designing a user-friendly navigation system for the e-commerce website dedicated to online printing services, ensuring effortless discovery of the desired products by customers. Second, developing an e-commerce website for online printing

services that integrates a 24-hour chatbot system, capable of promptly assisting customers with their inquiries.

2. METHODS

2.1 Level of Analysis

The level of analysis comprises four distinct stages, visually represented in Figure 1. This analytical level serves as a crucial process in equipping the chatbot with the ability to comprehend and interpret the relevant information that the information system, specifically the E-Commerce for Online Printing Services, should provide. Each of these processes will now be explained in detail, shedding light on their significance in achieving an effective and efficient chatbot system.

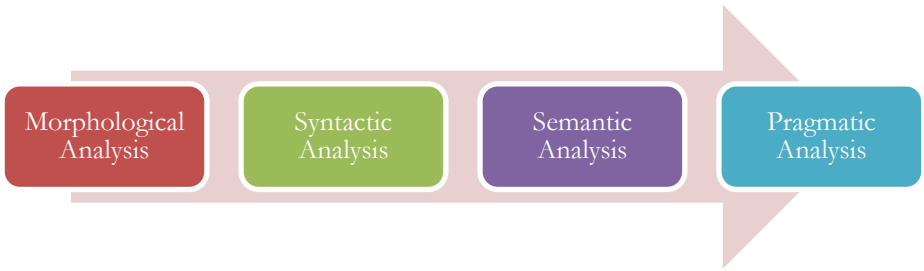

Figure 1. Level of Analysis Process

2.1.1 Morphological Analysis

Morphological analysis, as an initial stage of Natural Language Processing (NLP) applied to raw text, holds a crucial position in shaping the outcomes of subsequent levels. Its primary objective is to investigate the structure of words, with a specific focus on morphemes, which serve as the smallest units of meaning in a language [8]. Through morphological analysis, experts can differentiate various forms of a word, encompassing plurals, inflections, genders, and other variants. This process enables a deeper understanding of the linguistic components within a text, facilitating more accurate and nuanced language processing.

2.1.2 Syntactic Analysis

The second level of analysis was syntactic analysis. Syntactic analysis was a crucial step in natural language processing, as it assessed how language aligned with grammatical rules. This level involved applying grammatical rules to a group of words and deriving meaning from them through various techniques. Syntactic analysis aimed to provide a hierarchical structure of tagged words that depicted the relationships between the words in a sentence or fragment, and was essential for subsequent semantic processing. Three main techniques commonly used in

this analysis were Tokenization, Part-of-speech (POS) tagging, and Parsing. Parsing is the grammatical analysis of a sentence. Parsing is the process of identifying clauses, phrases, POS and determining the relationship among the token [3]. Parsing method chooses exact words from the input text, makes them less sophisticated, and uses them for output [7].

2.1.3 Semantic Analysis

The third level of natural language text analysis was semantic analysis, which was concerned with understanding the meaning of a text in context. Unlike lexical analysis, which focused on the meaning of individual words and fixed word combinations, semantic analysis examined the relationships between words in a sentence and the overall meaning of the text. This level of analysis was critical for understanding the intent behind a message and was often used in natural language processing tasks such as dialogue systems and chatbots. Three key techniques used in semantic analysis were named entity recognition (NER), word-sense disambiguation, and natural language generation [9].

2.1.4 Pragmatic Analysis

Pragmatic analysis was the final level of analysis in Natural Language Processing (NLP). It focused on understanding the intended meaning behind the words used in a sentence or document, considering the context and real-world knowledge. Pragmatic analysis was concerned with the entire communicative and social context in which language was used. This level of analysis was crucial in understanding the intended message and the impact it had on interpretation. Pragmatic analysis involved abstracting the meaningful use of language in various contexts. It examined the reported meaning and reinterpreted it to understand the intended meaning. This was accomplished by applying a set of rules that characterized cooperative dialogues. These rules helped users discover the intended result by understanding the context and real-world knowledge related to the language used [10].

2.2 Chatbot Development Method

Methodology serves as the overarching strategy and rationale behind a research study. In the context of this particular study, which revolves around the development of an e-commerce chatbot system for online printing services, the chosen methodology was the Systems Development Life Cycle (SDLC). The SDLC provides a comprehensive framework that delineates each step involved in the creation and implementation of a software development project. By adhering to the SDLC, the study ensured a systematic and structured approach to the development process. Figure 2 illustrates the sequential stages of the SDLC

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

process, highlighting the well-defined path followed to achieve the desired outcome [11].

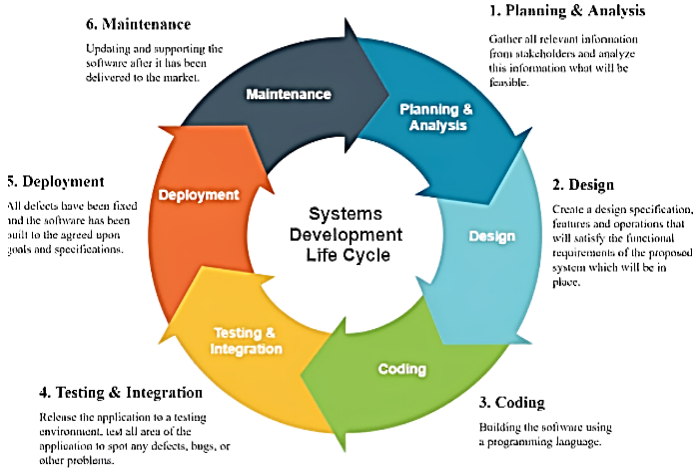

Figure 2. System Development Life Cycle (SDLC) [12]

Based on Figure 2, which depicts the stages of Planning and Analysis, Design, Coding, Testing and Integration, Deployment, and Maintenance, the following explanations can be provided:

2.2.1 Planning and Analysis

The developer gathered information about the target market, including the demographics of the users and their printing needs. They also researched the existing online printing services and identified any gaps or opportunities in the market. Once all the information had been gathered and analyzed, the developer used it to create a detailed study plan that outlined the scope, schedule, and resources required for the study. This plan served as a roadmap for the development of GoPrintBot and was used to guide all subsequent phases of the SDLC.

2.2.2 Design

This phase was all about converting the requirements gathered during the planning and analysis phase into a detailed design of the system. The design phase began with the development of a system architecture that defined the overall structure of the system, including the hardware and software components, their interfaces, and the interactions between them. The system architecture was a high-level view of the system that guided the design of the individual components. The design phase also involved the selection of appropriate design patterns and frameworks that could be used to implement the system components. The design phase also

included the creation of user interface (UI) design, which was responsible for the overall look and feel of the system. UI design was a critical aspect of the design phase as it defined how users interacted with the system and how the system presented information to the users.

2.2.3 Coding

During this phase, the developers took the detailed design created in the previous phase and used programming languages to bring the system to life. During this phase, a variety of programming languages, frameworks, and libraries were used to build the system. For this study, the developers primarily focused on using a combination of languages such as HTML, CSS, JavaScript, and PHP to build the front-end and back-end of the system and MySQL for the server-side logic and database management. The developers also used libraries such as Bootstrap and incorporated some Vanilla CSS, a lightweight CSS framework that provides a minimal set of styles for a fast and clean starting point. Another key component of GoPrintBot was developed using DialogFlow. DialogFlow is a powerful natural language processing platform that allows developers to create chatbots that can understand and respond to user input in a conversational manner. This chatbot system was integrated into the platform to provide users with an easy and intuitive way to navigate the platform.

2.2.4 Testing and Integration

In addition to User Acceptance Testing, the developer may also conduct various types of testing such as integration testing, performance testing, security testing, and regression testing to ensure the system functions optimally and is secure. The testing phase is crucial as it helps identify and fix any issues before the system is deployed to production. Once the testing phase is complete, and all defects have been fixed, the system is ready for deployment.

2.2.5 Deployment

This phase involved several activities such as configuring the software, setting up the production environment, testing the software in the production environment, and finally, releasing the software to the end-users.

2.2.6 Maintenance

This phase was critical for ensuring that the system was running smoothly, and that any issues or bugs were addressed in a timely manner. The maintenance phase included activities such as monitoring the system's performance, fixing bugs, adding new features, and making improvements to the system's overall functionality.

3 RESULTS AND DISCUSSION

3.1 System Architecture

To enhance comprehension, the study provided a detailed explanation of the system architecture in a step-by-step manner. Figure 3 and Figure 4 present a visual representation of the proposed system architecture for the chatbot study, comprising four primary modules: the knowledge module, the dialogue module, the handover module, and the adapter. Acting as a mediator, the handover module directed queries that couldn't be answered by the knowledge module to human customer service and transmitted the responses from customer service to clients through the adapter [13]. The dialogue module played a crucial role in managing customer conversations, ensuring that the chatbot could understand and respond appropriately in human language. In the context of text messages, the term "language form" pertains to the structure and syntax of sentences, encompassing the order of words based on their meaning relationships [13].

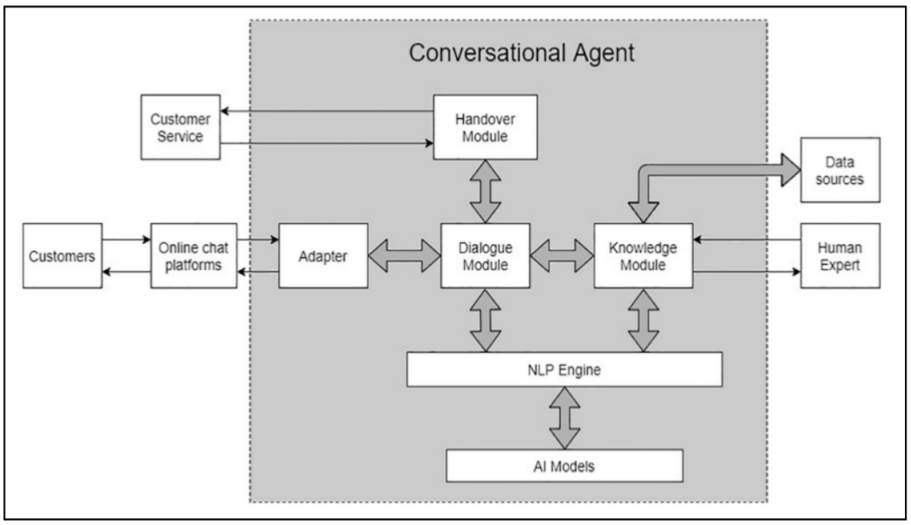

Figure 3. Overview of System Architecture

The inclusion of the handover module in the proposed system design holds strategic importance through its human-in-the-loop pattern, which ensures that the algorithm's performance aligns with the organization's requirements and adapts to changes in the environment [14]. Rather than simply replacing humans, the collaboration between robots and humans enables firms to achieve significant performance improvements. Thus, human engagement becomes crucial for effective user-machine communication, enabling companies to maximize the benefits of chatbot adoption.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Consequently, the handover module plays a key role in facilitating human engagement within the operational flow. It allows for a seamless switch between human customer support and the chatbot when the chatbot is unable to provide a satisfactory answer to a customer's query. This integration of human involvement in the system design ensures that customer inquiries are efficiently addressed and resolves any limitations the chatbot may encounter.

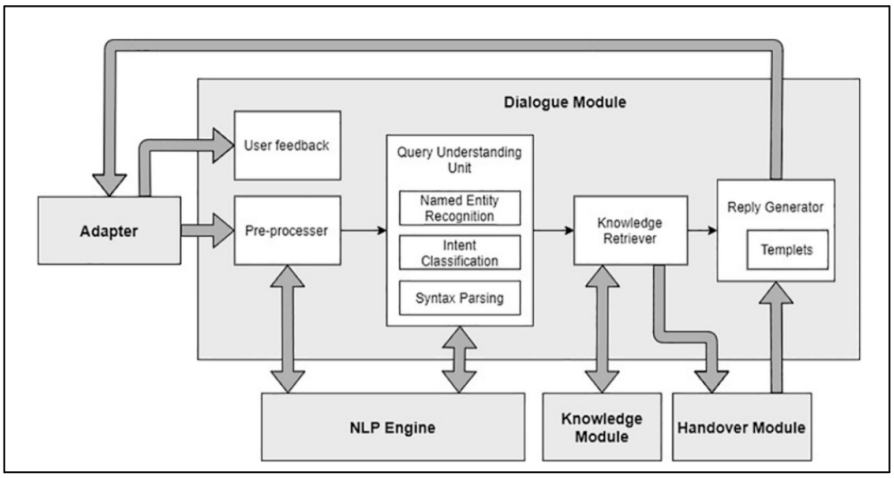

Figure 4. Process of Dialog module

The diagram depicted in Figure 5 presents an exceptional visual representation of the system's database structure, providing researchers with profound insights into its complex composition. Its significance lies in its ability to identify potential data redundancies and address any gaps in information, thereby ensuring the utmost integrity of the stored data. By conducting a meticulous examination of the entity relationship diagram (ERD), researchers acquire a comprehensive understanding of how to construct the necessary queries essential for system development. The ERD serves as a valuable guiding tool, facilitating the streamlined design and implementation of the system's database in an efficient and effective manner. Consequently, the ERD plays a pivotal role in enhancing the overall functionality and performance of the system. Through the insightful analysis of the diagram, researchers are empowered to optimize the system's database structure, eliminating redundancies and ensuring data integrity. The ERD provides with a visual framework to discern relationships between entities, facilitating the construction of appropriate queries. By leveraging this knowledge, it can design an efficient and effective database system, enabling seamless data management and retrieval. The ERD's role as a guiding tool empowers to make informed decisions, resulting in an improved overall functionality and performance of the system. Thus, the diagram's representation and the utilization of the ERD contribute significantly to the success and effectiveness of the system.

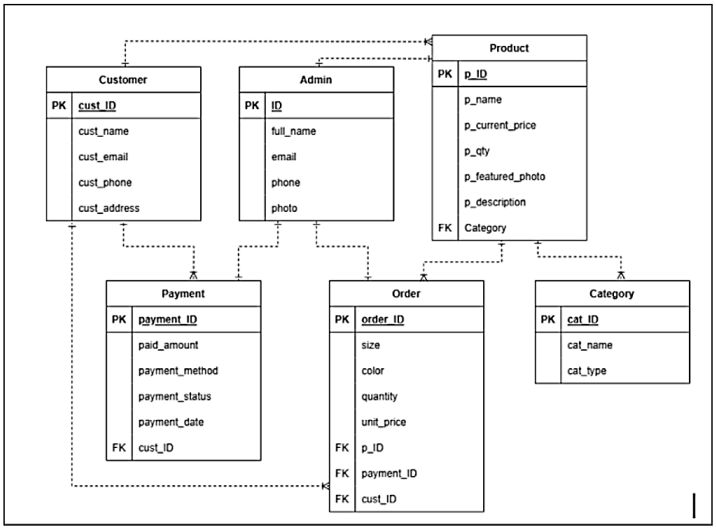

Figure 5. Entity Relationship Diagram

3.2 Front-end Design Development

In order to create a user-friendly front-end for the e-commerce website specializing in online printing services, the researcher will utilize the capabilities of Sublime Text software. The front-end website development process encompasses the creation of visually appealing components that users interact with, including the layout, design, and coding of the website using HTML, CSS, and JavaScript. For this project, Bootstrap 3.3.7 has been chosen as the framework of choice, renowned for its reliability and widespread adoption in frontend development. Bootstrap 3.3.7 offers a comprehensive collection of HTML, CSS, and JavaScript components that serve as a robust foundation for building responsive and user-friendly websites. Its popularity stems from its user-friendly nature and customizable features, making it a favored choice among developers of varying skill levels. The researcher firmly believed that opting for Bootstrap 3.3.7 would enable the efficient and effective development of the frontend design for the e-commerce platform, meeting the project's requirements and enhancing the overall user experience.

3.3 Back-end Programming

The backend system of the e-commerce platform for online printing services was developed using the versatile PHP programming language. The decision to utilize PHP was driven by its adaptability and ease of use in creating dynamic and interactive websites. PHP's extensive libraries and robust support for various databases make it a well-suited choice for managing the complex data and

transactions involved in an e-commerce system. Moreover, PHP's open-source nature provides the researcher with access to a vast community of developers, ensuring reliable support and a wealth of resources for the project.

In this development process, the researcher relied on XAMPP, a crucial software package that includes Apache, PHP, and MySQL. XAMPP's components, specifically PHPMyAdmin and MySQL, play a vital role in the proper functioning and development of the GoPrintBot e-commerce website for online printing services. By using XAMPP, developers can create and run a local web server environment on their own computer, facilitating efficient testing and development of the backend system. This setup enables seamless integration between PHP and MySQL, allowing for effective data management and robust backend functionality for the e-commerce platform.

The homepage of the GoPrintBot website serves as a central hub where users can conveniently select from a diverse range of products for printing. A notable feature of the homepage is the integration of a chatbot, enabling users to interact with it and receive assistance pertaining to their printing requirements. This chatbot feature holds significant importance as it offers users a swift and effortless means to navigate the website, locate desired products or services, and obtain immediate support. Figure 6 provides a visual representation of the homepage, illustrating its layout and design.

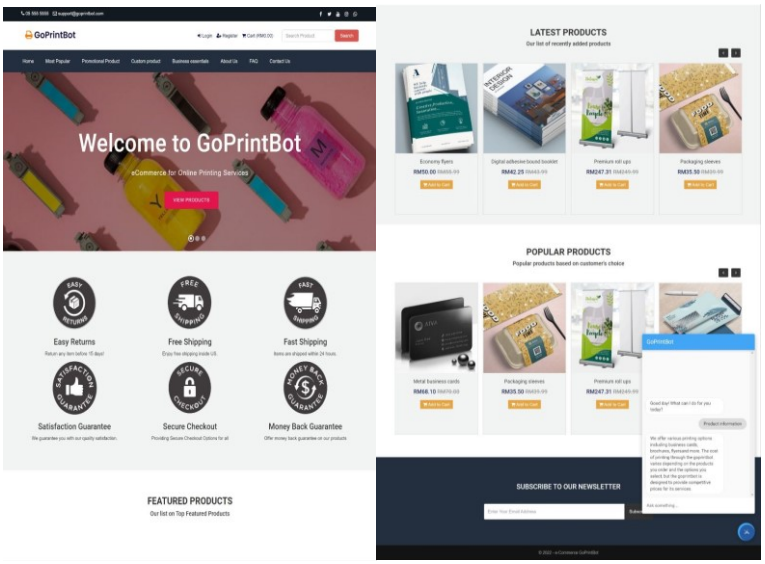

Figure 6. Homepage website

The admin panel pages form an integral part of the GoPrintBot platform's backend system, specifically designed for platform administrators to effectively

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

manage and monitor its operations. These pages are not publicly accessible and can only be accessed by authorized personnel, ensuring secure control over the platform's administration. Among the key functionalities provided by the admin panel pages are order management capabilities, allowing administrators to oversee and track orders, as well as access detailed order information. Additionally, the admin panel encompasses product management pages, empowering administrators to manage the platform's product catalog. This includes tasks such as adding new products, modifying existing ones, and removing products from the listings.

Figure 7 to 9 visually depict the layout and design of the admin panel pages, providing administrators with a clear interface to navigate and efficiently carry out their managerial responsibilities. These pages serve as vital tools in maintaining the smooth operation and overall effectiveness of the GoPrintBot platform.

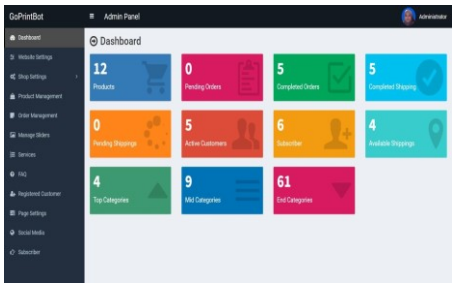

Figure 7. Admin panel pages

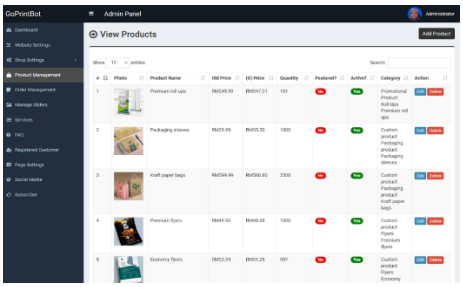

Figure 8. Product Management

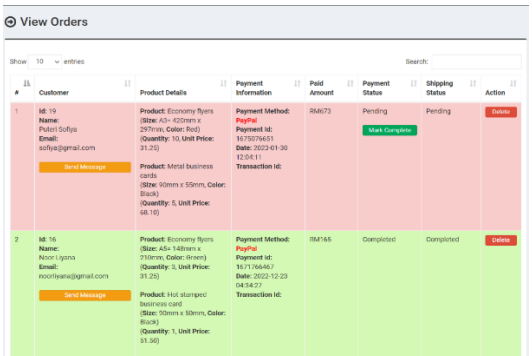

Figure 9. View and Manage Order

In examining the aforementioned passage, we delve into a discussion surrounding the intricacies and merits of the system architecture, frontend and backend development, as well as the user experience and administrative functionalities of the GoPrintBot platform.

Firstly, the passage aptly emphasizes the significance of conveying the system architecture through well-designed diagrams and entity relationship diagrams (ERDs). Such visual representations serve as invaluable tools for researchers and developers, enabling them to obtain a comprehensive understanding of the platform's underlying structure. By delineating the various modules within the architecture, including the knowledge module, dialogue module, handover module, and adapter, the system facilitates seamless communication between the chatbot and human customer support, thereby ensuring efficient customer service. This thoughtful design approach greatly contributes to the platform's overall functionality and effectiveness, bolstering its performance and enhancing its usability.

Moreover, the discussion highlights the criticality of data integrity within the platform. The passage emphasizes the thoughtful design of the database structure, which plays a pivotal role in upholding the accuracy and reliability of stored information. By utilizing diagrams and ERDs, researchers are empowered to identify potential data redundancies and address any missing information. This meticulous approach not only fortifies the platform's integrity but also enables researchers to construct effective queries that drive system development. Consequently, the platform benefits from improved functionality and efficiency.

Moving on to the frontend development aspect, the passage sheds light on the significance of creating a user-friendly interface that enhances the overall user experience. Leveraging Sublime Text software and Bootstrap 3.3.7, the platform incorporates visually appealing components and ensures responsive and intuitive website navigation. These tools prove instrumental in facilitating efficient frontend design, culminating in a seamless and enjoyable user experience. By prioritizing user-centric design principles, the platform fosters positive engagement and user satisfaction.

In terms of backend development, the passage underscores the employment of the PHP programming language. This choice is driven by PHP's versatility and extensive libraries, which enable the creation of dynamic and interactive functionality for the e-commerce platform. PHP's ability to manage complex data and transactions, coupled with its compatibility with various databases, positions it as an ideal choice for backend development. Furthermore, the utilization of XAMPP, including PHPMyAdmin and MySQL, provides a reliable local web server environment that facilitates proper backend functioning, thereby streamlining testing and development processes. The shifts its focus to the GoPrintBot platform's homepage, which assumes the role of a central hub for users to easily select their desired products for printing. Notably, the integration of a chatbot feature serves to further enhance the user experience by offering quick assistance and seamless navigation. This user-friendly feature streamlines the

process of finding desired products or services, ultimately resulting in improved overall satisfaction for users.

Finally, the passage delves into the administrative functionalities provided by the platform's admin panel pages. Specifically designed for platform administrators and accessible only to authorized personnel, these pages offer a range of functionalities, such as order management and product management. The order management functionality empowers administrators to efficiently track, view details, and handle orders, while the product management feature enables them to add, modify, and remove products from the platform's catalog. By streamlining administrative tasks, these functionalities contribute to the smooth operation of the platform, ensuring effective management and monitoring of its overall performance.

4 CONCLUSION

In conclusion, the GoPrintBot ecommerce online printing services study was a comprehensive effort to design and develop an effective platform for customers to place their printing orders online. Through the analysis of system requirements, the design of the user interface, and the implementation and testing phases, the study has successfully delivered a functional and user-friendly solution. The testing phase demonstrated the usability and reliability of the application, and the results were documented accordingly. The result of this study was a functional platform that made it easier for customers to place printing orders and for the company to manage those orders.

REFERENCES

[1] H. M. Kavitha, S. Duncan, P. Ravikumar, and E. Varun, "Online Shopping Customer Behaviour Analysis using centrality measures," *1st IEEE International Conference on Advances in Information Technology*, pp. 223–227, 2019, doi: 10.1109/ICAIT47043.2019.8987252

[2] A. Hutapea, "Chatbot: Architecture, Design, & Development," *University of Pennsylvania School of Engineering and Applied Science Department of Computer and Information Science,* 2017.

[3] C. Huang, "The Intelligent Agent NLP-based Customer Service System," *ACM International Conference Proceeding Series*, pp.41–50, 2021 doi: 10.1145/3460268.3460275

[4] L. Cui, S. Huang, F. Wei, C. Tan, C. Duan, and M. Zhou, "Superagent: A customer service chatbot for E-commerce websites," *ACL 2017-55th Annual Meeting of the Association for Computational Linguistics, Proceedings of System Demonstrations*, pp. 97–102, 2017, doi: 10.18653/v1/P17-4017

[5] S. Angelov, and M. Lazarova, "E-commerce distributed chatbot system," *ACM International Conference Proceeding Series*, pp. 1–8, 2019, doi: 10.1145/3351556.3351587

[6] P. Meesad, "Thai Fake News Detection Based on Information Retrieval," *Natural Language Processing and Machine Learning. SN Computer Science*, vol. 2, no. 6, pp. 1–17, 2021, doi: 10.1007/s42979-021-00775-6

[7] J. Skrebeca, P. Kalniete, J. Goldbergs, L. Pitkevica, D. Tihomirova, and A. Romanovs, "Modern Development Trends of Chatbots Using Artificial Intelligence (AI)," *ITMS 2021 - 2021 62nd International Scientific Conference on Information Technology and Management Science of Riga Technical University*, 2021 doi: 10.1109/ITMS52826.2021.9615258

[8] A. Alothman, and A. Alsalman, "Arabic Morphological Analysis Techniques" *International Journal of Advanced Computer Science and Applications*, vol. 11, no. 2, 2020.

[9] D. H.Maulud, S. R. Zeebaree, K. Jacksi, M. A. M. Sadeeq, and K. H. Sharif, "State of art for semantic analysis of natural language processing," *Qubahan Academic Journal*, vol. 1, no. 2, pp. 21-28, 2021

[10] C. S. Sütçü, and C. Aytekin, "An Example of Pragmatic Analysis in Natural Language Processing: Sentimental Analysis of Movie Reviews" *CTC, 2019*.

[11] H. Christanto and Y. Singgalen, "Analysis and Design of Student Guidance Information System through Software Development Life Cycle (SDLC) and Waterfall Model", *J. Inf. Syst. Informatics*, vol. 5, no. 1, pp. 259-270, Mar. 2023.

[12] Y. Singgalen, "Analysis and Design of Regional Tourism Information System 'SIPARDA' of Morotai Island Regency", *J. Inf. Syst. Informatics*, vol. 4, no. 4, pp. 849-863, Nov. 2022.

[13] E. W. T. Ngai, M. C. M. Lee, M. Luo, P. S. L. Chan, and T. Liang, "An intelligent knowledge-based chatbot for customer service. Electronic Commerce Research and Applications," vol. 50, no. september, pp. 101098, 2021, doi: 10.1016/j.elerap.2021.101098

[14] T. Grønsund, and M. Aanestad, "Augmenting the algorithm: Emerging human-in-the-loop work configurations," *Journal of Strategic Information Systems*, vol. 29, no. 2, pp. 101614, 2020, doi: 10.1016/j.jsis.2020.101614