Angels and Lemons' E-Ordering: Development of a Web-Based Ordering System for Angels and Lemons

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Abstract: *This research presents the development of "Angels and Lemons' E-Ordering," a web-based ordering system designed for Angels and Lemons, a lemonade-selling business. The system aims to streamline the ordering process, reduce errors in order-taking, and enhance customer experience. Key features include a carting mechanism for orders, mock-ups of payment gateways (specifically G-Cash and PayMaya) to mitigate the risk of bogus buyers, and a customer-staff-admin-manager interface for efficient order fulfillment. Customers can place their orders on the web site or upfront. In the web site, they may only place pick-up orders by which they can choose their preferred pick-up times for their orders. The staff actor is responsible for preparing and fulfilling all orders, including handling upfront orders where cash payments, in addition to the e-wallet options, are accepted. The admin-manager functionalities include product management (addition, editing, and archival). The system also generates essential business reports, such as sales data, product performance trends, and order method comparisons. The findings of this study underscore the advantages of adopting a web-based ordering system to enhance order accuracy and streamline the ordering process for small businesses. It is developed for demonstration purposes and is not intended for operational use.*

Keywords—Web-based ordering system; E-ordering system; Carting Mechanism; E-Wallet Payment; Order Pick-Up

1. INTRODUCTION

In traditional food or beverage businesses, both large and small-scaled alike, orders were typically given and taken manually, either written or verbal, and then passed on to the staff for preparation and fulfillment. As technology progressed, the ordering process has been streamlined by the use of online ordering systems, aiding both the customers and the business. Through these systems, customers could easily place orders using an online menu. Online clients could simply track orders if there was a meal selection available. The management kept track of consumer information and enhanced food delivery services (Rane, Patil, Salunkhe, & Kakade, 2022). In regards to delivery through online ordering, 19.06 million people have been recorded to be delivered food using this method as per research conducted to find and numerate the segments of people using online ordering and delivery for food and groceries (Statista Research Department, 2024). [1][2]

The food industry is highly labor-intensive, and traditional order-taking methods using pen and book present several challenges. The manual order-taking process is often tedious, leading to errors due to miscommunication, which can result in incorrect orders and customer dissatisfaction. Additionally, employing the right staff to manage these tasks adds to operational costs, as labor is one of the biggest expenses in the food industry (Trupthi, Raj, Akshaya, & Srilaxmi, 2019). Consequently, sticking to traditional methods might mean missing out on a large number of potential customers as per the data provided earlier. [3]

According to Cruz et al. (2024), the fast-paced progression of technology stands to drastically change the way individuals monitor and manage their activities, especially on the managerial side. It has also been proven that online methods could alleviate pain points for businesses, regardless of their size. In the study conducted by Rane et al.'s (2022), several key benefits of an online food ordering system were highlighted. The system simplified the ordering process by providing necessary information, having the functionality of receiving and updating orders, and including features for administrators to manage the food system efficiently. It facilitated order tracking, maintained a customer database, and enhanced food delivery service. Additionally, it allowed for easy customization of the online menu and convenient access for customers to place orders. According to Avila et al. (2023), the prototype mobile application utilizing QR codes to order from Starbucks that their team developed led to the enhancement of employee efficiency, especially during peak hours, and customer satisfaction because of the streamlining of ordering and payment processes. In regards to finances, one of the ways to reduce the expense of employing was to use modern technology to replace some of the jobs done by human beings and make machines do the work. Adapting to the technological trends could make a business successful, and although not proven completely; the failure to comply might have led to the contrast. [4][5][6]

Angels and Lemons by Kateampla is a small business created by the Hernandez family. Located at 112 Masagana Street, Pinagbarilan, Baliwag, Bulacan — Angels and Lemons have a stall set-up in front of their house that operates daily, selling homemade and quality lemon-based beverages. The owners open their stall at 10:00am up to 6:00pm daily. The stall has built a small but strong and loyal customer base and has been looking at a constant growth. The majority of orders are taken manually through verbal interactions, by which the owners would take their orders and fulfill them, while some customers place orders via the business' Facebook page.

The researchers developed a web-based ordering system named 'Angels and Lemons' E-Ordering' in respect to the business. The system was presented to respondents particularly customers, both potential, and returning as well as people in the IT field. The system aims to streamline the ordering process for customers as well as improve the accuracy of order-taking, preparation, and fulfillment by the use of web capabilities. Given the family-owned nature of the business, the system incorporates customer, staff, and admin-manager user roles to reflect the actual workflow of the business.

1.1 Statement of the Problem

The traditional method of order-taking at Angels and Lemons relies on verbal and written communication, presenting challenges such as order inaccuracies and potential miscommunication. Additionally, the current system lacks an efficient method to manage customer orders and track business performance. This research seeks to address the following specific problems:

1. How can the ordering process be made more user-friendly?
2. What methods can be employed to reduce errors in order-taking and fulfillment compared to traditional verbal or written methods?
3. How can the implementation of an e-ordering system streamline the customer experience by allowing both pick-up and upfront orders?
4. How can the system generate essential business reports such as sales data, product performance trends, and advanced versus same-day orders comparison to aid in business decision-making?

1.2 Objectives of The Study

The objective of this study is to develop a web-based ordering system focused on customer pick-up, named 'Angels and Lemons' E-Ordering,' for the small beverage business Angels and Lemons. The system aims to streamline and enhance the ordering process for customers, as well as improve the accuracy of order-taking, preparation, and fulfillment. Specifically, the study seeks to:

1. Provide a more user-friendly ordering process through the e-ordering system.
2. Reduce errors in order-taking and fulfillment compared to traditional verbal or written methods by using the e-ordering system along with its carting mechanism and mock-up payment gateway streamlining.
3. Improve the ordering process by implementing features that allow customers to place pick-up orders using their accounts or upfront orders through the staff, thereby focusing on accurate order preparation and fulfillment.
4. Using the order details gathered, the system will generate essential reports covering:
    1. Sales report from orders
    2. Product sales performance trends
    3. Comparison report between advanced and same-day orders.

Given that the business is managed and operated by the owners themselves, the system will incorporate customer, staff, and admin-manager user roles to reflect the actual workflow of the business.

1.3 Significance of the Study

The findings of the study will benefit the following:

Angels and Lemons' Owners – Since the system is specifically made for them, the owners are directly the biggest benefactors of the study. Successfully addressing the study's aim will improve their business processes and overall quality. The admin-manager role will enable the owners to handle managerial and operational tasks efficiently, including generating reports, managing users, and product management. Since they are also responsible for operational tasks, they will benefit from increased order accuracy in comparison with manual order-taking and preparation.

Small Business Owners – Although specifically made for Angels and Lemons, small businesses in the food and beverage industry can benefit from the findings of this study. Implementing online processes may help them streamline their operations.

Customers – The business' customers as well as those of other similar businesses, will experience a more convenient and satisfactory online ordering process. Customers will have an easier time placing orders, have greater control over customization, and experience fewer errors in their orders.

Future Researchers – For future researchers who intend to do relevant studies, this study will serve as a beneficial reference. The study may provide the researchers with insights and recommendations for similar researches.

1.4 Scope and Limitations

The study aimed to develop the Angels and Lemons E-Ordering system to streamline ordering processes and optimize workflows for order-taking and fulfillment. The system encompasses distinct user roles: customers, staff, and admin-manager.

The ordering process begins with customer account registration, requiring entry of name, email address, and phone number. Registered users can then sign in to utilize the ordering functionalities, which include a carting mechanism for placing orders. All orders are designated for pick-up only. During checkout, customers can select either an immediate pick-up time or schedule an "Advanced Order" for the following day, specifying their preferred pick-up time without constraints. For same-day orders, customers must choose a pick-up time at least thirty (30) minutes in advance for orders of nine (9) beverages or fewer, or one hour in advance for larger orders, with an additional hour per every ten (10) additional orders. Order statuses and history can be tracked within the system. Payment options for registered users include mock-ups of G-Cash and PayMaya e-wallet gateways.

Customers who intend to go into the stall instead of using the ordering system may place upfront orders directly through the staff. Upfront orders can be paid for using cash or any available payment gateway (mock-ups of G-Cash and PayMaya), facilitated by the staff at the point of order placement.

A strict no-cancellation and no-refund policy is enforced. This ensures efficient stock management and reduces the risk of wastage on the owners' end. Customers are made aware of this policy before completing their purchase to ensure transparency and fairness.

The admin-manager role encompasses administrative and managerial tasks. Upon login, the admin-manager accesses a dashboard displaying key business performance metrics. The admin-manager also has a functionality overseeing product management, including the addition, modification, and archiving of products. The admin-manager also manages staff accounts within the system.

The staff play a crucial role in order fulfillment. All aspects of order transactions, from initial confirmation to preparation and readiness for pick-up are handled by those who have access to this module. The staff update order statuses within the system, transitioning orders from "confirmed" to "ready for pick-up," and marking orders as "claimed" or "unclaimed" based on customer interaction.

The study's findings and recommendations may not be directly applicable to businesses in different locations with varying market dynamics. The ordering system is online and web-based; it does not explore alternative technology platforms or offline functionalities. Orders from customers that will be going through the web site are to be treated as for pick-up only; consequently, the addresses of the customers are not going to be taken as there would be no restriction as long as the customers are to pick their order up. In lieu, the payment method shall strictly be e-wallet as to mitigate the damage bogus customers may pose. The ordering system for customers will not be taking in orders intended for upfront payment and delivery. Additionally, the system does not have inventory management functions, meaning it does not track stock levels or manage inventory replenishment. While the system is developed for the business and showcases specific functionalities, it is purely designed for demonstration purposes and not for operational deployment in its current state.

1.5 Definition of Terms

The following terms are hereby defined in this study:

Web-based ordering system. This is a digital platform accessed through a web browser that allows customers to place orders online for products or services offered by a business.

E-ordering System. A digital platform enabling customers to place orders online for pick-up, improving order accuracy and efficiency.

Streamlining. Streamlining involves making a process more efficient and simplified by eliminating unnecessary steps, reducing complexity, and improving workflow.

Carting Mechanism. This is a component of the web-based ordering system that enables customers to add items to a virtual shopping cart before proceeding to checkout.

E-wallet Payments. Digital payment methods using electronic wallets for secure and convenient transactions.

Customer-Staff-Admin-Manager Interface. The interactive component of the system where customers, staff, and admin-managers can manage orders and view information.

Order Pick-up. A service model where customers collect their orders at a specified location and time.

2. METHODOLOGIES

This chapter provides an overview of the methodology that the researchers have used to develop the web-based ordering system, including how necessary data was gathered, the instruments utilized, and the analysis performed to progress the study.

2.1 Research Instrument

The research instrument was based on the quality models defined in ISO/IEC 25010:2011 (International Organization for Standardization, 2011). This international standard provided a comprehensive framework for evaluating software quality across several characteristics: Functionality, Reliability, Performance Efficiency, Usability, Security, and Maintainability. These were adapted to fit the evaluation needs of the Angels and Lemons E-Ordering system. The adopted ISO/IEC 25010 form was utilized to gather feedback from ten (10) IT professionals and fifteen (15) customers, both returning and potential. The respondents tested the ease of placing orders and completing transactions and IT professionals conducted a comprehensive assessment of the system's performance and security features. This structured approach ensured a thorough evaluation of the system's quality attributes, guiding further development and optimization.

2.2 Waterfall Development Methodology

To design and develop the "Angels and Lemons' E-Ordering" system, the researchers utilized the Waterfall Development Methodology, a linear and sequential approach commonly used in software development. This methodology ensured that each phase was thoroughly completed before moving on to the next, providing a structured and organized process for developing robust software systems.

Requirements Analysis: The first phase focused on gathering and documenting the system requirements for the web-based ordering system. The researchers conducted detailed meetings with the business owners and potential customers, to identify the needs and challenges of the current manual order-taking process. The existing process was analyzed to pinpoint inefficiencies and the researchers have documented both functional requirements, such as the carting mechanism, mock-ups of e-wallet payments specifically G-Cash and PayMaya, as they are the ones the shop use, and order pick-up scheduling, and non-functional requirements, like security and performance.

System Design: Following the requirements analysis, the researchers proceeded with designing the system architecture and user interfaces. They developed the overall system architecture, including the database design. Detailed database schemas were created to manage user accounts, orders, products, and transactions. Additionally, technical specifications for system components and their interactions were defined. The culmination of this phase was a set of detailed design documents that served as a blueprint for the implementation phase.

Implementation: With the design phase completed, the researchers moved on to the implementation phase, translating the design documents into functional code. The development environment was set up with the necessary tools and technologies. The front-end interface was developed using HTML, Bootstrap CSS, CSS, and JavaScript, ensuring a responsive and visually appealing user experience. For the back-end, PHP was used to handle server-side logic and integration with the database. Key features, such as the mock e-wallet payment system, the carting mechanism, and the order scheduling functionality, were developed according to the specifications outlined in the design documents.

Integration and Testing: The phase involved performing integrative tests conducted by the researchers and several IT advisers. This phase ensured that all functionalities work as intended in coordination with the study's objectives. Any issues identified during the testing period were addressed to ensure that the system has met all intended requirements.

Deployment: Since the e-ordering system will not be deployed for business-use, the deployment phase was treated as the presentation phase by which the system and its functionalities was presented to respondents. After the presentation, the respondents have answered the adopted ISO/IEC 25010 form prepared to assess the system. The feedback focused on the ease of placing orders, completing transactions, and the system's overall performance. This practical approach allowed for a more direct and relevant evaluation of the system's real-world applicability and user experience.

3. PRESENTATIONS, DISCUSSION, AND INTERPRETATION OF DATA

This chapter covers the discussion of the evaluation and outcome of the Angels and Lemons' E-Ordering, focusing on its capabilities, limitations, and the results of the system evaluation answered by the respondents.

3.1 Project Capabilities and Limitations

The following are the potential of Angels and Lemons' E-Ordering:

1. Angels and Lemons' E-Ordering provides customers with a more user-friendly ordering process through its usage.
2. It reduces errors in order-taking as the carting mechanism is implemented.
3. It gives the staff a more streamlined and efficient order management capabilities as they can manage and update order statuses, ensuring a smooth

transition from order placement to fulfillment. This reduces the likelihood of errors and delays in order preparation.

The following are the limitations of Angels and Lemons' E-Ordering:

1. The E-Ordering is currently in prototype form, featuring functionalities tailored for the chosen business, but solely for the purpose of demonstration rather than deployment for their operations.
2. The E-Ordering only supports pick-up orders for registered customers and upfront orders facilitated by the staff. There is no functionality for orders intended for delivery.

3.2 Project Evaluation Result

The demonstration of Angels and Lemons' E-Ordering was evaluated in accordance to the ISO/IEC 25010:2011 standards. The system was evaluated in terms of its Functionality, Reliability, Performance Efficiency, Usability, Security, and Maintainability.

The following is the interpretation for the range of Mean scores gathered from the evaluation answered by its end users and IT professionals:

Table 1

Mean range interpretation scale:

Scale	Description	Range
1	Strongly Disagree	1.00 – 1.50
2	Disagree	1.51 – 2.50
3	Neutral	2.51 – 3.50
4	Agree	3.51 – 4.50
5	Strongly Agree	4.51 – 5.00

Table 2

Evaluation results computation.

INDICATORS	MEAN	DESCRIPTIVE RATING
A. FUNCTIONALITY		
1. Does the system cover all required functionalities? (e.g., ordering, carting, payment)	4.36	Agree
2. Are the system's functions suitable for achieving specific tasks and objectives?	4.52	Strongly Agree
3. Do the system's intended functions work accurately?	4.44	Agree
(e.g., accurately computes total price, displays proper order information)		
B. RELIABILITY		
1. The system is capable of handling a high volume of orders without any data loss.	3.96	Agree
2. The system prevents unauthorized access (e.g., admin-side is accessible for people with managerial roles only)	4.56	Strongly Agree
3. The system securely stores your order-related information and remains accessible whenever you need to access it for review needs	4.20	Agree
C. PERFORMANCE EFFICIENCY		
1. The system works quickly and without delays when you need to input or retrieve order information	3.88	Agree
2. The system allows you to access order-related records and receive notifications in a timely manner	3.84	Agree
3. The system operates smoothly without causing unnecessary delays or inconveniences	3.80	Agree
D. COMPATIBILITY		
1. Ability to access the system using your preferred browser	4.00	Agree
2. The system's compatibility with web operating systems that you use	3.88	Agree
E. USABILITY		
1. The system provides ease of use and navigation, particularly for individuals who are not tech-savvy	4.12	Agree
2. The system is not difficult to operate and control when placing intended orders and other functionalities	4.12	Agree
F. SECURITY		
1. Is the information kept private and protected from unauthorized access?	4.52	Strongly Agree
2. Does the system require secure login credentials to ensure only authorized individuals can access records?	4.40	Agree

3. Does the system comply with privacy regulations to safeguard any personal information?	3.92	Agree
G. MAINTAINABILITY		
1. Perception of the system being designed to be regularly updated and improved to meet users' needs	3.72	Agree
2. Does the system provide clear instructions or user guides to assist with any troubleshooting or maintenance tasks?	3.80	Agree
3. Are you confident that the system will be regularly updated and improved to ensure it continues to work well and provide the best possible user experience?	3.64	Agree
OVERALL	**4.09**	**Agree**

Table 2 presents the mean range computation of the evaluation handed out by the researchers. The overall mean was 4.09, meaning its evaluation was received in positivity with most of the criteria being in the "Agree" category; indicating that the system meets expectations in most areas.

4. SUMMARY OF FINDINGS CONCLUSION AND RECOMMENDATION

4.1 Summary of Findings

The study evaluated the "Angels and Lemons' E-Ordering" system with feedback from twenty-five (25) participants, comprising of fifteen (15) customers and ten (10) IT professionals. The evaluation focused on assessing the system in accordance to the ISO/IEC 25010:2011 standards. The following are the key findings of the evaluation that was utilized to gauge the capabilities of the E-Ordering prototype.

Firstly, in regards to its functionalities, the system effectively supports order placement, cart management, and mock e-wallet payments (G-Cash and PayMaya), meeting operational needs with a high level of user satisfaction. It accurately computes order details and provides users with necessary information, contributing to streamlined operations and enhanced user satisfaction.

In terms of the reliability aspect of the system, it was positively received. It demonstrated capability in handling high volumes of orders without data loss and maintained secure access for authorized personnel only. The system securely stored order-related information, ensuring accessibility and data integrity.

The evaluation of performance efficiency highlighted that the system operated smoothly without significant delays. It provided satisfactory notifications and access to order records, enhancing overall efficiency in order processing and fulfillment.

The system's compatibility with different web browsers and operating systems was satisfactory, allowing users to access and utilize its features without compatibility issues.

Regarding usability, respondents found the system easy to navigate and use, catering to both tech-savvy and non-tech-savvy individuals. It streamlined the ordering process and contributed to a positive user experience.

The security measures implemented in the system were robust, ensuring the privacy and protection of user information. It required secure login credentials and complied with privacy regulations, enhancing user trust and confidence.

The maintainability aspect indicated that the system was designed for regular updates and improvements. It provided clear instructions and user guides for troubleshooting and maintenance, ensuring ongoing reliability and user satisfaction.

Overall, the "Angels and Lemons' E-Ordering" system meets and exceeds user expectations across multiple dimensions, demonstrating high functionality, reliability, performance efficiency, compatibility, usability, security, and maintainability. These attributes contribute to a streamlined and secure user experience, ensuring the system is both effective and user-friendly for a wide range of customers and IT professionals. The positive feedback from the evaluation confirms the system's capability to support operational needs and enhance user satisfaction.

4.2 Conclusion

In consideration of the objectives of the study and the development of Angels and Lemons' E-Ordering, the following conclusions were reached after testing the prototype system and the evaluation was completed.

1. The e-ordering system has successfully streamlined the ordering process for customers. By providing a user-friendly interface, incorporating a carting mechanism, and allowing flexible pick-up scheduling, it has effectively addressed the challenges associated with manual order-taking. This improvement caters to both tech-savvy and non-tech-savvy customers, enhancing overall accessibility and convenience.
2. Compared to traditional verbal or written methods, the e-ordering system has significantly minimized errors in order-taking and fulfillment. The

implementation of a carting mechanism ensures accuracy before finalizing orders. Additionally, automated order status updates and the use of mock-up payment gateways (G-Cash and PayMaya) contribute to smoother transactions and increased operational efficiency.

3. The system's features, such as the ability for customers to place pick-up orders through their accounts or upfront orders via staff, optimize the order process from preparation to fulfillment. This flexibility caters to varying customer preferences and operational needs, thereby enhancing overall service quality.

4. Utilizing the gathered order details, the system generates essential reports including sales data, product performance trends, and comparisons between advanced and same-day orders. These insights empower business decision-making, enabling proactive adjustments and strategic planning.

4.3 Recommendations

Based on the conclusion and results of the evaluation of the study's e-ordering prototype, the following recommendations for Angels and Lemons' E-Ordering are:

1. Explore alternative technology platforms. While this study focused on a web-based ordering system, future researchers could explore alternative technology platforms such as mobile applications or integrated POS systems. This exploration could cater to different customer preferences and operational needs that may not be fully addressed by a web-based system alone.

2. Enhance flexibility in ordering and payment. To cater to diverse customer preferences and operational scenarios, future studies could explore functionalities for delivery orders and additional payment methods. This could broaden the system's appeal and usability in various business contexts.

3. Integrate inventory management. Address the limitation of not having inventory management functionality by incorporating features that track stock levels, manage inventory replenishment, and provide insights into product availability. This enhancement would support more efficient business operations and improve customer satisfaction by reducing instances of stockouts.

4. It is recommended to establish continuous user feedback mechanisms that will allow for improvements, ensuring that the app remains relevant and effective in meeting user expectations.

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