Maggot Sales Application On Larva Go Using Search Engine Optimization (SEO)

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ABSTRACT

Larva Go is a maggot-based waste management business derived from the larvae of the Black Soldier Fly (Hermetia illucens). These maggots produce highly nutritious larvae as animal feed and residue in the form of quality organic fertilizer in organic waste management. However, the business faces the challenges of a manual sales system through WhatsApp, limited marketing, and error-prone manual recording. To overcome these problems, research was conducted using the Waterfall software development model, and Search Engine Optimization (SEO) optimization. The goal is to expand marketing reach, automate the sales process, and manage customer data. The application is equipped with features such as product information, ordering, payment through Midtrans, and special delivery for the Tegal Regency area. The results showed that the maggot sales application was successfully developed and has been hosted so that it can be accessed online. Testing was conducted by twenty users, the results of which 93% showed that the application functioned well and provided an easy user experience, from registration, ordering, to automatically integrated payments. In addition, Larva Go search optimization through search engine optimization with on-page methods has been implemented and successfully found in search engines, at the top rank.

Keywords: Larva Go, Maggot, Sales, Waste Management, SEO

1. Introduction

Maggot is the larva of the Black Soldier Fly (Hermetia illucens) which has great potential in organic waste management. The life cycle of the black soldier fly consists of several stages, namely eggs, larvae (maggot or maggot), prepupa, pupa (cocoon), and finally the Black Soldier Fly (BSF). (Mangisah et al., 2022). These larvae can consume various types of organic waste, such as food scraps and animal feces, making them efficient in the decomposition process. In addition to reducing waste volume, maggots produce high-value larvae due to their good protein content, ideal for animal and pet feed. The residue from the decomposition process, or kasgot, can be used as a quality organic fertilizer, making the use of maggot environmentally friendly and sustainable (Oktavia et al., 2020).

One such organic waste management business is Larva Go, which was founded by Abdul Aziz Al Ghifari and his team in 2022. Starting from circural waste bank (2021), Larva Go utilizes the Black Soldier Fly (BSF) larval cycle to convert organic waste into maggots. Apart from focusing on profit, Larva Go also serves as an educational place for people who want to learn about organic waste management and maggot utilization (Ghifari, 2024).

Larva Go sells maggots through direct selling with potential customers via WhatsApp. Interested customers place orders and the details are recorded by Larva Go's sales staff.

The records include the type of maggot, order quantity and delivery address. Then the order is packaged and ready to be sent after the customer makes payment through the agreed cargo service. All processes are done through WhatsApp media communication.

From the results of the initial research conducted, the author found several problems; 1) limited services related to product information to customers and their marketing reach, because only through WhatsApp media. 2) the risk of errors in recording the type, quantity, and delivery address of the maggot ordered which will cause errors in payment and delivery transactions. 3) limited information on the availability of Larva Go products which depends on the maggot production process and the amount of organic waste supply as the main feed for maggots, which can result in losing customers. From these problems, there is an urgency to create a sales application and perform Search Engine Optimization (SEO) optimization, which can make it easier for potential customers to find maggot products through search engines, increasing sales opportunities and market reach.

Search Engine Optimization (SEO)

Search Engine Optimization (SEO) is an optimization technique that utilizes keywords or phrases that have relevant clues to the content on web pages, where this information will be indexed by search engines (Woncharso et al., 2021).

Waterfall

The Waterfall Model is a traditional method of software development that describes a linear and sequential development process. This model must be done sequentially or sequentially. If one stage has not been completed, it cannot continue to the next stage. Stages start from concept planning (requirement analysis), system modeling (system design), implementation, testing and maintenance (Zikri et al., 2024).

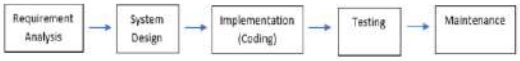

Figure 1: Waterfall Method (Zikri et al., 2024)

Stage 1. Requirement Analysis. Requirement analysis is carried out to identify existing problems, understand system work and analyze system requirements.
Stage 2. System Design. Design includes system design, database, interface to coding.
Stage 3. Implementation (coding). At the implementation stage, the design results are converted into program code.
Stage 4. The testing stage is carried out to ensure that each module functions correctly according to specifications.
Stage 5. The maintenance stage includes the installation and repair process of the system in accordance with what has been approved.

2. Material and Methods

This research uses an approach that includes data collection techniques through literature study, observation, and interviews.
In addition, the system development process is applied with a waterfall model.

Data Collection

The author collects data in several ways, namely:

1. Literature Study
   In the literature study stage, a search, collection, and review of references relevant to the research topic related to the maggot business and system development technology are carried out.
2. Observation
   Observation is done by directly analyzing the business process and cultivation of maggots at Larva Go. The author observes the flow of maggot sales, interactions between staff and customers, marketing strategies, and ongoing transaction processes. This observation

aims to understand the needs of the new system to be developed.

3. Interviews

Interviews were conducted with the owner of Larva Go and obtained in-depth information related to the ongoing marketing and sales process, problems and system needs.

Waterfall Software Development

This research uses the waterfall model software development methodology, with five stages:

1. Requirement Analysis

At the initial stage is the requirement analysis stage. In the current system process, there are marketing procedures and sales procedures. The marketing procedure has three processes, namely: 1) the offer process, which is carried out by the admin to prospective customers, 2) the promotion process, in the form of delivering product information through WhatsApp media, and 3) the follow-up process, namely conducting follow-up services for prospective customers who are interested in Larva Go products.

In the sales procedure, there are four processes, namely: 1) the order process and purchase order (po) recording, carried out by prospective customers who are interested in the product and recorded by Larva Go staff, 2) the product preparation process, namely the ordered product is prepared and packaged by the staff, 3) the payment process, the ordered goods are paid by the customer and verified by Larva Go staff, 4) the delivery process, carried out after the payment verification process is carried out.

Functional Requirements

The following is a list of functional requirements designed to fulfill the requirements in the system. This system involves three main actors, namely customers, admins, and owners. Details of the functional requirements for each actor can be seen in the table below:

Table 1: Functional Requirements

No	Actors	Functions	Requirements
1	Customer	Sign Up for an Account	Sign up for an account to be able to make transactions
		Making an Order	a) View product data b) Making a product order c) Choose a payment method d) Making a payment
		Check order history	a) View details of orders that have been placed. b) Check the status of orders that have been placed
2	Admin	Manage Accounts	Manage Customer Accounts
		Manage Payments	Manage Customer Payments
		Manage Orders	a) Update the status of orders from customers b) Prepare orders
		Manage Products	a) Add product b) Delete product c) Edit Product
		Manage Shipments	a) Manage the product delivery process after payment has been validated. b) Keep an eye on the delivery status
		Make a Reports	Make an order report for the owner

3	Owner	Validating the Report	Validate the report

2. System Design

The use case diagram design in this maggot sales application involves three main actors, namely admin, customer, and owner, each of which has an important role in running the system.

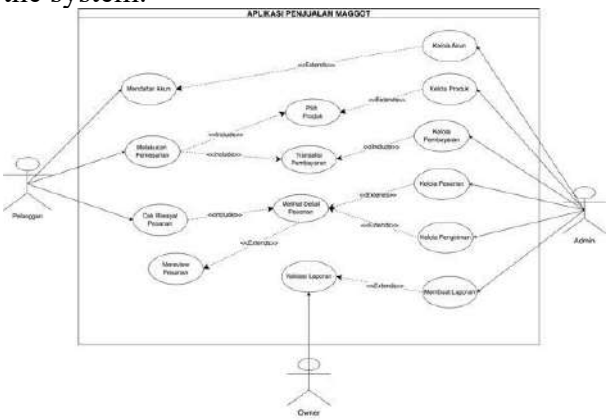

Figure 2: *Use Case Diagram*

***Entity Relationship Diagram* (ERD)**

The following is a database design that will be carried out by designing an Entity Relationship Diagram (ERD).

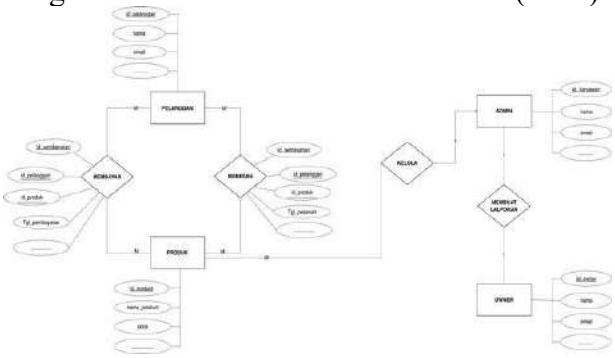

Figure 3 *ERD*

HIPO Diagram

The following is a coding design using the Hierarchy Plus Input Output (HIPO) design, describing the menu on the system. The following is the HIPO design that has been designed:

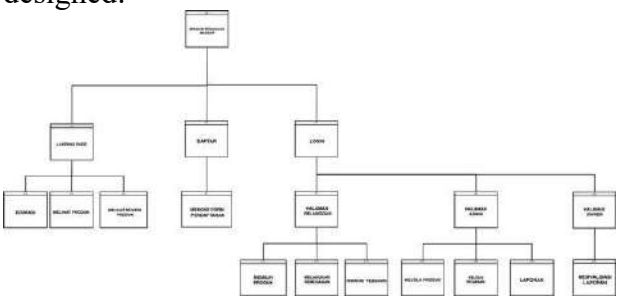

Figure 4: HIPO

3. Coding

This stage involves developing a web-based application using the PHP programming language and MySQL database. The application includes features for landing page, login, register, product information, purchase, payment, and customer data management. In addition, SEO-Onpage implementation was carried out to make the application more discoverable through search engines.

4. Testing

At this stage, the application that has been built will be tested using the Black Box Testing method to ensure all features run according to their functions. This test is carried out to detect any errors or bugs, as well as ensure that the system can meet user needs in accordance with the design.

Table 2: Test Plan

No	*Test Case*	Expected results
1	Register a user by leaving all fields blank.	The system rejects the registration request and displays the alert "Registration failed, all fields must be filled in."
2	Register a user by entering a password of less than 8 characters.	The system rejects the registration request and displays the alert "Registration failed, password

		must be at least 8 characters."
3	Log in by leaving all fields blank.	The system rejects the login request and displays the alert "Login failed, email and password cannot be empty."
4	Log in by filling in the fields according to the provisions.	Display the main page of the maggot sales application.
5	Log in by filling in a valid email but an invalid password.	The system rejects the login request and displays the alert "Login failed, incorrect email or password."
6	Log in by filling in an invalid/unregistered email and password.	The system rejects the login request and displays an alert "Login failed, account not found."
7	Uploading a product with the name, price, and stock fields blank.	The system rejects the product upload and displays the message "Upload failed, all fields must be filled."
8	Uploading a product by leaving the price field blank but filling in the name and stock.	The system rejects the product upload and displays the message "Upload failed, price must be filled in."
9	Uploading a product with a negative price.	The system rejects the product upload and displays the message "Upload failed, invalid price."
10	Uploading a product with negative stock.	The system rejects the product upload and displays the message "Upload failed, invalid stock."
11	Edit an existing product by changing the name and price.	The system accepts the edit request and displays the message "Product successfully updated."
12	Delete an existing product.	The system accepts the delete request and displays the message "Product successfully deleted."
13	Place a product order with the delivery address field blank.	The system rejects the booking request and displays the message "Booking failed, shipping address must be filled in."
14	Place a product order by filling in all the required fields.	The system accepts the booking request and displays the message "Booking

		successful." Or go to midtrans payment page
15	Edit user account information (for example, name, email, and roles).	The system accepts the edit request and displays the message "User account updated successfully."
16	Delete the user account.	The system accepts the delete request and displays the message "User account successfully deleted."
17	Cancel an order	The system accepts the cancellation request and displays the message "Order successfully canceled."
18	Change order status	The system accepts the status change request and displays the message "Order status successfully updated."

3. Results and Discussions

The following are the results and discussion of the maggot sales application on the website-based larva go waste bank using search engine optimization (seo).

Page Results

1. Login Page

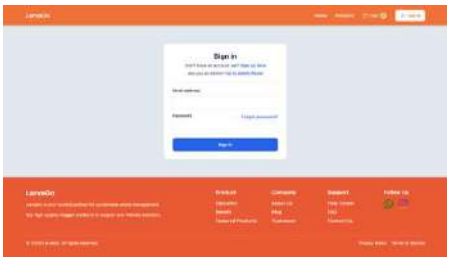

Figure 5: Login Page

2. Product Page

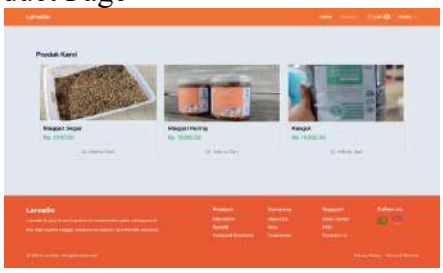

Figure 6: Product Page

3. Checkout Page

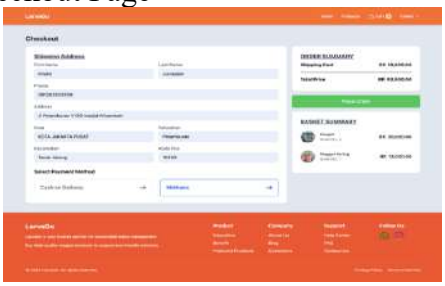

Figure 7: Checkout Page

4. Order History Page

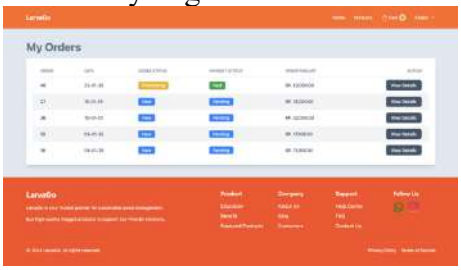

Figure 8: Order History Page

5. Manage Order Page

Figure 9: Manage Order Page

6. Manage Payment Page

Figure 10: Manage Payment Page

7. Manage Report Page

Figure 11: Manage Report Page

Black Box Testing

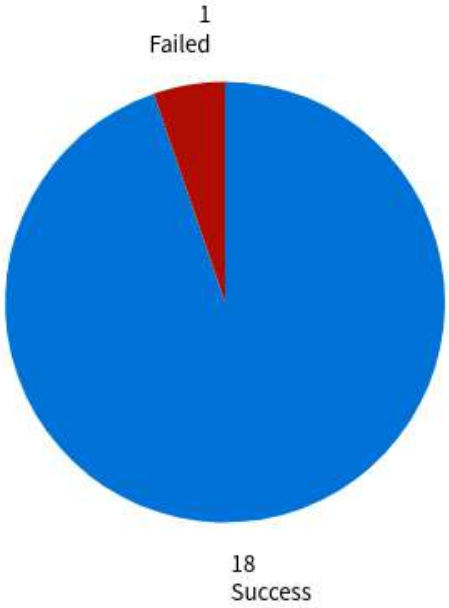

Figure 12: Testing Results

Implementation of Search Engine Optimization (SEO) in Applications

The author uses On-Page SEO by testing website performance using Google Lighthouse, which evaluates the speed, accessibility, best practices, and SEO of the developed application. The results of this test are an indicator of the success of On-Page SEO implementation in improving website performance and quality.

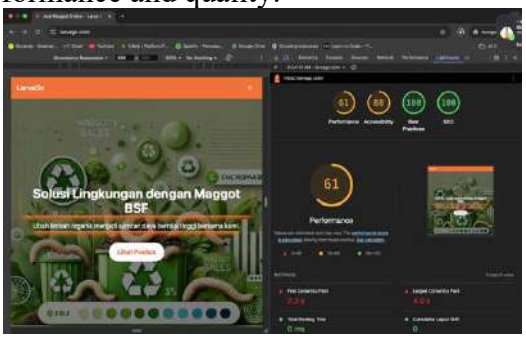

Figure 13: SEO Performance Evaluation with Google Lighthouse

Based on testing using Google Lighthouse, the SEO performance evaluation results are obtained with a score of 100 as shown in Figure 13. This score indicates that the optimization of On-Page SEO elements applied has met the best standards, such as the use of relevant title tags, informative meta descriptions, clear heading structures, and fast and responsive website performance.

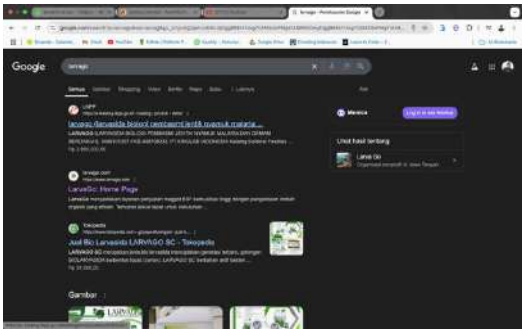

Figure 14: Larva Go Search Results on Google

The search results for “Larva Go” on Google, as shown in Figure 14, display this website at the top of the search results. This proves that the On-Page SEO strategy implemented is effective in improving search rankings organically. This success is also supported by the implementation of search engine-friendly URL structure, image optimization, and good user experience in website navigation.

4. Conclusion

Based on the research that has been done, the following conclusions can be drawn; the

maggot sales application has been successfully developed with main features such as user registration, product browsing, ordering and payment processes. Testing of 18 system functions by 20 users obtained 93% success. This shows that the system works well. In addition, Larva Go search optimization through search engine optimization with the on-page method has been implemented and successfully found in search engines, at the top rank.

Acknowledgement

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