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Food Waste Management

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ABSTRACT— **"**Food waste has become a significant problem that negatively affects economic growth, particularly in the agricultural processing industries. To address this, a web application has been developed to manage food waste in places like office premises, weddings, and events. By automating the process of managing food waste, this project aims to reduce the amount of food that is wasted on a daily basis. Food recycling has always been a complex task, and this web application provides a solution to this issue.The issue of food wastage has become increasingly prevalent in recent times and is negatively impacting the economic growth of industries, particularly those in the agricultural processing sector. To address this problem, a project has been initiated to focus on reducing food wastage in various settings such as offices, weddings, and events. The project aims to develop a web application that facilitates the management of leftover food in a useful manner. Considering that significant amounts of food are being wasted every day, it is important to find ways to reduce food wastage through technology. The goal is to automate the process of managing food wastages and encourage more sustainable and responsible use of resources.**"**

I. INTRODUCTION

The Food Wastage Management System is a web-based platform that serves as an interface between food donors and those in need. Through this application, donors can enter their food quantity details and addresses, and create an account to request the collection of their surplus food. The admin then arranges for nearby agents to collect the food and distribute it to orphanages or individuals in need. Confidentiality is maintained for each donor, as the system maintains separate accounts. This project aims to address the issue of food waste and poverty by providing a successful social innovation that tackles both problems. The platform is built using PHP and a MySQL database and has three modules - Admin, Donor, and User.

According to an FAO study in 2011, approximately 1.3 billion tons of food is lost or wasted annually, which amounts to 32% of all food produced for human consumption globally. When converted to calories, this estimate suggests that one out of every four food calories produced is wasted. Food loss and waste occur at different stages in the food supply chain for developed and developing regions. The majority of food is wasted at the retail and consumer stages in industrialized countries, while in low-income countries, food is often lost in the production or processing stages. However, most food waste comes from consumers in areas of mass food consumption. For example, in developed countries, food waste at the consumer level is almost as high as the total net food production of sub-Saharan Africa.

Food loss and waste have significant negative impacts on farmers, consumers, and societies. Farmers experience wasted investments and lost profits due to unsold food items, potentially leading to higher prices for consumers in some cases. This is especially critical for smallholders living on the brink of food insecurity. The inefficient use of land, water, and energy resources and the unnecessary generation of greenhouse gas emissions throughout the food supply chain also contribute to environmental degradation. The disposal of wasted food further exacerbates this issue by producing methane gas from landfills. The total land mass required to grow all of the unused food globally is equivalent to 1.4 billion hectares or 30% of the Earth's agricultural land mass.

II. LITERATURE REVIEW

Thepaper [1] concludes that initiatives to reduce food waste can be classified into three main categories: information and capacity building, redistribution, and supply chain initiatives. All three types of initiatives require collaboration, timing, and

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competencies for success. Information and capacity-building initiatives focus on educating consumers and providing them with the motivation and skills to avoid food waste. Redistribution initiatives aim to capture foods otherwise wasted in the supply chain and provide them to consumers while raising awareness of supply chain inefficiencies. Supply chain initiatives involve altering retail sales or supply chain functioning to reduce food waste and often present a business opportunity. The paper highlights the importance of collaboration, timing, and competencies for success in reducing food waste.

The paper [2] provides an in-depth analysis of the life cycle performance of a digester for reducing the carbon footprint in milk production. The study reveals that the digester effectively reduces the carbon footprint of milk production by 25% at the farm gate. The profitability of the project is highly sensitive to factors such as electricity prices, equipment lifetime, efficiency, and public aid. The study suggests that the project can be economically profitable with a higher price of electricity and the valorization of bedding co-products. A graphical representation of the Life Cycle Costing and Life Cycle Impact, along with three main indices, such as IRR, Breakeven Price of Electricity, and Impact Savings Ratio, can help decision-makers to compare scenarios and make informed decisions.

In thispaper [3], the authors explore the measurement of food waste, focusing on the quantity and value of food waste in the food supply chain. They present their own definition of food waste, which highlights the portion of food that ends up in the landfill. The authors argue that the quantity and value of food waste are often overstated in current estimates. They also identify points in the food supply chain where policymakers can intervene to reduce food waste. While the paper's approach has limitations, it provides a framework for future research to inform policy decisions aimed at reducing food waste.

This paper [5] reviews eight previous publications that investigated the potential for food waste prevention and environmental impacts from the same. The main aim of the paper is to compare results and discuss differences in methodological approaches used in these studies. The review shows that the climate impact from the prevention of end-consumer food waste has been estimated to be between −0.8 and −4.4 kg CO2/kg prevented waste in the reviewed studies. The paper identifies food production as the overall determining factor for benefits related to food waste prevention in reviewed studies. In addition, consumer transport and end-consumer preparation can have a large impact on overall results, mainly due to the relatively small amount of food transported/prepared per unit of energy consumed. The paper also highlights the importance of developing accessible food production LCA data to further advances in LCA of food waste prevention.

The paper [5] recommends increased transparency in presentations of methodologies used for the assessment of types and amounts of preventable food in future studies. The paper also recommends the use of a "best" and "worst" case scenario or sensitivity analyses, varying the composition of prevented food waste, to check the robustness of results. The paper suggests that future research projects would benefit from increased standardization of guidelines for methodological choices to increase transparency, internal coherence, and possibilities for cross-study comparisons.

The paper [6] presents a framework for analyzing food waste in a computable general equilibrium context and identifies the trade-off between time spent on food preparation and savings in food inputs used as a crucial component of the costs of reducing food waste. The study suggests that policies to encourage technological improvements that save both food and time spent in food preparation would be crucial in reducing food waste costs. Future research could extend the analysis to more concrete policy suggestions by including food-saving technologies and quantitatively linking them to the trade-off between time used for food preparation and food waste reductions in the model. Additionally, extending the spatial coverage of the study to the whole EU-27 and conducting a sensitivity analysis for the level of food waste would provide more insight into the problem.

This paper [7] discusses the results of a study on the potential financial and environmental impacts of reducing the storage temperatures of refrigerated foods in households. The study found that if only the foods currently refrigerated were stored at lower temperatures, the financial value of the saved food waste would be £162.9 million, with a relatively small increase in energy costs required to run the fridge. However, when additional foods were included in the analysis, such as those not typically stored in the fridge and those that do not require chilled storage, the financial value of the saved food waste increased significantly to £283.8 million. The study also found that reducing fridge temperatures to 4°C should be recommended to consumers as an approach to reducing food waste.

III. EXISTING SYSTEM

The food waste management website is built using PHP and MySQL. It allows users to donate food waste, which can help in reducing food wastage and saving costs. The website is designed to be simple and

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easy to use for anyone who wants to donate their excess food. Users can create an account, search for nearby food banks and organizations that accept food donations, and schedule a pickup or drop-off. The website also includes features for tracking food donations and managing inventory. The system is designed to ensure the security and privacy of user data.

IV. PROPOSED SYSTEM

PHP is a popular choice for website development for various reasons. One of the main advantages of PHP is that it is a free and open-source language, which makes it an accessible option for small projects or developers on a budget. Additionally, PHP has strong community support and many resources available, which can help solve problems during programming. PHP is also highly portable and can be used on various operating systems and web server software.

Another advantage of PHP is its simple syntax and C-like structure, which makes it easy for C programmers to learn and use. This simplicity can lead to faster development times and fewer errors. Additionally, the fact that PHP's source code is open means that it is continuously being developed and improved by the community, which can lead to more features and capabilities over time.

However, it is important to note that ASP.NET and JSP also have their own advantages and may be better suited for certain projects. It ultimately depends on the specific needs and requirements of the project.

	ASP.NET	PHP	JSP
security	Safety is good, but there exist certain degree of security vulnerabilities	PHP is a recognized safety performance	Safety is the highest
platform incompatibility	single platform	multiplatform	multiplatform
operating efficiency	high	higher	highest
cost	high	free	high

V. METHODOLOGY

I. Development Environment

Individuals who lack experience with development environments should not attempt to set it up themselves as it can lead to conflicts between various editions and complex configuration problems. In addition, it is essential to ensure consistency between the PHP language version and the server before starting development. PHP has two main editions - PHP4 and PHP5 - that have differences with SESSION, exception handling, variable range, data type, etc. It is recommended to use the Apache server when editing PHP programs on the Windows platform to avoid incompatible problems. In terms of databases, MySQL and Oracle are the most commonly used DBMS with PHP. MySQL, being open source, free, and efficient, is the preferred choice for most developers and is perfect for medium and small application systems. It also supports many platforms and multi-thread on the Unix/Linux system, making it the first choice for small to medium-level PHP websites. MySQL provides a series of supports such as read-write access.

II. Functional Module Design

Organizing the demand report into modules with high cohesion and low coupling is a good practice for software development. High cohesion refers to grouping related functions or features together in a module, while low coupling refers to minimizing the dependencies between modules.

By applying these principles, the demand report can be divided into separate modules that focus on specific aspects of demand, such as geographical location, product type, or customer demographics. Each module can have its own set of functions and data structures, which are designed to work together seamlessly.

I Admin Module

Admin Module Contains:

1. **Dashboard**: In this section, the admin can view the total state, total city, Total Food Donor, Total Listed Food, All Food requests, New Food Requests, Rejected Food Request and Completed Food Request,
2. **State**: In this section, the admin can manage the state (Add/Update/Del).
3. **City**: In this section, the admin can manage the city (Add/Update/Del).
4. **Reg Food Donor**: In this section, the admin can view registered food donors.
5. **Listed Food**: In this section, the admin can view the listed food by the food donor.
6. **Food Request**: In this section, the admin can view the request for food that is sentto the user.
7. **Enquiry**: In this section, the admin can view and maintain the inquiry.
8. **Pages**: In this section, the admin can manage the about us and contact us pages.
9. **Search Listed Food**: In this section admin, search food request by request number.
10. **Reports**: In this section,the admin can view donated food and registered food donor in a particular period

Admin can also update his profile, change the password and recover the password.

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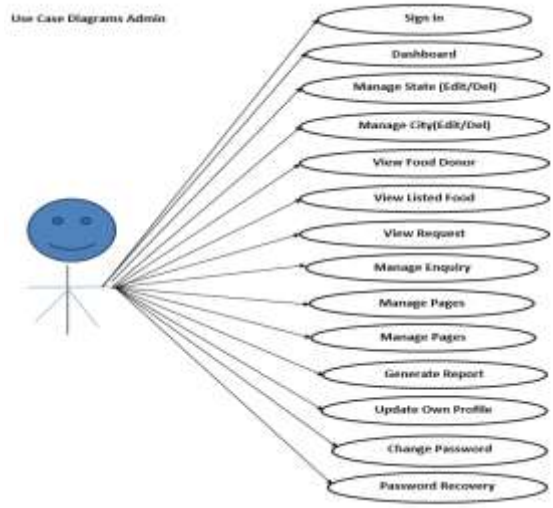
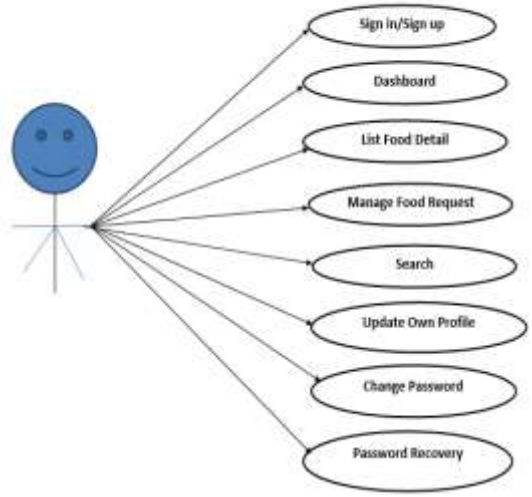


IIDonor Module
Donor Module Contains:

1. **Dashboard**: In this section, donors can view the total listed food and total food takeaway.
2. **List Your Food Detail**: In this section, donors can list the donated food detail.
3. **Request**: In this section, the donor can view the request which is sent by the user.
4. **Search**: In this section, donors can search food requests by request number.

Donors can also update their profile, change the password and recover the password.

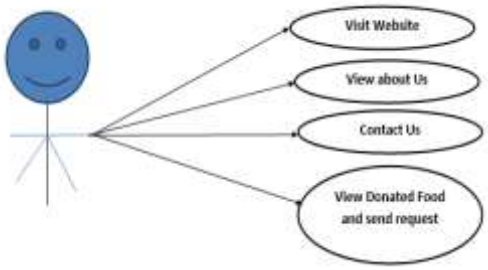
Use Case Diagram of Donor



III. Visited Users

1. **Home**: The user can visit the website and check the details.
2. **About Us**: The user can see the details of the website.
3. **Contact Us**: The user can see the contact detail and contact the website administrator.
4. **Food Available List**: The user can view available donated food and send a request for food.
5. **Request Food**: The user can also request available food.

Use Case Diagram of User



III. Database design and implementation

In addition to the security and character set/coding considerations mentioned, there are several other important aspects to consider during database design and implementation:

Data consistency: The database should maintain consistency and integrity of data by enforcing constraints such as unique keys, foreign keys, and check constraints. This can prevent data anomalies and inconsistencies.

Normalization: The database should be normalized to reduce redundancy and improve data integrity. This involves organizing data into tables and ensuring that each table contains only related data.

Indexing: Proper indexing can significantly improve the performance of database queries. Indexes should be added to columns that are frequently used in search criteria.

Backup and recovery: Regular backups should be taken to ensure that data can be restored in case of database failure or corruption. Additionally, a recovery plan should be in place to restore the database to a known state in case of errors or accidental deletions.

Scalability: The database should be designed with scalability in mind to accommodate future growth and increased traffic. This may involve using distributed databases or sharding techniques.

Performance optimization: Several techniques can be used to optimize database performance, such as caching, query optimization, and reducing unnecessary data retrieval.

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VI. RESULTS

The results are displayed through a well-constructed website with inter-connected modules that work together to make a whole project.

Fig 1: Home Page

Fig 2: Admin Dashboard

VII. FUTURE ENHANCEMENTS

There are several potential future enhancements for the food waste management website. One possibility is to integrate blockchain technology to provide greater transparency and accountability in the donation and distribution process. Another possibility is to incorporate machine learning algorithms to optimize food donation pickup and delivery routes, reducing transportation costs and minimizing food waste. Additionally, expanding the website's reach to include more regions and partnering with additional organizations could increase the overall impact of the project. Finally, incorporating social media integration and gamification elements could increase user engagement and incentivize participation in the food waste reduction effort.

VIII. CONCLUSION

It's great to hear that the Food Wastage Management System project has been carefully studied, analyzed, and implemented with the guidance of an experienced project guide. The project's focus on targeting individuals who want to donate wasted food is an important step towards reducing food waste and cost-saving. Integrating emerging technologies such as blockchain could further enhance the system's efficiency and transparency while expanding its coverage to more areas would help maximize its impact on reducing food waste. Overall, it's important to continue exploring ways to improve and expand the system to address the pressing issue of food waste management.

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