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An Advanced NGO Management System for Efficient Operations, Enhanced Donor Engagement and Transparent Community Development

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Abstract: The state-based, web-based Advanced NGO management system optimizes the effectiveness and accountability of donations by building trust between donors and NROs. Create a laboratory for food testing that allows for the distribution and responsibility of correct resources using five important user roles, administrators, NGO managers, donors, delivery staff, and real monitoring and automation. The system promotes intelligent resources and robust quality assurance management, maximize trust, maximize social impact, and demonstrates the life-changing power of digital solutions for nonprofit organizations.

Keywords: Donor Engagement, NGO, Sentiment Analysis, Spring Boot Framework, Web-Based System

INTRODUCTION

The humanitarian sector is strongly based on non-governmental organizations (NGOs) to alleviate important global challenges such as poverty, hunger and limited access to essential resources. However, the operational effectiveness of many NGOs is hampered by inefficient donation processing, lack of transparent processes, and difficulties in maintaining consistent donation support. Traditional donation mechanisms often lead to delays in support, resource distraction and declining trust in participants. Integrating advanced technology is important to address these challenges.

This study introduces "Intelligent and Transparent Aid Management: Progressive NGO Management System" and introduces an online platform to optimize NGO operations and promote stronger donor relationships. The system uses a structured framework that supports five different user roles. Units for administrators, NGO managers, donors, delivery staff and food testing. By quickly deploying real monitoring, automated operational workflows, and data control analytics capabilities, platform-efficient donation management, and favors. This approach provides donors with a complete overview of their contributions, increases transparency and supports sustainable commitment. At the same time, NGOs can optimize resource distribution, improve supplementary measures, and create strong trust in donor bases. Thanks to the effective implementation of progressive technology, the proposed solution aims to determine new standards for digital transformation in the non-profit sector and strengthen the enterprise, achieving improved operational efficiency and long-term sustainability.

PROBLEM STATEMENT

Most NGOs find it difficult to make their contributions transparent. Donors are always worried about whether their donations are common use. Furthermore, food safety is a problem. This is because donated foods must be analyzed before distribution and determined to be safe. After all, donation logistics and persecution requires an efficient system to prevent mismanagement. The lack of well-defined technology-based systems creates a reliable, operationally inefficient and food-safe environment.

OBJECTIVE OF THE STUDY

1.Tracks Donations in Real Time – Tracks the donation process from collection to distribution, making everything transparent.
2.Automates Donation Management and Delivery Coordination – Increases efficiency by automating critical processes such as donation management and delivery coordination.
3.Enhances Operational Effectiveness – Streamlines work processes for NGOs, donors, and food testing units to provide seamless operations.
4.Ensures Food Safety and Quality Control – Enforces food testing protocols to ensure the safety and quality of items delivered.
5.Uses Geolocation-Based Delivery Tracking – Maps routes and optimizes distribution with location-based tracking.

SCOPE OF THE STUDY

The system is configured for donors, NGOs, delivery staff, food testing units, and administrators. It captures all the stages of the donation process, right from registration of the donor to the submission of the donation and up to testing, approval, delivery, and the final acknowledgement. The system facilitates documenting every aspect of the process clearly and transparently, tackling critical issues in NGO operations.

SIGNIFICANCE OF THE STUDY

This study contributes to physical technology-based social impact solutions by solving the challenges of NGO donation management. With increased transparency and efficiency, the system promotes higher donor trust, more donations and efficient distribution of resources for the poor. The inclusion of food testing mechanisms also ensures pre-distribution security and quality. Advanced NGO management systems are a step towards digitizing and streamlining the management of donations in NGOs. By using technology, automation, and real-world monitoring, the system ensures greater efficiency, higher donor commitment, and systematic ways to implement community service. Through this research, we will attempt to create a model that NGOs can implement worldwide to improve donation management and distribution.

LITERATURE REVIEW

A third of food production is wasted each year, making food loss a serious global problem that exacerbates hunger and has an adverse effect on the environment (FAO). [1]. Eight to ten percent of greenhouse gas emissions come from food waste, underscoring the need for improved supply chain management and redistribution regulations (UNEP). [2]. SDG 12.3, which aims to cut per capita food waste in half by 2030, is in line with waste reduction (UNEP). [2]. To fight food insecurity and landfill waste, groups such as Feeding America redistribute excess food (Feeding America). [3]. Technology's contribution to waste reduction is demonstrated by community-driven solutions like the food-sharing app Olio (Olio) [4]. However, logistical, regulatory, and perishability issues make redistribution difficult, necessitating innovation in technology and policy (Feeding America). [3]. Numerous studies draw attention to challenges with food safety as well as collection, storage, delivery and legal restrictions that prevent extensive food rescue efforts (Feeding America) [5]. Modern refrigeration and packaging techniques increase food shelf life and facilitate safe redistribution (Feeding America). [3]. The effectiveness and transparency of food donations are increased by app-based platforms such as Food Rescue US and AI-driven tracking systems (Food Rescue US, Google Maps API). [8][9]. Temperature control and sanitation reduce the risk of contamination, making food safety crucial during redistribution (Food Rescue US). [10]. While blockchain and predictive analytics optimize distribution networks, AI-driven sentiment analysis improves donor engagement (Google Maps API, Blockchain Technologies). [11]. Sentiment classification for food programs is improved by research on multilingual WordNets and sentiment models like SentiLARE (WordNet, SentiLARE). [12][13]. Research shows that food banks' supply chains are inefficient, highlighting the necessity of improved IT infrastructure and logistics (Akkerman et al.)[14]. NGOs can track deliveries more effectively with Google Maps API integration (Kumar). [15]. Planning a food donation strategically can improve redistribution efforts even more (Croella & Gregori). [16]. Improving food shelf efficiency requires an understanding of donor motivations and customer needs (Verpy et al.). [17].

RESEARCH METHODOLOGY

The Advanced NGO Management System proposed will automate donation management, increase transparency, and increase donor participation through an internet-based system. The methodology provides details of the system architecture, data management, user roles, and major technological integrations employed to attain these goals. The development process adheres to a systematic approach, and the system will meet functional and non-functional requirements effectively.

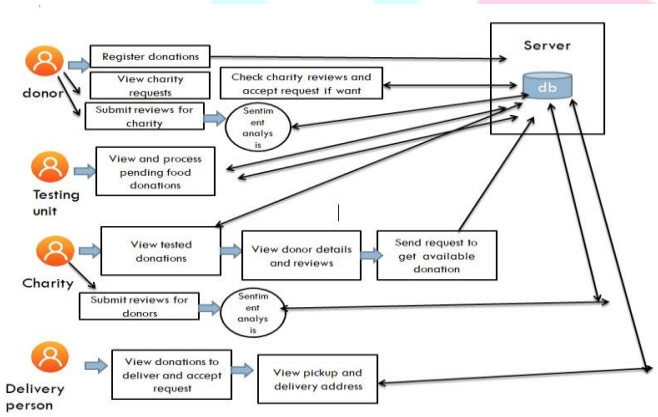


Fig1: Working Flow

The work diagram of an advanced NGO management system shows the interactions between different users within the system, such as donors, NGOs, food testing units, delivery personnel, and central database servers. The system consists of workflows to make the process transparent and efficient when managing donations.

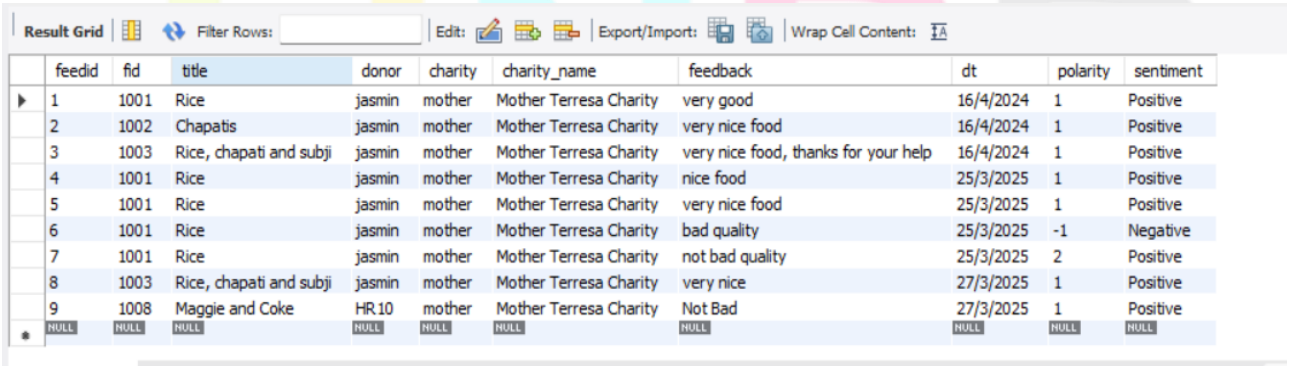
Donor Interaction:
Donors create donations of food and essentials.
Charities can be viewed and viewed and based on charities.
Food Testing Unit Role:
The testing unit accepts food donations, processes outstanding requests, and uploads test reports to guarantee food quality.

Charity Interaction:
Charities are able to see available tested donations, make requests for donations, and see donor information and reviews prior to accepting a donation.
Once they receive food, they post reviews for donors, which are processed through sentiment analysis.
Delivery Process:
Delivery staff see donations to deliver, take requests, and receive pickup and delivery addresses through Google Maps API.
Upon delivery of the food, they also send notifications to both the donor and charity for acknowledgement.
Database & Server:
The server handles all user activities, keeps donation records, monitors delivery status, and interprets sentiment analysis reports.
Sentiment analysis assists in identifying trustworthiness and transparency among donors and charities.
This process guarantees real-time monitoring, food safety validation, and streamlined distribution, which makes the donation process safe, transparent, and efficient.

SENTIMENT ANALYSIS WITHIN THE SYSTEM
To increase transparency and trust, the system includes mood analysis of donors and charity reviews. This helps users decide on NGOs and donor ratings.
Steps involved in Sentiment Analysis:
Extract Keywords:
Donations and Charity reviews are analyzed with the help of Natural Language Processing (NLP).
Extract the most appropriate words using algorithms (fast automatic keyword extraction).
Analyze Keywords Using WordNet Library:
The extracted keywords are sent to WordNet, a vocabulary database that determines the meaning and context of the word.
Calculate Sentiment Score:
The system gives a numeric sentiment score depending on the tone of the review:
Score < 0 → Negative Review (reflecting poor NGO service or donation experience).
Score = 0 → Neutral Review (reflecting balanced or neutral review).
Score > 0 → Positive Review (reflecting a positive experience with the NGO or donor).

Review Text	Extracted Keywords	Sentiment Score	Sentiment Category
"Great experience donating, very transparent process."	Great, transparent, donating	0.85	Positive
"Service was okay, but response time could be improved."	Okay, response time, improved	0.10	Neutral
"Very poor management and lack of communication."	Poor management, lack, communication	-0.75	Negative
"They provided detailed reports and were very efficient."	Detailed reports, efficient	0.90	Positive
"Donation process was confusing and slow."	Confusing, slow, donation process	-0.40	Negative

Table 1: feedback results


Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

feedid	fid	title	donor	charity	charity_name	feedback	dt	polarity	sentiment
1	1001	Rice	jasmin	mother	Mother Terresa Charity	very good	16/4/2024	1	Positive
2	1002	Chapatis	jasmin	mother	Mother Terresa Charity	very nice food	16/4/2024	1	Positive
3	1003	Rice, chapati and subji	jasmin	mother	Mother Terresa Charity	very nice food, thanks for your help	16/4/2024	1	Positive
4	1001	Rice	jasmin	mother	Mother Terresa Charity	nice food	25/3/2025	1	Positive
5	1001	Rice	jasmin	mother	Mother Terresa Charity	very nice food	25/3/2025	1	Positive
6	1001	Rice	jasmin	mother	Mother Terresa Charity	bad quality	25/3/2025	-1	Negative
7	1001	Rice	jasmin	mother	Mother Terresa Charity	not bad quality	25/3/2025	2	Positive
8	1003	Rice, chapati and subji	jasmin	mother	Mother Terresa Charity	very nice	27/3/2025	1	Positive
9	1008	Maggie and Coke	HR10	mother	Mother Terresa Charity	Not Bad	27/3/2025	1	Positive
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

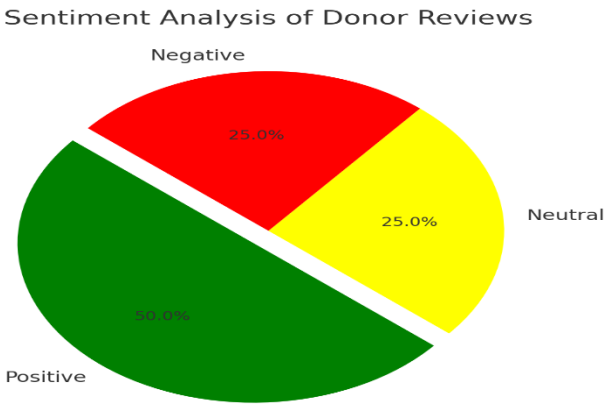


Fig 2: pie chart

Store & Display Result:
The sentiment score is stored in the database and shown to donors and charities.
NGOs with continually positive feedback earn greater credibility, providing improved donor participation.
Through the use of sentiment analysis, the system provides equitable assessment, enhanced trust, and increased transparency in NGO activities, ultimately enhancing donor-NGO relationships.

Table 2: Food donation Result

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

fid	title	details	quantity	dt	hr	min	category	foodType	expiry	expirty_unit	sts	userid	charity_userid	delivery_user
1001	Rice	Cooked Rice	10	14/4/2024	21	7	Veg	Cooked Food	24	hrs	food_received	jasmin	mother	manish
1002	Chapatis	100 chapatis available	100	16/4/2024	11	12	Veg	Packed Food	24	hrs	food_received	jasmin	mother	manish
1003	Rice, chapati and subji	10 people food is available	10	16/4/2024	13	34	Veg	Cooked Food	24	hrs	food_received	jasmin	mother	manish
1004	Phaphda	snaks	20	16/4/2024	13	56	Veg	Packed Food	7	days	delivery_accepted	jasmin	mother	Harish
1005	Rice	Read to Eat cooked rice	10	5/1/2025	19	44	Veg	Cooked Food	24	hrs	requested	sachin	mother	NA
1006	sugar donation	pandhara rang	10	18/2/2025	15	26	Veg	Row Food	1	years	pending	jasmin	NA	NA
1007	Rice	fresh food	10	25/3/2025	20	32	Veg	Cooked Food	24	hrs	food_delivered	sachin	mother	manish
1008	Maggie and Coke	To help GenZ	150	27/3/2025	15	47	Veg	Packed Food	1	years	food_received	HR10	mother	Harish
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

USER ROLE AND FUNCTIONALITY

There are five user roles, each with designated functionalities:
Admin: Manages NGOs, donors, and delivery persons. Oversees donation activity.

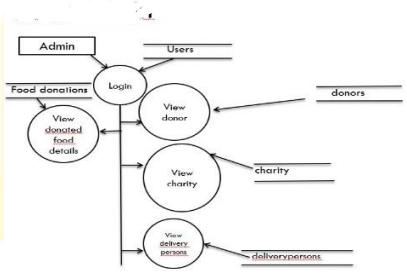


Fig 3: DFD Admin

NGO Admin: Issues donation requests, receives donations, and accepts deliveries.

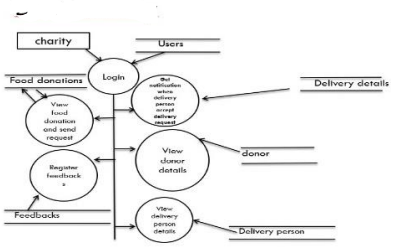


Fig 4: DFD Charity

Donor: Makes donation registrations, checks delivery status, and gets notified.

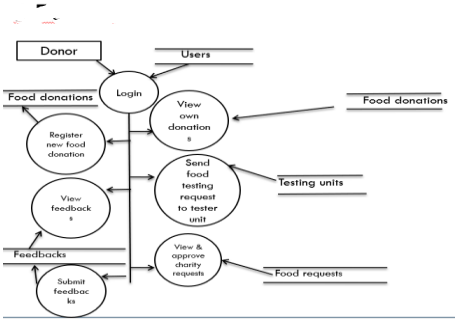


Fig 5: DFD Donor

Food Testing Unit: Inspects food safety and uploads report prior to distribution.

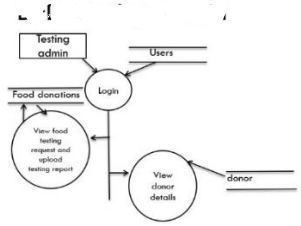


Fig 6: DFD Food Testing Unit

Delivery Person: Accepts delivery request, updates status, and accepts delivery completion.

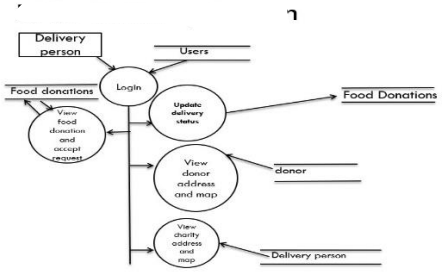


Fig 7: DFD Delivery Person

REAL-TIME NOTIFICATION AND TRANSPERANCY

The system has a real-time notification component implemented through Spring Boot WebSockets or Firebase Cloud Messaging to notify donors, NGOs, and delivery staff. The notifications are as follows:

Acceptance and test status of donations.

Assignment of delivery person and estimated time of arrival.

Confirmation on successful delivery.

ADVANTAGES OF THE SYSTEM

1.Improved Transparency –This makes the system more transparent by providing donors and charities with real-time information on the status of donations, tracking of deliveries, and acknowledgment reports**.**

2.Optimized Resource Allocation –This makes it easier to donate and deliver food and other necessities to people in need quickly.

3.Trust and Credibility–Includes sentiment analysis to assess reviews from donors and charities to enhance trust and credibility among the stakeholders.

4.Food Safety Assurance–A food testing module that guarantees donated food's quality prior to distribution.

5.Real-Time Tracking–Integration with Google Maps API enables route optimization for delivery staff and informs users regarding delivery status.

6.User-Friendly Interface–Designed with MySQL, Bootstrap, and Spring Boot, this interface is simple to use and intuitive for all users.

7.Automated Review Analysis –AI-powered sentiment analysis guarantees that donors can select NGOs with knowledge.

CONCLUSION

The Advanced NGO Management System is intended to streamline donation procedures, optimize donor interactions, and increase the transparency of charity operations. By merging real-time monitoring, sentiment analysis, and machine learning-based decision-making, the system guarantees an effortless, effective, and accountable method for the management of NGO operations.

Automated management of workflow is one of the principal aspects of this system that optimizes food donations verification, quality testing, and distribution to recipients with a limited need for human intervention. It not only minimizes time spent but maximizes operational responsibility too. Further, the system incorporates Natural Language Processing (NLP) technology in terms of sentiment analysis and keyword extraction that helps NGOs decode donors' sentiment better, segregate immediate requirements, and plan outreach efforts to better suit requirements. AI-driven logistics optimization still further enhances resource allocation so that donations reach their intended beneficiaries at the right time and in an efficient manner.

With such high-level capabilities, the Advanced NGO Management System revolutionizes the manner in which NGOs manage donations, distribution, and interactions, making charity work more transparent, efficient, and effective.

FUTURESCOPE

Though the existing version of the "Advanced NGO Management System" provides a solid foundation, there are some interesting areas for future development and improvement:

1.Mobile Application-

Expand the system's presence by creating a mobile application for donors, NGOs, and delivery staff.
Allow users to donate, monitor deliveries, and get real-time alerts on their mobile phones.

2.Geolocation Integration-

Add geolocation services to plan optimal routes for delivering packages and accurately estimate delivery time.
Increase transparency through the ability for donors and NGOs to monitor the physical transportation of donated goods.

3.Integration with Payment Gateways-

Facilitate online donations by integrating secure payment gateways.
Make it possible for donors to give financially directly on the platform.

4.Social Media Integration-

Support sharing and awareness through social media integration.
Urge donors to share the news of their contributions and interact with the NGO community.

5.Going Beyond Food Donations-

Expand the system to cover other critical commodities, like apparel, healthcare products, and educational material. Partner with additional NGOs and charities to reach out to a larger audience.

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