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Design and Development of An Emailing Management System: System Modeling

Abstract: - An email management system's primary objective is to develop a software platform that effectively handles email communication. The growing significance of electronic communication in various domains makes its relevance in today's landscape undeniable. This system incorporates numerous features designed to streamline the process of sending, monitoring, and organizing emails with maximum efficiency. Whether utilized for marketing, Customer Relationship Management (CRM), outreach initiatives, or internal company communication, it provides a comprehensive toolkit to facilitate these tasks seamlessly. The presence of a well-designed email management system is crucial for building and maintaining strong customer relationships, generating leads, promoting products or services, and enhancing an organization's online presence. Furthermore, intelligent email management works to reinforce online reputation and ensure adherence to legal privacy standards. This effort aims to create, refine, and optimize a comprehensive email management system customized to an organization's specific needs. Objectives include enhancing email campaign effectiveness, optimizing message delivery success, meeting privacy regulations, and delivering a user-friendly interface. This article concentrates our work on system modeling. UML modeling language is used to clearly demonstrate both static and dynamic system aspects, including class, use case, activity, and sequence diagrams. To make the proposed solution more concrete, we created four user interface prototypes.

Keywords: Emailing, modeling, Prototyping, E-commerce, management system

I. INTRODUCTION

The establishment of an emailing management system requires constructing an advanced software platform that handles extensive email communications effectively. Such a system represents intricate software that enhances organizational email processes, regardless of company scale. Its functionality encompasses automated dispatch, monitoring, and email administration capabilities [1]. Understanding emailing is essential before examining its management systems. Emailing functions as a marketing instrument for multiple purposes: information distribution, invitations, sales activities, customer retention, relationship management, and feedback acquisition. The terminology stems from combining "e" (electronic) with"mail." Specifically, e-mailing constitutes mass electronic message distribution to internet users, predominantly for promotional but also informational purposes. While variations like "e-mail", "email", "mail" exist, French administrative documentation officially recognizes "courriel" may prefix email addresses [2]. In its marketing capacity, emailing fulfills various strategic roles: customer communication, sales enhancement, loyalty development, and personalized relationship cultivation, with documented effectiveness in academic research [3]. Developing an emailing management system holds strategic significance in today's landscape. The initiative strives to engineer and refine a system addressing organizational requirements within dynamic digital environments. Its extensive objectives include: enhancing campaign performance metrics, optimizing inbox delivery rates, maintaining regulatory alignment (with frameworks like RGPD and CAN-SPAM Act), and implementing user-centric inter- faces for marketing personnel. Contemporary systems must incorporate sophisticated capabilities: automated recipient segmentation, personalized content delivery, instantaneous performance metrics, and seamless integration with broader digital marketing infrastructure [4]. Our approach employs Unified Modeling Language (UML), acknowledged for its systematic representation of complex systems [5]. The modeling encompasses comprehensive static and dynamic system representations. Complementing these technical diagrams, we provide interface mock-ups demonstrating practical system operations. These visual prototypes illuminate the user experience design while facilitating requirement validation and stakeholder communication [6].

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II. THEORETICAL FRAMEWORK

An effective email management system plays a vital role in customer relationship cultivation, lead acquisition, product marketing, and digital presence enhancement. Smart email administration also contributes to reputation management and regulatory compliance. The theoretical underpinnings of such systems span multiple fields, with marketing at the forefront - specifically addressing consumer needs and delivering appropriate solutions. Email marketing platforms serve as crucial tools for product promotion, customer base development, and lead generation [7], [8]. The recent emphasis on relationship marketing focuses on nurturing existing customer loyalty and fostering enduring brand- consumer connections [9], [10]. Communication, defined as information transfer between parties, manifests in relationship marketing through interconnected activities, particularly multi-channel communication strategies for customer interaction [11]. The psychological dimension examines individual behavior and mental processes. Research indicates relationship marketing positively influences customer attitudes and behaviors, including loyalty [?], and word-of- mouth dissemination [12].

Email management systems leverage these insights for behavioral analysis and message customization.

From a technological perspective, email management systems integrate various components including programming languages, database systems, and web servers. These systems must operate within legal frameworks such as the CAN-SPAM Act (Federal Trade Commission, n.d.) and GDPR [13]..

A. System features

Regarding the core capabilities of this platform, we will explore operational control, promotional initiative oversight, human-computer interaction design, protective measures, and data privacy.

- Concerning operational aspects, we highlight the con- tact oversight capability, facilitating data introduction, structural arrangement, and information refreshment of contact directories, while delivering sophisticated grouping functions for precise audience targeting. Furthermore, the system incorporates a collection of ready-made electronic message layouts to expedite message creation, alongside functionality for storing and controlling personalized layouts. Moreover, the platform handles incoming communications and opt-out requests, streamlines reply management, and ensures adherence to data protection and subscription withdrawal guidelines.
- For promotional initiative oversight, we present electronic messaging campaigns to coordinate and streamline large-volume message distribution. This encompasses detailed performance observation through comprehensive metrics. Additionally, we deliver a straightforward message composition tool for creating visually impressive communications, alongside dynamic customization features enabling content adaptation based on recipient details. Our solution also enables monitoring and evaluation of message engagement, interaction, and outcome metrics, providing analytical summaries to evaluate overall campaign success.
- Regarding human-computer interaction, we accentuate a welcoming interface prioritizing straightforward operation for non-technical users. This incorporates instinctive layout and a unified control center for e*ff*ective activity tracking and administration. More- over, our solution provides modification and automation capabilities, enabling triggered message deployment based on user actions and o*ff*ering advanced personalization features to elevate the overall experience. Additionally, our platform enables smooth connection with various Client Relationship Management (CRM) tools and supports integration with additional marketing and analysis platforms.
- Concerning protective measures and data privacy, the platform safeguards delicate user information and de- ploys security protocols to deter unauthorized usage.

In conclusion, the conceptual structure of an electronic message management platform is extensive and multifaceted. It enables comprehension of marketing-related challenges, communication aspects, psychological factors, technological considerations, and electronic messaging regulations. It also presents the opportunity to identify appropriate technologies and instruments to establish a robust and e*ff*ective system.

III. MODELING THE E-MAILING MANAGEMENT SYSTEM

A. Static view

In the process of employing UML (Unified Modeling Language) for designing an electronic message administration platform, one may implement diverse visual representations that encompass varying viewpoints

and dimensions of the platform. Within this endeavor, our focus shall concentrate on the unchanging perspective of the system. This fixed perspective, in the context of UML, delivers a graphical illustration of the constant components within a system, encompassing classifications, entities, elements, and their mutual connections. Such visualization enables a transparent representation of the framework, entity categories, and the associations existing among them. A pair of frequently implemented fixed perspective diagrams within UML comprise the classification diagram, which portrays the immutable framework, categories, and connections be- tween entity groupings, alongside the functionality diagram, which delineates the operational characteristics and capabilities of the platform from the perspective of its end users.

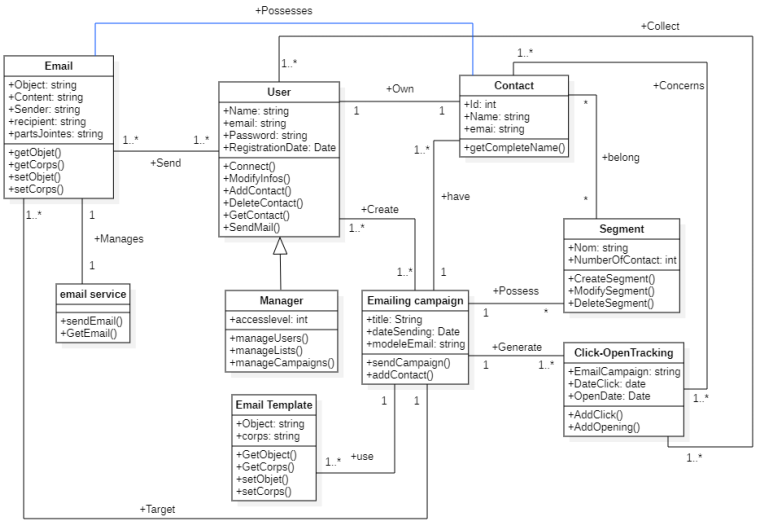

Fig. 1. Class diagram

1) **Class diagram**

A UML class diagram represents the static structure of a system by showing the system's classes, their attributes, methods, relationships, and the constraints between them. For an emailing management system, our system's class diagram might include the following classes: User; Manager; Contact; Segment; ClickOpenTracking; Email; Emailing campaign; Email template; and Email Service. Figure 1 shows Class diagram portraying the class diagram, we have displayed eight primary class and one hierarchical classification. The classifications are detailed as follows:

- **User**: The platform enables individual participants to establish personal credentials by sup- plying unique authentication details. Following authentication, participants can conceptualize, adjust, and oversee their message distribution initiatives and associated message layouts. Essential participant data encompasses complete identification, electronic address, and enrollment timestamp.
- **Manager**: Beyond standard participant capabilities, a system controller possesses expanded authorizations to oversee all participant credentials and sophisticated platform configurations.
- **Contact**: A recipient embodies an individual targeted through electronic message marketing initiatives. For each recipient, the platform maintains information including identification, electronic address, telecommunication digits, and territorial location. This facilitates the compilation of valuable demographic and preference information. Individual recipients may belong to multiple groupings, contingent upon their attributes.
- **Segment**: A grouping represents a collection of recipients sharing comparable profiles or interests, established by participants according to particular criteria applied to recipient information. Upon creation, the grouping automatically maintains a current roster of all corresponding recipients.
- **Click-OpenTracking**: The platform documents recipients' engagement with distributed messages, including viewership and interaction events, within an information repository. This enables the collection of comprehensive analytical data regarding marketing initiative performance.
- **Email**: as illustrated in the schematic, maintains a pivotal position within the message administration

platform. It encapsulates fundamental message attributes, including subject matter, content, originator, recipient, and supplementary attachments, all defined as text strings. The classification provides methodologies for accessing and modifying message sub- jects and content (retrieveSubject(), retrieve- Content(), modifySubject(), modifyContent()), enabling straightforward manipulation of message information. A direct association exists with the System Participant classification, indicating close interaction between platform participants and their managed messages. This framework enables the Electronic Message classification to function as the foundation for all message-related operations within the plat- form.

- **Emailing Campaign**: A message initiative models the comprehensive process, from conception to execution of a message distribution campaign. It encompasses target groupings, utilized message layouts, and distribution scheduling. Specialized functionalities enable participants to conceptualize, arrange, initiate, and evaluate initiative outcomes.
- **Email Template**: A message template contains textual elements, formatting specifications, visual elements, and hyperlinks for integration into initiative messages. It encompasses the subject line and body content of the template and supports reuse and customization across various initiatives.
- **Email Service**: This technical service establishes connectivity with external SMTP servers handling message delivery. It orchestrates the transmission of messages composed through the initiative management platform.

In summation, the classification diagram represents an essential instrument for electronic message management platform design. It provides visual representation of platform classifications and their interconnections. It facilitates code generation and architectural documentation of the platform.

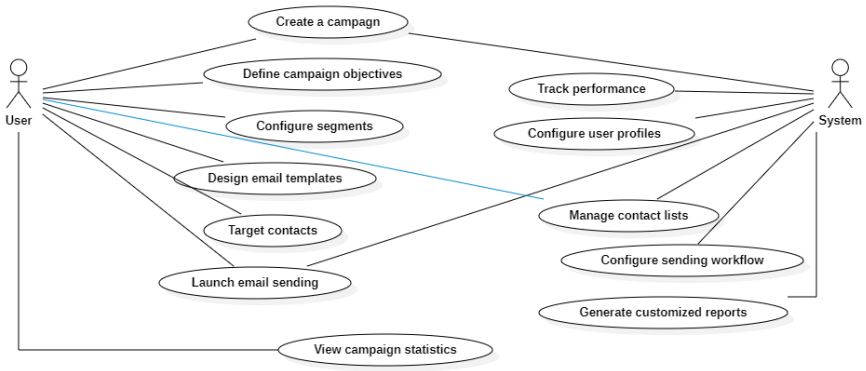

Fig. 2. Use Case diagram

2) **Use Case diagram**

The interactions between actors and the system are depicted in a UML use case diagram. Figure 2 illustrates the 12 distinct scenarios in which the user and the system are the two primary actors in the context of an emailing management system.

Figure 2 shows Use Case diagram. Both actors share certain circumstances, like campaign creation, contact list management, and email correspondence. In order to de- fine campaign objectives, configure segments, create email forms, target contacts, and examine campaign statistics, the ”user” actor is essential.

On the other hand, the system is in charge of managing the contact list, visually representing the quantity of clicks and views, configuring the user profile and sending flow, and ultimately producing a customised report.

To put it briefly, the use case diagram is a crucial component of an emailing management system’s design. It shows how the players and the system interact as well as the features of the system. It is capable of producing system specs and to document how the system works.

B. Dynamic view

A variety of diagrams that provide distinct viewpoints and insights into the system can be used while modelling an emailing management system using UML (Unified Modelling Language). The dynamic perspective of the

system will be the focus of this section. Behavioral models, which offer a thorough grasp of the system's operational dynamics, successfully capture the dynamic picture. The activity diagram and the sequence diagram are two of the most well-known models. Activity diagrams are a great way to demonstrate control and data flow because they are primarily concerned with showing the process. They provide a visual representation of how a function behaves or how a use case develops. Sequence diagrams, on the other hand, focus more on the interactions between various actors over time while still modelling system behavior. Lifelines or horizontal cuboids are used to represent actors.

1) **Activity diagram**

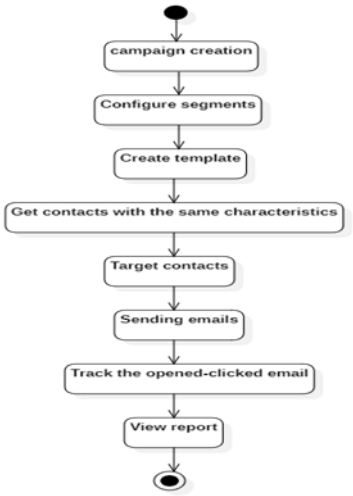

Fig. 3. Activity diagram

An activity diagram shows how a process or procedure's actions flow. It simulates decision-making, synchronization, loops, and task-processing-specific activities.

A Campaign object with a unique identity is created by the system after a user submits a request to start a new email campaign. By defining the desired criteria,

the user creates an initial target segment. The system then utilizes this information to generate the relevant Segment object and determine which list of contacts are involved. This process can be repeated by the user to model multiple different segments. After that, the user creates the email template or templates for the campaign, setting up the graphic layout, editorial content, and any incorporated images or links. when the template and target segments have been made. On the other hand, the system uses outside dispatch providers to handle the actual distribution of customized emails to every contact in the targeted segments. The solution generates comprehensive analytical reports on campaign performance by tracking and recording recipient open and click statistics in a database both during and after distribution.

2) **Sequence diagram**

A sequence diagram shows the interaction between objects over time. It visualizes the sequence of messages exchanged between objects to complete a given task or scenario.

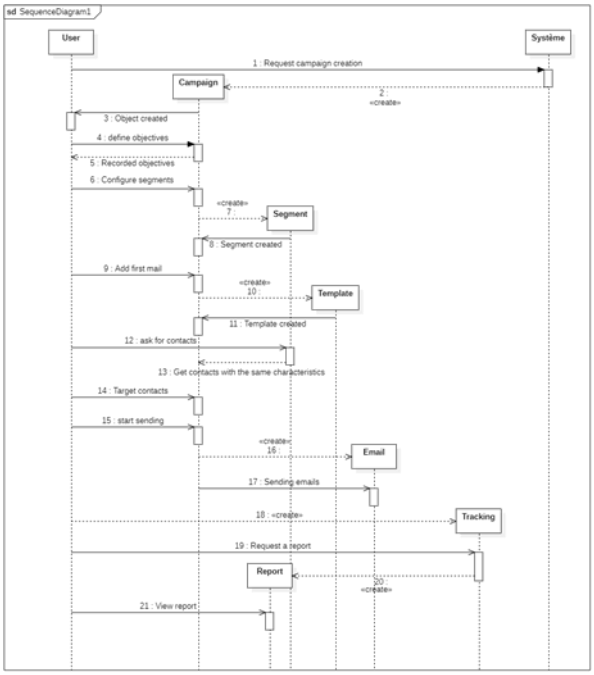

Fig. 4. Sequence diagram

The user asks the system to create a campaign, and the system responds by creating a campaign object. At this point, the user defines the campaign objectives and sets up segments to define recipient characteristics. This marks the end of campaign object creation. Next, the user adds his first e-mail, enabling the initial mail template to be configured. The user targets contacts who share specific characteristics, to ensure that the campaign reaches the right people. Once the target has been defined, the user proceeds to send the e-mails. But before the e- mails can be sent, a subject line must be created. This allows each e-mail to be personalized according to the campaign's specific parameters. Once everything is configured, the user can then proceed to send the e-mails. The Tracking object tracks the number of clicks and views, indicating that the campaign has been successful.

To conclude this section, based on the Unified Modeling Language (UML), the focus was on creating visual models to represent the key parts of the system. In all, four di*ff*erent diagrams were created. Two of these were "static" diagrams showing the structure. The first, a class diagram, shows nine main classes. The second was a use case diagram linking two roles to twelve essential tasks. For the dynamic process diagrams, an activity diagram was used to illustrate the system's step-by-step procedure. A sequence diagram describing the interactions between the various actors involved in the process was also included.

The creation of these diagrams provided a visual representation of the system's structural elements and how information flows through the system. The combination of class, use case, activity, and sequence diagrams enabled the system to function effectively.

IV. PROTOTYPING

Computer ergonomics and human-machine inter- faces are essential elements of contemporary technology that can greatly enhance productivity and user experience. The goal of user centered design (UCD) is to make products that are easy to use, e*ff*ective, and pleasurable by giving users' requirements and preferences first priority during the design process [14]. Prototypes facilitate problem-solving and enhance teamwork by helping teams organize their thoughts [15]. A wireframe, also known as a functional model, is a diagram that is used to specify the sections and elements of a user interface as it is being designed. Digital diagrams, paper collages, and sketching are some of the techniques that can be used to generate wireframes. A method used in user experience (UX) design called wireframe modelling makes it possible to find and fix usability problems early in the design process, including layout, navigation, and content organization.

Additionally, it aids in locating any gaps in the user interface and possible conflicts between the needs of the user and the capabilities of the application [16]. The suggested models are demonstrated by the examples in this section. These models are implemented using Photoshop. This paper proposes four models.

A. Authentication model

The login interface for the email marketing platform ”ADBOX” is displayed in Figure 5. Since this interface serves as the gateway for authorized users to access the system, it is consistent with the User and Manager classes shown in the class diagram. The user’s email address and password can be entered in the areas at the top of the screen. These credentials match the distinct identifiers that are kept on file for every management or user account in the system. A ”FORGOT PASSWORD?” link that will initiate a password reset flow and ”Remember me” choices to preserve the login session are located beneath the password field. The ”Sign In” button is the primary call to action; by clicking it, the user should be able to access their account and all related features of the email marketing platform after having their credentials verified. A ”Create an” account option at the foot of the page enables new users to create a profile by completing a registration process that requires them to enter their full name, email address, and password, which the administrator must verify. Before users can engage with the primary features of contact management, email campaign creation.

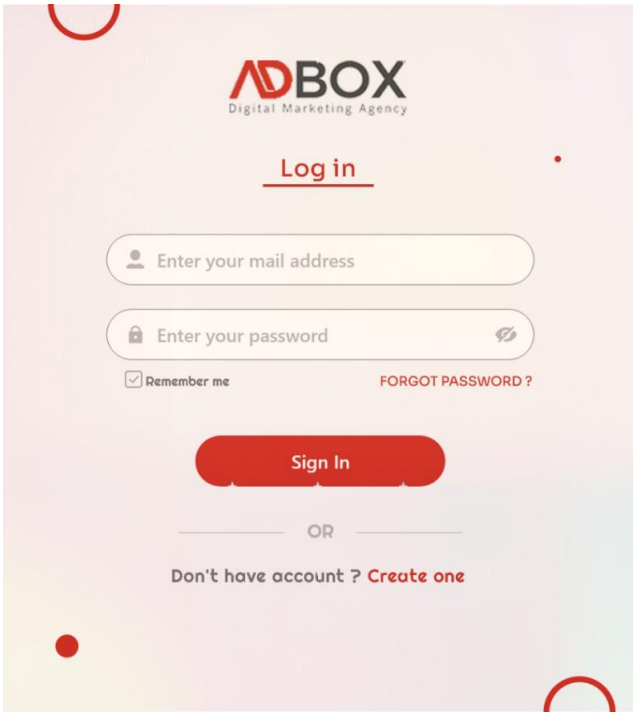

Fig.5. Authentification Page

B. Dashboard model

Figure 6 shows a dashboard interface for an e-mail campaign management system called “ADBOX”. It displays various metrics and visualizations relating to e-mail campaigns and their performance. At the top, graphs show the total number of opens, clicks, unsubscribed contacts, and complaints over time. Below, a revenue summary graph illustrates total revenues over the past year. On the right- hand side, pie charts display contact satisfaction and click-through rates for the current month. The “Campaign” section of the left-hand sidebar corresponds to the Campaign class, which models the complete process of creating and executing an e- mail campaign, including targeting segments, using e-mail templates, planning mailings, and analyzing results. The “Templates” section, bottom right, presents recently created e-mail templates, such as “E-commerce” and “Vacation”. The e-mail template class, which includes the layout, graphics, links, and text of emails used in campaigns, is in line with these templates. The distribution of contacts by Contact and Segment classes across various nations is shown in the ”Top Countries” section. Campaigns target segments, which are collections of contacts with similar traits. The interaction tracking feature, which logs how contacts respond to send emails and

provides performance analytics, is represented by graphs that display the total number of opens, clicks, unsubscribes, and complaints. The system's financial and revenue-tracking components are represented by the earnings table, which is most likely derived from campaign performance measurements.

Fig. 6. Dashboard model

C. Campaign model

The "Campaign" section, which is the representation of the "Campaign" class that models the full lifecycle of email marketing campaign creation and execution, is the main emphasis of Figure 7. Several examples of the Campaign class are shown in the list, including "N2 Campaign," "Test Day," "Team Greetings," and "N1 Campaign." Details like the start date, the number of targeted subscribers, and the campaign's current state (going, halted, or completed) are provided by each campaign instance. In keeping with the interaction tracking feature that logs how contacts respond to the sent emails, the chart shows important campaign metrics over time, such as opens (emails opened by recipients), clicks (links clicked in emails), and bounces (emails that couldn't be sent). The number of contacts or subscribers targeted for each campaign is displayed in the "Subscribers" column. This information is based on the Contact and Segment classes, which define and classify the targeted population based on particular attributes. Campaigns likely employ instances of the Email Template class to design and combine email content, formatting, and visual features like images and click- able links, even though this isn't represented clearly in this view. The "Earnings" area of the interface also shows the total income made by these campaigns, which is determined by the performance and engagement indicators that were monitored. According to the geographic information kept in the Contact class, the "Top Countries" section offers a break- down of targeted contacts in various nations. Last but not least, the "Templates" section offers current instances of the "E-mail Templates" class utilized in campaigns, including "E-commerce," "Holidays," and "New Year," which stand for pre-made e-mail templates that can be altered and applied to various campaigns.

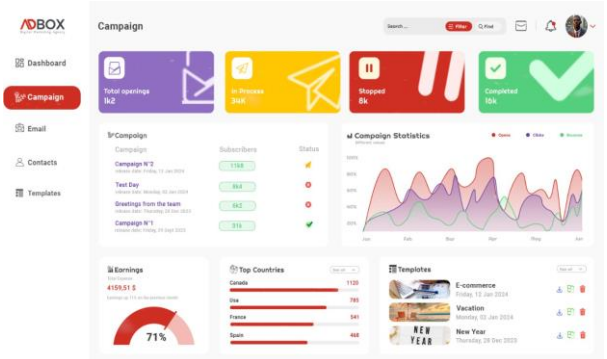

Fig. 7. Campaign model

D. Email model

Figure 8 displays graphs tracking key e-mail campaign metrics over time, including total opens (e- mails opened by recipients), total clicks (links clicked in e-mails), total unsubscribes (recipients who have unsubscribed), and

total complaints (spam complaints received). The “Delivery” section pro- vides an overview of critical campaign delivery statistics, such as:

- Delivery rate (percentage of e-mails success- fully delivered)
- Bounce rate (percentage of e-mails that could not be delivered due to invalid addresses)
- Unsubscribe rate (percentage of recipients who unsubscribed after receiving e-mails)
- Spam rate (percentage of e-mails marked as spam by recipients)
- The table lists individual email campaigns such as “Healthcare”, “Gaming” and “SkinCare”. For each campaign, it displays:
- Title: The subject/title of the email campaign
- Status: The Status (sent, in progress, etc.) represented by icons.
- Open rate: Percentage of recipients who have opened the e-mail.
- Clicks: Number of clicks/interactions with links from the e-mail.
- Unsubscribes: Percentage of recipients who unsubscribed after this e-mail

These metrics align with the interaction tracking functionality, which records how contacts interact with sent e-mails, as specified in the campaign and e-mail template classes. By linking these elements, it is possible to evaluate the performance, engagement, and deliverability of individual email campaigns, as well as the overall trends of several campaigns managed by this email marketing system.

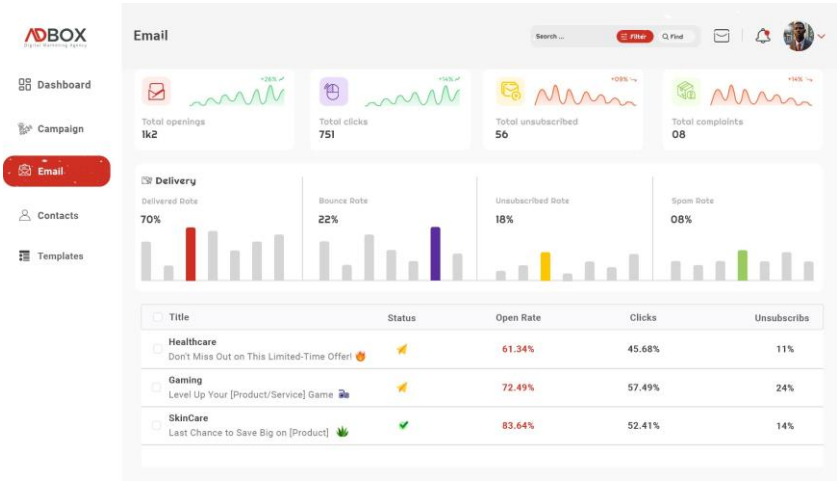

Fig. 8. E-mail model

V. Discussion

There are numerous benefits and opportunities associated with the email management system that is detailed in this paper. First off, the system’s design strategy aligns with relationship marketing’s tenets, which include building enduring ties with clients [9], [10]. Customer loyalty will be strengthened by the system’s capacity to log interactions, segment contacts, and personalize messages, all of which will guarantee more targeted and pertinent communication [17]. One of the system’s strengths is its capacity to produce comprehensive analytical reports on campaign performance, which let users evaluate how well their marketing initiatives are working. Complex system design has benefited greatly from the usage of UML as a modelling tool. Because it o*ff*ers a common visual language, UML has the benefit of making communication easier between the di*ff*erent project stakeholders in this situation. UML diagrams enable developers, designers, and business specialists comprehend the structure and behavior of the system by serving as a common language. This is crucial because technology in digital marketing, which is by definition quite diverse, needs to be carefully matched with user wants and company objectives. One of UML modeling’s benefits is that it has enabled the identification and resolution of numerous design issues prior to the development stage. For instance, the class diagram’s clear depiction of the connections between the ”Email Campaign,” ”Segment,” and ”Contact” classes highlighted the necessity of scalable and adaptable mailing list management, which is a crucial component of a successful messaging management system. In system design, modelling is complementary. Whether in low or high fidelity, mock-ups allow the user interface and interaction flows to be seen before system development is finished. Mock-ups are helpful when building the

dashboard or campaign development interface for our email management system. These models would guarantee that the interface accurately reflects the structure and functionality depicted in the UML diagrams, in addition to validating the system's ergonomics and user experience. With access to real- time data based on fundamental ideas, this design approach guarantees that the system can o*ff*er tailored communication and tracking of consumer interactions—a tangible application of loyalty programs. This email management system was designed using a strong and efficient methodology that combines UML modelling and model development. It not only makes it possible to create a technically competent system with relationship marketing ideas in mind, but it also guarantees that the system will be easy to use and entertaining. In the realm of digital marketing, where technology, user experience, and business objectives must all be precisely aligned, this design technique could be used as a model for other kinds of (clearly more sophisticated) systems that are produced.

VI. CONCLUSION

As a result, this study concludes by offering a thorough method that may be used to develop an e*ffi*cient email management system. The use case of UML modelling, which covers class, use case, activity, and sequence diagrams, has given a clear illustration of the static and dynamic features. We displayed user interface mockups in order to give the suggested experience more substance. The system is designed to meet the various needs of contemporary marketers who require a strong yet adaptable platform for developing, carrying out, or evaluating successful email marketing campaigns in any organization.

Among the many features it offers are effective con- tact and campaign management, which is combined with an intuitive interface, sophisticated customization and automation features, and robust performance monitoring and analysis capabilities.

VII. FUTURE PERSPECTIVE

The future of email management systems lies in the integration of advanced technologies and further customization to meet the dynamic needs of organizations. Upcoming developments may focus on incorporating Artificial Intelligence (AI) and machine learning (ML) to enhance automation, such as predictive email sorting, smart response generation, and advanced spam filtering. AI-powered analytics could further provide insights into customer engagement and campaign performance, allowing organizations to refine their strategies in real-time.

Cloud-based solutions are likely to dominate, enabling seamless accessibility, scalability, and cost- effi*c*iency. Enhanced security features, including block chain technology, may emerge to ensure data integrity, compliance with evolving privacy regulations, and protection against cyber threats.

User experience (UX) improvements will remain a priority, with emphasis on intuitive interfaces and voice command capabilities, making email management more accessible across devices. Interoperability with other organizational tools, such as Customer Relationship Management (CRM) systems and Enterprise Resource Planning (ERP) platforms, will be strengthened, fostering a unified ecosystem.

The role of natural language processing (NLP) in improving language personalization and contextual understanding is also expected to grow, enabling more e*ff*ective communication tailored to individual user preferences. Additionally, augmented reality (AR) and virtual reality (VR) interfaces might redefine the way organizations visualize and interact with email data in collaborative environments.

Future email management systems will likely emphasize eco-conscious development, adopting energy-effi*c*ient algorithms and practices to reduce their carbon footprint. This aligns with broader global efforts towards sustainable technology.

In summary, the evolution of email management systems will revolve around automation, security, customization, and sustainability, ensuring their in- dispensable role in both organizational growth and customer relationship management. These advancements will continue to bridge the gap between human-centered communication and technological effi*c*iency.

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