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COMP3030J Software Engineering Project 2023-2024

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Abstract

In the context of the urgent need for sustainable development, achieving the goal of sustainable communities in SDG 11 has become a major issue for Natural Edge property management companies. For example, the Edge of Nature Property Management Company provides some convenient facilities, but according to the investigation, the utilization rate of these facilities is extremely low and there are high carbon emissions, which is not consistent with the concept of sustainable development. This report documents the entire system of service community websites developed by GreenVista Software Company to help Nature's Edge Property Management Company solve these problems, the schedule or each project stage, the developing process of the website and how the development team cooperated and finished the team-based project that are demonstrated in detail in this document.

1 Project introduction

In today's rapidly developing field of community management, various community website development companies often choose the transitional development of community service functions, aiming at creating convenient living conditions for community users, while ignoring the sustainable construction and long-term concern of the community, which leads to the low utilization rate of community equipment and excessive carbon emissions in the community. High energy consumption is inconsistent with the concept of sustainable development. Therefore, in order to solve the current situation in the field of community development, and solve the relevant problems of Nature's Edge property management company. At present, the market urgently needs a new generation of innovative sustainable community service website which can combine the service of traditional community website and sustainable development. Not only that, improving the readability of the website is also the urgent need of new users of the current mainstream community website, due to the complexity of the website and the concealment of some functions, it may cause unnecessary trouble to users who just contact the community website. Therefore, it is necessary to make the entire community website platform intelligent and enhance the interaction between users and the website. This will inevitably make the website can have a longer development and stand out in a lot of competition.

The project aims to not only create a community comprehensive service website for Nature's Edge property management company with functionality, security and reliability to meet the needs of users, but also provide a reliable sample template for the future development of various developable communities in response to market needs. Compared with the old traditional community website, the sustainable community website also has the functions of community resource integration, community service application, sustainable development guide, electronic library and employment recruitment. These functions take into account the relevant service functions of the traditional community, and guide the community users to implement the concept of sustainable development through the sustainable development guide. At the same time, e-library and community online recruitment also promote the realization of education (SDG4) and solve the problem of community user employment (SDG8). Not only that, its expansion auxiliary functions also include community resource map navigation and artificial intelligence enabling, which provides no small convenience for new users or older users of the community, allowing them to get familiar with the relevant functional operations of the platform and the resource division of the community faster; The owner can customize threshold control of resource consumption, automatic resource monitoring alarm, and chart statistics of energy use (such as electricity, water and other resources) to provide users with fast and convenient sustainable energy consumption management, and solve the problem of excessive community energy consumption and excessive carbon emissions from the root cause by reducing users' daily excessive consumption of resources. In addition, this project enhances security through the use of encryption methods and the implementation of rights management systems to provide different functions to our clients and their

clients. The reliability of the project can be guaranteed by manual and automatic testing. In order to enhance the uniqueness of the project, the project also trained the sustainable intelligent community customer service AI, which can not only provide the content of internal resources in the community, but also provide sustainable development guidance. When the daily energy consumption of users is too high, or the carbon emission during travel time is excessive, the AI will give assessment and suggestions by analysing user data, and the platform will be enabled by artificial intelligence. Provide users with a full range of sustainable life.

2 Project development plan

Our project plan is as follows:

Stage 1 (Deadline: March 20) Project design: Design project requirements, describe function points in detail, draw detailed UI design drafts, check function maps and design drafts

Stage2 (Deadline: April 1) Architecture and interface design: Check the feasibility of function points Map functional descriptions to software terms Design interface document Design database Technology stack selection

Stage 3 (Deadline: 21 April) Realize front-end information and related functions Implementation interface We will implement the guiding function for sustainable development Implement the community service query function To implement the integration function of community educational resources Optimize the finished code Front-end and back-end joint debugging

Stage 4 (Deadline: 10 May) Front-end interactive function logic implementation Back-end implementation and deployment Implementation interface Implement the user system function Implement the function of community employment platform Processing database operation Implement all classes Optimize the finished code Front-end and back-end joint debugging

Stage 5 (Deadline 17 May) Conduct unit module testing and integration testing Deploy to server

The technology stack that will be used for this project is listed below:

Frame: React.
Front-end:Antd component library, Swr + axios request library, G2antv chart presentation, zustand state management.
language: Python.
Database: MySQL.
AI service:calling the ChatGPT API.

3 Groupwork introduction

3.1 Division of labor of the team

There are 6 members in the project team, and appropriate division of labor is assigned to them according to their different strengths to ensure that the team members can complete the task excellently and ensure the rationality of the project division of labor. At the same time, we divided the project into seven functional modules (sustainability guide module, community service inquiry module, community education resource module, user registration and login system module, owner resource management module, community recruitment platform module and community announcement module). We allocated each module and some related functions to suitable candidates. Because the overall

cooperation ability of the whole team and the individual ability of the team members are related to the development trend of the whole project, these two abilities are a good foundation for the operation of the whole project, so we should let the right person choose the right job. Of course, good communication is essential in teamwork tasks, in order to achieve this goal, the team members agreed to hold a meeting every Wednesday, report the task of the week to feedback and modify the error, specify the relevant plan for the next week, and report the project progress to the TA and consult key issues, so as to operate the team more efficiently.

The following table shows the specific roles of team members:

Name	UCD Number	Acting module	Task	Contribution
Ruotong Sun	21207481	user registration and login system module	Served as the development team leader in the team, responsible for the selection and design of the project framework, project interface design, platform login, registration page, login page and the front and back-end design of related functions. At the same time, he was responsible for the design of some AI interfaces, monitoring the project progress and communicating with customers.	16.70%
Xinran Liu	21207240	community service inquiry module	Act as the designated development plan in the team and coordinate the team development schedule. At the beginning of the project, this member was one of the members of UI design, and was also responsible for the front and back-end design of the community service query page and its related functions. At the same time, she was a member of the project module testing and inheritance testing in the middle and late milestones.	16.70%
Huiyang Liu	21207451	sustainability guide module	Serve as back-end development guide and technical advisor to the team. Responsible for the front and back end design of the sustainability guide page and its related functions, project database design and deployment. At the same time, I am responsible for maintaining and managing the code, designing and writing test cases and scripts, fixing problems caused by back-end bugs after integration, and answering user technical support requests.	16.70%
Shizheng Wang	21207489	community recruitment platform module, community education resource module	Responsible for development coordination and development resource management in the team. At the beginning of the project, this member was one of the members of UI design, and was also responsible for the front and back-end design of the community recruitment page and its related functions, the front end design of the electronic library page and most of the back-end algorithm design. At the same time, he was responsible for the integration of development resources and the selection of development components and plug-ins. At the same time, he was a member of the project module testing and inheritance testing in the middle and late milestones.	16.70%
Juncheng Zhang	21207492	community education resource module, community announcement module	Responsible for document management within the team. Responsible for the front-end and back-end design of the community announcement page and its related functions, and the back-end algorithm design of the electronic library page. Responsible for team document weekly update, development log update, large team document update, and late module test report and integration report.	16.70%
Te Qi	21207494	owner resource management module	Serve as front-end development guide and technical consultant in the team. Responsible for the front and back end design of community resource management page and its related functions. At the same time, I was responsible for the development of other auxiliary functions, such as Chinese and English switching , theme switching , etc., repairing the problems caused by front-end bugs after integration and answering users' technical support requests.	16.70%

Figure 1: Division details table

3.2 Groupwork problems

During the software development process, our team encountered many challenges and problems. Here are some of the problems our team encountered:

1. Communication problems: In the early stage of the development task, the relationship between the members is not very familiar or contact is too little, resulting in poor communication and asymmetric information, which greatly affects the progress of the project. Team members have different communication styles and personalities, so everyone has different communication preferences and habits, which leads to poor communication and misunderstanding during information transfer. For example, some members dislike communication because they are introverted and unfamiliar with individual members, while others prefer face-to-face communication offline, which leads to confusion and loss of information exchange. Making the early progress of the project slow.

2. Task allocation problem: Since we do not know much about each other's habits and abilities in the early stage of the project, task allocation is also one of the big problems we face in the early stage of team establishment. Due to unreasonable allocation, which may cause dissatisfaction and affect the cohesion and effectiveness of the team, we made a simple division of tasks after roughly understanding each other's capabilities. However, due to unclear division of labor and incomplete understanding of personnel capabilities, we encountered overlapping project tasks in the early stage of development. In the code part, the development progress is too slow due to individual capability deviation.

3. Technical conflicts and difficulties: Due to the different technical abilities of the team members, it is inevitable that there will be disagreements in terms of technology selection, development methods, or code specifications. This can lead to delayed development progress, reduced code quality, and even impact the success of the project. Or because the new technology in the development process needs time to learn or the collaboration members do not grasp the new knowledge in time, which also affects the development progress to a certain extent.

4. Insufficient resources: During the development of the project, the team also encountered a lack of sufficient component and interface resources in the early and middle stages of development. This prevents the team from effectively developing and testing specific features, which in turn affects the schedule and quality of the project.

5. Requirement change: In the software development process, requirements change is one of the situations we encounter. Due to time constraints, some complex functions have to be adjusted to ensure the integrity of the project submission, and some parts of the code have to be adjusted to resolve conflicts due to the addition of new function points to enrich the project. This caused the development plan and schedule to be affected, so the need to readjust, but also increased the workload and stress of the team.

3.3 Solution

1. Strengthen communication: First of all, the key to strengthen communication is to understand each other. Through about two weeks of contact, we got familiar with the character of each team member. On top of this, with the opinions of all team members, we also held group meetings at fixed times every week to strengthen information exchange and exchange results. Meanwhile, we also set up group wechat groups and Flybook working groups for everyone to exchange opinions and improve work efficiency.

2. Define tasks and evaluate members regularly: In order to solve the problem of division of labor, after getting familiar with the individual abilities of each team member, we reformulated the division

of labor. After communicating with the team, we combined the individual abilities and the willingness of relevant members to solve the problem of unclear division of labor. At the same time, the team regularly evaluates the performance and progress of its members, and adjusts the assignments in a timely manner to ensure that each member is able to take on tasks appropriate to his or her ability level.

3. Study and discuss regularly: After discussion, we requested that team members should receive relevant designated skills training on a regular basis to improve their professional level and ability to cope with various challenges in the project. At the same time, report your progress on time to ensure that you keep up with the knowledge you need to develop the current progress. As for the application of new technology, we let several team members with strong ability to cooperate and develop successfully solved the problem of technical conflicts and difficulties.

4. Allocate resources according to priorities: After discussion, we redeploy and optimise existing resources to ensure maximum use of resources. This includes realigning project schedules and priorities, as well as optimizing how software resources are used. And manage resource shortfalls through effective project management and prioritization. By making a detailed project plan and work arrangement, clarifying the priority and schedule of tasks, and adjusting the project schedule and resource allocation in a timely manner, we can ensure that the project can be delivered on time and meet the expected quality standards.

5. Change Management Process: After several meetings, we decided to establish an effective change management process for the requirement change, including the submission, review, approval and implementation of the change request. By strictly managing the requirements change process, ensure that all changes are fully evaluated and approved, avoid unnecessary changes and minimize disruption to the project.

4 Requipment analysis

4.1 Functional requirements

• **Sustainability guide module:** Input some household (electricity, water, household waste, etc.), community, travel methods and other aspects of sustainable development guidelines, list the content, click on the full text can be seen, property users can publish new guidelines, property users can delete and edit the guidelines.

• **community service inquiry module:** Map query content: fitness equipment, supermarket convenience store, fitness gym swimming pool, elderly activity center, children's playground, photo studio Photocopying studio, elderly health center.
Map display: Different facilities are displayed on the map with different signs, and users can choose to see only a certain type or all through the label, and click on a specific place to display the panorama.
On-site service types: water delivery, newspaper subscription, water and electricity maintenance.
On-site service appointment: owner information, on-site time, service type (water and electricity maintenance: maintenance type, specific problems.

• **community education resource module:** Available to owner users E-book data: Entry of valuable, complete, e-book format books.
Classification: E-books are classified by keywords (tags), and books are sorted by time under the classification.
Search function: Books can be searched according to some fields of the title.
Book download: Books that users want to browse can be downloaded and viewed offline.
Bookmarks: Users can record which page of the e-book they read and jump directly to it.
Manual customer service search title: Through the user's description of the book, recommend the book

in the electronic library to the user.
Property users can add and delete books and modify book information (keywords/tags).

• **user registration and login system module:** Open the page first display the home page.
Registration information: user name, password, email, address information, address information proof materials, can only be registered owner users, property users need to unlock resources after audit, recruitment.
Login information: Username/Email/phone, password.
The same set of login system, but according to the user identity display different homepage.
Users can add an avatar.
Anonymous users can view guides, services, education, announcements.
Owner users can view guides, services, education, announcements, resources (subject to review), jobs (subject to review).
Business users can view guides, services, education, announcements, recruitment; Ability to edit, post and delete job postings.
Property users can view guides, services, education, announcements, recruitment; Can edit, publish, delete announcements, education, guides, services, books; Review the recruitment of corporate users; Review the owner user's address information supporting materials.
AI assistant.

• **owner resource management module:**Owner information: account number, registrant, contact information.
Owner's resource classification: water consumption, electricity consumption, gas consumption; Data are aggregated on a monthly basis (heating costs in winter; Property charges).
The card shows the consumption of the year (e.g. water, electricity). Use the chart library to display a line chart throughout the year (showing changes in usage).
Comparison with community per household (or "green" standard) data (horizontal comparison).
The user sets the alarm threshold. If the alarm exceeds the threshold, the platform generates an alarm.
Notification: Pop-up window will be displayed every time you enter the page.

• **community recruitment platform module:**Can view all the job postings.
Click Publish information to view the full text, you can click the send resume function.
Fill in the name, contact information and resume file can be sent (also sent to the corporate user's email address).
Business users can filter published (not approved), pending review, received delivery.
A business user editing a posted job or an unapproved job requires a property review.

• **community announcement module:** Click to view All Announcements to view all existing announcements in the history (announcement title, click to enter the page to view the announcement details).
The property can edit the configuration to delete the content of the pushed announcement and update the push status of the existing announcement.

• **Other auxiliary functions:**Switch between dark and light themes , English/Chinese switching, Page switching animation

4.2 Nonfunctional requirements

• **Performance requirement:** The system response time should be controlled within 2 seconds, and for complex queries and other operations, the response time should not exceed 5 seconds.

• **Reliability requirement:** The system should have high availability to ensure that the service availability time reaches more than 99.99%. And the system should have fault tolerance, in the event

of failure can be quickly recovered, and does not affect the normal operation of the system.

• **Security requirement:** The system should have a strict user authentication mechanism to ensure the legitimacy and security of user identity. The system shall encrypt and store and transmit sensitive data to protect users' private information from being leaked.

• **Maintainability requirement:** The system should have good maintainability and be easy to update and expand. The system should provide comprehensive logging and error reporting functions to facilitate the developer to troubleshoot and repair.

• **Availability requirement:** The system should have a good user interface design, simple and clear, easy to use. The system should have good documentation and help functions to facilitate users to query and learn the use of the system.

• **Operating cost requirement:** For the website construction cost does not exceed the budget, for the later profit requirements do not exceed the maintenance and operating costs.

• **Scalability requirement:** The system should have good scalability, and can easily integrate and expand new functional modules. The system should support the needs of multiple languages and regions, and be able to adapt to users in different regions and language environments.

5 Technical implementation

5.1 Sustainability guide module

5.1.1 view all sustainability guidelines

• User Story: As an user of the sustainability community platform, I want to be able to review all the sustainability guidelines to understand the platform's philosophy, goals and practices for sustainability.

• Design and Implementation: When users successfully log in to the platform page and click the Sustainable Development Guide button in the navigation bar, they can jump to the Sustainable Development Guide button to view all the sustainable development guides. This page is paginized, and each page displays individual guides (including basic information such as name and picture). Click on the specific guide to go to the detailed page to view the article or information.

5.1.2 Edit(Add, delete) the sustainability guide

• User Story: As an administrator, I want to be able to remove existing guidelines or add new ones based on specific needs or situations to better suit the realities and needs of the community.

• Design and Implementation: We allow the administrator to log in to the administrator homepage, and through the navigation bar you can go to the Sustainability Guide page and edit the relevant sustainability guide. Compared to the average user, the administrator has more buttons to add new sustainability guides, while each sustainability details page also has a delete button, which can be clicked to delete the overall content.

5.2 community service inquiry module

Note: Unauthenticated users are unavailable.

5.2.1 view service detail function

• User Story: As an user, I want to see specific information about a community service.

• Design and Implementation: We allow users to view all community on-site or fixed services as well as specific information. When users click the community service button in the navigation bar, they can jump to the available community service page to view all community services. At the top of the page, there is a switch button for on-site service and fixed service. Click to switch to the relevant service page. The pages are numbered, and by clicking on a specific number to go to the relevant page, each page shows several community services (including repair and delivery services). Click on a specific service to go to the details page.

5.2.2 Community resouce map

• User Story: As an user of a community platform, I want to be able to browse a community map to see where buildings or resources are located in the community and to discover nearby activities.

• Design and Implementation: We allow users to use the community map to view community buildings or check the distribution of community resources. We have placed a map of the community, and marked the relevant facilities and resources, which can be enlarged.

5.2.3 Booking service function(on-door service)

• User Story: As an user, I want to subscribe to the on-door service and set the scheduled time and notes.

• Design and Implementation: We allow users to click the Subscribe button to reserve related services by setting the appointment time and adding remarks.

5.2.4 Location information map display(fixed service)

• User Story: As an user, I want to know the location information of the fixed service by using map.

• Design and Implementation: Map points to show the specific location of fixed services in the community.

5.2.5 Video display function(fixed servcie)

• User Story: As an user, I want to know the specific content of the fixed service more vividly through the video.

• Design and Implementation:We allow users to more vividly understand the specific content of the service through video playback. We do this by adding a video player component to the service details page. This component is embedded directly into the service details page. This component has basic play, pause, volume adjustment and other functions, as well as an optional full-screen mode and playback progress bar. On the back-end, deploy corresponding interfaces to obtain video information, such as the URL, title, and description of the video. This information will be stored in a database to dynamically load video content when the page loads. On the front end, the video information is obtained by calling the back-end interface, and the video URL is embedded into the video player component. When the user accesses the service details page, the video player automatically loads. Users can click on the player to play, pause, adjust the volume and other operations.

5.2.6 View user service appointments

• User Story: As an Administrator, I would like to see the reservation information of the owners.

• Design and Implementation: We allow Administrators to view the order of the owner user as well as specific information (including the type of service, Owner's name, phone number, email, address the

location of the owner's house, the appointment time and the owner's notes). The back-end provides interfaces. And administrators can obtain the latest reservation information from the database. These interfaces can return a list of reservation orders, as well as specific information about each order.

5.2.7 Editing community service

• User Story: As an Administrator, I want to edit (add, modify, delete) community service content.

• Design and Implementation: We allow the administrator to add community services by clicking the button to enter the add page. After each service, there are edit and delete buttons. Click the delete button to delete directly, and click Edit to enter the detailed page to modify the content again. Through the corresponding interface provided by the back-end, the administrator can obtain the list of community services from the database, and add, modify, and delete operations. These interfaces support the function of adding, deleting, modifying and checking, which can help administrators to flexibly manage community service content.

5.3 community education resource module

5.3.1 View all books

• User Story: As an user of a sustainability community platform, I want to be able to look at all e-books to enrich my knowledge.

• Design and implementation: We allow users to view all e-books by clicking on the EBOOK button in the navigation bar, which can be redirected to the e-library page. The page is paginated and each page displays several books including basic information such as names and pictures). Click on the specific book to go to the details page to view the e-book.

5.3.2 Fuzzy search

• User Story: As an user, I want to be able to enter a few words or a specific tag to display the books related to those words and tags from all e-books, so that I can find the books I'm interested in more quickly.

• Design and Implementation: We allow users to search for related words or tags through the search box, and the search box displays books related to these words and tags. We added a search box to the book search page for entering keywords or words. A search button has been added to the far right of the search box to display a drop-down list of search results in real time as you type. The back end uses fuzzy search algorithm to search book title, author, description and other fields to find books related to keywords or words entered by users.

5.3.3 Label classification

• User Story: As an user, I want to be able to categorize labels for e-books.

• Design and Implementation: On the book list page, we added a label filter that allows users to filter out books that belong to a specific label category by clicking the corresponding label button. When the user clicks a label button, the page automatically displays a list of books associated with that label.

5.3.4 Book download

• User Story: As an user I want to download books and watch them

• Design and Implementation: We allow users to click on the download button of the book they want to download to download their favorite ebook so that they can read it at any time. After the download link is generated through the back end, the link is returned to the front end page. This link is a URL with a unique identifier that users can access to download the corresponding e-book file. Front-end processing: When the front-end page receives the download link, it converts the link into the href attribute of the download button to generate the download link. When the user clicks the download button, the browser will automatically jump to the download link and start downloading the e-book file.

5.3.5 Editing book

• User Story: As an administrator, I want to edit (add, delete) e-book content.

• Design and Implementation: We allow administrators to add new ebooks by clicking an adding button to go to the Add page. After each e-book there are edit and delete buttons. Click the Delete button to delete directly, and click Edit to enter the detailed page of the book to modify the content. Through the corresponding interface provided by the background, the administrator can obtain the list of electronic books from the database, and add, modify, delete and other operations. These interfaces support add, delete, modify and check functions, which can help administrators flexibly manage the books in the electronic library.

5.4 User registration and login system module & homepage

5.4.1 Anonymous user login

• User Story: As a tourist or a user who wishes to use the platform, I want to browse the general content of the platform and its related features, by clicking Anonymous login, so that I can log in as an anonymous user to the platform that opens individual features.

• Design and Implementation: By clicking the Anonymous login hyperlink to go to the anonymous user homepage (only some functions are open to anonymous users).

5.4.2 Login about all kinds of users(user,administer,enterprise)

• User Story: As an user, I want to register or log in to an existing account so that I can log in to the user's main page (owner page, business page, property page) to use the relevant features of the page.

• Design and Implementation: The user has the type attribute, determines the user type through the judgment function, and redirects the user to the user-related homepage of the type.

5.4.3 Normal user registration

• User Story: As an user who wants to use the platform, you can register by entering your personal information and house information.

• Implementation:Enter the relevant information into the database through jdbc statement to complete the registration.

5.4.4 view Home page recommendation

• User Story: As an user (normal user, enterprise, administer), I can see the homepage of today's sustainability guidelines (such as guidance on how to separate garbage, how to save water, etc.), some books related recommendations, etc.

• Design and Implementation:Users can view popular book recommendations (showing some popular books) or Today's Guide (showing only some content) on the home page, click on all books or all sustainability Guides to go to all books or all guides, click on a book name already displayed on the home page or click on the book name you want on the book display page to browse the book content. Click on the "Today's Recommended Guide" section displayed on the home page, or click on a specific guide in the entire guide page to go to its details page (Note: The small modules displayed on the three user home pages will be slightly different).

5.5 User resource management module

Note: Unauthenticated users are unavailable.

5.5.1 Resource monitoring chart

• User Story: As an user, I want to see the use of living resources (water, electricity, gas, etc.) in my family more intuitively through the chart, so as to save resources.

• Design and Implementation: We allow users to fill in the threshold values of various resources on the threshold setting board, and when the usage of a certain resource exceeds the threshold, the exceeded part of the resource chart will be marked with a red alarm. We use sensors to collect resource usage data in real time from water meters, electricity meters, gas meters and other devices in the home and send it to a back-end server for processing. The back-end server needs to receive and process the resource usage data sent from the sensor. The server can summarize, count, and analyze the data, and then provide the processed data to the front-end page. On the front-end page, use the resource monitoring chart component, which displays resource usage. This chart is a line chart that shows the usage of different resources over time. In the Resource monitoring chart component, the processed resource usage data is displayed. Users can intuitively understand the use of household resources through charts, including water consumption, electricity consumption, gas consumption and so on.

5.5.2 Resource threshold setting alarm function

• User Story: As an user, I want to set a threshold for the usage of household resources. When the usage exceeds the set value, the excess will be marked with a red alert on the chart, thus warning me that I need to save resources.

• Design and Implementation: We allow users to fill in the threshold values of various resources on the threshold setting board, and when the usage of a certain resource exceeds the threshold, the exceeded part of the resource chart will be marked with a red alarm. The back-end server receives the threshold set by the user and stores it in the database. The server monitors resource usage in real time and flags data that exceeds a threshold as an alert. On the resource monitoring chart, the portion that exceeds the threshold is marked as a red alert based on the threshold set by the user and the real-time resource usage data returned by the back end. Use red marked polylines to highlight data that exceeds the threshold.

5.5.3 resource usage comparison

• User Story: As an user, I want to have a more intuitive understanding of the proportion of household resources being used, which can warn me that I need a larger proportion of resources to be used more economically.

• Design and Implementation: We allow users to more intuitively view the percentage of household resources used. Components are used to display the proportion of different resources used. This

component is embedded in the home Resource management page, which is a pie chart that displays the percentage of usage of various resources. Get real-time usage data for various household resources from the back end, including water, electricity, gas, etc. This data can be collected in real time via sensors or smart monitoring devices and sent to back-end servers for processing. According to the real-time resource usage data returned by the back end, the usage ratio of various resources is displayed. Users can intuitively understand the relative importance and usage of various resources through the chart.

5.6 community recruitment module

5.6.1 View all recruitments

• User Story: As an user, I want to be able to easily view all the jobs posted on the community job page in order to find the right job opportunity for me.

• Design and Implementation: We allow users to view all job postings by clicking on the EMPLOYMENT button in the navigation bar. This button can be redirected to the job page. The page is paginated and each page displays basic information about several job ads, such as (relevant company, job description and date of application). Click on the specific job advertisement to go to the details page to see the specific information.

5.6.2 Apply for recruitment

• User Story: As an user, I want to be able to easily submit my job application on the community job page in order to participate in the competition for the job I am interested in.

• Design and Implementation: We allow users to submit a job application by going to a detailed page that they like the job. On the detailed page of each job advertisement, by clicking the Apply button, a pop-up window will appear to prompt you to upload your resume. Next to the upload button, users can click the upload button to select the resume file that is prepared on their local computer. The system supports common file formats, such as PDF, Word, etc.

5.6.3 View all of the company recruitment information

• User Story: As enterprise, I want to be able to see all the job ads that have been posted by my company and the approval status.

• Design and Implementation: We allow companies to view all job advertisements and review status (audited or unaudited) that have been published by the company. Click the Detail View button to view the advertising content.

5.6.4 Edit (add, delete) recruitment information

• User Story: As enterprise, I would like to be able to add and delete job advertisement information through the community recruitment page in order to update the job vacancy situation within the company in a timely manner and attract more job seekers to join our team.

• Design and Implementation: We allow businesses to add new job ads and send them to administrators for review by clicking a button to go to the Add page. There is a delete button behind each AD. Click "Delete" button to delete directly. Through the corresponding interface provided by the background, the administrator can obtain the recruitment advertisement list from the database, and add, delete and other operations. These interfaces support addition, deletion, and functions.

5.7 community announcement module

5.7.1 View history All announcements

• User Story: As an user, I want to be able to view all of the historical announcements so that I can understand the past movement and notifications of the community.

• Design and Implementation: Our users click the announcement button in the navigation bar to enter the announcement page to view all announcements. In this page, there are several announcements on each page. Click the specific announcement to view your announcement information (announcement information, release time, publisher, etc.). The back-end interface is used to obtain information about all historical bulletins. This interface retrieves and returns the title, publication time, content, and other information of all historical announcements from the database. The announcement page is a list sorted by publication time.

5.7.2 Edit (add, delete) a bulletin

• User Story: As an administrator, I want to edit (add, delete) bulletin content.

• Design and Implementation: We allow administrators to add new announcements by clicking a add button to go to the Add page. Each announcement is followed by edit and delete buttons. Click the "Delete" button to delete it directly. The administrator can obtain the bulletin list from the database and add and delete bulletins through the corresponding interfaces provided in the background. These interfaces support the add, delete, and query functions, helping administrators flexibly manage bulletins on the bulletin platform.

5.8 Resume

enterprise(navigation bar with RESUME button and related interface)

5.8.1 CV Download

• User Story: As enterprise I want to download resumes and review them.

• Design and Implementation: We allow enterprises to click the Download button to download user resumes for viewing. Implementation: A download button is placed on the user interface, and when the enterprise user clicks the button, the download operation is triggered. Through an interface provided by the back end for downloading resumes, when a download request is received, the back end retrieves the file of the corresponding resume from the database and returns the file stream to the front end. Once the front-end receives the file stream, it can convert it to a file and save it on the user's local device, which is done through JavaScript code.

5.8.2 Review CV

• User Story: As enterprise, I would like to be able to review a candidate's resume to assess their qualifications and suitability for the position.

• Design and Implementation: We allow enterprise to accept or reject a user's application by clicking the "Accept" or "reject" button after reading the resume. At the same time, depending on the situation, the user's application status will be changed to reviewed or not reviewed.When a resume is approved the user will be notified by SMS that the resume has been reviewed.

5.9 Review

administer(The navigation bar has the REVIEW button and related interfaces)

5.9.1 Review job ads

• User Story: As an administrator, I want to be able to review the job ads posted by the company and decide whether or not to approve them.

• Design and Implementation: We allow the administrator to enter the review page by clicking the review list button in the navigation bar. In this page, there are job advertisements issued by various companies. After each advertisement, there are two buttons of "accept" or "reject" to approve or reject the job advertisement. If passed, update the user recruitment page and add the approved ads.

5.9.2 Review application for certification.

• User Story: As an administrator, I want to be able to review a user's authentication request and decide whether or not to approve it.

• Design and Implementation: We allow administrators to access the review page by clicking the Review list button in the navigation bar. On this page, there are all users who have not submitted authentication information. Each user bar has an "accept" or "reject" button to approve or deny authentication. If yes, update the user sidebar authentication status.

5.9.3 View application detail

• User Story: As an administrator, I want to be able to view a user's authentication request and check out their application details.

• Design and Implementation: We allow administrators to access the details page by clicking the detail button on the individual application bar. On this page, you can view the details of the applicant.

5.9.4 Send reject reason message

• User Story: As an administrator, I want to be able to send the user or enterprise a specific reason for the rejection.

• Design and Implementation: We allow the administrator to send the rejection reason to the enterprise or user after clicking the "reject" button. Click to enter the rejection reason edit page, enter the title, the specific reason to send to the enterprise or user.

5.10 Sidebar function

5.10.1 Users view or modify personal information

• User Story: As an user, I want to be able to view or modify my personal information or house information in order to keep my information current and accurate.

• Design and Implementation: The user clicks on the profile on the home page. The personal information sidebar expands. Users can view the information filled in during registration, click the relevant information twice to modify and re-enter the information, click "OK!" to update. Use front-end validation to ensure that the information entered is in the correct format. Before changing a password, the front-end and back-end verify the current password and ensure that the new password meets security requirements. Provide avatar upload function, allowing users to select and upload image files.

The back end receives the information submitted by the user and saves it to the database. A success or failure response message is returned to inform the user of the result of the operation.

5.10.2 Submit authentication information

• User Story: As an unauthenticated user, I want to submit the relevant certification so that I can unlock more platform features.

• Design and Implementation: By filling in the relevant information, click Submit to send to the administrator review form.

5.10.3 Add or delete administrators and enterprises

• User Story: As a senior administrator added in the background, I can add or remove enterprises and administrators through the sidebar.

• Design and Implementation: We allow senior administrators to add and remove administrators and enterprises. There is a label on the top side of the sidebar that can switch between the administrator list and the enterprise list. By clicking the Add button, a pop-up window will pop up. You can register and add new administrators and enterprises by entering relevant information such as account password. In each column of the form there is a delete button after the administrator and the enterprise, click to delete.

5.10.4 AI customer Service

• User Story: As an user, I hope to use intelligent customer service to obtain resource information about the platform, community resources or consult community-related questions, so as to better understand and use this community platform. At the same time, AI customer service will provide 24-hour service.

• Implementation:Our program allows users to click on the AI session sidebar to communicate with AI customer service. This AI customer service is implemented by invoking the chatgpt interface, and we also create a knowledge base containing frequently asked questions, answers, and related resources about the sustainable community platform. When the user enters the relevant keywords, the keywords are extracted and the corresponding answers or resource recommendations are sent.

5.11 Other auxiliary functions

5.11.1 Light and dark theme switch

• User Story: As an user, I want to be able to switch between light and dark themes in the app so that I can choose the most appropriate theme mode based on my preferences or ambient light.

• Design and Implementation: Users click the toolbar to expand, and then click the theme switch button to switch the light and dark themes of the page. By creating CSS files for both light and dark themes, each contains all the style definitions for the corresponding theme. Load the default theme stylesheet in the HTML file and use JavaScript to dynamically switch stylesheets when the user clicks the toggle button. Use the browser's local storage) to save the user's theme selection so that the user can keep their selection the next time they visit. Adding a button to the menu toolbar allows users to manually switch themes. When the page loads, check to see if there are saved theme selections in local storage and update the stylesheet accordingly.

5.11.2 Page switch animation

• User Story: As an user, I want to see smooth animations when switching between pages to enhance the user experience.

• Implementation: Use CSS animations to implement page switching animations. When the user performs a page switching operation, the routing function is used to load a new page, and the animation effect is triggered after the page is loaded.

5.11.3 Navigation bar

• User Story: As a website user, I want to be able to use the navigation bar to easily navigate and access the different pages and functions of the website in order to quickly find the information I need or perform the action I want.

• Design and Implementation: We allow users to easily browse different pages by using the navigation bar, write the structure of the navigation bar using HTML according to the needs and functions of the website, including logo, page links and buttons, and realize different page jumps through routing.

5.12 Non-functional Requirements Implementation

5.12.1 Security

• User Story: As an user, I expect the system to keep my personal information safe.

• Design and Implementation: Before storing user's personal information in the database, sensitive data is encrypted to ensure that even if unauthorized individuals gain access to the database, they cannot directly read the user's personal information. Additionally, for enhanced security, passwords transmitted from the frontend are encrypted using MD5 encryption before being transmitted to the backend and stored in the database. Both the database and the backend are unable to retrieve the plaintext passwords. On the backend, JSON Web Token (JWT) technology is utilized to verify the user's identity and strict access control measures are implemented to ensure that only authorized users can access sensitive data within the system. Authentication and authorization mechanisms are employed to regulate user access based on their permission levels.

5.12.2 Performance

• User Story: As an user, I expect the system to have a fast response time.

• Design and Implementation: Use SSR(Server Side Rendering), that is, server side rendering. It refers to the rendering process is completed at the server side, and the final rendering result HTML page is sent to the client through the HTTP protocol, also known as "isomorphism". The main benefit of SSR is that the loading speed of the first screen is greatly improved, from 5s to 2s.

6 Database design

For database design, the following ER diagram will be used to describe the relationships between entities in the database, including entities, attributes, and relationships, to clearly show the structure and design of the database.

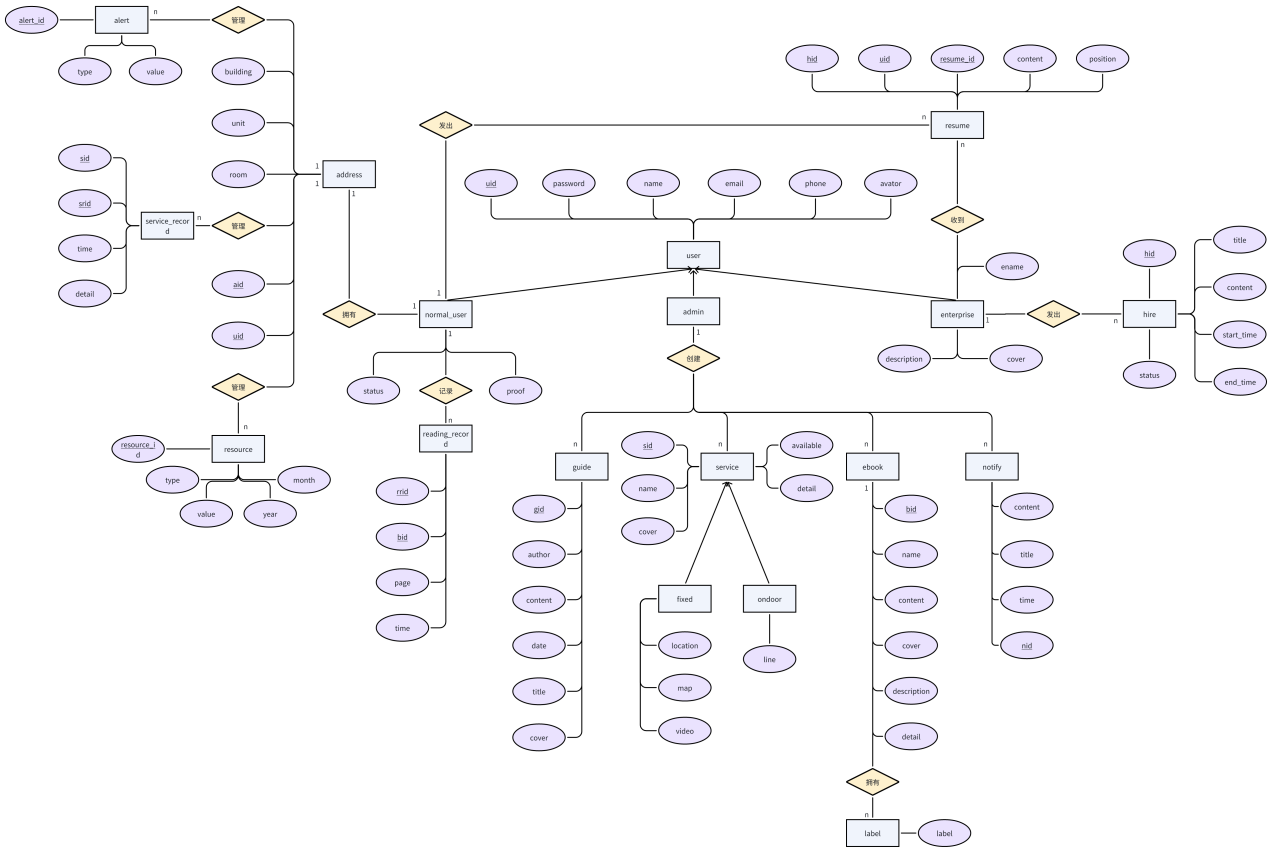

Figure 2: ER diagram

7 Project Testing

7.1 Module Testing

In order to verify whether the function of each module can work properly, we designed the following test scenarios:

According to the functions and requirements of the module, we write test cases to verify the various functions and boundary conditions of the module. Test cases cover all functions and possible input combinations of the module. Execute written test cases in the test environment, enter test data and record the actual output results. Ensure that the module works properly in all situations and with the expected results. Then record the relevant data.

Static resource availability: To ensure the availability of static resources in the project, we perform the following tests:
- Download test: Using a new device to download a static resource file from the GitLab repository and verify that the file can be successfully retrieved.
- Compatibility testing: We test the compatibility of static resources for various browsers and devices to ensure that they display and function correctly.

7.2 Functionality Testing

The overall functionality of the website program is tested by performing various scenarios and user interactions. Make sure all functions, such as search, booking, and auditing, work properly. We write test cases through user stories and test whether each function can be implemented perfectly according to each user story requirement.

7.3 Integration Testing

After completing the module testing, we perform the integration testing. Test how different modules interact and handle data exchange. We have tested the page jump and corresponding functions after the integration of the three accounts to monitor whether the program can run normally.

7.4 Performance Testing

Identify specific goals for performance testing, including evaluating system performance metrics such as response time, throughput, and resource utilization. Test the performance of the website application under different load and traffic conditions.

8 Challenges and Risks

During the project development process, our team encountered many very difficult risks and challenges, such as technical challenges: because we had never had the experience of using AI interfaces and training AI models, this caused a lot of obstacles on the road to realizing intelligent customer service. To solve this problem, the team members actively invested in the field of learning and researching AI interfaces and training AI models, reading relevant literature, attending online courses, watching tutorial videos, trying to understand the basic concepts, principles and applications of AI technology, and finally helping each other to successfully implement this function. There's also time pressure: Due to the large size of the project and the need to change part of the requirements sometimes for some reasons, resulting in time pressure and urgency, in order to solve this problem, we re-evaluate the project requirements and determine the priority, and establish a strict approval system for some requirements changes, and adopt flexible development methods such as agile development, allowing flexible response to demand changes and time pressure during the project process. Through iterative development and rapid iteration, timely adjust the project schedule and work priorities, maintain the flexibility and control of the project.

9 Conclusion

9.1 Team collaborative development project summary

Through the collaborative development of the team, we successfully completed the implementation of the project in accordance with the project requirements and customer needs, and achieved a series of gratifying results. In this process, the team members have overcome all kinds of difficulties and challenges, and fully demonstrated the cohesion and cooperation spirit of the team. First of all, we successfully dealt with various challenges and problems encountered during the development of the project. Whether it was technical challenges, time pressures, or resource constraints, the team was able to respond positively, find solutions, and ultimately achieve success, with some members mastering new technical capabilities. This fully proves the team's execution ability and adaptability. Secondly, we have achieved satisfactory project results. Through the joint efforts of the team, we successfully realized the functions and features of the project, met the needs of the customer, and delivered high-quality, highly innovative results on time. These achievements not only reflect the technical level and creativity of the team, but also lay a solid foundation for the further development of the project. Finally, the successful completion of our project is not only dependent on the strength of the team members themselves, we would like to highly appreciate and express our sincere respect to the TA Lai Yishu and the lecturer Dr. Catherine, who have given great help and support to our team during our development process, and have given us enough excellent development suggestions to promote the development process of the project. Make the project get enough room for improvement, thanks again for their help.

9.2 Project future expectation and development

The team will continue to maintain a sense of innovation, continue to innovate and optimize the project, and constantly explore and apply new technologies and methods. We will continue to optimize the functionality and performance of the project and improve user experience and satisfaction to meet the changing market needs. The team plans to expand the scope and application areas of the project to further enrich the functions and features of the project. We will actively explore new application scenarios and industry fields, expand the market coverage of the project, and achieve greater value and influence of the project. The team will also strengthen the ecological construction of sustainable community websites, and we will actively seek learning cooperation with industry leading enterprises and institutions to jointly explore and develop new application scenarios and solutions, share resources and achievements, and achieve win-win development. Through the above development strategies and measures, the team is confident to push the project to new heights and achieve a better future. We believe that with the joint efforts of the team, the project will continue to grow and create greater value and significance for the realization of sustainable community construction!