Developing Volunteer Management System with Java EE Technology

the Case of Taichung Volunteer Service Promotion Center

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***Abstract*—Volunteer service exercisers or teams currently use the Volunteer Service Integrated Information System (VSIIS) developed by the Ministry of Health and Welfare (MOHW) to support their businesses. This study proposes the Volunteer Management System for the Taichung Volunteer Service Promotion Center, which is a volunteer service exerciser, with better user interface designs and browser compatibility, when compared to the VSIIS. The proposed system works independently and can export data to the VSIIS for reporting to the MOHW. The system is built with the Java EE and other open technologies, and its source codes are open to the public. Other volunteers can join the development by helping to continuously improve the proposed Volunteer Management System.**

Keywords—volunteer service, application system, Java EE Technology

I. INTRODUCTION

The amendment of the Volunteer Service Act has been passed since 2014. The purpose of the act is to effectively manage and utilize the resources of volunteer services. The act states the measures for promoting the volunteer service and the rights and the obligations for the volunteers, as they are obligated to attend the educational training programs and are awarded according to their service time.

The Ministry of Health and Welfare (MOHW), Taiwan, has established the Volunteer Service Integrated Information System (VSIIS) for volunteer service exercisers or teams for supporting their business. The features of the VSIIS cover businesses including: maintenance of volunteer information, maintenance of education trainings, maintenance of insurance information, registrations of the service record books, and award applications.

However, after interviewing the system users at the Taichung Volunteer Service Promotion Center, we have identified the following opportunities to improve the VSIIS:

- User interface designs: For example, the VSIIS does not design the user interface for entering service hours in batches. That causes the users to spend a lot of time in entering and results in a negative attitude towards the system.
- Browser incompatibility: The VSIIS only supports the Internet Explorer browser. Other browsers, such as Chrome or Firefox, cannot properly display some of the dialog windows.

In addition to that, the VSIIS is outsourced to an external company and its source codes are not open to the public. The outsourcing takes too much time to fulfill the change requests and new feature requirements to the VSIIS due to the cumbersome administrative process. Furthermore, the closed developing environment stops other volunteers from collaborating with the system's development.

This study aims to design and build an independent Volunteer Management System using the open technologies to help the operations of volunteer service business in the VSPC of Taichung City. The proposed system operates independently and can export data to the VSIIS. The system is built with the Java EE technology and PrimeFaces UI framework, so that the system can provide a better browser compatibility. Some user interfaces are improved by entering data in batches. More importantly, the source codes are open to allow other volunteers to join the development and thereby continuously improve the system. The source codes can be accessed from https://bitbucket.org/104gradstud/volunteer.

The remaining sections of the paper are organized as follows: Section two reviews the organization structure and daily operations regulated by the Volunteer Service Act, the current information systems for supporting the volunteer service business, as well as the Java EE technology employed to build the proposed Volunteer Management System. Section three formalizes the business life cycle for the VSPC of Taichung City and identifies the system's functional

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requirements. Section four presents the system architecture of the proposed Volunteer Management System for the VSPC. Parts of the system features are demonstrated in Section five. The conclusion follows in the last section.

II. Literature Review

A. Volunteer Service Act and Related Regulations

The Taiwan government passed the amendment of the Volunteer Service Act in 2014 to regulate and manage the resources of the volunteer services, showing the active support of the government for the volunteer work. The act regulates the organization structure, rights and obligations of volunteers, promotion measures, as well as attribution of liability for the volunteer services. Central and local governing authorities have now established regulations for executing the volunteer service works. For example, the MOHW, Taiwan, established the Regulations on Management of Volunteer Service Certificates and Service Record Books [1]. The Taichung City Government established the Operation Direction for Volunteer Service for the Civil Affairs Business of Taichung City Government in 2016 [2].

The organization structure for managing volunteer service business consists of four levels according to the Volunteer Service Act, which are competent authority, authority in charge, volunteer service exerciser, and volunteer team. Let's take Taichung City as an example. The competent authority is the Taichung City Government. It has many authorities in charge, with the Social Affairs Bureau as one of them, as it administers many volunteer service exercisers, like foundations or associations, where many volunteer teams can be formed.

The volunteer team is the unit that runs the daily operations that include the maintenance of volunteer information, education trainings, the registrations of the service record books, and the registrations of the service hours.

B. Current Related Information Systems

Currently, there are several information systems available to support the business of the volunteer service. MOHW, Taiwan, has established the VSIIS for volunteer service exercisers and teams. InterSoft [3] and Iscom Online International Information [4] companies also provide their own volunteer service management systems.

We therefore evaluate the three systems from the viewpoint of the business process of the volunteer service, as shown in TABLE I. All of them support the volunteer registration, event management, and registrations of the service hours. Only the VSIIS offers the functions for the registrations of the service record books. Let's look at the extra features for each system. The VSIIS provides the functions of the manpower bank. The system of InterSoft Co. provides the functions of managing the allowance records and the online surveys. The system of Iscom Online International Information allows volunteer scheduling and the ability to check in/out of the activities using mobile devices.

TABLE I. Supproted activites in the volunteer service business by the three reviewed information system

Activities	**Information Systems [Owner]**		
	***Volunteer Service Integrated Information System (VSIIS)* [Ministry of Health and Welfare, Taiwan]**	***Volunteer Management System [InterSoft Co.]***	***Volunteer Management System [Iscom Online International Information Inc.]***
Volunteer Registration	Y	Y	Y
Education Training	Y	Y	
Registrations of the service record books	Y		
Event Management	Insurance records maintenance	Event record maintenance Insurance and allowance record maintenance	Activity record maintenance; Volunteer scheduling
Registrations of the service hours	Service-hour record maintenance	Service attendance record maintenance	Check in/out using the mobile devices
Reporting	Data importing and exporting		
Assessment and Awards	Award application record maintenance	Assessment and award records; On-line surveys.	
Others	On-line Announcement ; manpower banks		

C. Java EE and JSF Technology

The Java Enterprise Edition (Java EE) is a popular enterprise application platform. Java was ranked number one in the TIOBE Programming Community index as of June 2017 [5]. While Java EE 7 is the current version, Java EE 8 will be released at the end of 2017 [6]. Java EE is a set of community-driven enterprise software standards developed by the Java Community Process. The members in the community may come from industry experts, businesses, or open source organizations and Java user groups. The development of the Java EE application can be modularized by the components that run on the application servers. The modularization and rich APIs for the enterprise computing lead the Java EE application with scalability, reliability, and security [7].

JavaServer Faces (JSF) Technology is one of the Java EE standards for building server-side user interfaces [8]. The JSF technology includes a set of APIs for managing and rendering user interface components, handling client and server side events, navigating pages, and other features for developing enterprise web applications [9]. Following the Model-View-Control (MVC) design pattern, the JSF architecture separates the application logic codes from the representation. Web page developers link JSF UI components tags to the Managed Beans where the application logic codes exist to make the web pages.

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While the JSF provides many basic UI component tags, third-party libraries are available to offer numerous and sophisticated UI components for developing rich user interfaces. PrimeFaces is one of the third-party libraries [10], which offers more than 100 UI components, for example, AutoComplent, Dialog, HtmlEditor, etc. Besides, the provided Ajax Framework, Dialog Framework, Push Framework, and Theme Engine, supercharge the developers with the ease and flexibility to develop the sophisticated user interfaces. The current stable version is PrmeFaces 6.1 as of the time of writing this paper.

III. Business Process and System Requirements

The proposed Volunteer Management System (VMS) is designed for the Volunteer Service Promotion Center (VSPC) of Taichung City, as established by the Social Affairs Bureau for managing their volunteer service exercises. This study defines the Registrations to award the Applications life cycle to formalize the business process for the Taichung VSPC. The life cycle includes the following activities:

1. Volunteer registrations: to register volunteers and maintain their records.
2. Education trainings: to organize training courses and maintain the training records for volunteers.
3. Service record book distribution: to issue service record books to qualified volunteers. Volunteers use the books to collect the proof of the service from many volunteer service exercisers.
4. Event management: to organize events that require volunteers. Manage the check in/out of volunteers at events. Provide event allowance and insurance to the volunteers.
5. Service hour management: to maintain the service hour records for each volunteer.
6. Reporting: to regularly report the required data to the central governing authority, such as reporting volunteer lists and service hours.
7. Assessment and awards: to assess and award outstanding volunteers.

The proposed Volunteer Management System supports these activities including: volunteer registrations, education trainings, service record book issuing, and reporting. Table 2 arranges the system functions that have been built to support the tasks in various activities in the volunteer service life cycle.

We have also improved several UI designs to provide more convenient ways to input the data:

A. UI Iimprovements for Maintaining Volunteer Records

Firstly, an address input component is built. Instead of keying in the full address word by word, the component allows the users to select the county/city and area, and then default the post code for the users. Secondly, when the users view the volunteer record list, the system provides a right-click pop-up menu for viewing details and deleting records.

TABLE II. Supported tasks by the proposed volunteer Management System

Activities	Tasks	UI Improvements
Volunteer Registrations	Volunteer registration record maintenance	Entering address with cascading list boxes; Pop-up menu for viewing and deleting records
Education Trainnings	Education training hour record maintenance	Enter multiple education training records in batch; Pop-up menu for viewing and deleting records
Service record book registration	Service record book record maintenance	
Event Management		
Service hour registration	Service hour record maintenance	Enter service hours records for multiple volunteers across multiple month in batch; Pop-up tooltip for specific fields
Reporting	Exporting records of volunteer registrations, education training hours, service record books, and service hours.	
Assessment and Awards		
User Management	Organization structure maintenance; User authorization control	

B. UI Improvements for Maintain Educating Training Records

While allowing the users to enter the training record for one volunteer at a time, the system has also designed a batch input procedure. The users first select multiple volunteers and provide the training hours applied to each of the selected volunteers. The system can then create an education training record for each of the selected volunteers, as this can save time for inputting the training records. In addition, a right-click pop-up menu for viewing and deleting is provided by the system when the users view the training record list.

C. UI Improvements for Maintain Service-Hours Records

A procedure is designed to allow the users to input service hours for multiple volunteers over multiple months. The users first select the multiple volunteers, and then select the date range that can cover multiple months. After the users provide the service hours for each of the selected volunteers within the date range, the system can equally allocate the service hours for each volunteer to each month. In addition to the enhancement, the system provides the pop-up tooltip for some fields that might be confusing for the users, which would, in turn, reduce the user's helpline calls to the Taichung VSPC. The employees at the Taichung VSPC can then save time by not having to answer the same user's questions from the different volunteer service exercisers.

IV. System Architecture and Designs

The proposed Volunteer Management System is an independent system that supports the operations of the volunteer service exercisers and the volunteer teams. They can all use the system to support their daily activities including:

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volunteer registrations, education trainings, service-hours registration, and service record book issuing. To report to the central governing authority, the data in the Volunteer Management System can be exported to files and then imported to the VSIIS of the MOHW.

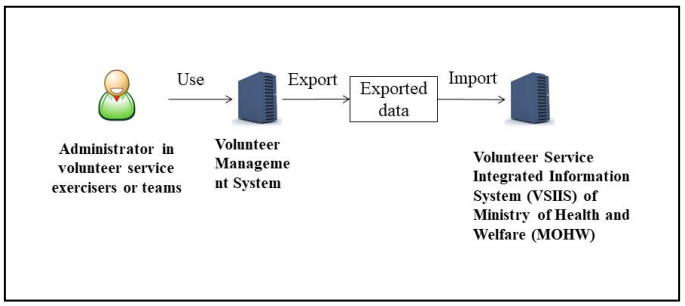

Fig. 1. The proposed Volunteer Management System works independently. Data in the system can be exported to Volunteer Service Integrated Information System (VSIIS) of Ministry of Health and Welfare (MOHW).

The system is designed based on the Java EE Technology, which is a multi-tiered architecture that contains layers from the front-end to the back-end, including [11]:

- Client Tier: Components that render the user interfaces exist in this tier.
- Web Tier: Components that handle the logic of the user interaction are arranged in this tier. After receiving the actions from the users, web components will handle them and return the results to the components in the representation tier, and then to render results to the users.
- Business Tier: Components that encode the application business logics and data access logics are placed in this tier. Web components will call the business component to deal with the user's actions that require to be constrained by the business rules, or the actions to access information in a database, or a legacy system.
- Enterprise Information System Tier: Systems such as an enterprise infrastructure or databases are arranged in this tier.

The components that are built for volunteer registration are shown in Fig. 2. In the client tier, `create_volunteer.xhtml`, `search_volunteer.xhtml`, and `update_volunteer.xhtml` are JSF facelets for rendering user interfaces. The web components: `create_volunteer` and `update_volunteer` handle the user's actions from the `create_volunteer.xhtml` and the `update_volunteer.xhtml`, respectively. The `contextMenuView` component handles the right-click pop-menu actions from the `search_volunteer.xhtml`. In the business logic tier, the `volunteerBean` component encodes the logic to provide the data access service for the components in the web component tiers.

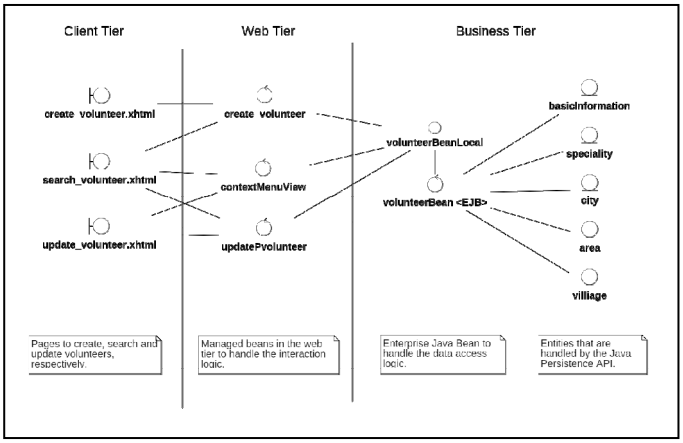

Fig. 2. Components and their dependencies to realize the volunteer registration function.

V. System Demonstrations

A. Entering Address with Cascading List Boxes

Cascading list boxes are employed to make the users fill out their address faster. When entering the residence address, a user first selects a municipality or county from the first list box, as shown in Fig. 3. Next, the system will update the available areas/cities in the second list box for the selected municipality or county. Then, the system will update the available villages for the selected county for the user. Once the user selects a village, the system will default the zip code for the user. Lastly, the user enters the remaining parts of the residence address.

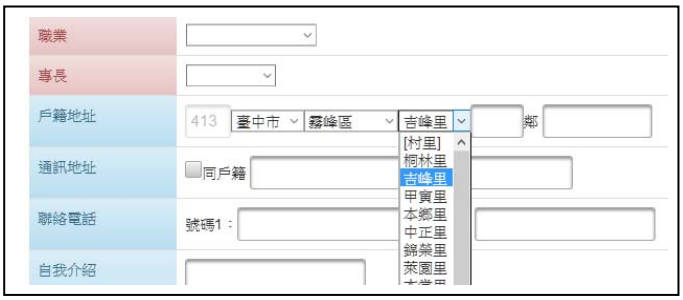

Fig. 3. Cascading list boxes to enter the volunteer's address.

B. Creating Organization Units

The organization structure of managing the volunteer services consists of four layers: competent authority, authority in charge, volunteer service exerciser, and volunteer team. The system provides functions to maintain the organization structure. To create an organization unit, a user first enters the contact information, as shown in Fig. 4. Then, the user selects the type of parent organization that supervises the unit to be created. Next, the system will show the available parent and ancestor organizations for the user. After specifying the parent and ancestor organizations, the user can then enter the new organization unit name.

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Fig. 4. Function to create an unit in the organization hierarchy.

C. *Entering Service Hours for Multiple Volunteers*

The task of entering the service hours for the volunteers operates on a regular basis. The proposed system designs a procedure to enter in a batch of hours for the multiple volunteers during a given period. As shown in Fig. 5, a user selects one or more volunteers from a volunteer team. Then, the user specifies the start and end dates for the service period. Next, the user can select the Batch Input option and enter the service hours. The system will default the provided hours to each of the selected volunteers. Lastly, once the user clicks on the save button to save the records, the system will equally allocate the service hours of the volunteer to each month during the period for each volunteer. This can save the time comparing with entering for each volunteer for a period of one by one and month by month.

Fig. 5. Entering service hours for multiple volunteers across multiple months.

VI. Conclusion

This study has proposed the Volunteer Management System to the VSPC of Taichung City, Taiwan. The business of the VSPC has been formalized into a seven-stage life cycle, starting from volunteer registrations and ending at assessment and award. The proposed system has supported activities including: volunteer registrations, education trainings, service record book issuing, and reporting. Several UI designs have been improved to reduce the time of the data entry, and comparing to the VSIIS currently being used by the VSPC of Taichung City. The adapted Java EE and other open technologies will help the system to provide a better browser compatibility than the VSIIS. Finally, the source codes of the proposed system are open to public, which can be accessed from https://bitbucket.org/104gradstud/volunteer, thereby allowing other volunteers to join the development to continuously improve the system.

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