

APPLYING MODEL-VIEW-CONTROLLER MODEL (MVC MODEL) IN BUILDING A DORMITORY MANAGEMENT INFORMATION SYSTEM FOR THE UNIVERSITY OF DANANG, UNIVERSITY OF SCIENCE AND TECHNOLOGY

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Abstract - The article presents the method of building a dormitory management information system for the University of Science and Technology, University of Danang by using the modern web technology. It is a website manager that is built on the Model-View-Controller model (MVC model) using ASP.NET MVC technology. In this paper, the authors have clearly identified functions of the MVC model in the current website management systems. They have analyzed two patterns of MVC model, which are Supervising Controller and Passive View. The Passive View pattern is selected to build the dormitory management information system because it can manage to separate tasks into dependent and special components easily, which helps the system to operate better and more effectively.

Key words - Dormitory management information model; MVC model; Supervising Controller pattern; Passive View pattern; Dormitory management website; ASP.NET technology.

1. Introduction

Currently, in the country and in the world, there is much commercial software designed to serve boarder management. However, in universities, the adaptability of these applications is not high actually. In addition, the cost of owning the copyright of such software is quite high.

On the other hand, demand for accommodation of university students across the country is great. The dormitory management with large numbers of students needs much effort, time and cost. Recognizing this, some universities have developed a website system to manage operations of their dormitories.

In the dormitory website of National University of Ho Chi Minh City [5], students can only read the news, search and look up but they cannot register/extend dormitory rooms. Therefore, the website is only used for post news, announcements, but it is not as alternative for the manual work in dormitory management activities.

With the dormitory website of Pedagogical University, the University of Thai Nguyen [6], students cannot perform the following affairs:

- Interacting directly with dormitory management staff via website;
- Asking for registering or extending dormitory rooms;
- Sending requests to the dormitory management staff.

Most of dormitory management websites, which are still superficial, are only used for introduction and promotion donot fully meet the needs and the purpose of boarders and managers.

Therefore, using information technology to develop an

application for the University of Science and Technology University of Danang is an urgent requirement to make the dormitory management more convenient and more accurate. Moreover, it could support boarders to get information in a quick and timely way.

2. Dormitory management model

We have based on the MVC model [1], [3], [4] using ASP.NET MVC technology [2] to build the Dormitory Management Model of the University of Science and Technology, University of Danang.

2.1. Model-View-Controller (MVC model)

MVC model (Figure 1) plays an important role in the construction, development, operation and maintenance of a system or a software application. It creates a 3-layer Model – View – Controller isolation and interacts with each other [3], making the exchange and processing of transactions quick and easy. MVC model mainly applies to the software systems of website and is used with the Web programming popular language such as PHP, ASP.NET, JSP and so on.

Model: the component that contains all logic operations, processing methods, databases accessing, data description object such as processing function, etc.

View: undertakes the display of information, interaction with the users, which contains all GUI objects as textbox, images, etc. in a simple way. It is a set of form or HTML file.

Controller: takes the responsibility of redirection for user request and revokes the proper methods to handle them. For instance, this component will receive URL/form requests to operate directly with the Model.

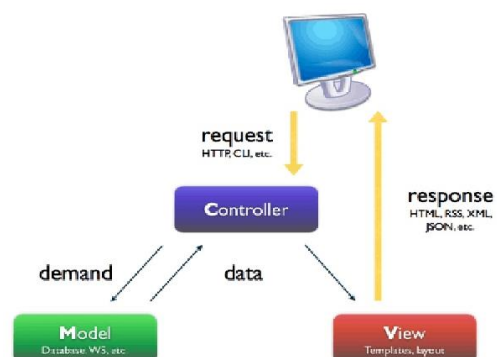


Figure 1. MVC Model

We have chosen the MVC model to develop Dormitory Management Website because of the following reasons:

- This model does not depend on environment, platform and/or programming language;
- Arranging functions/classes in separated Controller – Model – View. Therefore, it would be easy to build, manage, operate and maintain a project. Making it clear in the process of project development as well as controlling the processing flows and creating the components which could handle specialized services;
- The MVC model is not a language, but when different participants (programmers, managers, investors, etc.) take the look together they would understand what it is, then they can exchange requests and discuss their work.

This is a standard model and the most optimal compared to others. It is used in many projects and areas, particularly in the technology of application-software production. We use the standard model MVC to distribute and transfer technology easily.

There are two versions in the MVC model. They are the Passive View and Supervising Controller patterns.

2.1.1. Supervising Controller pattern

Firstly, the View will take events from user transactions and transmit them to Controller where they can be handled. To update changes of Model, the View will take data-binding for simple handlings. For complicated ones, the Controller will retrieve data from the Model and transfer updates to the View.

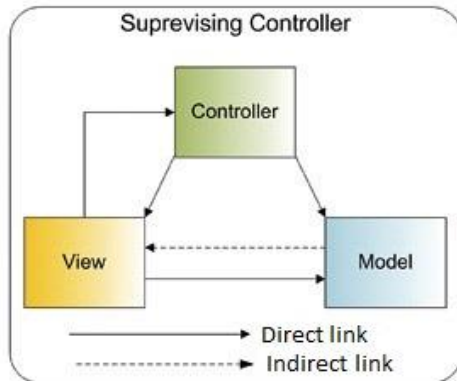


Figure 2. Supervising Controller pattern

2.1.2. Passive View pattern

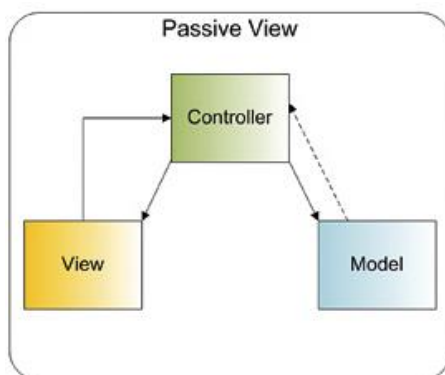


Figure 3. Passive View pattern

In this pattern (Figure 3), the View does not process as well as interact directly with Model components. It transfers handlings to the Controller to undertake. It will interact with the Model and update changings to View. Thus, the Controller could play a role as intermediate component that communicates View and Model.

The deployment process is vertical in the Passive View; i.e. data will go from View to Controller then come to Model. When the model changes data, the Controller will receive the modified data via link between them. The updated data will continue to fetch the View from the Controller. The Passive View pattern was selected to build the dormitory management information system because it can manage to separate tasks into specific ones easily as well as make the system operate coherently and effectively.

2.2. ASP.NET MVC Technology

This technology allows us to distinct the task of application (logical input, logical business and logical interface). Thus, the testing is taken easily. All principal features of MVC model are installed based on interface and are tested by using mock objects (simulation of real objects in the application). The unit-test could be applied without running Controller in the ASP.NET MVC process. This leads to the fast and convenient deployment of unit-test [1].

MVC is an extensible and pluggable platform. The design of ASP.NET MVC components make them easily changeable or adjustable. Therefore, the View engine, URL routing mechanic, action-method parameter extraction and others could be embedded.

The ASP.NET MVC also supports Dependency Injection (DI) and Inversion of Control (IoC). DI permits us to bind objects to a class instead of obeying that class has to initiate ones. IoC defines that if an object requires another, then the first object will get the second one from a foreign source such as configuration file. As a result, the use of DI và IoC will make testing easier.

There is a powerful URL mapping component in ASP.NET MVC which allows us to build applications including contensive URLs as well as search them easily.

The ASP.NET MVC platform contains outstanding feature that is lightweight and easy testing for interface while comparing it with Web Forms application. Moreover, it integrates available features of ASP.NET. The definition of ASP.NET MVC platform has been taken by the name space System.Web.Mvc [2].

We have implemented the version 4.0 of ASP.NET MVC since it appends ASP.NET Web APIs that support mobile devices better.

In this system, we have not used complicated SQL instructions. The querying of data has been done via LinQToEntities.

2.3. System analysis and design

2.3.1. Actors

The system consists of two user groups (Figure 4):

1. Boarders: use the system to exploit information and interact with managers in the boarding process.

2. Management staff: use the system that serves the management tasks with appropriate decentralization, i.e. there is different authority for each employee.

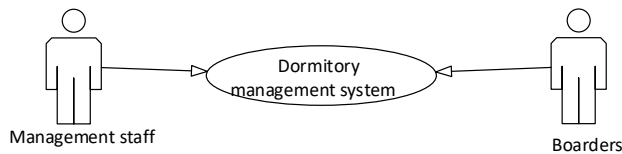


Figure 4. The system actors in Dormitory management information system

Management staff not only manage the system but also edit news as well as activities before publishing them on the website.

2.3.2. Use case diagram of Dormitory management information system

The system has to ensure to provide enough procedures that attend to management activities manually (Figure 5).

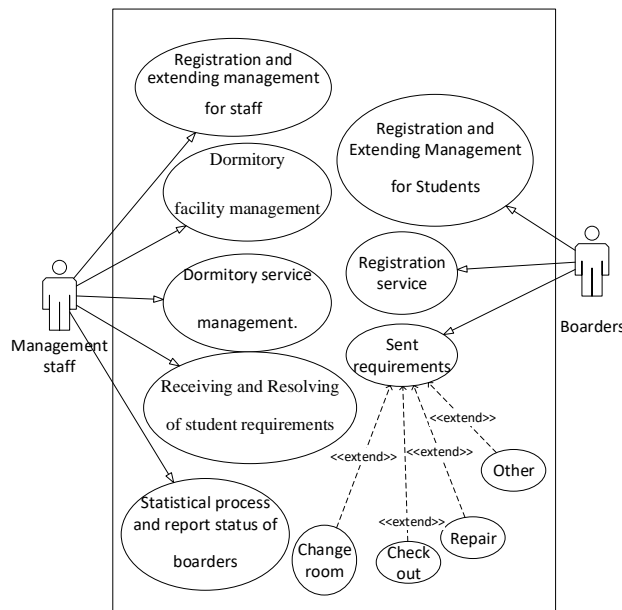


Figure 5. Use case diagram of Dormitory management information system

a. Use case “Registration and extending management for staff”

Before starting new curriculum, management staff login to make a schedule the registration and extending of boarding in the dormitory. Then they are going to inform students about it. After its deadline, the system will close registration/extending automatically. Management staff could assign conditional students into rooms manually and automatically based on priorities and registration time. When the assignation completes, the system will send students a confirmation and quotations to let them pay it and take the boarding.

b. Use case “Registration and Extending Management for Students”

In order to register or extend room in the dormitory, firstly, students have to log in the system before the deadline as mentioned above in the schedule. Non-resident students can only register rooms whereas boarders have the only option of extending their rooms.

After being logged in successfully, the system will list the qualified rooms for non-resident students. They can choose the rooms that they would like to join in. For boarders, the system allows them to extend their room or choose another one. While selecting the rooms and sending information, the registration/extending may be cancelled/suspended if the management staff has not examined it yet. When the request has been approved, the students will receive an announcement containing the full information to let them do boarding procedures.

c. Use case “Examination of dormitory room (manually and automatically)”

With manual examination function, management staff can permit the students to join in the rooms selected by them or assign them into other rooms for any reason. Moreover, management staff can delete invalid requests.

With the automatic examination function, the system will rely on the student priorities as the first parameter. The second parameter is the registration time to assign students into appropriate rooms according to their registers.

d. Use case of dormitory facility management

Management officers can manage the facilities of the whole dormitory or managed by each room, make statistics of the number of assets that are damaged or need to be repaired or replaced.

When repair requests are sent by the students via system, management officers will approve and send a staff to do the repair. After completing the repair, repair personnel will report to management officials about updated asset status and repair activities.

e. Use case of dormitory service management

About Internet service of the dormitory, this kind of service is room service and only need one student representative to register. After registering and being approved, students will receive notice and come to management office to finish the procedures, then management officers will send a staff to install internet. The service charge will be notified by email to each student.

f. Use case “Receiving and Resolving of student requirements”

Boarders can submit their requests to dormitory management via messages on the system: request for room transfer, check, request for repairs and other requirements.

With each boarder, the request for repairs and other requirements are not made simultaneously with the request for transfer and check. After boarders send request, management officials will review to make a decision to approve or not approve of the requirement via system.

g. Use case “Statistical process and report status of boarders”

After logging in the system, managers can select the information required for the statistics to view and export the results. There are two statistical functions: quick statistics and detailed statistics.

Quick Statistics provide general data about students, facilities and boarding fees. Detailed statistics provide

specific data for each item. All statistical results can be exported to the forms and have an attached specific list, making the report quick and accurate.

2.3.3. General structure of system

The system structure includes the following principal functions (see Figure 6):

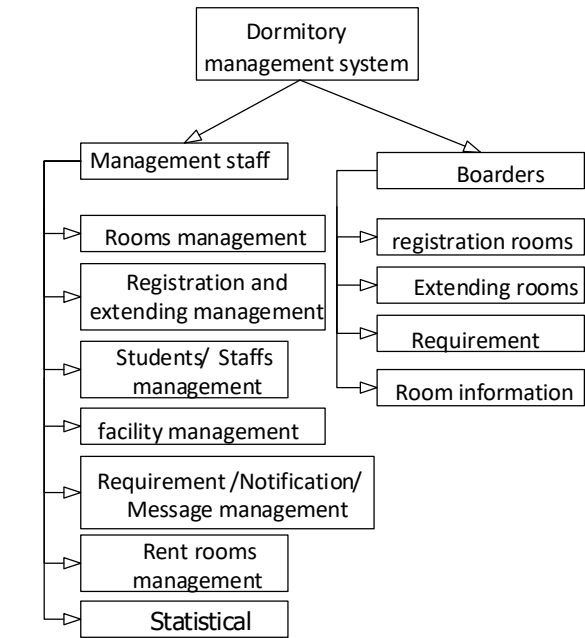


Figure 6. The structure of system.

Sequence diagram of the dormitory management information system in MVC model (Figure 7):

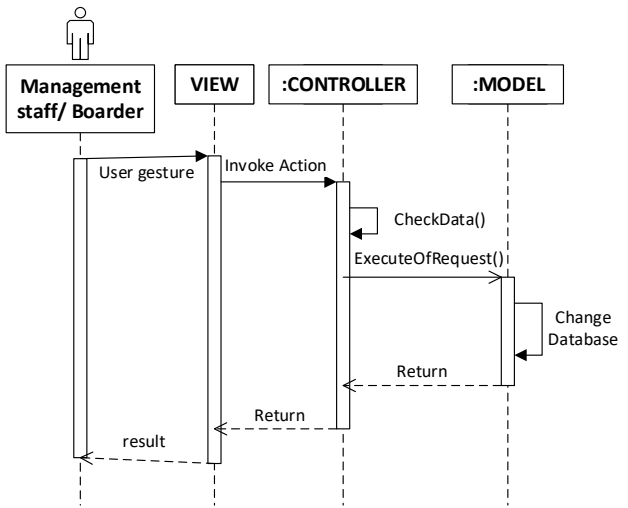


Figure 7. Sequence diagram of the dormitorymanagement informationsystem.

2.3.4. Analysingdata system

The main database of system management includes (Figure 8):

Boarder: Student ID, accounts and related personal information.

Facilities of Dormitory: include rooms, fixed assets and common assets of the dormitory. *Rooms in the dormitory* include number of rooms, blocks, the number of

beds, boarding fees ... *Fixed assets in rooms* include the code of assets, name of assets, price, use status... *Common assets of dormitory:* include the code of assets, name of assets, price, use status, etc.

Registration or extension of student: Student ID number, registration room, time, approved room, the status of the registration or extension.

Request: Student ID number, type of request, content, time and condition.

Services: type of services, service charges, and form of payment.

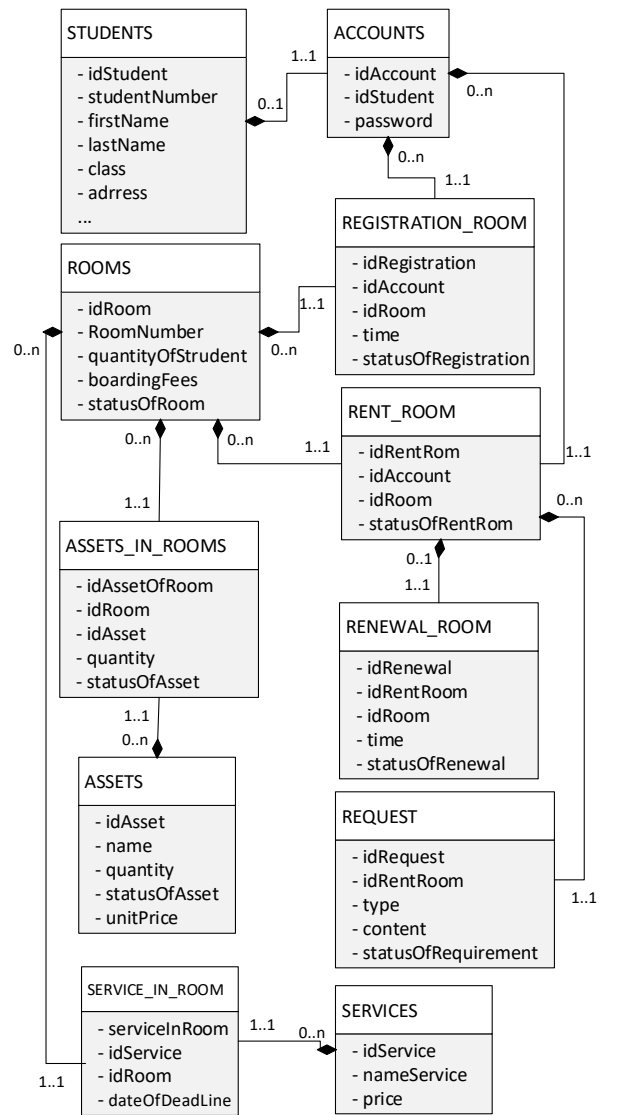


Figure 8. Class diagram of system.

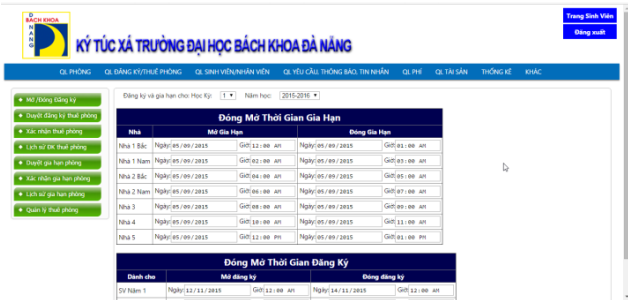


Figure 9. Registration and extending management functions

Dormitory management information system is implemented in details according to the system design, including the management part for staffs and the using part for students. Following are some screen images of the dormitory management website: Dormitory registration and extending request activation for the manager (Figure 9); Room information for students to register (Figure 10).



Figure 10. Function of room information viewing

3. Conclusions

The Dormitory management information system has been running tests with real data provided by the

Department of student affairs and dormitory of University of Science and Technology, The University of Danang. The experimental results show that Dormitory management information system has achieved the objective and the requirements of the Dormitory management department.

However, to make the use of Dormitory management information system more flexible and convenient, in the near future, we continue to develop a version for mobile devices like smartphones and tablets.

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