# An Approach for Management of Regional Portal Sites through Project-Based Learning

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**Abstract**

*In this paper, we present an approach for management of regional portal sites through project-based learning. In this approach, we have developed a framework to regularly provide information systems and contents based on needs of regional communities for the regional portal site by developing them on the project-based learning in our university. The waterfall model that is one of the software development techniques as the method of executing the project-based learning is practiced. This paper shows current status and effectiveness of our approach.*

## 1. Introduction

The progress of information-communication technology brings us the possibility to share information through online communication tools called social media such as blogs and Twitter [1]. In regional communities in Japan, there are a lot of approaches to provide regional information to WWW (World Wide Web) by using the social media in order to revitalize economy and the security of each community. Generally, regardless of if the situation used personally or publicly, the information sharing with others on the web is mainly classified into two types that are stock and flow. The information of the stock type is stocked with information in the specific location like web sites, and the information of the flow type is stream data in real-time like Twitter. During the big earthquake of 3.11 that occurred in Japan, we were able to communicate with others who weren't able to communicate by telephone and mail via Twitter and Skype [2]. There were a lot of cases where followers of Twitter gave each other the stock information on rolling blackouts of Tokyo area at that time. The social media have a potential problem of permitting sending false rumor. On the other hand, the effectiveness of the social media that handled the flow information was shown.

Regional portal sites have been used as effective method of information sharing of the stock information of each regional community before the social media become popular. In addition, the regional portal sites where information on the social media is displayed on each page have appeared. The regional portal site is regarded as a mechanism that provides the information that integrated the stock and the flow on each regional community against local residents according to this appearance. However, many regional portal sites have problem in the cost of hardware, software and human resources, and it has been often maintained by budget from the local authorities and devoted volunteers. According to a questionnaire survey report of the management of 327 regional portal sites in Japan by Local Authorities Systems Development Center (LASDEC), the sites of about 80 percent of 115 sites managed by the cooperation of the local authorities and private organizations are maintained by the budget from each local authority [11]. It's difficult to manage the site in the online ads used in the individual blogs.

Project-based Learning (PBL) is a learning method to solve complex problems in the society by students' collaboration. A lot of higher education organizations have developed each student's career through the practice of project-based learning. However, it is difficult for the students to continue the collaborative learning with other students at limited course hour every week because students take different courses in the universities. For this reason, course improvement is required in order to refine the learning hour by setting their familiar theme in the projects.

We have proposed an approach for management of the regional portal sites through the project-based learning. In this approach, we have developed a framework to regularly provide information systems and digital contents based on demand of the regional community for the regional portal site by developing them on the project-based learning in our university since last year. This paper presents the result of practice

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evaluation of learning support for the project-based learning in Chitose-city, Japan as a test-base field.

## 2. An Approach for Information Sharing in the Regional Community and Project-based Learning

### 2.1. An Approach for Information Sharing in Chitose-city


**Figure 1.** Top page of the regional portal site “Hello Chitose”

Chitose-city is one of the towns of about 80,000 people in outskirts of Sapporo that is the city in the north of Japan. It is known as a gateway in Hokkaido prefecture because there is New Chitose-airport in this city. The regional portal site “Hello Chitose” [5] by the use of ICT (Information-Communication Technology) has been managed as an approach of informatization in this town. Top page of the site is shown in Figure 1. The purpose of the management of this site is to provide the citizens the regional information and places of information sharing. This site has been managed by the incorporated nonprofit organization established by an industry-university-government cooperation. The member who composes the NPO is the administration, a university, social welfare council, education commission, chamber of commerce and industry, and citizens. Four people of university ventures and the regional university are engaged as staffs for the site management. The management tasks of the site are decided by the meeting of concerned staffs of each organization. This site deals with contents related to shop information, event information, sightseeing information, information for daily life and study contents of the regional community. These contents are managed by Contents Management System (CMS). Additionally, as the number of accesses per year, the number of sessions which means movement from the display of the visitor of the site to going out is about 100000, the number of unique users who visited the site is 60000, the number of page views which means how many pages displayed in total is 400000. As the current status, the local authority has put out the budget in order to manage this site. In the NPO, it is an important issue to construct a framework to manage the site effectively and to improve usefulness of this site without the support of the budget from the local authority.

### 2.2. Project-Based Learning

In our university, the project-based information system education to cultivate information technology experts has been executed since last year. This project targets third grade students. They have already learned the practice of a basic programming with Java language and Flash technology at second grade. Two required courses called “System Design Project C” and “System Design Project D” have been set for this project-based learning. System Design Project C is the course at the semester of spring and System Design Project D is the course at the semester of autumn. Each course is executed for 15 weeks in total; each week is three hours. The students make teams that consist of several people and actually develop a new information system and contents for the regional portal site through the project learning. The students who had taken each course were 64 people last year. Students who worked on the project related to the regional portal site were 16 people per 4 teams in System Design Project C and 12 people per 3 teams in System Design Project D. Details of the teams are shown in Table 1. A professor and an assistant professor instruct the students about process on the project-based learning. Teaching assistants is arranged to each team one by one in order to assist the students’ learning.

**Table 1.** Teams and theme of each project

| Category | Students | Theme |
|---|---|---|
| **System Design Project C** | | |
| System Development | 4 | Development of a volunteer support system for the social welfare council in a regional community |
| System Development | 4 | Implementation of a comment function on legacy town information system |

| | | |
|---|---|---|
| Contents Development | 4 | Contents to learn method of separating garbage |
| Contents Design | 4 | Presentation of improvement idea of the regional portal site |
| **System Design Project D** | | |
| System Development | 4 | Development of a volunteer support system for the social welfare council in a regional community |
| System Development | 4 | Implementation of a comment function on legacy town information system |
| Contents Development | 4 | Contents for environmental learning |

In this learning, the waterfall model that is one of the software development techniques is adopted in order to realize the system development by the students. The learning flow with the waterfall model in this project-based learning is shown in figure 2. The model has been proposed since 1970s and shows the process of the system development from requirement analysis to maintenance. On the other hand, the model has a problem that developers shuoud execute the analysis and the design at the initial stage. It is said that this model is unsuitable for today's general software development. However, the learning period for the project-based learning is limited. Thus, this model was judged as the best. The themes of project-based learning are decided by the professors from higher priority tasks based on the results of survey to the member who joined in the NPO. The student selects the one of which each student is interesting from set themes before the learning begins. The students who select the same theme compose the team and a leader who accommodates the team is decided in each team. In the early state of the learning, the students directly hear the requirements from the staffs of the theme as the requirement analysis. In addition, we improved the efficiency of the projects because the professors decided the schedule and the place for the hearing with the staffs. Then, each team design the system or the contents based on the requirements and write specifications that show the process of the learning. The students report on the process of the project to the professors and the regional staffs every week in middle of the learning. The professors give advice to the students about communication with regional staffs and improvement of technical skills. The staffs tell to the students if there are points that should be improved to the system as needed. Finally, each team presents the results of their project in final week of the project-based learning. The professors and the staffs in the regional community related to the projects attend the presentation, and evaluate the students' results. The developed systems and contents are released to the regional portal site based on the evaluation results. Three staffs attended at the presentation of System Design Project C, and two staffs attended at it of System Design Project D last year.

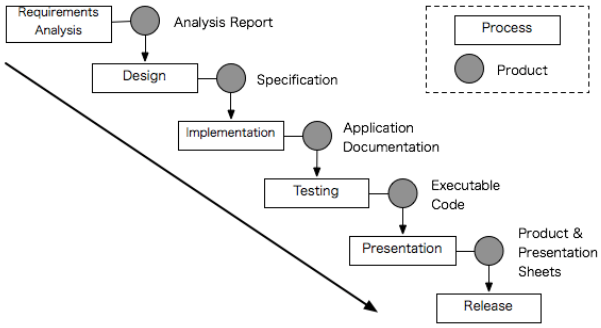


**Figure 2.** The Learning Flow with the waterfall model in this Project-Based Learning

In the project-based learning, we have prepared the information environment for the students. The students can discuss with other students on Internet by using Campus SNS (Social Networking Service). Additionally, the students can manage the version of the programs with Web server that utilizes WebDAV [6] and Subversion [7] technology.

## 3. Results of Project-Based Learning by Collaboration with Regional Community

The results of the project-based learning by collaboration with the regional community are shown as follows.

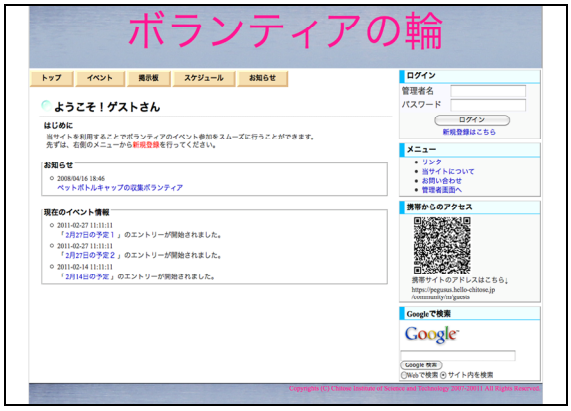


**Figure 3.** Top page of Volunteer Support System for Regional Social Welfare Council

### 3.1 A Volunteer Support System for Regional Social Welfare Council

This web application system is volunteer support system for the social welfare council in the regional community. The purpose of this system is enlightenment of the volunteer work and support of volunteers' information sharing. The staffs of the social welfare council can send registered member information related to the volunteer activities and can mediate the volunteers. Moreover, citizens interested in the volunteer activities in the regional community can exchange information related to the activities by sign-in. PostgresSQL [8] as a database system and Java Technology [9] as a programming language are used in order to develop this system. This project was executed by four students. The development period is one year. Top page of this system is shown in figure 3.

### 3.2 A Comment Function on Legacy Town Information System

This system is a function on the legacy regional information database system of the regional portal site in order to input the visitors' comments. This system provides store information and spot information on the town. The input form is displayed on each information page generated by the legacy system. Moreover, a list of the input comments is displayed on the same page. PostgresSQL as a database system and Java Technology as a programming language are used in order to develop this system. This project was executed by four students. The development period is one year. Input form is shown in figure 4.

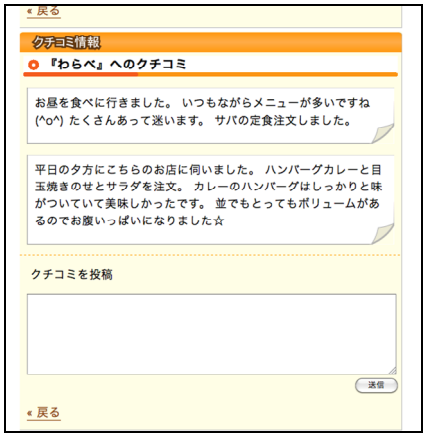


**Figure 4.** Input Form for Visitors' Comments

### 3.3 Environmental Learning Contents

These contents are used for environmental learning of elementary and junior high schools in the regional community. Schoolchildren learn environmental problems and the garbage issues through the learning contents on the regional portal site. The learning contents have elements for entertainments such as quizzes and games in order to attract the children's interest. Teachers of elementary school and the children can easily change the content of the environmental learning contents by using a text editor because the content of the text and the quiz is stored as CSV (Comma-Separated Values) data. Chitose city environmental section that supports the environmental learning in the regional community supervised contents. Flash technology [10] is used in order to develop these contents. This project was executed by four students. The development period is about four months. The quiz content is shown in figure 5. The game content is shown in figure 6. A textbook for the environmental learning is shown in figure 7.


**Figure 5.** Quiz Content for Envrionmental Learning


**Figure 6.** Game Content for Environmental Learning


**Figure 7.** Textbook for Environmental Learning

## 4. Evaluations and Discussion

We verified the effectiveness of our approach that had practiced last year. The following three items were evaluated in the verification.

1. Cost to practice each project
2. Achievement degree of each project
3. Impression of students and staffs in each project

### 4.1 Cost to Practice Each Project

Firstly, we evaluated the personal and temporal cost caused between the students and the staffs in the project-based learning. A staff participated from the cooperating organizations in each project. The evaluation result is shown in table 2. If ratio of the meeting for cooperation period is 1.0, it means the meeting between the students and the staffs was held one per month. Each project arranged for meetings to discuss once or twice in a month. However, the rate of the project with Chitose chamber of commerce and industry became 0.66 because the meetings were arranged only for hearing of the requirements.

**Table 2.** Cost to Practice Each Project

| **Chitose social welfare council** | |
|---|---|
| Cooperation period | 12 months |
| Number of meeting | 21 |
| Rate of meeting for cooperation period | 1.75 |
| **Chitose chamber of commerce and industry** | |
| Cooperation period | 3 months |
| Number of meeting | 2 |
| Rate of meeting for cooperation period | 0.66 |
| **Chitose city environmental section** | |
| Cooperation period | 6 months |
| Number of meeting | 9 |
| Rate of meeting for cooperation period | 1.50 |

### 4.2 Achievement Degree of Each Project

When the students begin the learning, each project makes specifications that describe the requirements on which they work for the learning period. We confirmed the current state to all requirements and calculated the achievement degree of each project based on the specifications. The judgment result and the achievement degree of each project are shown in Table 3, 4 and 5. Results of the items of each requirement were judged as three stages. '***' means the requirement item was met. '**' means a part of the requirement item was met. '*' means the requirement item was not met or the work for the requirement item was not started. Then, each judgment result is expressed as numeric values. The condition for expressing the numeric values are as follows: '***' is 2 points. '**' is 1 points, and '*' is 0 points. The achievement degree is calculated as a percentage of the summation of the judgment results to the total points. Each achievement degree of the projects is 83.3%, 50.0% and 87.5%.

**Table 3.** Judgment Results and Achievement Degree in Volunteer Support System

| Requirements | Judgment |
|---|---|
| To classify plain users and administrators | *** |
| To serve the authentication function by the username and the password | *** |
| To register a new user | *** |
| To change the password of administrators and plain users | *** |
| To manage all users by administrators | *** |
| To post event information by administrators | *** |
| To post schedule information by administrators | ** |
| To post update information by administrators | *** |
| To post messages to BBS by the users | ** |
| To delete messages on BBS that the user wrote | *** |
| To manage all messages on BBS by administrators | *** |
| To contact administrators volunteer information by users | *** |
| To post volunteer information by plain users | *** |
| To post volunteer information by administrators | *** |
| To install QR code to access the mobile site | ** |
| To provide same function as PC site to the mobile site | * |
| Achievement Degree | 83.3% |

**Table 4.** Judgment Results and Achievement Degree in The Comment Function

| Requirements | Judgment |
|---|---|
| To post comments by visitors on specific pages | *** |
| To delete comment that the visitor wrote | ** |
| To display written comments on specific pages | *** |
| To display updated comments on top page of the legacy system | *** |
| To notify to users who manage a specific page via email when the comments is posted | * |
| To manage written comments on a specific | * |

| | |
|---|---|
| page by users who manage the page | |
| To manage all comments by administrators | * |
| Achievement Degree | 50.0% |

**Table 5.** Judgment Results and Achievement Degree in Environmental Learning Contents

| Requirements | Judgment |
|---|---|
| To illustrate complex contents of the learning contents for schoolchildren | *** |
| To compose easy sentences for schoolchildren | * |
| To edit sentences of the learning contents by users with files | *** |
| To take entertainment to the learning contents for schoolchildren | *** |
| To set an appropriate screen layout to display the learning contents on a projector and a digital board | *** |
| To edit quizzes of learning contents by users with files | *** |
| To display sentences and images in choices of the quiz | *** |
| To standardize visual design of the learning contents | *** |
| Achievement Degree | 87.5% |

4.3 Impression of students and staffs in Each Project

After finishing learning, we asked the regional staffs comments and executed questionnaire survey to the students. The comments of the three staffs of regional organization are shown as follows.

- It was meaningful for me to develop the systems through the project with the students.
- I think that the contents with high utility were made from university students' aspects.
- I want to contact the students well to understand progress of the project more in the future.
- The meeting with the students is not hard. The students came to the social welfare council when we were busy.
- We used the environmental quiz in an environmental fair in which schoolchildren in the regional community gathered. We want to use it next year.

Results of the questionnaire survey and some comments of the students are shown as follows.

(Question 1) How much is a difficulty level of this project-based learning?

- Easy: 0 student (0%)
- Unknown: 4 students (20%)
- Difficult: 16 students (80%)

(Question 2) Is this project-based learning useful for your career development?

- Yes: 14 students (70%)
- Unknown: 4 students (20%)
- No: 2 students (10%)

(Comments)

- The time for the project was insufficient.
- It's really difficult.
- It was hard to contact the staffs of the local authority.
- I'm tired.

4.4 Discussions

It is thought that the meeting, which is held once or twice a month, is not a burden for the regional staffs based on the results that are shown in 4.1 and 4.3. For this reason, the value of the rate has the possibility of becoming a standard to cooperate with the regional organizations in the future.

About the judgment results of each requirement shown in 4.2, in the project of the volunteer support system, a part of the requirement to connect with the database system is not completely met because a program error was found. Moreover, the use of the system by mobile devices has not been achieved because Java Script is used for a part of user interface. In the comment function, it was difficult for the students to integrate the authentication function of the legacy system and their function. So, many functions are not implemented except the functions for posting the comments and displaying the comments. The students can learn methods to develop systems by their paces when they develop newly systems. On the other hand, it is difficult for the students to understand the meaning of the systems that already exist in order to extend the functions. In the environmental contents, difficulties of sentences of the environmental contents are not checked because it was not possible to collaborate directory with teachers in elementary and junior high schools. In the project-based learning, it is necessary to collaborate with more staffs in regional community. After finishing learning, working to release the developed system to the site is difficult for the students due to a time restriction. Then, the professors have treated this works.

In this time, it is thought that each project was able to achieve a constant result based on the results that are shown in 4.2 and 4.3. Moreover, it is thought that the project-based learning contributed to the students' career development.

## 5. Conclusion

We have developed the information system and the contents to manage the regional portal sites through the project-based learning in Chitose city, Japan as a test bed. In this approach, we have constructed a framework to develop the systems and the contents continuously by adopting the waterfall model which is one of software development methods. We confirmed the constructed framework by actually practicing the project-based learning last year. As a result of the practice, we obtained the effectiveness of this framework and the advantage to the students' career development.

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