

Modularization of Information Sharing System “SharedPanel” to Accommodate Inputs from more SNSs and Expand Display Patterns

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Abstract: Learning Management Systems (LMSs) are the most commonly used ICT tools in higher education institutions; these institutions also utilize ICT tools such as Facebook and Twitter (external services). However, it is difficult to preserve data when using external services, and it is also difficult to simultaneously manage learning content within a single lesson when using both an LMS and external services. In addition, it is difficult to consistently reflect upon what works in the classroom, as there are so many possible ways that LMSs and external services are used in combination. In previous research, we developed an information sharing tool, “SharedPanel,” which collects posts and messages from Facebook, Twitter, e-mail, Evernote, and LINE and stores them in an LMS (Moodle). This system enables learners to input information, such as ideas/educational resources, into their favorite tool and share it with other learners on Moodle easily, without having to log in to Moodle. In this study, we modularized the element where information is entered (information input element) and the element where the acquired information is displayed (information display element) to enable other developers to add other external services and display formats. In this study, modularization means separating functions out from the main part; the separated parts are standardized, interchangeable, have a high level of independence, and are parts of the whole. Modularized parts can be easily added or changed without major change to the main element of SharedPanel.

Keywords: LMS, SNS, Information Sharing, SharedPanel, Modularization

1. Introduction

1.1 Current situation of ICT tool use in higher education

Recently, in institutions of higher education, many teachers have been facilitating information-sharing activities between learners using ICT tools. The systems used in these activities vary and include not only LMSs but also multiple external services. For example, Williams and Jacobs (2004) directed learners in an MBA course to write blogs on the subject matter and share them with the other learners. Grünberg and Armellini (2004) revealed that teachers used e-mail to share professional resources, and 912 professionally-related exchange acts were found in 1356 messages. Camiel et al., (2014) instructed students to share meaningful resources and more than 59% of the students answered that reading their classmates’ tweets enhanced their professional development. Cain et al., (2011) used a Facebook group page to expose students to contemporary business issues not covered in the course as well as to expose them to the perspectives of experts and thought leaders external to their university. Guest experts were invited to join the Facebook group and submit posts on business-related topics.

By sharing information such as ideas and educational resources, learners can benefit each other. In particular, adult learners in practical seminars, compared to younger students in school, can benefit significantly because they can offer and receive practical information based on their

experiences. By using ICT tools, teachers and organizers of these seminars and classes can facilitate the easy sharing of ideas and educational resources and can use them in the future.

However, the sharing and subsequent collection of information between learners in practical seminars using ICT tools is difficult because of the lack of common ICT tools and the risk of losing data. Teachers and seminar organizers sometimes have difficulties finding ICT tools that every seminar student has a user account with and can easily use. Therefore, they must set aside time to teach the students how to use the ICT tool at the start of their seminar. Most common ICT tools (e.g., Moodle, Facebook, Twitter, etc.) require users to have accounts in order to input information; the instructors need to prepare user accounts for every learner before the seminar, but this may be difficult to do beforehand because of inadequate information about the learners. Furthermore, learning deliverables can be used to evaluate students and could be reused in other classes or in other learning activities. SNS use in learning activities can cause some problems such as data loss and difficulty finding past posts. In addition, the data are not permanently available. For example, if Facebook suddenly stopped their service, users could no longer access their posts.

Therefore, in our project, by connecting an LMS with external services, we aim to be able to store and integrate learning deliverables on the LMS while simultaneously using ICT tools that are considered optimal for each learning activity. In previous research, as a first step of our project, we developed an information sharing tool, “SharedPanel,” which collects posts and messages from Facebook, Twitter, e-mail, Evernote, and LINE to store in a LMS (Moodle) (Nagaoka et al., 2017a; Nagaoka et al., 2017b). In this study, we modularized the element where information is entered (information input element) as well as the element where information is displayed (information display element) to enable other developers to add other external services and display formats.

1.2 The Basic Functions of Information Sharing System “SharedPanel”

Figure 1 shows an image of “SharedPanel”. Collected information from each ICT tool is recorded in the Moodle database, and the results are shown on one page, like cards. This system enables learners to share information using their favorite services, which they know how to use very well. This system includes four main benefits as explained in Table 1.

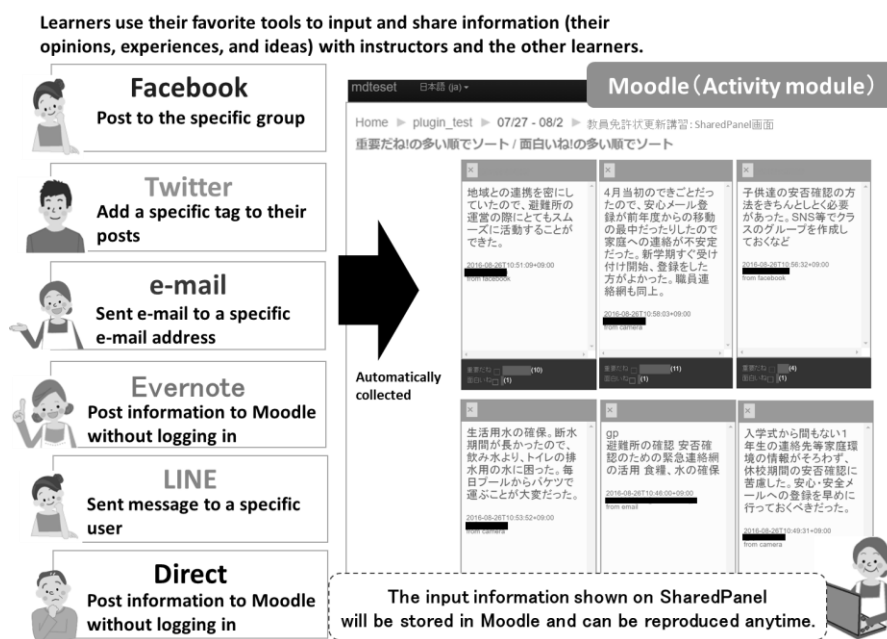


Figure 1. An image of “SharedPanel”

Table 1
Four main benefits to use SharedPanel

Data Preservation	Teachers and learners can use their favorite ICT tools, such as Facebook and Twitter, to share ideas or educational resources; their posts can be stored permanently in a Moodle database. Collected posts are shown on one page, so teachers/students can check past posts at a glance.
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SNS Connected	Learners can share their ideas and educational resources easily through their favorite tools such as SNSs and e-mail. Furthermore, if they find interesting posts on SNSs, they can share those posts easily by, for example, retweeting on Twitter.
Mobile Friendly	Learners can easily input and share their ideas and educational resources from mobile devices because Facebook, Twitter, and Evernote provide official mobile applications for both Android and iOS users and E-mail services also have mobile applications.
Tool Variability	Each learner can choose their most favorite tools from Facebook, Twitter, Email, LINE, and Evernote to input and share their opinions and experiences.

1.3 How to use SharedPanel in Learning Activities

SharedPanel can be used to share various ideas and educational resources. The following cases illustrate some ways to use SharedPanel (Table2). Table 3 shows the characteristics of SharedPanel used in cases (case 1 to case 4)

Table 2

Four cases to use SharedPanel

Case 1: Preserve Posted Information on the Specific External Services

Ms. Yasuda teaches a course on childcare training with an enrollment of 30 students. She wants her learners to record what they learned during the seminar. Last year, she told her learners to input their experiences into the LMS because reflecting their experiences after the training would benefit the learners for their future careers; she also wanted to show this input experience to learners in a future seminar. However, most learners did not log in to the LMS because it was burdensome. Therefore, she decided to have students input data into Facebook and she stored their posts for learners in the next seminar using SharedPanel in Moodle.

Case 2: Share Web Resources Such as Recent News in Daily Life

Mr. Chang teaches a course on modern sociology with an enrollment of 100 students. In the past, he had instructed his learners to find interesting web resources and introduce them in the next class, but nobody followed through. Therefore, using SharedPanel, he instructed his learners to share interesting web resources and comments through their favorite tools and then introduce them in the next class. Some learners retweeted interesting resources that they had found on Twitter and others posted interesting resources that they had found on Facebook to the Facebook group.

Case 3: Share Pictures and Notes in Fieldwork

Mr. Ming teaches a course on disaster prevention to 60 students. In the fieldwork, he wants his learners to take pictures and notes of areas that they recognize as dangerous in the case of a disaster. Last year, he gave his learners a camera and notes for recording, but integrating the photos and notes into a paper, and developing presentations for other learners, took a lot of time. Using SharedPanel, students could take pictures and notes with their smartphones using their favorite tools and share them easily with the other students. In the class, Mr. Ming introduced interesting shared content and asked the content creator to explain it to the other students.

Case 4: Share Learners' Opinions and Experiences in a Short-term Seminar

Ms. Smith holds a one-day seminar to teach critical care to 50 medical staff personnel. She wants her participants to acquire practical information. Therefore, she wants them to share their experiences, such as troubles during previous natural disasters, using ICT tools. However, the participants' backgrounds vary significantly and they did not use common ICT tools. Therefore, she decided to use SharedPanel to share each participant's experience and created discussions based upon them.

Table 3

Characteristics of SharedPanel used in the cases 1 to case 4

	Case 1	Case 2	Case 3	Case 4
Data Preservation	Strongly Yes	Yes	Yes	Yes
SNS Connected	Yes	Strongly Yes	Yes	—
Mobile Friendly	Yes	Yes	Strongly Yes	Yes
Tool Variability	Yes	Yes	Yes	Strongly Yes

2. Modularization of SharedPanel

The previous version of SharedPanel, which had already been developed, could not connect with new external services, and developers also needed to be able to update existing tools on their own. In

addition, the only display format provided was card format, and customization by a third party (such as displaying information in a timeline format) was difficult.

Therefore, in this research, we modularized the element of SharedPanel that acquires information from external services (information input element) and the element that displays the acquired information on the screen of Moodle (information display element). After doing so, anyone can add new tools and display formats. Figure 2 shows the relation among information input element, main part, and information display element of SharedPanel. The created plugin should be published on Github (the community for developers to find, share, and build software and anyone can use software uploaded here for free), and developers need to add a brief description on SharedPanel's Wiki page.

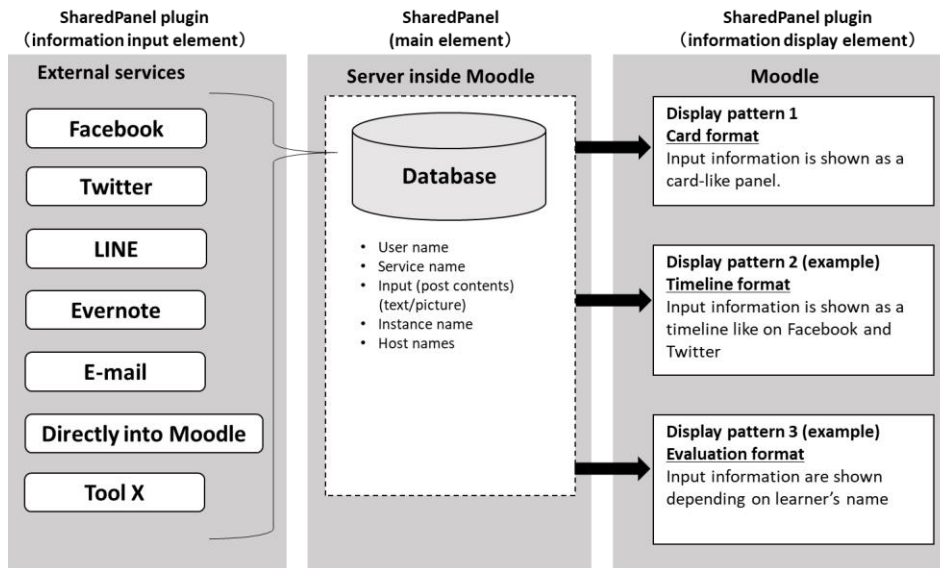


Figure 2. The Modularization of “SharedPanel”

3.1 Modularization of Information Input Element

3.1.1 Purpose

Through modularization of the information input element, a third party can add new external services. New applications of SharedPanel become possible, including the following examples:

- Using SNS developed for education such as OpenPNE, learners could interact with other students on SNSs. For example, Hasegawa et al (2010) had OB · OG of the university share information on work on OpenPNE and made students refer them for job hunting. If OpenPNE is added as external service, learners can collect learning deliverables, such as discussion data, and export it to their LMS for later reflection.
- It is important for students, especially students majoring in the arts, to share their uploaded productions. For example, the Guardian (2017) encouraged students to submit their artworks such as pictures and photographs via Facebook, Twitter, and Instagram. If SNSs focusing on sharing photograph and works (e.g., Instagram, etc) are added as external services, students can upload their works to SNSs while teachers can check their students works on one page and preserve data inside Moodle.

3.1.2 Process to modularize the information input element

To modularize the information input element, we separated information input element from the main element of SharedPanel and created a template and a protocol for adding new external services. In the previous version of SharedPanel, the information input element program was not separated as a

single plugin, so SharedPanel itself had to be updated in order to add a new tool, affecting the main element of this system significantly. Here, we modularized the information input element as an independent plugin of SharedPanel. Now, even if a new external service is added, the main element of the system is not influenced drastically.

3.1.3 How to add a new external service

New external services can be added by the following steps as explained in Figure 3.

1. Create three files (setting_servicename.php/importcard_servicename.php/servicename.php) based on the template, or install the developed plugin from Github.
2. Deploy each file under the designated directory and add some codes by following protocols; deployed files will be recognized.

When adding new external services, developers need to acquire “user name” and “contents” at least. The class for handling data from the external service should be defined in servicename.php by extending the parent class "card" that includes the class methods such as:

- [add] Insert data acquired from external services into database
- [add_attachment] Insert data acquired from external services into database
- [update] Update data in database
- [delete] Delete card
- [switch_hide_card] hide deleted cards

3.2 Modularization of the Information Display Element

3.2.1 Purpose

All 4 cases explained in Table2 can be realized with card format which is already developed. However, through modularization of the information display element, a third party can add a new display style such as timeline format (example1) and evaluation format (example 2) as explained in Figure 3.

- (Example1: Timeline Format) A screen style that shows information in a timeline format such as the one used by Facebook.
- (Example2: Evaluation Format) A screen style that shows information depending on learner’s name. If this format is added, teachers can check information depending on learner’s name to evaluate them and learners can use them for their reflection.

By realizing example 1, learners can use their favorite external services to share information and can check shared information on Moodle as one timeline. And with example 2, teachers can check shared information to evaluate their students on Moodle by switching the display depending on individual learner’s name. Example 2 is very important especially in case 2 and case 3 because these activities will be implemented as a part of a course and requires evaluation compared to case 1 and case 4. Furthermore, SharedPanel can be used beyond 4 cases. For example, third party can develop the display which shared cards are categorized automatically depending on included keywords. Therefore, modularization of information display format is necessary for further development to provide best display style for each learning activities.

3.2.2 Process

To modularize the information display element, we separated information display element from the main element of SharedPanel and created a template and a protocol to add a new display pattern.

3.2.3 How to add new display pattern

New display patterns can be added using the following steps as explained in Figure 3.

1. Create files (style_sample1.php) based on the template or install the developed plugin form Github.
2. Deploy each file under the designated directory and add some codes by following protocols; deployed files will be recognized.

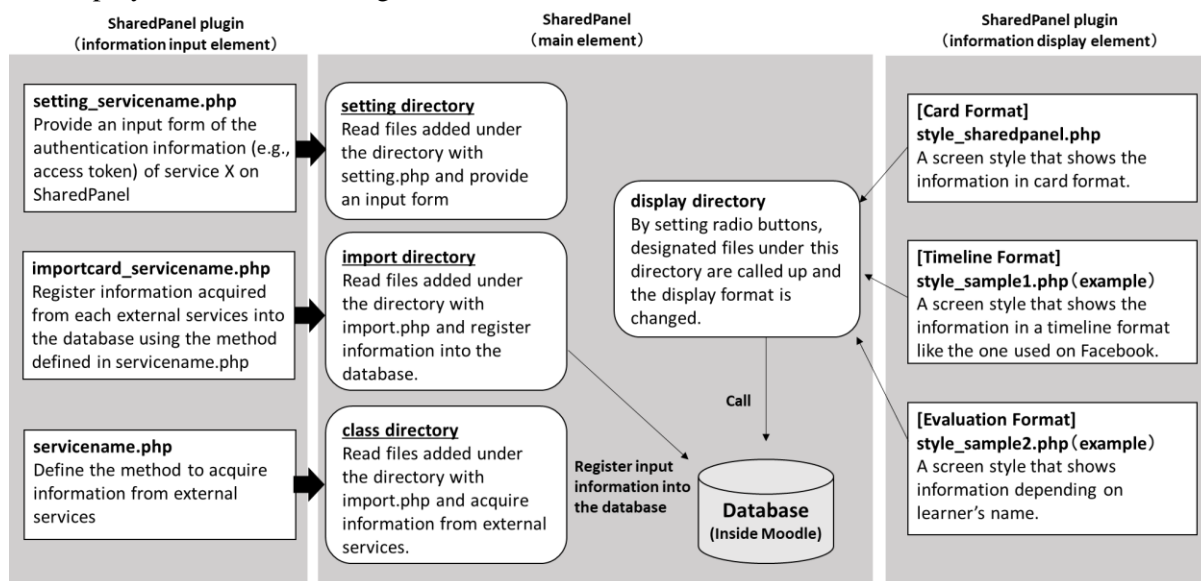


Figure 3. The Detail of Modularization of “SharedPanel”

3. Future study and LTI

In the future research, we will make SharedPanel compliant with LTI (Learning Tools Interoperability). By adjusting into LTI, SharedPanel can be used in multiple LMS such as Sakai, Blackboard, and canvas. Specifically, we modify the internal code and develop LTI provider so that users can use this function when they prepare the environment as LTI consumer.

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