

## **Researchmap opening the door to the world of Science2.0**

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### **Abstract**

Our project team launched a new web service, Researchmap. Researchmap is an information sharing platform for the researchers. By unifying the data of researchers, such as academic literature and conference talks, Researchmap supports researchers to build their own portal sites instantly, and to start collaboration with other researchers. The user of Researchmap obtains three virtual spaces of the different access levels. The first one is called "My Portal" which can be used as his/her homepage. The second one is called "My Room" which is meant for his/her virtual private space which is not accessible by anyone else. The last one is called "Community" which can be used as collaborative working/learning space with other member researchers. Researchmap provides more than 30 portlet applications including Curriculum Vitae, Weblog, Cabinet and Video Sharing. The user can arrange the portlet applications on a given page by drag-and-drop manner: the user can arrange them intuitively just as he/she arranges his/her room to express himself/herself.

### **KEY WORDS**

Science2.0, CSCW, knowledge sharing, science education

## 1. Introduction

Nowadays, the academia faces a new problem, which is called “information explosion”, which means the rapid increase in the amount of digital information and the effects of this abundance of data. As the amount of available data grows, the problem of managing the information becomes more difficult, which can lead to information overload [1]. This tendency has been accelerated recently; most research papers and lectures are not digitalized, but born digital. More lectures and lecture slides are provided online. Here is the reason why many of the recent research have focused on building better tools to help people manage and visualize their information [2].

There is another move that we should pay attention, which is the transdisciplinary research integration. Transdisciplinarity connotes a research strategy that crosses many disciplinary boundaries to create a holistic approach. It applies to research efforts focused on problems that cross the boundaries of two or more disciplines, such as research on effective information systems for biomedical research. However, it is usually quite difficult for researchers to find adequate co-researchers. Here is the reason why not a few social network services (SNS) for researchers have been launched in the past two years [3].

As such, it is becoming absolutely necessary for a researcher to have an information infrastructure available at any time; in fact, it is as important as to have your office. In this case, the “information infrastructure” means not only a high-speed connection and a computer or a mobile phone for your personal use, but a sophisticated and flexible service which you can rely on, with integrated many different functions that are “feasible on the web”, such as web-based e-mail, calendar, cabinet, and online broadcasting systems. Furthermore, it should integrate the academic data scattered on the web, such as papers, slides, lecture videos, research keywords, Curriculum Vitae and experiment data. These are commonly called Web 2.0, and for researchers, it is anticipated that a “Science 2.0” environment be realized and become freely available.

This is why we launched Researchmap in 2009. With all the necessary functions and services included, Researchmap will be the research infrastructure for the next generation.

## 2. The structure of Researchmap

“Science 2.0”, coined by M. Mitchell Waldrop, a science writer, refers to new practices of scientists who post raw experimental results, nascent theories, claims of discovery and draft papers on the Web for others to read or see and post comments on. This idea quickly came under spotlight after the article was published in the Scientific American in (January) 2008 [4].

Waldrop advocated “open access” practices in research activities, which drew immediate criticism. Scientists may risk having their findings copied or exploited. There will be a mixture of wheat and chaff. Acts of bashing against a researcher, such as flaming and trolling, may occur, making his or her work severely interrupted.

To avoid these downsides, we must offer the authority to researchers to control the privacy settings of their content. Furthermore, it must be easy to set. In other words, no researcher wants to list up all the names of researchers who may access to the slides, every time he/she uploads one. To satisfy these requirements, we built Researchmap so that it has four different virtual spaces which have different types of privacy settings. The first layer is called The Portal, which is open to the public, and edited by the administrators. The second layer is called My Portal, which is edited by each registered researcher. The access level of each content of My Portal is controlled by the researcher. The third layer is called Communities. Each community is built by the owner of the community, and the owner can define the members of the community, He/She also can control the authority of each member in the community. The members can participate in the community, and collaborate each other within the privilege given by the owner; some members may have the same privilege as the owner, and some others may have only the privilege to read some content. The fourth layer is called My Room, which is only accessible by each researcher. To realize this concept we adopted NetCommons as the infrastructure software of Researchmap.

NetCommons is a community-based content management system (CMS), which aims to help group work and e-learning [5]. This information-sharing platform has been constantly developed since 2001. It was

released as an open source system in 2005, and now it is used as an Information and Communication Technology (ICT) platform by more than 2,500 organizations and institutions, mainly schools and other educational bodies. According to a 2008 survey by the Committee of Executive Directors of Education Centers of Selected Cities in Japan, more than one-third of the 64 Education Centers around Japan had introduced, trained or studied NetCommons system. It shows that NetCommons has been rapidly favored by educational and academic institutions.

Unlike many other CMSs, NetCommons is made up of three different layers of virtual spaces. The first layer is a “public space”, where you publish your content to show to the outside world. The second is a “group space”, which only a specific group of registered users can view and use. The third is a “private space”, which is closed to anyone but you. Each space is divided by several rooms, each of which you can control as to who obtains access. For instance, when you have a group with ten members, you can authorize User01 and User02 to act as group moderators. User09 and User10 are set to be read-only guest members, and other users (User03 to User08) are group members, who can participate in the group work and exchange ideas. The website administrator can also sentimentalize the public space into several rooms, so that site editing will be done by group moderators and other members—they don’t have to ask the administrator for permission or for him/her to act. By this, the site administrator’s workload is slashed, and each unit in the organization can promptly update the website.

With Researchmap, Portal page and My Portal is equivalent to NetCommons’ “public space”, My Room is “private space”, and Community is “group space”.

Other than the three virtual spaces and precise access authorization settings, the feature of NetCommons is its desktop-like user experience [6].

Figure 1 shows NetCommons’ WYSIWYG editor, which is incorporated in Researchmap. WYSIWYG, or “what you see is what you get”, means that content displayed during editing appears very similar to the final output as an HTML web page or printed document. A WYSIWYG editor that works on any of popular browser has been said to be nearly impossible because different browsers render different output. NetCommons tried and succeeded in this; its WYSIWYG editor operates on both Internet Explorer and Firefox, and is usable on Safari.

By using this editor, anyone—even a not-so-computer-wise users who are not familiar with HTML codes and the wiki markups—can easily make a web page. Researchmap has this WYSIWYG editor built-in as default. This friendly user interface attracts researchers who used to keep distance from ICT.

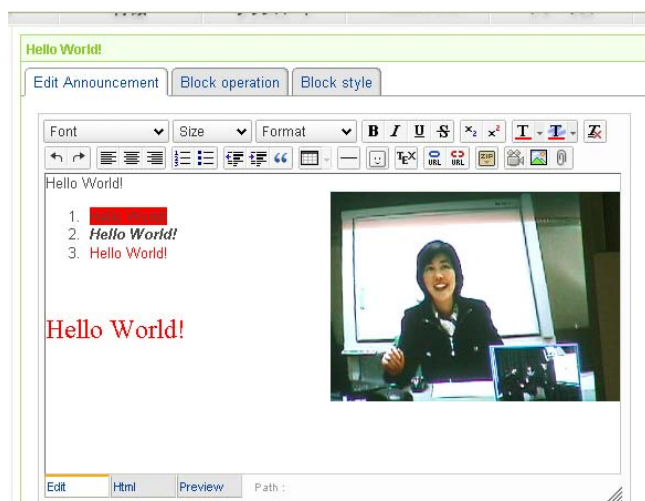


Figure 1: WYSIWYG editor on NetCommons

Pages on the NetCommons system are made with a combination of multiple modules. This feature is not a NetCommons exclusive, but with other CMSs, where you open an “edit” page to change layout, it is not as user-intuitive as in NetCommons.

On NetCommons, a page layout can be changed by drag-and-drop (see Figure 2). You can intuitively try and find the best layout for your modules to appear. This feels as easy and simple as changing your desktop layout.



Figure 2: Drag-and-drop layout interface on NetCommons

### 3. Features of Researchmap

In this section, we explain how we implemented the four different virtual spaces in Researchmap to realize the concept of Sience2.0.

#### 3.1 My Portal

My Portal is the first page a registered researcher with an ID see on logging on. It makes a personal homepage space.

The first page has a built-in CV (Curriculum Vitae) module. A registered user can write and publish his/her background, experiences, list of publications, research area and keywords, and so on (Figure 3).

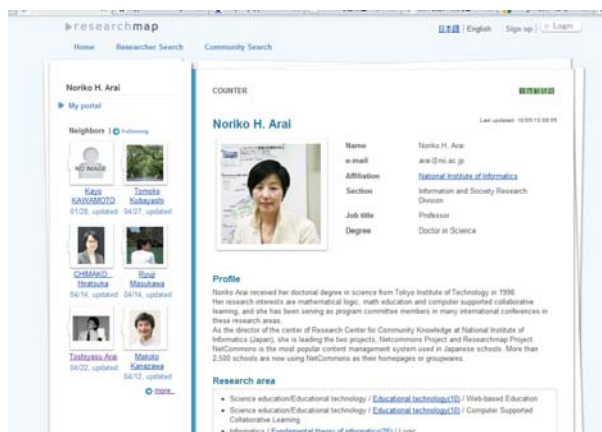


Figure 3: CV module on Researchmap

Each item has three access levels: public, open to researchers only, and private. Users can freely set what to publish in what way. You can, for instance, make your institution and list of publications fully public, and experiences and e-mail address available to researchers only.

On My Portal, registered users can add extra pages, other than the default CV page. You can choose from a wide variety of modules provided on Researchmap as you would like to offer more information to the visitors.

Video Sharing module enables a user to deliver his/her lectures and speeches online. It works as if you have your own youtube.com channel. Like youtube.com (and unlike more conventional video stream

sites), it converts uploaded AVI or MPEG files to flash files, which means that the movies are playable on any operating system and require less bandwidth. In other words, it is easier and more accessible.

Researchmap has another technology incorporated: associative search engine called GETA. On the left-hand side of your My Portal page on Researchmap, there is Neighbor module (see Figure 3). This module is powered by GETA(Generic Engine for Transposable Association), which accepts a group of texts as queries and returns highly related texts in the relevance order [7][8]. It sees how close different texts are each other. In deciding a user's Neighbors, the engine analyses his/her papers, research keywords and books in his/her Portal page, then assesses similarity with those of other researchers. His/Her Neighbors are thus calculated and displayed automatically.

When someone you don't personally know—someone outside the academic world or a researcher outside your area of study—accesses Researchmap and view your My Portal page, he/she will get a clearer picture of your area, and have a chance to know who the key researchers are, and who the associated researchers are. Among other features are weblog, archive tool for lecture materials to be viewed and/or downloaded, photo album which has built-in slideshow software.

### 3.2 My Room

As a Researchmap registered user, you have My Room, a private space, as well as My Portal, a publicly open space. Not being open to other members, My Room is to be used as your personal “virtual desktop”.

My Room's first page has a built-in Private Message (PM) module, which works just like a web-mailer. By sending PMs, you can contact another Researchmap member at any time (Figure 4).

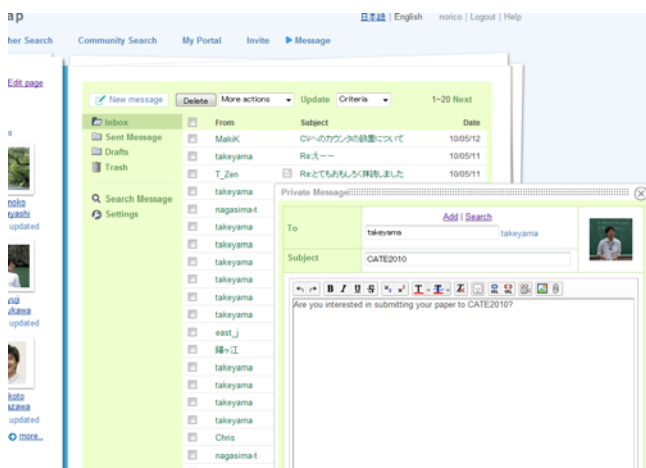


Figure 4: Private Message module on Researchmap

The PM module is rich-formatted; you can embed images or other files in your message, as you do with an HTML file. This is especially useful when you send research-related messages that have additional data, charts and so on. You can also organize your message box by applying tags to each sent and received message. Additionally, you can forward any PMs to your usual e-mail account.

On My Room, you can add any pages and modules as you would like, just as you can do with My Portal. As in Figure 5, you can add a ToDo list and your monthly schedule. You can add a file cabinet to store backup files of your paper if you like.

These modules are accessible via mobile phone. All of major mobile phone carriers support this, so you can check your schedule when you are away from your physical office.

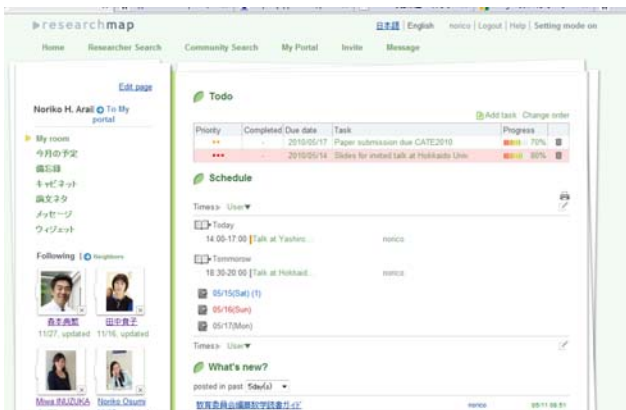


Figure 5: My Room, with the ToDo list and schedule modules added

### 3.3 Community

Most of SNS services provide some virtual collaborative tools such as BBS to help users build online communities, and Researchmap is not an exception. However, our Community System is more flexible than other existing SNS's in the following sense.

As a Researchmap user with an ID, you can make a research community as you want, and invite other researchers to your activities. Opening a community is simple; fill in the form (your community name, its object and summary of its activities) and submit. You can set how open/closed the community is—open to every Researchmap users, closed to your co-researchers, or invitation only.

For instance, if you are going to make a community for your committee activities in your society, a closed community is suitable. If you want to discuss work environments with other researchers, an open community will work best.

If your co-researcher, who you want to take part in your community, has not yet registered and doesn't have an ID, you can "invite" him/her to Researchmap. There is no limit on the number of researchers you can invite. Invite as many colleagues as you want.

All the community activities are open only to the community members. This also means that only researchers with IDs can view the topics. The community owner can change member's status without asking Researchmap administration. This helps you solve problems or troubles, if any, as quickly and properly as possible.

On the first page of your community is a built-in bulletin board where you can exchange ideas and opinions. Also, you can add pages and modules to make your collaboration work better. This flexibility is essential. Unlike casual communications, we need to share huge amount of information of different kinds. The way we share the information and knowledge in the serious academic communication is rather similar to that of venture business. We need to share database, preprints, ideas, videos, and so on. It may be somewhat similar to the concept of Google Wave. However, unlike Google Wave, Researchmap is exclusively owned by and controlled by researchers.

### 3.4 Portal

Portal is the first page you see on visiting Researchmap. It is the front lobby. Most of the content of Researchmap is not edited by a human editor, but they are automatically generated from the content added by the users. For example, "Hot Keywords" section shows you what keywords are most discussed at the moment. "Hot Communities" section tells you which communities are the most active. The Researchmap search engine collects the data of academic events taken place all around Japan, and show it to the users. Some events are shown to any user access to the Researchmap, but some others are shown only to the logged-in users, that authority setting is controlled by the researcher who committed the information.

The more the information is accumulated in Researchmap, the more the importance of visualization,

summarization and curation of the information will increase. It is a big challenge for us how to find a clever way to realize these tasks.

### 3.5 Access permission control

As explained above, Researchmap is an invitation-based web community, like many SNS websites. That is, if you have a Researchmap user ID, you can invite someone you know. But there is one condition; you can only invite researchers. As long as they are researchers, no matter what institution they belong to (universities, governmental institutions or private sectors), you can invite your friends. But you can not invite someone who is not a researcher. This is where Researchmap is clearly distinct. Unlike many other SNS websites, Researchmap is not fully open to anybody.

Larger SNS sites are now subject to the same problems as the open web space after they have got more and more members. Your friend's friend's friend's friend is not your friend, but he/she can view your blog or send you a personal message because he/she has an ID at the SNS service. This is virtually the same as being fully open. In addition, your privacy is more clearly seen on an SNS service because the site is based on the users' personal network. The risk of privacy violation could be larger for an SNS than the open web space. To avoid this, Researchmap sets a condition for issuing an ID; you must have a valid e-mail account with research institute domains, such as .edu and .ac.jp. And you must be regarded as a researcher by other researchers.

Nevertheless, some parts of Researchmap are open to general public. The Portal page and your My Portal page are viewable for anyone, with or without an ID. But non-ID holders can just read, and can not, for example, post comments. This means that Researchmap is open to the extent that anybody can view the "Hot Keywords" and "Hot Communities" to have an idea about what is going on in the academic world.

### 3.6 Integration with other academic services

For researchers, the most troublesome part of work when making a website or research report is to compile a publication list; it is especially an arduous task to add metadata, making sure you do it as required.

Researchmap, coordinated with Pubmed, arXiv, Amazon and CiNii, has a perfect solution to this problem.

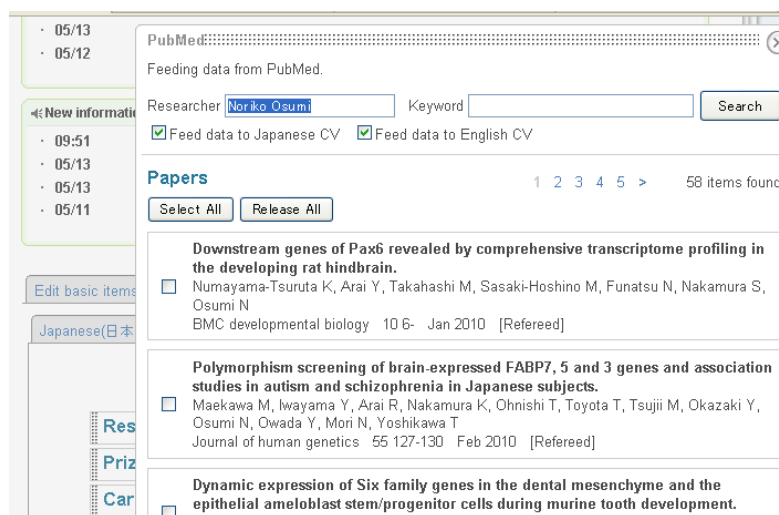


Figure 6 : Feeding data from Pubmed

Pubmed is an academic database which comprises more than 19 million citations for biomedical literature from MEDLINE, life science journals, and online books [9]. Using its API, we implemented a biomedical paper feeder on Researchmap as shown in Figure 6. By clicking the button, Pubmed feeder, it starts searching for the papers of which author coincides with the name of the researcher. After checking



whether or not they are truly his/her publication, the researcher feeds them to their CV.

Similarly, we provide arXiv feeder, Amazon feeder and CiNii feeder.

CiNii (Scholarly and Academic Information Navigator) is an academic database service, also run by National Institute of Informatics (NII) [10]. Incorporated in CiNii are 284 academic society journals in Japan; it is a thorough database of approximately 3.0 million items published in 1,000 titles of printed media. Researchmap acquires bibliographical information from CiNii, and import it into the CV module.

These feeders support researchers to create their complete list of publication with permanent ID and URL. With only a few clicks, researchers can skip most of the arduous task of compiling their publication list and add dozens, or even hundreds, of metadata. As expected, when Researchmap gets coordinated with database such as Scopus or Web of Science, researchers will be completely free from the most tedious part of their work.

Another database, KAKEN, is also being released by NII. KAKEN database is a collection of government-granted research projects as initially selected and as finished [11]. This large database is also coordinated with Researchmap. Just like with Pubmed, users can automatically fill in their CV module by acquiring data, such as their experiences and research keywords, from KAKEN.

#### 4. The impact of Researchmap

We started the beta version of Researchmap in March 2009, and released the official version in March 2010. With in a year, about 2,500 researchers joined Researchmap, and use it as a part of their research activity.

To have an idea of the effect of Researchmap, we did a survey of how the search engine recognizes My Portal pages of the registered researchers. It is widely known that the earlier (or higher) a site appears in the search results list, the more visitors it will receive from the search engine. Especially, the sites appearing among the first five in the search results list receive almost 100% recognition.

The survey was carried out as follows. We randomly picked thirty researchers satisfying the following conditions, (1) joining Researchmap more than 1 week, (2) filling more than ten items, and (3) exhibiting his/her identification photo. Then, we searched for the researcher's name (in Japanese) on Google, and see how high his/her My Portal page was ranked. The average score turned out to be 3.87, which means that almost 100% of the users who do the search. This survey was carried out on the 1<sup>st</sup> of April, 2010.

The more Researchmap gains the recognition on the web, the more researchers it attracts. Figure 8 shows how the number of researchers grew from 1/1/2010 to 4/23/2010, it shows that the number of the growth is now in the exponential phase (Figure 7).

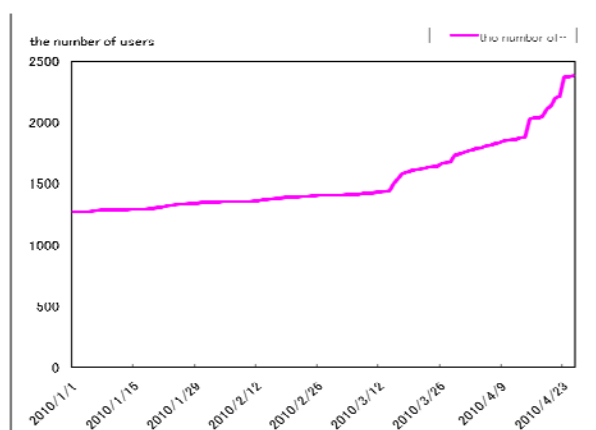


Figure 7: The growth of the number of the registered researchers from 1/1/2010 to 4/23/2010

By the end of April in 2010, sixty three research communities were built in Researchmap. The largest community in Researchmap is “Comprehensive Brain Science Network”, which is a community for the members of Comprehensive Brain Science Network, which is supported by Ministry of Education, Culture, Sports and Technology (MEXT), Japan, and more than 400 researchers join the project.



## 5. Conclusion

Researchmap is expected to provide every single researcher with a great opportunity to use the most advanced ICT services, regardless of what his/her institution's environment is like. Also, a researcher who is yet to be on tenure-track will find it extremely helpful to be free from all the ICT fuss he/she has to go under when moving from one institution to another.

Researchmap has more than 30 modules ready to use for putting out information. It also releases APIs, so there will be new tools available when more researchers are on Researchmap. This is especially good news for non-ICT researchers because they will be able to provide more information freely without much ICT hassles like programming and code writing, and with the full control of access authorization to their web pages.

So, what about a visitor without an ID? Does he/she have any advantages in using Researchmap? Yes. Until now, if you are a non-academic who is interested in a research activities and you are looking for an event calendar, for instance, you have to visit a specific society's website, and maybe another. But now, researchers are posting their dates of open lectures on Researchmap. You can view a list of events by different societies on one page. These events are tagged, so that visiting user can refine the search results by clicking on the tags and key words.

Not only open lectures, but also a wide range of research information is available for visiting users. Anyone can read a researcher's blog if it's openly published, and download lecture materials and research papers as permitted.

With a lot more functions added shortly, Researchmap is now expanding, so that it can bridge researchers and citizens.

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