BOTTOM-UP! - SOCIAL KNOWLEDGE SHARING IN DLR. A CASE STUDY OF COLLABORATION IN THE GERMAN AEROSPACE CENTER DLR.

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Abstract

Three years ago German Aerospace Centre (DLR, Deutsches Zentrum für Luft- und Raumfahrt) started to reorganize its knowledge management processes. For this purpose a new internal project was launched: "Establishing an integrated knowledge management system". By asking the employees we learned a lot about their needs concerning knowledge. We found out that the knowledge processes were not primarily driven by technology but especially by the way people react and interchange with each other. Not the information technology is the key to a successful knowledge management but the people are. From this follows that the improvement of knowledge processes can be done by bringing the right people together - whether online or offline - to share their knowledge and develop new ideas. Whenever technology is used to enhance these knowledge processes, it has to be in a social way to improve the bottom-up knowledge flow.

Our first example is the DLR-Wiki, in which each employee can easily share her or his own knowledge with others inside DLR. The second example is the Knowledge Sharing Meeting, a format of collaboration workshops aiming at creating communities of experts by using a bottom-up approach with the acceptance of executive staff. An overview of the other knowledge management activities at DLR will also be given.

I. INTRODUCTION

DLR as Germany's national research center for aeronautics and space does extensive research and development work in aeronautics, space, transportation, energy, defense and security and is integrated into national and international cooperative ventures.[i] As Germany's Space Agency, the German federal government has given DLR responsibility for the forward planning and implementation of the German space programme as well as international representation of Germany's interests.

In this way, DLR contributes the scientific and technical know-how that it has gained. It also promotes the next generation of scientists and provides advisory services to the German government.

Approximately 8000 people work for DLR; the center has 33 institutes and facilities at 16 locations in Germany.

The wide range of activities makes it obvious that many synergies can be raised if there is an inter-branch knowledge management (KM) that supports the distribution and exchange of knowledge.
DLR's output is always knowledge. Even though the "products" are not always declared as knowledge output, they are always in a context of research and bound to the knowledge of DLR. The knowledge-output itself can be e.g. in the form of prototypes, services, project results, scientific statements, applications, papers etc.
DLR needs knowledge as a first input, it needs knowledge in every process step to create new knowledge as an output and is therefore a knowledge organization.

But also the internal methodical knowledge, for instance how to manage a project, is an important value for DLR. It has to be sure that new employees are able to get all information to work motivated and efficiently. Any forgotten knowledge, e.g. during a change of IT devices, is a waste of time and money, which must be avoided. Besides, all employees need to be prevented from doing any redundant work that has already been done by someone else. Since DLR has already established a quality management system and is widely organized in processes, the internal preconditions at DLR for knowledge management are already set.[ii] A process model was established five years ago and has proven its validity over the years. Each employee can easily understand how DLR operates by studying the DLR process model which is divided in core, corporate and support processes.

With this groundwork, a foundation was laid to establish a Knowledge Management system that is intended to bring the right knowledge to the right people whenever they need it. Therefore the board of DLR

launched a project called "Establishing an Integrated Knowledge Management System" (EIWis).
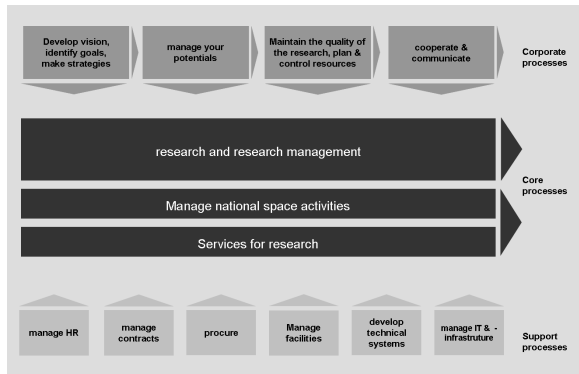

Fig. 1: DLR process model

II. SOCIAL KNOWLEDGE

"Knowledge is power"[iii] is a wide-spread quotation attributed to Francis Bacon. But power leads to political influences between humans. In a first approximation it is not clear that a person should give the value of his own work away only to share it. Especially scientists, whose main tasks consist of creating knowledge, often do not like the idea of sharing their knowledge. In this regard sharing knowledge is not as easy as it seems. As part of one's own value there are many problems which arise when knowledge should be shared seemingly for free. But it works, if the conditions for social knowledge are created right.

II.I SOCIAL MEDIA COMPARED TO SOCIAL KNOWLEDGE

There is a reason why social media applications became successful over the last ten years. People spend more time than ever on Facebook, not only young people look up terms and definitions on Wikipedia and the way that twitter provides information is faster than from any service ever before.
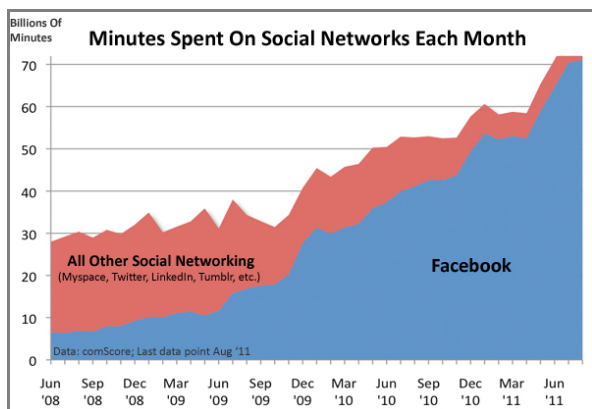

Fig. 2: Minutes per month spent on Social Networks 2008 - 2011[iv]

Smart mobile devices seem to suit perfectly into the network of social media: they provide access to them whenever they are demanded and wherever people are. In that way, social media has changed our life.
In this contemplation, it is clear that nowadays there is a demand for social media, because it has made everyone's daily life easier. Everyone knows that a new application on a smartphone can make something easier for him, sometimes even with more comfort or even more quality.

"Everything that can be social will be."[v] There is a need for social knowledge. Generating knowledge through a social lens presents a profound new way of thinking. The most obvious example is Wikipedia. The Internet encyclopedia was launched in 2001 and has now more than 30 billion articles in 287 editions / languages and has more than 73,000 active English-language editors.[vi] Anyone who can access a Wikipedia article can edit the article, too. The openness has led to some concerns, especially of the accuracy of information. A 2005 survey of Wikipedia based on a comparison of 42 science articles with Encyclopedia Britannica found that both encyclopedias have similar low rates of serious errors.[vii]
As a registered member – a so called Wikipedian – editors can reach an insider status depending on the numbers of contributions and the contributors can be awarded to honor excellent work. What unites the community of Wikipedia is the fact that they share the goal to publish license-free information.
The fact that Wikipedia is a non-commercial project shows that social knowledge sharing can work, especially in an environment of scientists. The main key is the culture of knowledge sharing.

II.II PRODUCTIVE SOCIAL KNOWLEDGE SHARING

According to the internet dimension, which has a greater number of participants and is growing faster, an intranet dimension of knowledge sharing is conceivable in any organization. But mostly, learning and knowledge sharing is seen as an "on-top" task and therefore often ignored or even rejected. At least, learning and knowledge sharing are rarely considered as important as the actual work tasks.
That is why it has to be understood by the employees, that knowledge sharing and learning is an important factor of their productivity. The task of the knowledge manager together with leadership should be to create a common understanding of social knowledge sharing.

If a scientist gets a hint from another scientist, then we have both: social knowledge sharing and social learning. Imagine the hint saves one day of work time to the demanding scientist. Then it is obvious

that his productivity is raised, because he can do other things in the time he would have spent on finding out what he learned from another scientist. A part of the saved working time minus the time spent for learning from the other scientist should also be saved for social knowledge sharing. In this manner the scientist can save time to give hints to other scientists without losing productivity – in fact just the reverse: the productivity will raise easily by the proper combination of working, learning and sharing. The big picture of all productivity gains will draw the organizational context. The better employees understand this context, the easier it will be to reach acceptance of social knowledge sharing. The acceptance of knowledge management tools is important for their further use.
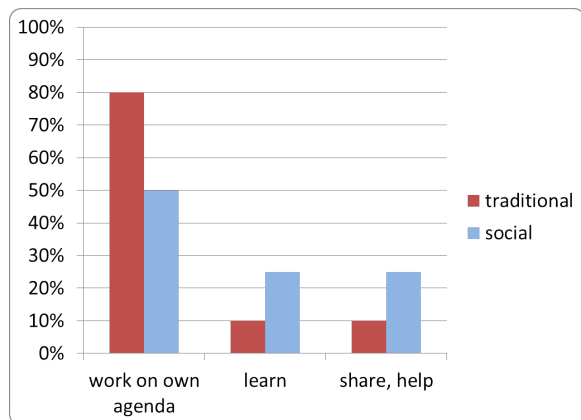

Fig. 3: comparison of traditional and social knowledge work[viii]

Social knowledge sharing and learning is based on understanding each other. To understand each other, there is no need of any IT infrastructure, if all colleagues can be reached. In small groups social knowledge exchange often happens in a coffee corner and with a minimum or even no technology. For bigger organizations like DLR it is simply not possible to create a meeting, in which every employee can participate. The task of IT is therefore to create virtual spaces where everybody can be reached. In that way, IT systems extend the range to reach people with similarities or solutions in the same organization.

Therefore DLR has established the DLR.Wiki which allows Bottom-Up-communication and social knowledge sharing across the whole organization. But there is also a non-IT solution: The knowledge exchange workshops are addressed primarily to scientists, not to leadership and allow to meet across the organizational structure. Both tools will be explained later.

III. PROJECT EIWIS

The project to establish an integrated knowledge management system at DLR (EIWis) was launched by a decision of the advisory board in April 2011, after a community of knowledge-management-interested employees wrote down many hints for developing and improving the knowledge processes at DLR into a pre-concept.

III.I EIWIS CONCEPT

EIWis is divided into two major phases. Phase I was the Analysis and Implementation phase. Most important was the stakeholder analysis and a survey among all employees. It was soon clear that the employees voted for a balance between components which are IT tools and components that help to exchange knowledge personally. It is easy to understand that employees do not want to communicate only via IT-tools. The personal contact helps a lot in communication and cannot be substituted by IT like E-Mail and Wikis. But on the other hand people need more transparency to find the knowledge and information that already exists. IT can help to manage this.

After that the results were interpreted, adequate components to meet the requirements were found and brought into a concept. This concept got approved by the advisory board.

III.II EIWIS IMPLEMENTATION

In phase II of project EIWis the components of the knowledge management system is being implemented. All components get implemented by partial project managers who come from central DLR divisions, e.g. human resources, IT management or strategy.
The components had a serial roll out. Not yet implemented is the project database which will use the wiki technology and is therefore scheduled after the wiki. The complete system will be rolled out to all employees after each component of the knowledge management system is implemented. This will require an information campaign and activities to raise participation.

EIWis has recently reached the end of the implementing phase. It was important to give information to all stakeholders and especially to the employees about the project and the actions that would result. The project team therefore launched an internal website and published the objectives, ideas, measurements and results in the internal DLR employee gazette and within internal employee conferences and meetings. The marketing activities still continue.
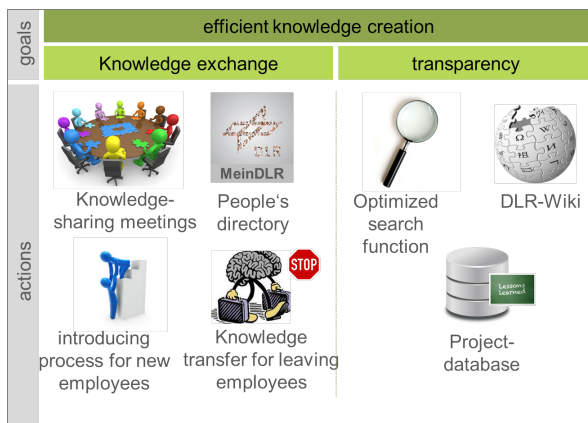
Fig. 4: EIWis concept

III.III EIWIS COMPONENTS

The components of the integrated knowledge management system, except of the DLR.Wiki and the knowledge sharing meetings (who will be explained later) will be explained briefly in the following.

Introducing process for new employees

New employees need to know where they can find knowledge or whom they can ask, if they have any questions. That helps to keep them motivated and makes the first days in our organization more efficient. We want to give them an overview of the KM system and of DLR. On the other hand there will be a special introduction for each institute.

Knowledge transfer for leaving employees

Leaving employees always leave with the knowledge they have achieved. Together with human resources EIWis develops a transfer process for leaving employees who are willing to transfer their knowledge. There will be different scenarios depending on the amount of knowledge and experience the person has, beginning from a checklist up to a whole workshop where all colleagues try to find out the relevant knowledge together with the leaving employee.

Optimized and semantic search function

The optimized search function is a pure IT tool but helps to get a way through the unstructured information in all electronic information resources. This can be the intranet, a hard disk, the internet, databases, etc. The old search function had no semantic technology so that the relevance of the search results could not be optimized. With a new technology the search engine will be able to "understand" the search topics and will also show results which have the same meaning but not necessarily the same wording as the original search request. In that way it will make the search for information easier and more comfortable.

Finding relevant information prevents to forget important knowledge.

People's directory

Together with the IT management EIWis created a people's directory in the DLR intranet. The contact data of each employee is automatically shown on the profile page. DLR employees can upload their photograph and write down their expertise, so that people can be found not only by their name but by their competencies or their experience. The network feature is not ready yet but will be improved, so that people are able to ask a question to a complete network community inside DLR. On the other hand, these communities can build up in the people's directory and spread into a real meeting.

Project database

The project database will be like a collection of wanted posters for all projects of DLR. The main information will be filtered out of the SAP system, which contains all administrative project information. Each project manager will be able and encouraged to add relevant project information. An important feature will be the upload function for Lessons Learned documents. That means that project information and project experience will be shared with others and the project managers can be contacted for collaboration, follow-on-activities or any knowledge exchange.

IV. THE DLR.WIKI

Wikis enable everyone to write down and publish what he knows whenever he is willing to do so. A wiki is an IT service, which is accessible through any internet browser. Anybody who is able to read, can edit an article, too. Wikis are easy to use without the need of reading a manual or even absolving a training. There were already several Wikis in a few institutes of DLR, but no one of them was connected to another one. Besides there are several wiki engines which are not able to work together. But wikis are important for a knowledge flow, because they allow to reach each employee across the organization. Moreover, they enable people to write down implicit knowledge that does not exist in an explicit way. Especially methodical knowledge about processes, procedures and links to other information resources can be captured in a wiki. The main task was to build up a new wiki that could connect to the other wikis and does help to structurize the existing knowledge. Besides the DLR wiki needed to be compatible to the rest of the intranet to connect the content directly and to link to the people's activities.

Together with the IT department we analyzed three wiki solutions, which were of major interest: MediaWiki[ix], which is open source and the software for

Wikipedia, WikiPlus[x], a Microsoft-Sharepoint Add-On and Atlassian Confluence[xi], a commercial wiki software. While many scientists of DLR were authors of Wikipedia and MediaWiki is a free software, the focus was on MediaWiki first. But our IT department preferred a commercial solution due to the fact that a commercial company would give support to their product. Besides, at the time of testing, there were no abilities to set rights in the MediaWiki.

WikiPlus was a promising wiki for us, because we already were using Microsoft Sharepoint. But it was not easy to use for us and we could not get every feature working properly. Moreover, our IT department feared too much interchange with Microsoft Sharepoint that could result in difficulties, especially when Sharepoint would be upgraded to a new release. Atlassian Confluence seemed to be the ideal mix of Sharepoint compatibility, usability and IT requirements. We tested the trial version in one institute for three months and tested the features. The main criteria was that it should support people in their daily work. After three months we came to the conclusion that Atlassian Confluence would meet our expectations in a wiki. More than that it has the possibility to program or buy add-ons to allow extra functionalities in the wiki. Very important for our scientists was the LaTeX Plugin, which allows to include LaTeX-Code and let the Wiki display the document. This allows also to create formulas and equations in a proper way.

After testing we prepared the concept and the rules, the so called "Wikiquette", for the DLR.Wiki. Initially, the institutes wanted to have spaces of their own, to have more trust. Therefore the wiki offers the ability to create closed and open spaces. When a contribution is published in a closed space, it later can be transferred to the open space to make it available across the organization.

The wiki is differentiated from the other IT services, to avoid misunderstanding. Due to the fact that the wiki provides information which is sometimes not approved, we had to make that clear in the open wikis. The wiki itself should not include regulations or administrative information, because there is a danger that someone could manipulate regulations. This is not possible in the intranet. Therefore rules and administrative information can be found in the intranet, which has a top-down policy, where only a few administrators are allowed to edit pages or upload documents.

Each employee is recognized by the wiki-system through single sign-on. That means, that there is no log-on in the system and the employees are recognized automatically. There are no pseudonyms and every employee is displayed with his clear name when creating, editing or changing an article. This helps to avoid vandalism, because nobody can do something anonymously and the wiki is defined as a tool for the internal knowledge exchange. In that way no external accesses are possible, to the regret of some institutes, who wanted to use the wiki in projects with external partners. But is has to be clear that the internal knowledge exchange must be only visible internally; otherwise the wiki would collapse due to a lack of trust, which is a basic pillar.

The DLR.Wiki also offers versioning, that means that any entry or change will be saved in the wiki articles and that each version can be compared and restored if necessary.
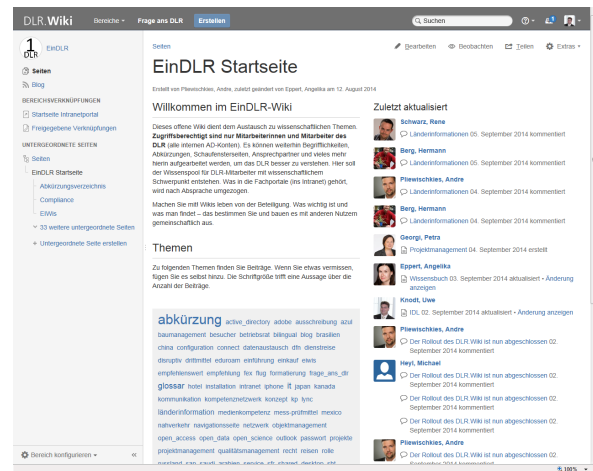

Fig. 5: The DLR.Wiki Homepage

As mentioned, there are open and closed spaces in the wiki. Open Spaces can be read and edited by every employee. There are four types of wiki spaces that help to categorize the wiki: Open Wikis, Project Wikis, Organization Wikis and Topic Wikis. The Open Wikis are for articles which should inform or should be discussed with all employees, Project Wikis are especially designed for projects, Organization Wikis are designed for organizational entities like institutes and Topic Wikis are for all scientific topics. The wiki includes a content management system which organizes all articles into a table of contents. Any article can be shifted manually between the spaces. There are administrators for each space who care for the entries and the users who have access. They can also control and change the access rights.

There are many more functions in the wiki that make its use very easy. Not all could be explained here and many functions can be extended through plugins.

The final roll-out of the DLR.Wiki was finished by the end of August, 2014. The statistics show a constant growth of the wiki. Nearly 100 new entries or changes are made per day. The figure below shows

the number of visits per day (upper field) and the average visit time in minutes. Until now it seems that the DLR.Wiki will meet its expectations.
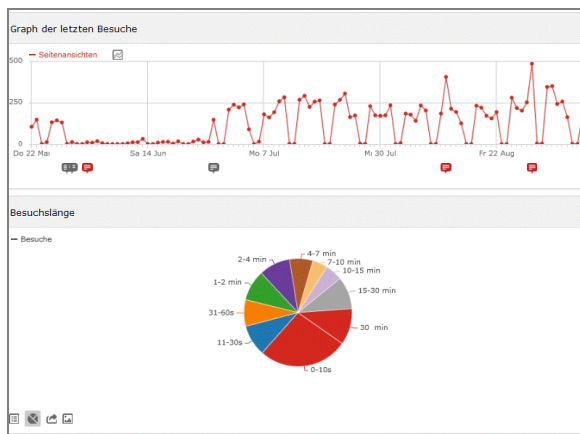

Fig. 6: Wiki statistics

VI. KNOWLEDGE SHARING MEETINGS

The Knowledge Sharing Meetings are not similar to conferences. The new way of these meetings is mainly that there is no real agenda for these meetings. Even the topic for a new knowledge sharing meeting will be found by a competition. The only central organization will be set from the EIWis project group to start the competition and the evaluation of topics by experts. The content is created completely decentralized, so that a scientific discussion can run without any financial, political or other barrier.

The concept itself seems to be easy: we bring people for a special topic together and help them to exchange their knowledge and experiences and to learn from each other. But very often it is not that easy to establish a Knowledge Sharing Meeting. Mostly scientists need start-up support, they need funding and support to organize everything needed.

Setting up a new Knowledge Sharing Meeting is divided into three major phases: First, there is a call for proposals; every member of DLR can propose a new topic together with a brief explanation via email to the EIWis project team. The topics will be published on the EIWis homepage in the intranet. In the second phase an online voting among all employees and all institute leaders takes place in the intranet; every employee can vote for one topic. After that a jury will select one topic, taking into account what most people voted for. The jury exists of the chairman and five experts, without any EIWis member to avoid impressions of personal preference from the organizers.
The winner, the so called topic owner, will receive massive support from the EIWis team to make the

first meeting happen. The EIWis team starts the first meeting and does all the organizing work, such as emailing, funding, administration, creating a Wiki page etc. We help the topic owner to create a workshop and to find an agenda. The wiki is used to document everything. Normally sub-groups develop during the meeting. They organize themselves and document their work in sub-pages of the specific topic. Very often the topics will be discussed afterwards in the wiki and further ideas and information get shared. In that way the community stays alive even after the meeting and the next meeting can take place in a bigger time interval. The results for the participants are not only the shared information or the networking but also cooperations and even joint projects which arise through the intensive workshop. A social event helps especially in the beginning of a workshop to get known to the other participants. Very common is a barbecue in the evening, if the weather allows it.
By the end of the first meeting it is important that the participants answer the question how the workshop will be continued. The next workshop will then be organized without the help of the EIWis team, but due to the fact that then all members are motivated, an organizing team for the next meeting will be found in the group.

Fig. 7: The first Knowledge Sharing Meeting

For EIWis, each meeting ends with an evaluation sheet, which has to be completed by each participant. We have organized two knowledge sharing meetings and both resulted in extremely positive feedback. The first knowledge sharing meeting had the topic "Visualizing big data in science" and the second one was about "Use cases of civilian unmanned flying objects". Both workshops were continued and will stay alive. Mostly the following workshops change the location so that the participants will get known of several DLR sites over the years.
Due to the success and the positive feedback the board of DLR decided to initiate one new knowledge sharing meeting per year.

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VI. CONCLUSION

DLR has implemented most of the components of its planned KM system. The majority of DLR's knowledge is located at the people who work for DLR. Therefore the components were chosen by DLR's employees. A strong bottom-up approach was necessary to include the needs of the employees. Each employee had the possibility to include his ideas into the knowledge management concept. This has helped to meet the people's needs according to knowledge management.

The wiki and the knowledge sharing meetings were the most successful components of EIWis so far regarding the feedback from people who used it. We found out that the approach of social knowledge for which a demand exists, was the key to success there. Many barriers, such as the "knowledge is power" or the "not invented here"-syndrom could be overcome.

The knowledge sharing meetings support social knowledge sharing and learning, while the DLR.Wiki enables people to make their tacit knowledge explicit. The implementation of the other components of the KM system is in the final phase now, while the lessons learned from the successfully implemented components are very useful for further implementations.

The discussion in DLR about the knowledge management activities has led to more awareness about knowledge and its worth. The EIWis project team must constantly evaluate each component of the KM system whether its effects are positive for knowledge sharing or not. Key performance indicators will be designed to measure the effects. Every KM system can only be a success when it meets the people's needs and gets used. All employees need to be informed about the goals and the possibilities the knowledge management system provides. Therefore an information campaign will be started to motivate people for using the KM system. The first response of employees shows that it is possible to manage the organizational knowledge more efficiently.

Never before so many knowledge management activities were launched at DLR. The first results are very promising and it seems that a lot of expectations on knowledge management in DLR can be met. But even the wiki needs internal marketing to make it more successful. The long-term future will show if the system will meet the objectives of EIWis.

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[v] Jeff Dachis in: Dion Hinchcliffe, Peter Kim: "Social Business By Design", Dion Hinchcliffe, Peter Kim, San Francisco 2012, p. vii

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[xi] https://www.atlassian.com/de/software/confluence/, last viewed September 9th, 2014

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