Universiteit Twente
de ondernemende universiteit

Subject **Final report**

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Final report Campus Blend using Sakai
Should the University of Twente implement Sakai?

Note for our Dutch readers: dit eindadvies is ook in het Nederlands beschikbaar, net als de deelrapporten. Ga hiervoor naar http://www.utwente.nl/elo.

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1. Introduction

This report is the English version of the final deliverable of the pilot phase of the *Campus Blend using Sakai* project (abbreviated as CBUS).
The pilot phase, in which we tested Sakai on different criteria, lasted for 10 months, roughly from August 2006 until May 2007. First and foremost, this report aggregates the four other deliverables of this project. Those reports are respectively (titles have been translated for consistency purposes):

- Sakai community (Report A)
- Technical analysis (Report B)
- Functional analysis (Report C)
- Scenario's for migration (Report D)

In this report, first the conclusions of the aforementioned reports will be summarised up (Chapter 2). Chapter 3 of this document will provide the final recommendations and conclusions (based on Sakai 2.3.1). The last chapter of this document is an epilogue where you will find five remarks on future directions, including the way Sakai should or could be implemented.

This document has been prepared for the reader whose time is limited. If more detail is required about how conclusions were reached on the four aspects, the aforementioned deliverables should be read.

The other four reports mentioned here, are not available in English. The reports do have extensive summaries in English. Those summaries have been collated and slightly edited for this final report. This document is therefore not a one-on-one translation of the original Dutch document, but follows the lines of the original document and has the same level of detail and amount of content.

2. Summaries of reports

Below are the English summaries of the four reports.

2.1. Sakai community

Report A documents the main challenges that the Sakai community faces, as identified by the project team during the pilot phase. This report describes the Sakai community as it is seen as of June 2007. The worldwide Sakai community is by all measures a young community, so developments are evolving rapidly. Latest developments in this regard will be documented on our wiki (http://www.sakai-pilot.utwente.nl/sakaiwiki/), as well as on the various websites that are available (such as http://www.sakaiproject.org).

The worldwide Sakai community as of June 2007 can be described with the following.
1. The Sakai community has its foundation in the USA, where several universities started the Sakai Project in 2004. Slowly, the community is spreading its wings, outside the USA. At the moment, the core of the community consists of universities and colleges in the USA, enhanced with institutions from some other English-speaking countries, namely the UK, Australia and South-Africa, as well as Spain.
2. The Sakai Foundation is the legal entity of the Sakai community. The Foundation is governed by the Board of Directors. The Sakai Foundation employs very few paid staff, which functions under an Executive Director.
3. The Sakai Foundation is financed through the Sakai Partner program (approx 120 member institutions from education) and commercial affiliates.
4. The newly appointed executive director, Michael Korcuska, has the responsibility to focus the community on the most appropriate activities necessary for success. Next year, the focus will be more on promotion and marketing of Sakai, as well as on enhancing the usability and user experience of Sakai (through the Fluid Project).
5. As of 2006, Sakai gets more and more attention outside the USA. Within Europe, one could say that the UK and The Netherlands are the early adopters. There is a growing number of implementations of Sakai. At the start of 2007 the following implementations of Sakai are known:
   a. North-America: 48 (USA: 46, Canada: 2)
   b. Europe: 16 (Portfolio4U implementations are counted as 1)
   c. Africa: 4
   d. Asia and Pacific: 4
   e. South America: 1
   This adds up to a total of 73 implementations of Sakai with production status. Apart from these full-blown Sakai production sites, there are numerous pilots with Sakai across the globe (>50).
6. Zooming in on The Netherlands, the current situation is that the following institutions fully or partly use Sakai in production- and pilot-situations:
   a. University of Amsterdam (Open Source Portfolio for 500 students, as well as several pilots with the complete Sakai toolset in several departments).
   b. Several institutes for vocational training (ROC's in Dutch), such as ROC van Twente, Alfa College, Mondriaan Onderwijsgroep, Gilde Opleidingen (which are all using Open Portfolio, a service-offering by Portfolio4U, based on the Open Source Portfolio component of the Sakai package).
   c. Leidse Onderwijsinstellingen; a commercial distance-learning company.
   d. Elsevier Opleidingen; a commercial educational provider (which is in turn collaborating with a company called A New Spring).
7. Pilots with Sakai are scheduled to start after the summer of 2007 at the following four institutions for Higher Education in The Netherlands:
   a. Hotelschool Den Haag
   b. Institute for Social Studies (ISS)
   c. Saxion Hogescholen
   d. Hogeschool Leiden
8. There are several Dutch commercial companies that are quite active within the Sakai community: Stoas, Portfolio4U, Edia, Omix and A New Spring. Most prominent are

Stoas (in collaboration with rSmart group and IBM) and Portfolio4U (all sorts of portfolio offerings, based on the Open Source Portfolio). Both companies are commercial affiliates of the Sakai Foundation, and are thereby financially supporting the Sakai community as a whole.

9. The software-product Sakai, is truly a community-source product. The member institutions jointly and collaboratively define the course of action.
10. The worldwide Sakai community has 116 active software developers.
11. The larger part of the communication within the Sakai community revolves around software (development) issues. Since a couple of months, more and more activity can be seen on issues such as pedagogy and usability.
12. New versions of Sakai are released twice a year (May and November).

At this moment in time, one cannot say that a Dutch development community does exist in The Netherlands. It might be too early to expect this, since serious attention in The Netherlands for Sakai has started only very recently. There is a growing attendance by different institutions at the Sakai SIG NL meetings. Experiences and expertise are shared during these meetings.
One could argue that confining a development community to The Netherlands is neither advisable nor realistic. Participation by the University of Twente on European or even worldwide level would give more possibilities for collaboration. One could then deploy and pool resources on high-priority issues. Very critical requirements could be handled together with local companies that have been mentioned before.

In summary: the Sakai community is on the right track. The focus should be changed (fewer technical issues, less USA, more communication, more usability, more pedagogy) in the future.

2.2. Technical analysis

The goal of report B is to summarize and evaluate the experiences with some technical aspects of Sakai. Focus was on the technical features to integrate Sakai with other learning related IT-systems in use at our university. We did not only carry out desk research. We also got our hands dirty in making a Demonstrator application to test the interoperability by using web services in practice. We wanted to get a feel for the complexity of this integration technology. We further carried out a gap analysis to determine the kind and level of knowledge that we as an organization need to acquire to run Sakai as a stand-alone system, but also as a building block in a future integrated learning and working environment for our students and teachers.

Sakai does not only distinguish itself from many other learning management systems (LMS) through the fact that it is Open Source. One of the main distinguishing features is the architecture of the software. Sakai has been designed with a Service Oriented Architecture in mind, which enables geographically distributed groups of developers to work independently on the functionality of Sakai. It is this architecture that also enables optimizing functionality over multiple IT-systems. Use the functionality only once and choose the best of breed available within an organization. If a certain function is available with better specifications in another system (for example Assessment in Question*mark* Perception), this tool can be removed from Sakai (provided other tools are not dependent on it). The Sakai tools are clearly separated: there is the provision of functionality in a service and the user-interface in a separate component. This service functionality is available in the form of a Java Application Programming Interface (API), which can be made available externally as language neutral web services using Axis.

Although these web services are still in development, there is a very solid foundation for the future to build and implement an integrated learning and working environment. Sakai has been specifically designed to function as a component in a Service Oriented Architecture (SOA).

In the area of e-Learning specifications, like SCORM and the IMS specifications, promising developments are in progress, but there is not yet full support. The lack of a properly tested

SCORM player, one of the older e-Learning specifications, is disappointing. Because the functionality offered by Sakai is a reflection of the needs of the Sakai community, this might be an indication that there is less demand for it. It should be noted that support for these e-Learning specifications is usually not located in the Sakai Framework itself but in the tools which are developed for this framework. For example: the IMS Learning Design (Level A) specification is supported by a tool that is well integrated, but developed in a separate (Australian) project, Learning Activity Management Systems (LAMS V2). The Dutch company Portfolio4U is developing an implementation of the IMS ePortfolio specification in collaboration with a number of other Dutch and international organizations.

In developing the Demonstrator Application, we had to acquire and use new integration technologies that were new to our institution. Web services, business process modeling with ActiveBPEL, several Open Source tools and last but certainly not least working in an Open Source community were all new concepts for us and posed an interesting challenge. The Demonstrator has proved that we have acquired the skills needed to integrate Sakai with another, locally developed, web system.

Summarizing, we can state that from a technical point of view, Sakai is excellently positioned and designed to be used as an important base for our future integrated learning and working environment, based on SOA principles. Being SOA enabled was not added as an afterthought, as is the case in most current LMS systems. Sakai is SOA by design!

2.3. Educational analysis

Report C focuses on the educational and functional perspectives of Sakai. The main question is whether Sakai provides additional value for the support of the pedagogical vision that is recently described in various documents. This is not only a matter of functionality available in Sakai, but also whether it is implemented in a logical and consistent way. Can Sakai facilitate the educational scenarios as described in the ELO Advice report (Koopal, Laagland, Portier, 2005)? In order to find the answers to these questions, we conducted several pilot projects in collaboration with three faculties of our university. On top of that, the project team has performed a profound functional analysis of Sakai.

We conducted four pilot projects in which over 200 students were actively engaged in working with Sakai. The use of Sakai was fully embedded in the course, so students were dependent on this service to get access to course information, learning materials, communication facilities, etc. In addition to the pilot projects, we organized three information sessions for interested students and teachers at the University of Twente. Finally, we received some feedback from regional partners. The context of each pilot was rather different.
- Three out of five faculties are represented: Behavioral Sciences (GW), Engineering Technology (CTW) and the School of Management & Governance (SMG).
- Sakai was used in Bachelor- as well as Master courses.
- The instructors had different levels of experience with IT.
- Different pedagogical paradigms had to be facilitated: both teacher- and student centered.

The main conclusion of the pilot projects, in combination with our own analysis, is that Sakai 2.3.1 is potentially a useful virtual learning environment for the University of Twente. Sakai includes some additional functions compared to our current learning environment TeleTOP, and is able to facilitate all four educational scenarios that have been previously defined. However, the results of the pilot projects and our own functional analysis also show that this release of Sakai (2.3.1) is not yet ready for a campus-wide implementation. We have identified a list of requirements[1] which have to be met <u>before</u> implementation on a campus-wide scale should be considered.

Our conclusions are based on Sakai releases 2.2.0 and 2.3.1. The Sakai release policy aims at releasing twice each year. Sakai 2.4.0 is available since May 2007 and encompasses some obvious improvements.

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[1] List of requirements is documented on our wiki: http://www.sakai-pilot.utwente.nl/sakaiwiki/shortlist

2.4. Scenario's for migration

Report D summarizes the actions to be taken to have a proper move (migration) from the current VLE, TeleTOP, to the future VLE, which would be Sakai. There are four migration scenario's which are described on a global level. The do-it-yourself scenario would be the best choice. This scenario comes with a workload of 684 hours and would last for about 16 weeks. The figures mentioned are to be finalized and will become more precise once an implementation plan is written. Before moving into the actual migration timeframe, there will be a pre-migration period of about 6-8 months.

Regarding hardware, the so-called "Thin client configuration" is the best choice for the University of Twente. This includes a hardware load balancer, which is a new technology for the university.

The annual costs for using Sakai at the University of Twente have not yet been calculated on a detailed level. More reliable figures can be drafted once an implementation plan is written. According to preliminary calculations the costs would be as stated below.

a. IT-infrastructure (including manpower for database and systems management); initially estimated at k€ 53.
b. Software development; 1 fte (k€ 89).
c. Pedagogical and didactical assistance and innovation; 0,8 fte (k€ 79).
d. Working within the Sakai community; 0,2 fte (k€ 16).

Therefore, a first global calculation of total annual costs for using Sakai at our university would be: 53 + 89 + 79 + 16 = k€ 227.

Costs in the first year, after the actual migration, would be higher due to preparation activities, the so-called pre-migration period. Furthermore we should take the membership fee for the Sakai Foundation into account, which is US$ 10.000 per year.

Possible efficiency benefits of Sakai have not been calculated to a detailed level yet. One can imagine that an instructor will save time because setting up a Sakai site is simpler and faster than setting up a TeleTOP site. Detailed calculations should be done in an implementation phase.

3. Discussion and conclusions

To conclude, it can be stated that traffic lights are GREEN on three aspects, which would mean that we can proceed. However, there is still one traffic light that is RED, which is with respect to the functionality of Sakai.

Therefore, the 4 reports can be visualized as below:

Sakai Community	Technical perspective
Functional analysis / Educational use	Financial

The red traffic light can be flipped to green once the necessary improvements and enhancements regarding functionality in Sakai (which have been identified in report D) are available in the next release(s) of Sakai. This could be realized by an active involvement of the University of Twente in requirement- and development-activities during what we have called the pre-migration phase.

During the last Sakai conference in Amsterdam (June 2007), it became obvious that better usability, accessibility and user experience are highly desired by almost everybody within the community. These issues are key factors in making Sakai even more successful.

3.1. Are all traffic lights green?

The University of Twente should not stand alone in changing the last red traffic light to green. There are at least six reasons which could contribute to flipping this last traffic light.

- The Chair of the Board of the Sakai Foundation (John Norman, University of Cambridge) has explicitly offered assistance in resolving some of our critical issues. In practice, this could mean that software developers of our university would temporarily work together with software developers at Cambridge. Such types of collaboration are quite common within the worldwide Sakai community (for example between Oxford and Cambridge, but also between Foothill College and the University of Michigan in the USA).
- The incoming Executive Director (ED) of the Sakai Foundation, Michael Korcuska, has clearly stated that his focus for the coming year will be on communication on Sakai, as well as improving the usability of Sakai. During the Question&Answer session in Amsterdam, 'user experience' was also one of the central discussion themes, a clear indication that the worldwide Sakai community is focusing on this theme.
- Oracle is working on an ambitious project which will dramatically enhance the integration, based on current techniques like web services, of the Oracle Peoplesoft Campus Solutions product and Sakai. First results are to be expected at the end of the year 2007. The University of Amsterdam is involved in this project.
- The recently started Fluid-project[2] is also very relevant for the University of Twente. This project recently was awarded a grant, valued at 2.5 million US$, from the Andrew W. Mellon Foundation. The Fluid Project is an international community of academic institutions, community source software projects and corporations working together to address the values of usability, accessibility, internationalization, quality

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[2] www.fluidproject.org

assurance and security within academic software projects. Fluid will result in a much better usability for the software projects that are involved. These are Sakai, Moodle, Kuali Student and uPortal.

- Two commercial companies in The Netherlands, A New Spring and Omix, have offered our university to cooperate with regard to Sakai, in some way or another. The interest of these (and other) companies shows that Sakai is regarded as a project and a product with quite a bright future.
- Saxion Hogescholen and Hogeschool Leiden (both universities for Applied Sciences) have recently informed us that they will be starting to use Sakai within pilots for the next academic year. On top of this, the commercial companies and institutions already using and/or piloting Sakai, which are the University of Amsterdam, Hotelschool The Hague and our University, might be interested in founding a Dutch developer's community. Also Hogeschool Windesheim, Universiteit Utrecht and Radboud Universiteit Nijmegen have showed some interest in Sakai.

The six reasons mentioned above show that serious improvements can be made to Sakai's usability and functionality. Furthermore, forming of a serious Dutch (developer's) community should not take too long.

It is expected that the next release of Sakai (2.5) will resolve most of our functional issues. Given the technical soundness that Sakai has to offer (component based architecture, SOA by design and therefore easy and also state-of-the-art integration possibilities) it seems appropriate to keep a close watch on what will be accomplished within the worldwide Sakai community until the end of 2007.

The university should seriously consider taking some pro-active steps, for example by dedicating some resources (work force) to the community which would start working on the flaws that we have identified. There will be ample assistance if we would start doing so.

3.2. Sakai and 3 Technical Universities (3TU)?

As far as can be predicted at the moment, the architecture of Sakai will quite well match the current developments within the federation of the three technical universities (3TU) within The Netherlands.

The 3TU working groups Digital Learning and Working Environment (Digitale Leer- en Werkomgeving, DLWO) and Architecture will be working on defining and documenting (by means of the Archimate[3] methodology) the required business processes and application services in this domain, to be completed by the end of 2007.

Currently, Sakai is already capable of providing some of the application services which undoubtedly are needed, now and in the future. TeleTOP (version 6.2) is, at this moment, not capable of this. Persisting with TeleTOP is therefore not advisable in the context of a much-needed federative Digital Learning and Working Environment for the 3TU federation.

3.3. Dutch developer's community?

Some of the reasons mentioned above, give enough motivation not to strive for a Dutch national developer's community. Such community should not be sought after as a precondition before the university should start implementing Sakai.

In order to internationalise the Sakai product, we could cooperate between all non-English-speaking countries. Considering the Bologna declaration and the arising necessary functionality of Sakai, a truly pan-European working group would be more desirable. Too much focus on a Dutch national developer's community could even pose a risk of isolating our country from possible European partners and developments in the end.

In essence it is very well conceivable that a Dutch national developer's community will arise anyway, because of the current growing interest in The Netherlands for Sakai.

Given our priority for usability, which is completely in line with the larger part of the Sakai community, it should be seriously taken into consideration to be pro-active on our part. We could actively get involved in the aforementioned Fluid project for example.

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[3] More information on Archimate can be found at
http://www.telin.nl/index.cfm?language=en&context=253&id=252

3.4. Conclusions

Given all the information we have and all the analysis we can do based on this information, there are two main conclusions that can be drawn:

First, we should not strive for campus-wide implementation of the current version of Sakai, 2.3.1. Nevertheless, the strong technical foundation of Sakai is a clear indicator that Sakai can surely play an important role in resolving the issues that were the main reason we started the project Campus Blend using Sakai (CBUS) in the first place. These issues are very heavily related to the lack of integration of the various IT-systems.
Furthermore, choosing Sakai is almost completely in line with the long term direction in which we are heading with regard to architecture within the federation of the three technical universities (3TU). One of the main architectural principles already jointly chosen is that new IT-systems should be service-oriented. Sakai is service-oriented by design.
As a last remark it should be noted here that within the worldwide Sakai community, there is a lot of traction at the moment on the issues of usability and user experience, which should be improved as soon as possible.

Secondly, it should be concluded that a final NO to Sakai at this moment would be very unwise. At least we should continue monitoring Sakai in the near future, preferably until December 2007. The results of this monitoring should then be reported, adding more information than currently available. A final decision should then be made early 2008. When this final decision is positive, the pre-migration period should start soon thereafter.
Tracking Sakai until December 2007 can be done by a small project team, formed by some of the current members of the project team.

4. Epilogue

The project team has strived for objectivity in the reports and this final report. The conclusions in the previous chapter might seem to focus at a relatively short period of time. Therefore, in this epilogue we will take the long view. We will look further than what is currently understood as a Virtual Learning Environment (VLE) or Course Management System (CMS), whereby discussions more often than not are on products and features of these products.
With this epilogue we hope to assist in decision making within the context of 3TU. There are five points that we would like to make.

First of all it should be understood that, even when all traffic lights would be green, we still would <u>not</u> have advised to implement Sakai immediately on a campus-wide scale. Our end users, students and staff, need an integrated digital learning and working environment. Sakai is not the solution to this problem, and is partly capable of solving it.

Secondly: Sakai is a very adequate and important building block for the future federative digital learning and working environment for the 3TU federation. Based on this, it would be justifiable if the University were to make a positive decision for Sakai at this moment in time.

Thirdly: The way things will develop in this area of interest becomes clearer as we are reading and talking about it. The future of a VLE will be that it is an integrated web environment, where different application services are being delivered by different application components (which are not necessarily noticeable for the end user). Sakai (an application component) will very likely be the provider of some e-learning application services, while MS Exchange might provide application services regarding e-mail.

A **fourth** important remark that we would like to make, is a logical derivative from the previous ones. We will need highly skilled personnel, now and certainly in the near future. We need people who are proficient in software engineering, IT-architecture, process analysis and -modeling. There is some capable staff right now, but this might not be enough in the future.

And lastly, the **fifth** remark that should be made here, is that TeleTOP is not very well fit (technically speaking) for the course of action that is being been designed for 3TU. TeleTOP does not provide internal services that can be (re)used in an integrated fashion, nor does it provide external services. Also Blackboard or Moodle are not really ready for this future.

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[all publications listed here are documents in the Dutch language; they are available at http://www.utwente.nl/elo]

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