

Dynamic probing of educational quality: the SEIN system

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Introduction

This chapter describes the design and implementation of a web-based system for the evaluation of distance learning courses at the Open University of the Netherlands. The evaluation system is called SEIN, which is the Dutch word for SIGNAL. The SEIN system comprises the arrangement and publication of course-related electronic questionnaires and the highly automated collection and aggregation of the students' responses. From early 2007 SEIN has been in operation at most of faculties of the Open University of the Netherlands (Law, Arts, Environmental Sciences, Educational technology, Business administration and Psychology) and it covers up to some 200 courses. SEIN is thereby an important institutional quality assurance tool for the monitoring and evaluation of Open University courses. Next, we will first outline the educational context of the Open University of the Netherlands. Subsequently, we will identify important internal and external drivers for quality assurance, we will outline the relevant characteristics of the SEIN system, and we will describe the process of implementation. Finally, preliminary effects of the SEIN implementation will be presented.

Educational context

The Open University of the Netherlands (<http://ou.nl/>) provides distance education for about 18,000 students. Students live all over the country and abroad and study primarily at their homes, at the times they choose. The students population is highly heterogeneous, for instance with respect to age, personal ambitions and previous level of education. The average age is 40. Most of the students have regular jobs and study only part-time. The Open University of the Netherlands has 7 faculties offering accredited bachelor and master programmes. The programmes are modular in kind and are based on some 300 distance courses (course size is typically 120 hours). All courses are basically offered online: this includes learning tasks, collaborative work, online feedback, online support, courseware, audiovisuals and various learning resources, notwithstanding the fact that still many books are being used as learning resources. Course development and curriculum development at the Open University of the Netherlands are supported by the Educational Technology Expertise Centre (<http://www.ou.nl/otec>). While flexibility, openness and autonomy are the main characteristics of the Open University's pedagogy, students are free to choose when to study and at what pace. As a consequence, the common idea of cohorts of students has only little

importance: apart from occasional collaborative work, students choose their own learning routes that aren't necessarily synchronised with other students. This is not without consequences for the SEIN system, because it means that course completion by students is not fixed to a specific date or period, but spreads all over the year. This means that the SEIN system should support continuous evaluation.

Internal drivers for the innovation of quality assurance

Distance universities, like the Open University of the Netherlands, have to organise their quality assurance systems even more carefully than other universities, because the lacking opportunities of face to face contacts about courses or tutors urges to apply alternative quality systems and tools that provide feedback information. The emergence of the internet has effected radical change in the process of course delivery by distance universities. Printed materials have largely been replaced with online content and online communication. This trend and the consequences for evaluation and monitoring of course quality can be observed at various distance universities all over the world (Watt, 2002). Consequently, the existing quality assurance system needed a radical revision in order to match the characteristics of online delivery. First, online courses offer more flexibility and topicality than printed material and as a consequence the urge for quick student feedback is great. Secondly, the existing system used paper and pen surveys to gather student opinions, whereas an electronic system is clearly fit for the actual requirements: the existing system was not only expensive and laborious, it was also far too slow. Online delivery of course material allows much faster pace of revision or adaptation of content than the written courses. The life cycle of courses has been reduced from about 5 years in the past to sometimes months in the actual situation. The quality assurance system should meet these changed conditions (Boon & Ebrecht., 2006)

External drivers for the innovation of quality assurance

More than any academic plea on the importance of quality assurance systems, the signing of the Bologna agreement (European Ministers of Education, 1999) was a strong impulse for the renewal of quality systems in higher education in Europe. In all the countries involved, national agencies started developing frames of reference and procedures to secure academic quality. Obviously the reputation of universities was at stake and the existing quality assurance models were greatly challenged by the ambitions of benchmarking, mobility of students and possibilities to exchange European credit points (ECTS) between institutions. In the Netherlands and Flanders (the Dutch speaking part of Belgium) the accreditation of higher education institutes is controlled by the NVAO (Nederlands Vlaamse Accreditatie Organisatie, <http://www.nvao.net/>). It was established in 2003 by international treaty and guarantees the quality of higher education by means of accrediting programs. Accreditation means "awarding a hallmark that indicates that certain quality standards have been satisfied". The Netherlands and Flanders have chosen for accreditation of higher education at the level of study programmes and not at the level of the institution as is the case in most Anglo-Saxon countries. Naturally, the Bologna treaty has been an important external driving force for quality assurance in higher education.

Quality assurance approach

Hence the external pressure to renew the quality system as a consequence of the Bologna agreement went hand in hand with internal motivation to design a new quality system and the

supporting tools to monitor student opinions on quality of course material and services. An important principle of the institutional quality system is its cyclic character according to the Plan Do Check Act cycle (Deming, 1986). Figure 1 represents the PDCA-cycle.

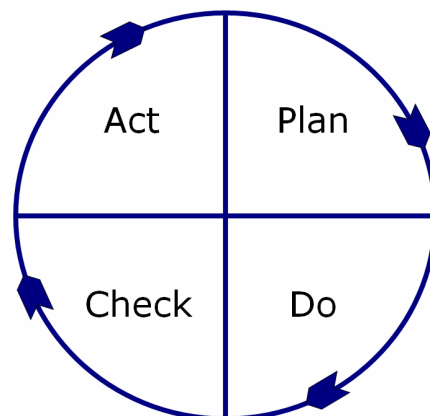


Figure 1. The Plan Do Check Act cycle according to Deming (1989).

The idea of the cycle is as follows:

- PLAN: Design the business process components
- DO: Implement the plan and measure its performance
- CHECK: Assess the outcomes
- ACT: Take measures to improve the process

The cyclic character implies that data are used on a regular basis to adjust policy and materials. At the Open University, the SEIN system is one of the central tools of the PCDA cycle. It is a web based, highly automated and user friendly tool at the institutional level, that provides continuous quality monitoring for the swift evaluation and interventions in courses and the benchmarking between courses and programmes.

Requirements

The educational context of the Open University of the Netherlands as described earlier resulted in a set of requirements for a new course evaluation system. First, the evaluation system would have to be compliant to the existing quality assurance frameworks of NVAO (<http://www.nvao.net/>). The framework of NVAO is elaborated by the organisation of Quality Assurance Netherland Universities (QANU) in the so-called Qanu protocol (Qanu, 2004).

This includes the incorporation of 6 dimensions of quality assessment:

- aims and objectives of the study programme,
- content and structure of the study programme,
- staff commitment,
- facilities,
- internal quality assurance,
- results.

Secondly, the new course evaluation system had to be automated as much as possible. Three major arguments underlied this requirement. First, the susceptibility for delay of the existing paper-based evaluation. Second, the desire to cover the whole population of students (18,000) and the whole range of courses provided by the Open University (300). Third, it should facilitate students to fill in the questionnaire at the moment and place most convenient to them. The automation should involve both the administration of the course evaluation system by the university faculties and the delivery of the questionnaires to the students. The

administration should involve a minimum of administrative acts for academic and supportive staff, that is, it should include (1) the possibility to assemble questionnaires from a pool of standardised questions as well as a facility to add and edit specific questions, (2) the automated aggregation and presentation of data, including relevant statistical parameters (e.g. means, standard deviations, percentages) and the option to select subgroups of students that satisfy specific criteria and (3) a facility that automatically selects and calls on students for evaluation by notifications and reminders.

Description of SEIN

At the start of the SEIN project, in 2003, the decision was taken to develop a new software system rather than buy an existing one. Although several commercial tools for online evaluation were obtainable, it soon became clear that the tailoring of these tools to the Open University's specific needs and context would be quite problematic. Therefore it was decided to commission the Educational Technology Expertise Centre to develop the evaluation system. Starting point, though, would be to make maximum use of the existing infrastructure of platforms, tools and servers in order to limit the efforts needed for new software development. As a consequence, the technical implementation of the SEIN system is quite complex showing a hybrid structure of linked components of different development technologies (e.g. ASP, Soap, FTP, Toolbook, Delphi, Pascal).

Within the scope of this chapter a simplified functional description of the system will be sufficient. The SEIN system basically provides individual teachers of the Open University with topical evaluation data of students by combining a questionnaire publication system with an automated data collection and report function. The process is co-ordinated by local administrators that have been appointed for each department. Each local administrator works closely together with teachers to create course questionnaires and published these on a web server to allow easy access by students. Once a week the SEIN system checks the students administration database to select the students have completed their course (or rather the students that have completed their exams). Subsequently, SEIN automatically sends an email notification to these students with a request to fill in the involved course evaluation form. If appropriate SEIN also sends reminders. Student response data are collected in a database. The local administrators regularly generate evaluation reports that reflect the students' appreciations of the course and forward these to the teachers involved. Subsequently, the teachers of the course may decide to make revisions to the course. Figure 2 displays the outline of the SEIN system.

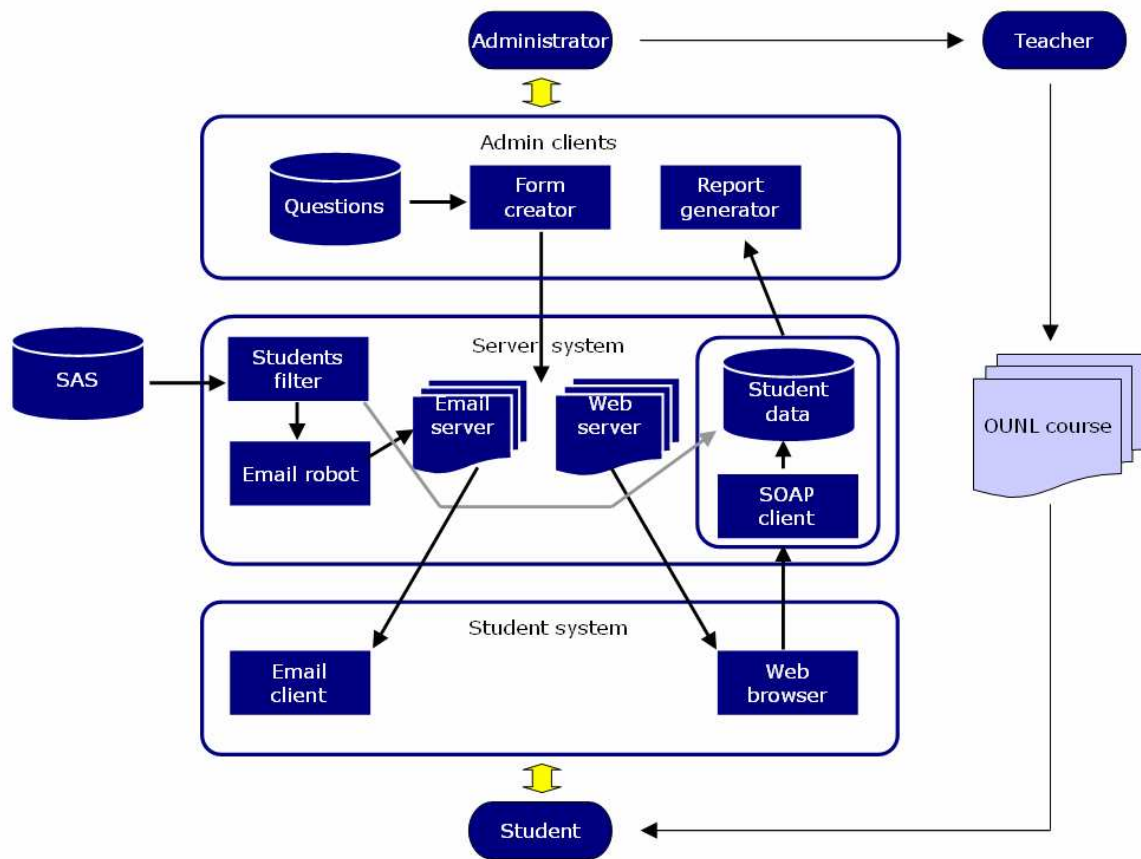


Figure 2. Outline of the SEIN system

The SEIN system can be considered to consist of three sub-systems:

- the SEIN administrator client system
- the SEIN server system
- the SEIN student system

The SEIN administrator client system

For reasons of efficiency and co-ordination each educational department has appointed a local administrator who is responsible for the arrangement of questionnaires and the handling of evaluation reports. Teaching staff has only viewing rights for the system. Each local administrator has a set of client programs available that contain three sub-systems:

- Form creator
 - This client application is used for the creation, modification and management of questions and the arrangement and publication of evaluation forms. It includes various integrity and validity checks to warrant correct forms. Figure 3 shows one of the screens of the form creator.

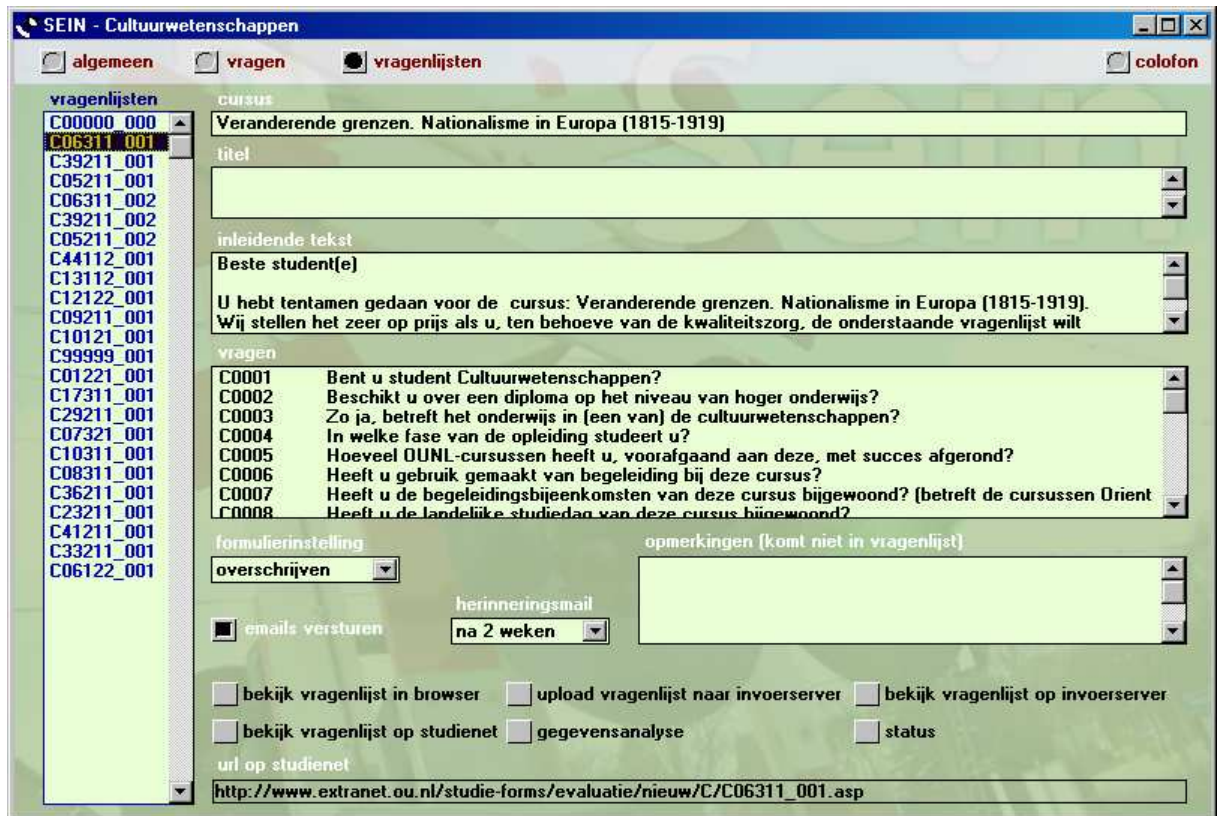


Figure 3. One of the screens of the form creator

The local SEIN administrator uses this screen to create the forms and to upload these to the web server. The buttons at the top are used to switch between different screens. The left hand side of the screen displays a list of the forms that have been created before. The large field in the middle of the screen shows a list of the questions that are added to the current form. The other fields are used for entering or editing of questions. Also various form properties can be set by the administrator.

- Questions database
The evaluation form creator uses a local database that enables the easy reuse of existing questions and forms. It stores an initial set of fixed standard questions as well as new or modified questions that are created on the local client system.
- Report generator
This application allows the administrator to create evaluation reports. It offers various lay-out templates that produce rich text files and it contains various filtering functions to select and aggregate meaningful data. Figure 4 shows the report generator.

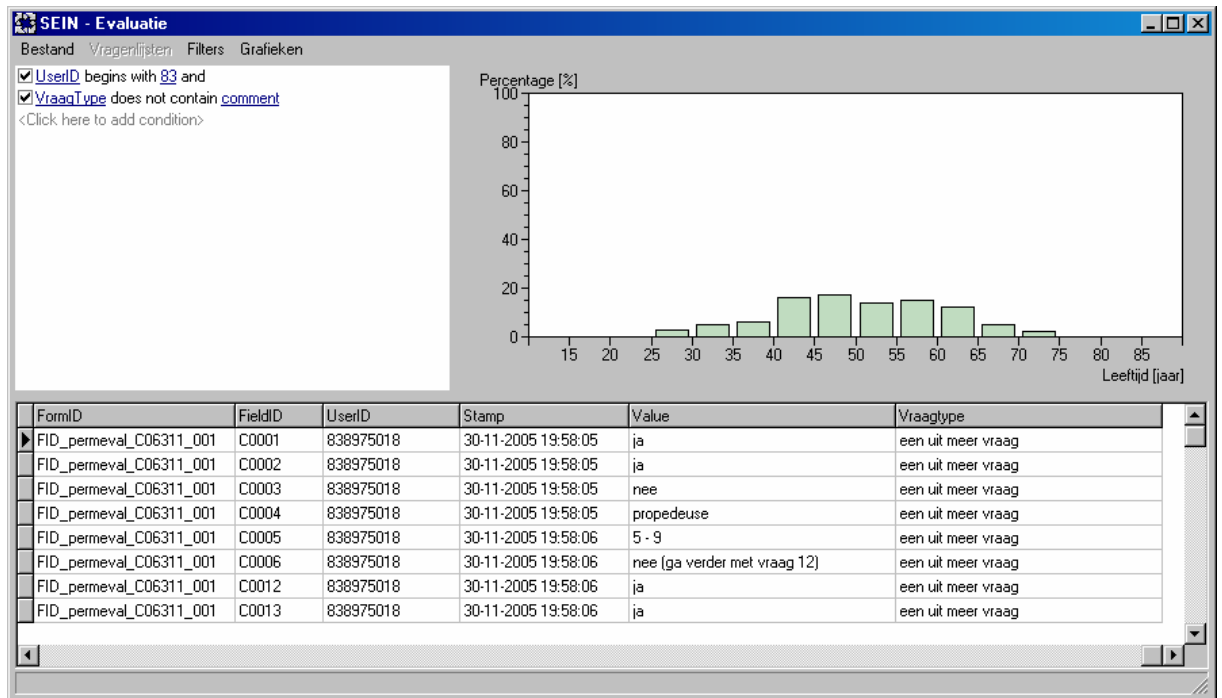


Figure 4. The report generator.

The upper left part of the screen displays conditions that can be set to filter the student data. The upper right part shows one of the graphics, in this case the age distribution of the selected students. The bottom part of the screen contains all original student data. This enables the SEIN administrator to screen the data before taking decisions on filtering conditions. By using one of the menu options the administrator can generate a template-based report (see appendix 1 for an excerpt). After creation of the report, the administrator forwards it to the teacher involved, who may be prompted to make revisions to the course.

The SEIN server system

The SEIN server system contains various components:

- Web server
The empty forms are uploaded from the admin clients to the web server by FTP. The existing configuration of web servers of the Open University has been used. This configuration includes a pre-publication infrastructure that enables previewing of the forms before making them available for students.
- Mail server
This is the regular mail server of the Open University. It enables the email notifications to the students.
- Student filter
This application comprises the selection of students that need to be notified for evaluation. The application consults the student administration system (SAS) through a tailored interface and makes available the records of all students that have taken an exam during the last 7 days. Naturally the data contain email addresses and course information. This process runs once a week.
- Email robot
This application automatically controls the notifications to students. Once a week it

reads the student filter data and produces a series of email messages for each course, provided that a form for the course has been made available at the web server. The message contains course-specific information and a link to the right evaluation form. Reminders are sent after 14 days to students who did not respond.

- SOAP client
This application saves the contents of the forms into a database. It is part of the existing virtual learning environment infrastructure of the Open University.
- Database server
This database server stores the collected student evaluation data. It concerns an SQL-server that is part of the existing virtual learning environment infrastructure.

The SEIN student system

The student side has been kept very simple. It uses two standard applications that are available at any computer:

- Web browser
Students use a browser to access the forms.
- Email client
Notifications are accessed through a regular email client.

It should be noted that quite some technical details have been omitted in this outline of the SEIN system. These omissions include the pre-publication server infrastructure, the authorisation and authentication system for many thousands of users, data replication and additional user roles for support and system management. The drawback of making use of many existing software components is that various technologies and platforms are incorporated. Table 1 lists the main technologies and development platforms that have been used.

SEIN component	Technology/platform
Form creator	Toolbook Instructor Borland Pascal ftp
Question base	Toolbook Instructor
Report creator	Borland Delphi
Web server	Microsoft Windows Server (ASP, http, ftp)
Web forms	ASP SOAP
Mail server	Microsoft Exchange Server
Student filter	Oracle query extension
Email robot	Borland Delphi
SOAP client	Borland Delphi
Database server	Microsoft SQL Server

Table 1. Technologies and platforms used in SEIN

Because of the various system component data exchange between components occurs frequently, which may affect system stability. Indeed, in case one of the servers would be

down the highly automated SEIN processes would be disrupted and the SEIN system would fail. This has been anticipated by incorporating various data transfer checks.

The implementation route

An important starting point of the SEIN system is that responsibilities for the quality assurance system should be decentralised in order to avoid unnecessary bureaucracy and centralised control and to keep the PCDA-quality cycle as concise as possible. Faculties would be responsible for the appropriate evaluation of their courses. Therefore, an important focus of the implementation strategy was to enable the faculties to manage the evaluation system and embed the system and the associated activities into their regular workflow. With this in mind the SEIN implementation strategy was designed to comprise four stages:

1. Sensitisation of managers
2. Instruction of users and trials
3. Full implementation
4. Involving and informing students

Note that these phases are somewhat different from existing implementation strategies, as defined by Rogers' diffusion theory (Rogers, 1962/2003) or Business Process Redesign (Davenport & Short, 1990). While Rogers's diffusion model presupposes that individuals autonomously decide whether to adopt or to reject new technologies, the implementation of SEIN has been decided upon by the authority of the university's board. Naturally, Rogers' focus on awareness, interest, knowledge, persuasion, trial and confirmation remain of great importance and are reflected in the SEIN stages. Business Process Redesign, also known also Business Process Re-engineering or Process Innovation, aims for a radical and cross-functional redesign of processes. In the SEIN case, however, only a modest improvement of the quality cycle is intended, without affecting the core of the business processes. In the next paragraphs we will elaborate the four stages.

1. Sensitisation of managers

Since the faculty managers would have to allocate sufficient staff capacity to carry out the evaluation process, their support for the SEIN operation would be crucial. Therefore, the first step of the implementation involved the sensitisation of managers. Faculty managers were informed of the functioning of the SEIN system and its implications for the (existing) tasks and roles of the staff members in their department. In view of the internal and external drivers for quality assurance, the managers needed to develop correct and realistic expectations of SEIN rather than being convinced of SEIN's importance. In particular, it was important to agree about the tasks that were necessary to exploit SEIN and the degree of support that would be necessary from the Educational Technology Expertise Centre. For example, the unjust assumption that the Educational Technology Expertise Centre would carry out all the statistics processing had to be denied and translated in clear role descriptions and activities. Furthermore, the sensitisation stage covered the following issues:

- The importance of developing one standard questionnaire in each department from the perspective of workload reduction and comparability of course evaluation.
- The importance of using short questionnaires in order to maintain the willingness of students to respond, which indeed is a crucial factor in the permanent evaluation.
- The appointment of a local administrator in each faculty that is responsible for the creation and management of the course questionnaires as well as the creation and distribution of reports.

- Procedures on how to respond to the evaluation results; in particular, what quality improvement actions are needed under what conditions?

2. Instructions and trials

Even more important than the sensitising of the faculty managers was the sensitising of the users. At this stage a first group of staff members of each faculty were appointed to get acquainted with SEIN. To this end, demonstration sessions were organised in which SEIN was explained and discussed. The sessions not only covered operational trivialities of the SEIN system but also encouraged the participants to consider and reflect on the opportunities of SEIN and its organisational consequences. Different roles of the local administrator and teachers were clarified and intentions were explained. A first version of the SEIN software was installed on the designated computers and the staff members were authorised to (1) access the database with questionnaires and to (2) publish the questionnaires on the web server. Also, trials were carried out with some Open University courses to test and evaluate the SEIN system in operation. Unfortunately, these pilot implementations of SEIN initially revealed quite some technical problems and instabilities. After improvement of the software and the use of additional checking routines, the system demonstrated its power in automated processing and enthused the future users. During this stage, the necessity of an institutional user platform was recognised, which enabled users to exchange ideas and experiences.

3. Full implementation

Large scale implementation of SEIN in the Open University was not straightforward. The differences in culture and expertise on evaluation between faculties were quite large. Faculties that were already advanced with the organisation of a quality assurance system were more inclined to integrate SEIN than faculties that just started thinking about amplifying quality assurance. Fortunately, upcoming visitations for accreditation created a sense of urgency within the reluctant faculties to adopt the SEIN system. To further the implementation, local change agents in the faculties were appointed, who worked in close co-operation with the SEIN team to support and supervise the initial use of SEIN in the faculties. Support comprised technical assistance as well as support at developing concise, informative and standardised questionnaires.

4. Involving and informing students

An important part of the implementation strategy comprised informing and involving the students; indeed, their role is crucial in the evaluation. Since education at the Open University provides little opportunity for face-to-face contacts between instructors and students, specific channels had to be used for communicating with students about the new evaluation system. To this end the following actions were taken:

- A paper in the Open University's student journal about SEIN and its background and purpose. In particular, the significance of SEIN for students of the Open University was emphasised.
- A public announcement on the website of the Open University of the Netherlands: (<http://www.ou.nl/eCache/DEF/10/919.html>)
- Announcements of SEIN in news reports on various sites of the open University's virtual learning environment.

- A personal letter explaining the background, purpose and value of SEIN and an invitation to participate in the course evaluation is sent to students who request for new course materials.
- Informing employees of the Open University's student helpdesk about SEIN.
- The use of an inviting, user-friendly and concise notification message that students receive after taking an exam for a course.

Evaluation

Currently, the SEIN system is being used by 6 faculties (Law, Arts, Environmental Sciences, Educational technology, Business administration and Psychology). In all, this concerns up to 200 courses by early 2007. More than 100 members of Open University staff are involved in the course evaluation cycle that is linked with the SEIN system. Currently, the SEIN questions database contains a large number of questions: 30 standard questions that can be reused in various domains, 200 specific questions and 150 questions about research and thesis projects. Questions cover 6 main categories: content, print, electronic media, exam, study load and support. While all questions have been screened, the question bank allows quick assembly of high quality questionnaires.

Without downplaying occasional problems with software stability, the first experiences with SEIN are encouraging. Users appreciate its user-friendliness, confirm that its use is time-saving and value the usability of evaluation reports in view of course quality. Even though no representative data of student responses are available yet, it appears that many students respond very soon after having received the notification. Several system characteristics of SEIN may play a role here: the short time between completion of the course and the receipt of a notification, the accessibility of the questionnaires, the compactness of the questionnaires and the single button ease of submitting the evaluation form.

Yet, the SEIN implementation did not go without problems. Unfortunately, the moment SEIN was introduced most faculties faced radical cutbacks of budget and reduction of staff. Remaining staff was largely overloaded with extra tasks. This has reduced the readiness of remaining staff to adopt SEIN. For the SEIN team it was necessary to increase the level of support, for instance by defining and checking high quality questions, by helping to publish the questionnaires or by creating specific report lay-outs. Sometimes, substantial persuasiveness was necessary, for instance when some of the staff members perceived the SEIN system as a threatening means for staff assessment. In some faculties where the use of statistical methods is less common, staff members were reserved because they did not want to be engaged in statistical analyses. During the training sessions these issues received extra attention.

The Open University's open education system and the associated freedom of study pace appears to effect large differences in the ways SEIN is being used. For small faculties, or rather for courses with small numbers of students, it may take a long time before a report can be generated that is sufficiently representative. In contrast, faculties with large student populations can expect responses in a short period of time. These differences are reflected in the frequencies of report generation. A small faculty such as the faculty of Natural Sciences has chosen for an annual report, whereas a large faculty such as the faculty of Business administration has chosen for trimester reports. Also, these differences called for modifications of the report tool design, in this particular case by enabling the definition of variable report periods.

While the basic premise of SEIN is the willingness of students to respond to the questionnaires, a current concern on the institutional level is that students may get overloaded

with online questionnaires and response rates will go down. This would greatly affect the intended quality assurance model. In order to keep ensured of the students' commitment it is arranged that they receive frequent feedback about the results and the measures that have been taken to improve the courses. For the same reason, student panels have been established that discuss quality assurance issues of the Open University.

Now that SEIN is operational for some time, it turns out that the users are better able to express their ideas and desires about the functions of SEIN. Occasionally, additional system features have been added already in order to preserve the staff's enthusiasm. For reasons of management and cost, however, new suggestions for SEIN functionalities are collected without instant implementation, but as possible ingredients for future upgrades. A decision on upgrades will be dependent on the outcomes of an institutional evaluation study that runs until mid 2007. This evaluation study examines the functioning and appreciation of the SEIN system as part of the Open University's quality assurance system.

In sum

The SEIN system is a sophisticated piece of tailored software that improves the quality assurance cycles of Open University courses. Although technical problems and reluctance of staff hampered swift implementation, additional efforts and support have created a shared enthusiasm and utilisation of SEIN in (almost) all educational programmes of the Open University of the Netherlands.

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Appendix 1: Report specimen



Report of the course

Introduction to psychology

S12112_001

458 students answered the questionnaire, 27 questions

Statistics

1 AL0012

To my opinion this course is highly suitable for self-study

number of respondents 452
response percentage 98,69
question type multiple choice

<i>Possible answers</i>	<i>percentage</i>
totally disagree	0,66
disagree	2,88
agree nor disagree	4,20
agree	39,82
totally agree	52,43

...

9 S0004

How much time did you need to study the course?

number of respondents 116
response percentage 25,33
question type multiple choice

<i>Possible answers</i>	<i>percentage</i>
< 100 hours	8,62
100 - 150 hours	14,66
150 - 200 hours	21,55
200 - 250 hours	34,48
250 - 300 hours	15,52
> 300 hours	5,17

...

18 S0011

How do you rate the quality of the content on this course. (Rate between 1-10)

number of respondents	116
response percentage	25,33
question type	rating
mean	7,89
standard deviation	0,83

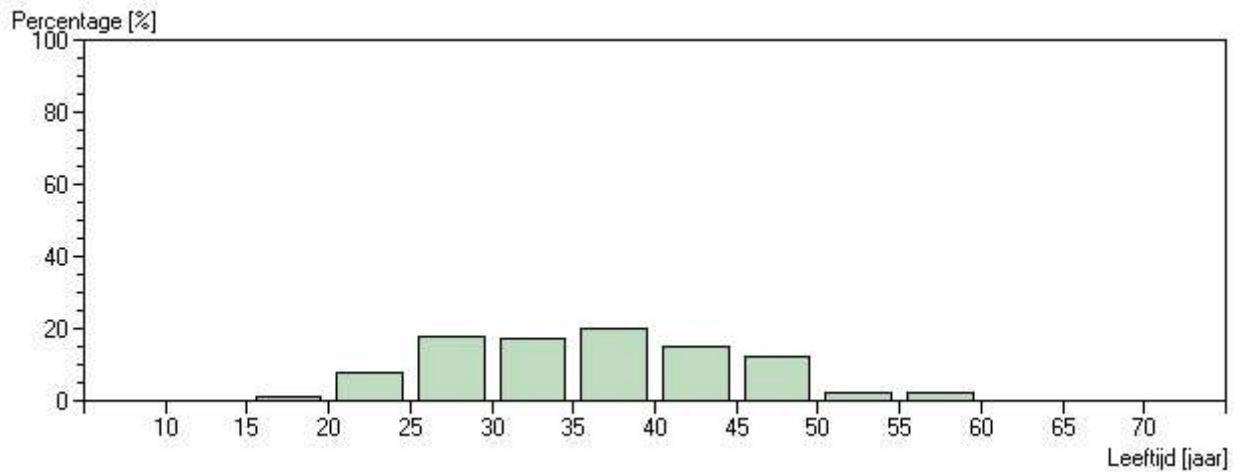
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27 ST0026

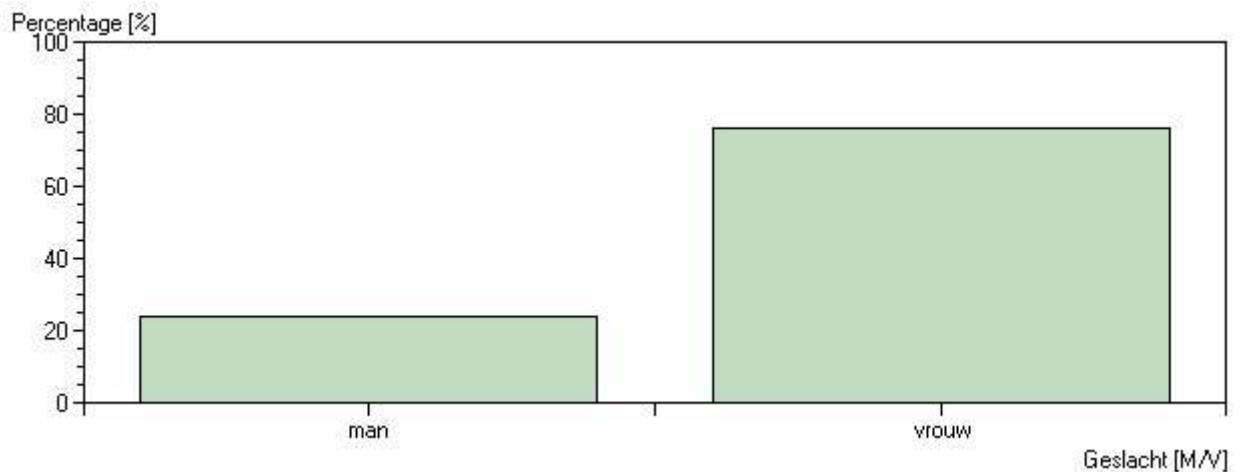
Give your remarks or questions about this course

number of respondents	43
response percentage	9,39
question type	open

Distributions



Age



Gender