Abstract: This paper looks at the process of managing large numbers of exams efficiently and secure with the use of a dedicated IT support. The system integrates regulations on different levels, from national to local, (even down to departments) and ensures that the rules are employed in all stages of handling the exams. The system has a proven record of handling large quantities of students on campus; it has been in production since August 2000 and the improvement with scanning the exams since February 2008. The scanning has brought about an increase of service to the students and support for the examiner in handling an ever increasing number of students. The work to include support of e-learning in this process has been started so that the benefits of standardized handling of exams can be incorporated in the flexible learning concept. This work contains three challenges, train the one time proctor, handling reports in a standardized way and develop system integration for sharing information between systems.

Introduction

The management of exams of large groups of students is a daunting task for on campus education that has the prospect of becoming overwhelming in an off campus setting. At the Department of Computer and Systems Sciences (DSV) at Stockholm University we have developed IT support for the on campus setting, and we are now starting the work to extend this system for use in the off campus setting. In all exams you need to follow rules and regulations. For instance there is a need to verify the identity of the student, detect the use of non-approved material; grading should be done according to the time limit set by the regulations. Also local regulations need to be taken into consideration; like in the Stockholm University all written exams should be anonymous in the grading process.

There are also administrative issues management needs to consider in handling large scale of examinations. This should meet the need for efficient handling of large numbers of written exams, maybe anonymous, that need to be matched with the individual student in a secure way. Also it is a logistical challenge to distribute graded exams securely.

In some aspects the ODL setting poses more challenges and calls for a more novel handling to provide a working management of exams. This paper will explore a novel way of solving the on campus handling of exams and propose an application of this for the ODL setting. The novel handling of the written exams on campus includes a system of automatic seating, anonymization and electronic distribution of anonymous exam papers to correct student. The on campus solution has a proven track record that now needs to expand into the field of ODL. We are only addressing the management issues in this paper, the issues of identity are in the realms of other past and future papers. The work in progress presented in this paper is conducted by the departments unit for Flexible Learning, the unit is involved in several projects aiming at providing a more flexible learning context for students and professors, both on and off campus. In the field of examinations, projects currently underway in the department are addressing various matters such as plagiarism, secure online exams, using video in online learning, management of exams and management of thesis process.
The work so far

Before the formation of the unit for Flexible learning the focus on the departments development of support was clearly on on-campus activities, with the formation of the unit for Flexible Learning the focus is on transforming the state of mind towards blended learning, both for on and off campus activities, this goes all the way from the physical environment in the form of lecture halls to training faculty in adopting the new era of learning. During the 18 months that the unit for Flexible Learning has been in operation several projects to support this drive has been started.

Support system for distributing video materials, both as support for on campus activities and for distance courses, this involved developing a video server http://play.dsv.su.se/ that automatically handle input from the lecture halls or manual upload from other sources. For editing of videos by adding links and chapters HyperCaster http://sourceforge.net/apps/trac/hypercaster/ was developed in cooperation with partners, see Figure 1 below for an example of links and chapters in a finished video presentation. Both of these systems aim at providing support for the new students coming into higher education and their need for a more individualized education. (Wettergren et. al 2009).

Figure 1: Example of Hypervideo application: describing reference styles and systems

A system to support the thesis production process is currently under production (SciPro, teaching and validation of the scientific process and outcomes), the system consist of three separate parts, a matching process that brings student ideas together with supervisors field of research and interest, a tool to support both student and supervisor during the thesis work and support for administer the seminars. (Hansson et.al. 2009) The matching component has been successfully used for the spring semester 2011 and a skeleton support tool is in place that are further developed in line with the aim of providing higher quality and higher degree of completion of thesis work on all levels, see Figure 2 below for some of the benefits this system aims to bring to the learners and other parties.

Initial initiative to develop IT support for the study administrative process at the department was in 1999 when a student project was expanded to develop a system (Daisy – DSVs Study administrative System) to support a long range of administrative functions in the educational activities at the department. The point of departure was that the setting was traditional learning with lectures, laboratory work and seminars. This system supports all aspects of delivering university education on campus and has been under constant improvement since the first implementation in autumn 2000. Some of the functions supported are scheduling, registration of students (for autumn 2011 upgraded for self registration for students), grading of assignments and exams, follow up of production in courses, units and departments. At present it is used at 7 departments in 2 universities.
One challenge has been to provide support for the exams that are in compliance with rules and regulations, both on the national and local level. On the national level the exam process needs to follow rules on identifying the person taking the exam, make sure no unapproved material is used or that no cooperation is taking place between students, graded exams has to be delivered to students within a certain time limit. There is also various local roles regarding exams, for instance that all exams has to be anonymous in the grading process.

Another challenge is to handle this on a large scale without unnecessary delays for the student and make the process standardized to ensure the rules and regulations is adhered to with limited recourses in regards to administrative support. The challenge is thus both qualitative, in making sure the standard process ensure equal and fair handling of each and every exam smoothly handled, and quantitative, in handling an average per semester of more than 300 separate written exams with up to 400 students taking the individual exams and at least as many exams in the form of laboratory work, assignments and reports. Each student takes an average of 4-6 written exams per semester.

**Management of on campus exams**

In order to facilitate the management of exams the study administrative system has functions for scheduling the exams, exam seating’s, exam logs, grading and reporting etc. Scheduling includes assigning a date for when the registration for exams opens and closes, deadline for when the grade has to be given to the student as well as booking of halls for exams and planning of staff for proctoring.

One important factor in handling the written exams as per regulations is to make the seating assignments of students in a random fashion, to prevent unapproved cooperation. At the same time the operator should be able to control certain parameters in the seating, like placing students from the same course in specific halls. The system gives full freedom for the operator to place groups of students in a preplanned way, but the system places each and every individual student randomly within this plan. After the seating is accepted by the operator all necessary paper are automatically printed, the students that has signed up for exam are notified on what hall they have to go to for the exam see Figure 3 below for example on how information on upcoming exams are presented, date and time are also included in the students personal study schedule.

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**Figure 2**: Target groups and major benefits of the Sci-Pro system
Figure 3: Information on an upcoming exam in the student’s view of the system

The papers printed are notice for notice boards, protocol for the exam where each student present are noted, coversheets for each individual exam containing an optical code, hall and seat, details of the exam (see Figure 4 below) and notice on how many sheets have been handed in, verified by the proctor. After grading the grade is also noted at the cover sheet by the examiner.

Figure 4: Example of top part of cover sheet for exam

A daunting task in managing some 5,000 students taking 4-6 exams each among the 300+ exams given each semester is to store and distribute the exam papers to the correct student, this made up more than half of the work for the administrative staff and the department was facing an increasing number of students taking even more exams each semester, and this in conjunction with the prospect of having to implement anonymous exam papers during the grading process inspired the development of a new management process for written exams. The IT support for this new process was included in the system that already was in use. In order to save work on handling the exam papers the cover sheet was introduced, the coversheet contains an optical code the system can read.

At the exam the student places all answer sheets in a plastic pocket with the cover sheet on top; the proctor verifies the number of papers being handed in and signs the cover sheet, after collation with the protocol the exams are handed over to the examiner. After the examiner has graded the exams, giving feedback to the student on their solutions, the examiner hands the exams to the management staff for scanning. The grades for each exam are noted in the system by the examiner and once the grading is complete the grades are visible for the student. After scanning the support system divide the file in separate exams and inserts a link for the student and the examiner and the exam papers get stored in the archive. Figure 5 below is how the exam is presented to the student, the C indicated the grade
of the exam, the green tick indicates that the grade has been uploaded to the national study records and the icon with binoculars is the link to the student’s exam paper.

![Introduktion till programmning (ID: INP), 7.5hp](image)

**Figure 5:** Example of presentation to student of scanned exam.

When the rule with anonymous grading process was introduced all that needed to be changed was to remove the name and identification from the cover sheet and substitute this with the hall and seat, and introduce a routine by the proctor to check that the student are seated according to the information on seating in the system. All information on each students seating (place and hall) are already in the system. The examiner has no name or other identifications on the exam when grading, and enters the grade in the system according to the hall and seat for each exam. Figure 6 below gives an example of the cover sheet of a graded exam with marks for each question and the grade for the exam; it also includes the number of pages handed in and verification by the proctor. After the grades have been finalized the names of each student become visible for the examiner for the event the student ask for re-grading. Figure 7 is an example of the examiners view of a graded exam where the name and identity of the students are available (blurred in the picture) as well as the placement and grade, with link to the scanned exam papers. The system can handle students from different universities (with different rules) on the same exam, the students with anonymous grading are only shown with seating information and the other students are shown with name on the cover sheets and exam rooster for the examiner.

![tisdag 30/11-10](image)

**Figure 6:** Example of graded exam, scanned cover page.

![Examiners view of a graded exam](image)

**Figure 7:** Example of graded exam, examiners view.
The system with scanning of graded exams has been in use since February 2008, and anonymous grading since August 2009. During this time manual handling of some 50,000 exam papers have been saved, and the service to the student increased by making the exam available faster and accessible in a more flexible way for the student. The standardized way of handling exams with IT support has increased the legal security for the students and the transparency in the system has made follow up by the examiner a lot easier, the scanning facilitates more efficient contacts on matters regarding the exam between students and professors, as both parties have access to the same scanned exam paper the need for photocopying and manually handing in the papers to clarify any question on the grading is minimized, and the matter can usually be solved in a very short timeframe compared to making appointments for meetings and discussions.

Transforming to flexible learning

By flexible learning we mean learning taking place in a setting that may involve on campus activities as well as off campus activities designed to provide an flexible learning situation that are considered to be appropriate and in line with the rapid evolving context of the modern world. (Clarke et.al 2009) This is learning that is adaptable by the learner to fit the everyday situation that the learner experience in social context, work context and IT skills. For support of flexible learning the systems supporting this also need to be flexible if there are to be a truly flexible experience, inflexible system will hinder the implementation of flexible learning. (Shureville et.al 2008)

The flexible learning challenge on the management of exams contains several elements that the improved system needs to handle:

1. Traditional written exams will be different; students may take the exam at the local library, local study center or a similar institution instead of traveling to the university.
2. Written exams may be substituted by hand ins.
3. Reports and laboratory work may be administered and handed in through a learning platform.

It is probable that there will be more hurdles to overcome in the development of the new generation of support for management of exams, but these three challenges indicates at least three different approaches that need to be handled to provide support to a secure and efficient management of exams in the flexible learning setting:

1. The manual handling of written exams in the distributed setting needs to be streamlined so that the persons handling the local student in an easy manner can fulfill the regulations of conducting the exam. This involves development of easy and understandable procedures that almost any person can be educated in on their own; the present procedure requires a short training that introduces the procedures.
2. Handling of exams other then written exams in halls involves development of support for the student to hand in their report via the system instead of directly to the examiner. From the users viewpoint this is probably not a big problem as it will only consist of handing in the exam in another system then at present. The bulk of the work needed is technical to handle various types of files, ensure secure handling of the report being handed in and develop tools for the examiner to read and grade the report on line, which is the major change for the examiner.
3. This is the major technical challenge as it involves the transformation of information and documents between systems, where the system used as pedagogical platform may be closed and not containing modules for integration with other systems. In this case the study administrative systems development may involve development of integrating modules in other systems.

As the Daisy system is presently being revised to also handle exams in the flexible learning setting work has begun with in particular point 2, handling other form of exams then traditional written exams. First stage of this has been completed by remodeling the object model to handle exams in general and exams consisting of reports in particular. The future system will also involve the possibility of making the grading of these types of exams anonymous if this rule will be extended to involve all types of exams and not only written exams as presently. We are also introducing online handling of exam parts (separate tasks that is only a part of an exam, similar to questions on a written exam) in the same standardized way ensuring all regulations are adhered to.

For handling of written exams delivered on line there is a ongoing project in cooperation with Kryterion Inc http://www.kryteriononline.com/ to test the online proctoring function with secure identification of the student taking the exam. This is to be able to offer a more flexible form of exams for learners not able to attend a traditional exam.
This service offers another challenge for the management of exams in the form of exporting the exams to the study administrative system and ensures that the anonymous grading is not compromised when there is a mixture of traditional and online exams, this problem already exists in on campus exams as some students with disabilities are taking the exams with the help of computers. As this test has not reached a conclusive results yet it is hard to say what the impact on the management will be, the new system will include modules to import data and exams from external systems. This leads in to point 3 above; the system currently being revised will have to include general components to import not only exams taken in other systems but also any grades assigned in external system. It is also expected that grades assigned in the management system should in some instances be exported to external system.

Regarding point 1 above the handling is not so much a system issue as develop more easily accessible training materials to make it possible for one time proctors to be trained in just a few minutes on how to handle the exam to fulfill the regulations and ensure that each student taking an exam, no matter what the context are, get the same possibilities to fair and secure grading and administration of the exam.

Concluding remarks

The transformation of a standardized handling of exams to a flexible learning environment offers several challenges that need to be addressed in order to provide an efficient and secure management of large scale of exams. As more flexible alternatives become available for students the number of exams will most likely increase, several of the courses given at the department the student has the possibility to chose between on campus or on line settings and the number of students attending on line courses are increasing, already there are online courses that have students in the range of several thousands. To manage exams for such a large group of students with manual routines will not be possible if all the regulations are to be adhered to.

As some of the challenges have been handled in the on campus context by implementing a standardized and secure handling of all the aspects of delivering exams to a large number of students the ground work in handling this has already been done. The fact that the study administrative system is being revised presently have presented a good opportunity to draw from this experience and adopt the new system to also include the flexible learning context in the handling of exams, thus making it possible to expand in this field as well.

References


