CBT development limits test development?

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Introduction

The Dutch Government commissioned Cito to construct the national final examinations for secondary education, some 600 in total each year. Approximately 200,000 16 to 18 years old candidates take them. 100.000 of them take the exams at the end of the prevocational education.

Cito develops exams for nearly all school subjects. Exams are held at least twice a year and take place within the schools. Marking is done by two teachers, one of whom is the students' own teacher.

For the final examinations Cito has to deal with the production of both paper-and-pencil tests and computer tests.

This paper describes the choices which have to be made in a hybrid system and the difficulties we meet to keep right up the best things of both testing methods paper and pencil tests and computer tests. Flexibility is high on the agenda of Dutch schools and Education authorities.

Now a days the decision makers want new kinds of tests in which the computer is used instead of paper. The computer permits to give different questions to different pupils at the same time. But paper is much more flexible than a computer in the way answers can be given.

Dutch schools all are online, which opens possibilities for a fully web based assessment system. But what is online? Cito has to deal with a wide variety in bandwidths, intranet systems, firewalls, and proxy servers. Furthermore, schools use a mix of Operation Systems, Media Players, and Browser applications. Under these circumstances Cito has to deliver multimedia examinations with video fragments and sound tracks simultaneously to 200.000 candidates. How can this be done? And as test developers we even ask more facilities from CitoTester. We want the Dutch exams in the prevocational education to look more and more like the real live with Microsoft Office, Internet, Stabicad, book keeping programs and so on.

CBT development limits test development?

When planning ICT in a test one calculates advantages and disadvantages. What kind of knowledge, skills and attitudes are possible? At the moment the schools are training their pupils at showing competencies. Knowledge is not enough. A pupil must act in the right way and must know why acting like this with awareness of risks for itself and its attendants.

We are developing CBT examinations in the Netherlands integrating knowledge testing and theoretical and practical skill testing. We want to use one ICT system to test each of them separately or both of them at a time.

We evolved from paper and pencil tests to overall CBT with the software Citotester. Using a question viewer asks for an item construction bank that allows all kind of questions.

At the moment we use Citotester for low stake exams. When using it for the high stake exams, as for example in high school exams, we must tackle problems like how many computers are available in the school at one time and can we make equivalent exams to be used at successive moments.

The presentation will show some examples of the use of CBT in a complex situation.

Combining practical and knowledge testing

There are different kinds of final examinations in the prevocational education. The examinations are tests for knowledge or practical hands-on tests.

In the Netherlands we are now looking for integrated possibilities in the examinations. Combining practical and knowledge testing is the aim.

The kind of testing is changing. We want to use a wide variety of question types. We want to make the test looking as much as possible as the real live. The pupils will meet situations likes these in the after school live as a labourer.

Unfortunately this real live is mostly condensed in a simulation because there are no possibilities for the schools to have enough real labour places at companies for the examination.

An example of an assignment: Imagine you are organising the welcome of foreign guests at your school. Plan and prepare a meal for ten persons visiting your school. In the end explain the guests your way of working and how you are aware of the hygienic precepts.

For this kind of assignment it is easy to use paper because one can use different kinds of formats for the questions and give many supplements.

Computer testing is regarded as a modern and efficient way of testing.
Decision makers want to replace paper tests by computer tests. Computer tests are easier to deliver at the schools and one can use more variations to keep the assignments secret for the candidates that are starting at a later moment.

At the same time the decision makers want to combine testing practical and theoretical skills and pure knowledge. In order to do so a new way of national examination has recently been developed. In the Netherlands they call it the central paper and practical examination (CSPE) at the end of the vocational course.

In these tests the computer is used in two ways:

In the first place the pupils get instructions to act as a professional making or repairing things. We give the instructions to do so on paper but often the work is done on a computer.

For example: A client wants to have a new wastewater installation in his house. Make a calculation how much it will cost and make a quotation for the client to make a wastewater installation in his house.

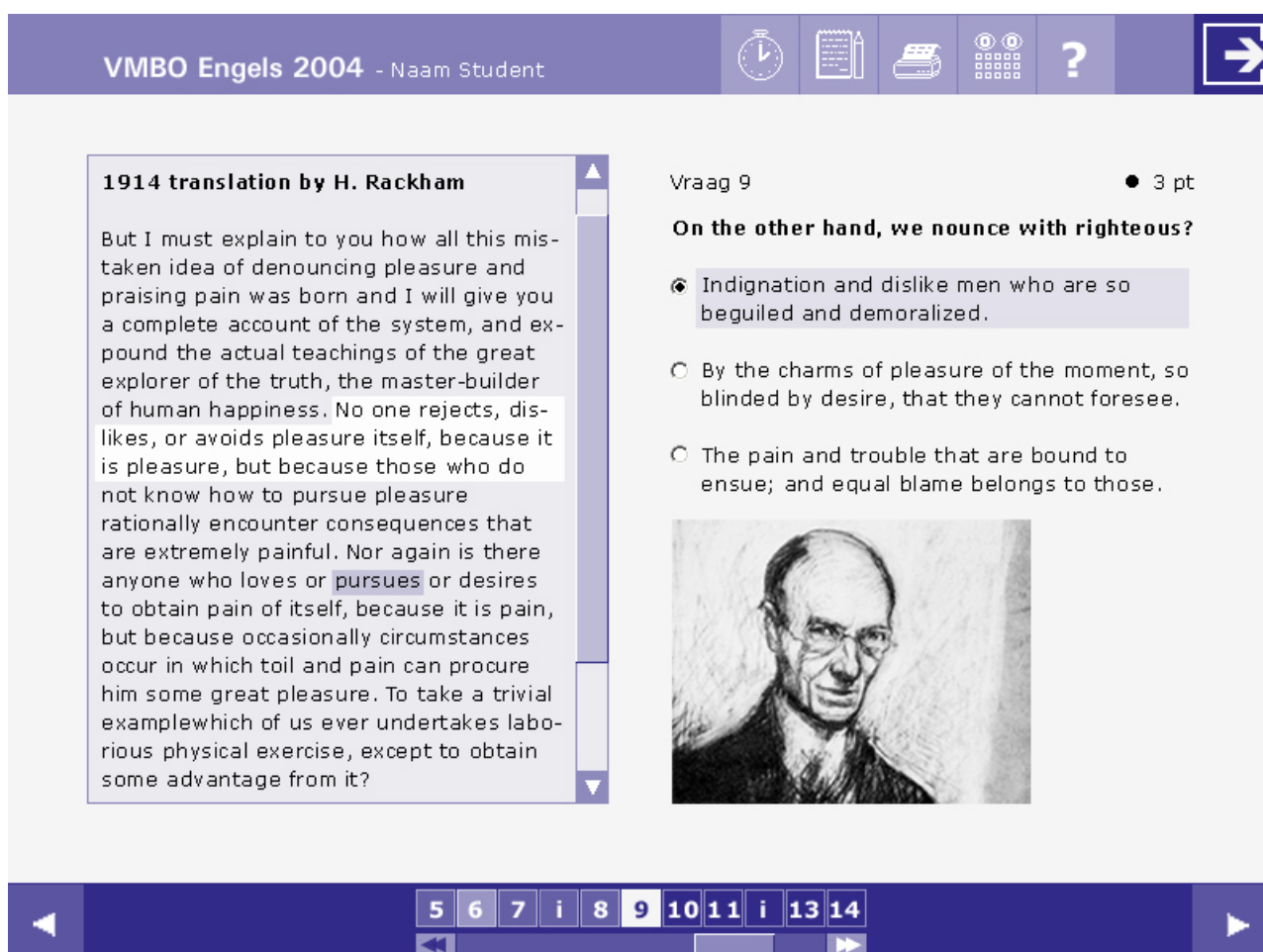I will show you an example of this kind of assignment.

Making the quotation the pupils use Microsoft Excel.

Secondly the pupils meet computer based testing (CBT). They have to answer multiple choice questions on a computer. In these questions their knowledge about the subject related to the practical task is tested. We want to present these questions to the pupils right after the related task so they are familiar with the subject. We call this a minitest because there are only ten till sixteen questions in one test.

For the CBT questions we use the Cito examination system, CitoTester, that recently has been developed. It has the advantage that we can use four different minitests at one place so the pupils can't predict what questions they will get. The teachers don't need to mark the minitests; the computer is doing that for them.

Developing CitoTester
The interface of CitoTester looks like this. I use a question about English so you can read it here on the conference.

*Cito Standard Interface for computer based testing.*

In the future we want to minimise the pure knowledge questions. These questions are not used in the real live which is simulated. To replace them we want to use film fragments made in real life situations. The pupils are asked to comment them.
For example. The pupils are facing speaking and working people and must be able to describe how the work could be done in a better way then in the film.
In an other example the pupils must be able to write a letter or e-mail to react on a client telling they will come next day to repair the apparatus that was broke down.

An even further innovation is when pupils have to interact with film fragments on the computer. One could think of a customer in a shop who is asking for some material. The question posed by the customer is not totally clear. The pupils have to ask for an explanation. They can choose different answers on the computer. The customer goes on dependent on the chosen answer.

The innovations of the tests described above are slowed down by the development of software. The version of CitoTester we are using now does not allow using complex answer-question structures. We can use film but the next film can't be dependent on the pupils answer. We can't use other programs simultaneously with CitoTester.

Most testing companies are able to prescribe what kind of hard- and software is used in their test centres. That makes a quick development of software possible. But Dutch schools as a test centre are free in choosing their hardware and other facilities. This results in a wide variety. Although CitoTester can't do everything we want as test developers, the architecture is already complicated in the point of view that it has to be used in the schools on all kinds of computers and networks. Dutch schools use a mix of Operation Systems, Media Players, and Browser applications.

To understand the situation in the Netherlands I'll show you the way CitoTester works.
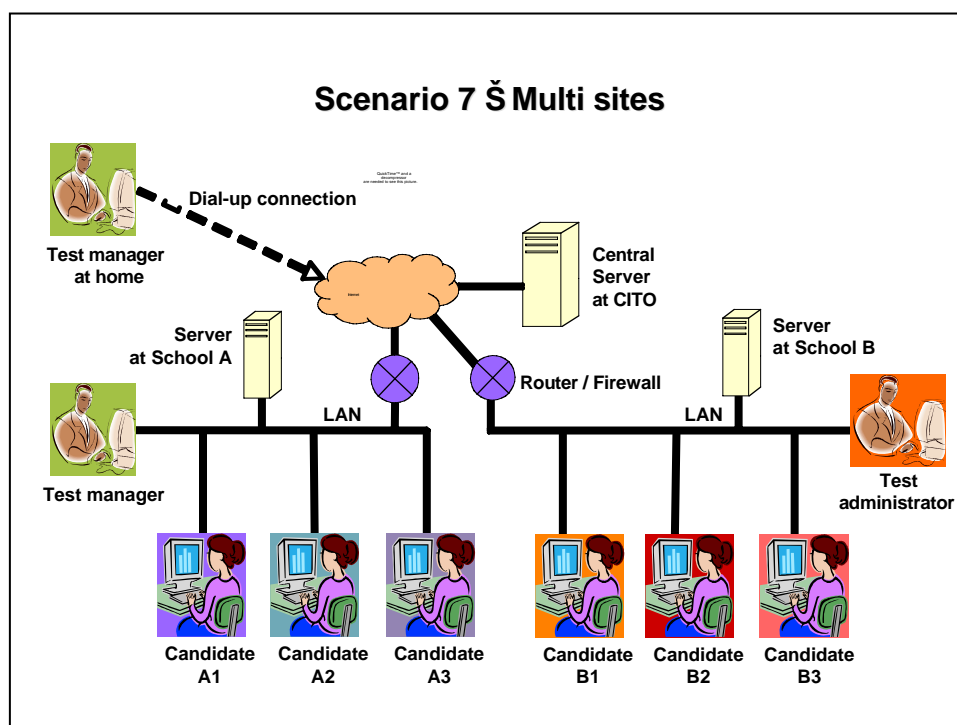
A TestManager is a tool for the test manager or administrator. It is installed on the local school server. There is an internet connection with a central server at Cito to synchronise all data as a kind of save backup system and to facilitated the analysing of the answers of the pupils.
At the moment we don't use the send the test packages to the school by Internet because the packages are too big to do so. Some packages are about 50 MB because of the films and sound fragments. We give the schools a cd-rom some weeks before the start of the exams.
At the start of the examination a copy of the test packages is placed on the computer of the candidate so during the test there is only data traffic with the answers of the candidate from the work station and the local server.
After closing the test the package at the client is deleted the data are locked in the local server and sent to the central server at Cito. The test is completed after en teacher has given marks to the pupil's answers at the essay questions. The computer gives the marks for the multiple choice questions.

This kind of working has the advantage that we can use heavy packages with film and so on even we don't know exactly what kind of computers and operating systems the schools are using. One server is enough for a lot of clients in the classrooms. But there are also disadvantages because of the choices the architects of CitoTester have made. The architects chose for a CitoTester specific keyboard driver and special screen driver. One can't use copy or shift tab. Internet explores is not allowed.

As test designers on the other hand we want to be more flexible in the kind of question types that can be used. We are restricted in the length of text that can be seen on the screen at the same time.

This kind of architecture in CitoTester at this moment limits the kind of possible applications that is placed in the CBT. For example it isn't possible to use Stabicad or Microsoft Word or Excel in CitoTester. You can't use Internet to look for some complementary information to give the answer to a real live question.

Combining other programs with CitoTester

In the Netherlands we want to develop more sophisticated tests and at the same time we want to use the computer. The problems as mentioned above, indicate a very complex dilemma. On one hand, the software has to stay simple to guarantee the possibility to use it in all schools. But on the other hand, we want the software to become broader in order to make computer testing an advanced device in schools with many possibilities to simulate the real world. For example: the tests would even be better if we were able to use real life software like Microsoft Office, Computer Assisted Design (CAD) and book keeping programs. Our teachers can't understand that we ask the pupils to work with the computer and use paper to go from one program to another.

Nowadays this isn't possible in CitoTester. We have to use al these programs separately. But we want the software to be better. As an in between solution we use Flash applications to simulate real life apparatus. The pupils answers are kept as a picture and exposed to a teacher to give the marks.

We want to achieve a better solution. Cito is studying for the possibility of using new kinds of software for another version of CitoTester that is able to perform with all the kind of things we want to build in an exam. They are thinking about using .NET. We want CitoTester to perform in a wider range of possibilities. Knowledge, technical possibilities, money and time are importing limiting factors for designing new testing instruments.

There is another problem using computers in the schools. In the Netherlands we were used to give all the exams of one subject at the same moment. Using paper tests it was no problem. Now we use the computer, schools are asking for more moments to do the tests.

That was not a big problem as long as we can use CitoTester for low stake exams with four versions of an exam that are only a little bit different. When using it for the high stake exams, as for example in high school exams, we must tackle problems like how many computers are available in the school at a time and can we make two equivalent exams to be used at successive moments.

Trying to solve a logistic problem we create a new psychometric problem.

A list of designer questions

As a result of all these new but limited ICT possibilities and at the same time the wish to make more complex exams looking real life changes the work of test designing. Now a days when we start with a new test we must answer a list like these following questions:

1. What kind of knowledge and skills do we want to test?
2. What kind of questions do we want to use to test them?
3. Do we need different versions of the questions at the same time so the schools can use different moments for the examination?
4. What are the possibilities in our CBT system now and in the nearby future?
5. What is the length of the texts we can use?
6. Can we use film and sound? Can we use Flash?
7. Can we use an integrated ICT solution or must we use both paper and ICT?

8. When searching for a solution using ICT in a testing situation we have to calculate the advantages and disadvantages of the system we are going to use years in advance.

I feel we are working on a nice job making new test designs for computer use and I hope I could take you with me in this engaging world.