Designing an Enhanced Hypermedia Assessment Tool for End User ICT Certifications

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Abstract

Information and Communication Technology (ICT) certifications are widespread in many countries. Many employed or unemployed persons pursue an ICT certification so as to increase their productivity or to increase their possibilities to find a job. Initiatives like ECDL and MOUS strengthened this practice. The majority of the existing ICT certifications, related to basic e-skills of end users, are assessed by automated tools. Although the syllabuses of the existing certifications differ the e-assessment tools have common features and limitations. This paper presents a review of the ICT certifications and the computerized tools used in them. The potentials of the automated testing software are compared with the non automated assessment method of the New CLAIT certification. Additionally the observations of end users, with respect to the features of the assessment software tools, were assembled with the aid of a questionnaire. Then, based on the results of the heuristic evaluation and on the restrictions identified by the candidates, an enhanced e-assessment tool for basic e-skills is designed. The results of a usability evaluation of a prototype of the proposed tool are discussed at the end of the paper.

Keywords: E-assessment, Educational Technology, Heuristic Evaluation

1 Introduction

ICT skills are essential in almost every job sector. The importance of e-skills is globally recognized (e-Europe, 2002; Curley, 2003) and several programmes have been launched towards this direction. By e-skills we mean the ability of an individual to efficiently handle an operating system, a word processor, a spreadsheet application, a web browser and e-mail software. All European countries have established various actions to achieve this goal. One initiative which began in 1994 (Haarala-Muhonen and Sokura, 2000) was the establishment of a certification related to basic ICT skills, called CDL (Computer Driving Licence). CDL, presently named ECDL (European CDL, www.ecdl.com), is globally recognized and it is the certification which holds the larger market share (CEPIS, 2004). A few other private organizations and Universities followed the ECDL paradigm issuing analogous ICT certifications. Such examples are the Microsoft Office User Specialist (MOUS - www.certiport.com), the Cambridge International IT Skills (www.cie.org.uk) and the New CLAIT Level 1 (www.ocr.org.uk).
ICT certifications are considered quite important for most people. According to the eSkills Certification Consortium (eSCC, 2004) and to CEPIS (2004) ICT certifications are important primarily because employees stay current with new technologies and because they help them find a job. This is verified by independent academic studies as well (Sokura, 2005). Table 1 presents the most important reasons for an individual to pursue certification as reported in the European e-Skills 2004 Conference (eSCC, 2004). Although the proportions vary at some points among the two continents, it can be agreed that finding a job or increase productivity and credibility are some of the most significant reasons for the individuals to achieve productivity.

Table 1. Reasons an individual pursues certification (source: eSCC, 2004)

<table>
<thead>
<tr>
<th>Reasons</th>
<th>North America</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase productivity</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Prepare for new position</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>Help find a job</td>
<td>19%</td>
<td>6%</td>
</tr>
<tr>
<td>Increase compensation</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Increase credibility</td>
<td>16%</td>
<td>19%</td>
</tr>
<tr>
<td>Fulfill job requirement</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Assess knowledge</td>
<td>10%</td>
<td>19%</td>
</tr>
<tr>
<td>Stay current with new technology</td>
<td>19%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Although the syllabuses of the end user ICT certifications differ the e-assessment tools utilized have common features and limitations. This paper reviews the computerized tools used in ECDL, MOUS and Cambridge IT Skills certifications and compares their potentials with the non automated assessment method of the New CLAIT certification. Additionally the observations of end users, with respect to the features of the assessment software tools, were assembled with the aid of a questionnaire completed by 45 examinees. Then, based on the results of the comparisons and on the restrictions identified by the candidates, an enhanced e-assessment tool for basic e-skills is designed. A prototype of the system is presented and the results of a user evaluation of the prototype of the proposed tool are discussed at the end of the paper.

2 Overview of ICT certifications

2.1 ECDL

The European Computer Driving Licence syllabus v4 (www.ecdl.com) consists of the following seven modules:

i. Concepts of Information Technology (IT)
ii. Using the Computer and Managing Files
iii. Word Processing
iv. Spreadsheets
v. Database
vi. Presentation
vii. Information and Communication (WWW and E-mail)

Each module describes in detail every concept and ability that the candidate should comprehend so as to pass the assessment. ECDL is designed to cover all the potential operations performed using Microsoft Office tools, even the rare ones, e.g. change the default uses of Microsoft Word. The first module aims at providing candidates with all the concepts needed to understand most of the common Information Society terms. The last module is further divided to Internet Explorer and Outlook Express and therefore we will treat the ECDL as it is an extra module.

2.2 MOUS

Similarly, the MOUS core certificate has defined 5 modules. Modules are named after the tool they depend on since it is a proprietary certificate.

i. Microsoft Word
ii. Microsoft Excel
iii. Microsoft PowerPoint
iv. Microsoft Access
v. Microsoft Outlook

Again the syllabus of each module thoroughly describes the knowledge each candidate should have. Each module is examined with the aid of an automated system which calls the respective tool and permits the candidate to complete the assigned task.

2.3 Cambridge IT Skills

Cambridge International Diploma in IT skills is administrated by the University of Cambridge. It contains 6 modules which are similar to the ECDL certificate.

i. Using the Computer and Managing Files
ii. Word Processing
iii. Spreadsheets
iv. Databases
v. Electronic Communication (E-mail, WWW)
vi. Presentations

2.4 New CLAIT

The New CLAIT certificate is consisted of more modules but modules are elective. A candidate may select one or more modules to be assessed. The assessment is not performed with the aid of a computerized system. Candidates are given a sheet with a number of questions which correspond and result to realistic situations and their aim is to construct an e-document (a word document, a spreadsheet, a web page, etc). Each question is associated with the previous ones. The final marking is performed by humans and not by computers like in the previous cases. New CLAIT’s logic is in contrast to the previous certificates which are corrected and marked by computers.

i. Using a computer
ii. Word processing
iii. Electronic communication
iv. Web pages
v. Spreadsheets
vi. Databases
vii. Desktop publishing
viii. Computer art
ix. Graphs and charts
x. Presentation graphics

3 Computer based marking against Human based marking
ECDL, MOUS and Cambridge IT Skills are tested and marked with the aid of automated tools which are similar to the one in figure 1. On the contrary, as explained, New CLAIT is marked by humans based on the printouts submitted by candidates.

![Example of an automated testing and marking system](image)

*Figure 1. Example of an automated testing and marking system*

Computer based testing and marking has a set of advantages which vary from immediate marking to objective and uniform assessment of all candidates. However reviewing such systems we discovered a number of problems which affect the performance of computers.

Firstly, the questions set are unlinked, meaning that candidates are asked to perform a number of tasks which do not aim at formatting a specific document. For example they may be asked to format a document and then print two copies of another document or insert a table in a third document. Although this tactic aims at measuring the knowledge of end users it may be disorienting and is not connected to realistic situations where users work in one document and perform a number of tasks on it. In New CLAIT, candidates are presented with a sheet containing a number of questions for formatting the same document and there also exist explanations of why such a
modification is needed. In this way assessment can be considered as formative in addition to summative (Angelo and Cross, 1993) helping candidates strengthen their e-skills.

Another problem is that questions which are partially correct are marked as wrong. Thus candidates cannot get a proportion of the mark as in ordinary paper based assessments. Of course this problem can be alleviated by separating each question in a number of steps and assigning a mark to each step. However the difficulty level will be lower if candidates are able to see this separation.

Some modules of the computer based assessed certificates are not assessed in real environment but in a simulative environment. In these cases candidates do not see their results of their actions. Technically it is not easy to predict all the user actions and create simulated screens. This is a serious shortcoming as users are often confused.

Additional time is needed so as to perform actions such as pressing the submit button when a question is answered or some time is lost when new questions are fetched. This time should be formally measured and taken into account when creating new assessments.

4 Problems identified by candidates

The previously mentioned problems were identified by us during an initial informal evaluation of the automated assessment tools. To discover potentially additional problems we interviewed 45 candidates with the aid of a questionnaire. Our primary aim was to realize why they pursue an ICT certification, the problems faced and their expectations. Here we only present the difficulties and inconveniences which were identified by the candidates.

The central problem which the majority of the interviewees underlined was that they could not revise the answer that they gave in a particular question. From the moment the submit button is pressed a question is considered as completed. Users do not have the chance to review their actions and possibly alter a number of them. In paper tests users have the chance to alter their replies at any point.

Another issue raised is that several questions are not of practical value. For example, changing the default user name of Word is not significant in realistic situations. Of course this is a matter of the syllabus and not of the automated system; however in New CLAIT such questions are not possible since they cannot be imprinted on the final printed sheets.

Not being able to see the result of their question is another problem which was noted by the subjects of our study. The indicated that this “software behaviour” is quite confusing and leads them in repeating the question several times before they press the submit button.

Quite a few candidates mentioned that they could not understand some of the questions and that when the supervisor explained the question, they knew how to perform the task. Question’s text is important as it may help or confuse examinees in replying the question.

Some of the participants complained about the usual software problems and crashes which interrupts the testing procedure. This is an implementation problem and not a problem of the logic of the testing procedure.
A few other minor problems were indicated which however are special cases and concerned only specific users.

5 An enhanced assessment environment

Having identified the previous problems, we aimed at creating an enhanced multimedia assessment tool. The primary aim of our effort was to allow users to focus on the assessment without disorienting them. Additionally the proposed system should be flexible allowing students to review their replies at any point. Furthermore the results of each action should be visible to the candidate. Tests should follow the common practice; that is working primarily on a document and possibly on a second one for exchanging data with the primary file.

Figure 2. An interface of the prototype assessment tool

Figure 2 (image edited for presentational reasons) shows a prototype interface of the system. As seen, an index of the questions exists on the left. Questions may be in one of two states: completed or pending. The result of the completed questions may be seen at any point and candidates are able to re-try them. Pending questions have not been answered yet. Users may start the assessment at any question and they are able to form their own assessment route by selecting any question they like as they advance towards completion.
During the design of a test, educators define a document and a set of queries on it. For each question they define a set of tasks which a candidate should complete. A proportion of the question’s mark is assigned to every task. In this way partially replied questions contribute to the final mark. They can also define alternative question titles should they judge it appropriate. Candidates may see the alternatives by clicking on the “?” button on the right of a question. If this button is disabled, as in figure 2, then no alternatives have been defined.

6 Evaluation

To realize the effects of the testing environment to students we designed and implemented an evaluation experiment. We formed three user groups, each consisting of 12 users. All users had attended the same training program about MS-Office. Hence they had a similar knowledge level. A 10-question test related to MS-Word was created. Participants had to reply to these questions and for each question 1 mark was given.

In the first group of participants the assignment handed out in paper and the final deliverable was a printout. The printouts were then hand-marked by us. Participants could earn 0.5 or 0.75 in some questions, depending on the percentage of the question that they had replied.

The second group of participants performed the test through the previously described automated system but they did not have the chance to review their replies. In addition each question was associated with a different document, as in the testing tools used in ECDL, MOUS and Cambridge IT Skills.

Finally, the last group was tested with our system with all the enhancements on. That is, they could review and possibly redo the required tasks and the document on which they were working was the same. Six out of the ten questions were divided into two tasks each marked with a 0.5 mark. Thus, participants could earn some points by replying parts of the questions.

| Table 2. Average score of each group in the test |
|----------------------------------|--------|--------|--------|
| Average                         | 8.29   | 7.08   | 8.04   |

Figure 3. Distribution of scores of the examinees
Table 2 presents the average score of each group in the test. As seen hand-marked tests help candidates in achieving higher scores. This is because candidates can get, for example, 0.75 points in one question while their replies are marked as incorrect (0 points) if they belong in the second group and 0.5 in the third group. Figure 3 shows the distribution of scores of the participants of each group. Evidently people who were tested using a classical assessment paradigm performed better. Nevertheless it should be underlined that the performance of the candidates that utilized our tool was improved compared to the candidates of the second group.

The time to complete the test was also measured in each study group. The first group completed the test in approximately 15 minutes. The average time of the second group was almost 18 minutes. The third group completed the assignment in less than 17 minutes. Again the results are in accordance with the previous regarding the performance of each group. The additional time needed can easily be justified. Students need more time to complete the computer administered tests because they have to press additional buttons, such as the submit button. On top of that when the questions posed concern different documents some examinees are disoriented and spend more time on questions.

7 Synopsis

In this paper we reviewed the syllabus and the testing mechanism of some of the existing ICT certifications. The computer administered assessment method was compared to the non-automated testing procedure of the New CLAIT ICT certificate. A few inconveniences and shortcomings of the automated testing programs were identified by this heuristic evaluation. End users who have taken the respective exams helped us in identifying a few more difficulties of the testing software. Based on these observations we created a prototype hypermedia assessment tool which tries to overcome most of the shortcomings of the existing systems. This system was proven beneficial as concluded by our evaluation experiment. However more work is needed so as to simulate the human administered and marked tests and aid candidates to focus on the assessment and not on the system.

References