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OCCASIONAL PAPERS

August 2011

Hilary Sidindi

THE PRACTICALITY AND ACCEPTABILITY OF USING BLENDED E-ASSESSMENTS AS A SUMMATIVE MEASURE OF STUDENTS' PERFORMANCE.

FOREWORD

The policy to continue the publication of Occasional Paper is guided by the principle that there is dearth of published research in Southern Africa.

The initiative taken by the University of Zimbabwe's Human Resources Research Centre (HRRC) which is a department based in the Faculty of Education, is therefore an attempt to address a vacuum.

Articles in the Occasional Papers series are therefore intended to disseminate research findings and contribute to academic knowledge from local and international scholars.

The articles are selected by the Editorial Board of the Zimbabwe Journal of Educational Research (ZJER) although the contents do not necessarily reflect the positions or opinions of either the University or the HRRC.

Papers in this series are intended to disseminate research findings and to stimulate policy dialogue. The series includes works which, in the opinion of the ZJER Editorial Board, contributes significantly to the state of knowledge about human resources issues and warrant wide distribution. Occasional papers are widely circulated in Zimbabwe and internationally.

This stimulating and dynamic paper by Hilary Sidindi provides an insight into "The Practicality and Acceptability of using Blended E-Assessments as a Summative Measure of Students' Performance".

It is hoped that the series will continue to add value to your knowledge base and your academic prowess.

Professor Fred Zindi (Ph.D)

Editor in Chief

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THE PRACTICALITY AND ACCEPTABILITY OF USING BLENDED E-ASSESSMENTS AS A SUMMATIVE MEASURE OF STUDENTS' PERFORMANCE.

Hilary Sidindi
Department of Accountancy, University of Zimbabwe
sidindih@commerce.uz.ac.zw sidindih@gmail.com

Abstract

Against a background of increasing class sizes, relative decline in teaching staff, and the need to align assessment techniques with new modes of teaching and learning, the Department of Accountancy at the University of Zimbabwe made a decision to use e-assessments in two compulsory undergraduate Information Systems courses. This paper reports on a study to evaluate the practicality and acceptability of using summative e-assessments in the department. It is anticipated that the lessons learned from the study would be useful in the formulation and implementation of university-wide summative e-assessment strategies in future.

The study was conducted with students taking compulsory courses in Information Processing and Accounting Information Systems. It commenced in 2009 and has now run consecutively over four semesters. The use of summative e-assessments has proved to be an effective assessment technique. The number of students sitting for computer based exams has increased from 330 in December 2009 to more than 700 in June 2011.

Although careful planning and administration are key factors in the successful implementation of e-assessments, student preparation has been identified as the most fundamental key factor. Evaluation has revealed that a large majority of students prefer e-assessments to pen-and-paper based assessments. Students regard e-assessments as being not only less stressful but also more interesting than pen-and-paper based assessments. The University should now embark on a programme to develop and implement university-wide summative e-assessment strategies aimed at phasing out pen-and-paper based assessments.

Introduction

Faced with the challenge of increasing enrolments and few lecturers, the Department of Accountancy at the University of Zimbabwe made a decision to use summative e-assessments in two undergraduate courses, Information Processing (Level 1) and Accounting Information Systems (Level 2) in 2009.

This decision was motivated by two main factors:

- Challenges faced by staff in teaching and assessing increasing class sizes
- The need to align assessment techniques with new modes of teaching and learning

Class sizes in some courses have been increasing rapidly while the staff compliment has remained static. Some courses in the department have more than 400 students being taught by one lecturer. The total number of students attending two compulsory courses taught by two lecturers, Information Processing (Level 1) and Accounting Information Systems (Level 2) have increased from 330 in 2009 to 700 in 2011.

Since 2006, the mode of teaching and learning used for the two courses has been blended learning, combining face to face lectures and the use of the University's Claroline e-learning system for posting and accessing learning material. However, the continued use of pen-and-paper based assessments during tests and end of semester exams has brought about a misalignment between the mode of teaching and learning and the assessment techniques. Students were therefore likely to be frustrated by the inconsistencies arising from the fact that they use technology in their learning process yet they continue to use the traditional pen-and-paper method during tests and end of semester examinations.

This paper reports on a study to evaluate the practicality of using summative e-assessments in the department. It is anticipated that the lessons learned from the study would be useful in the formulation and implementation of university-wide summative e-assessment strategies in future.

The study was conducted with all students taking compulsory courses in Information Processing and Accounting Information Systems and their two lecturers. It commenced in 2009 and has now run consecutively over four semesters.

Key study objectives were:

- To evaluate practical issues relating to the successful implementation of summative e-assessments
- To determine students' attitudes towards summative e-assessments

E-assessments

Much has been written about the benefits of e-assessments over pen and paper based assessments and the growing use of technology in both formative and summative assessments in education. Summative assessment is designed to measure achievement while formative assessment is used to aid the learning process.

Ashton, Beevers, and Bull (2004) have highlighted that "rapid feedback to both right and wrong answers is a major advantage of formative computer testing" (p. 79). Feedback not only helps to reinforce learning through success but also provides hints and advice to weaker students.

With regards to summative e-assessment, McKenna and Bull (2000) have suggested that the rapid increase in student numbers and relative decrease in staff has motivated the search for more efficient ways of assessing large students groups. "In the USA, approximately one million examinations for undergraduates and postgraduates were delivered and marked by computers in the 1997-1998 academic year, under the auspices of a national testing programme" (. p.24).

Summative e-assessments

The use of summative e-assessments is not only a complex matter but also more controversial than formative e-assessments. The direct impact that summative assessments have on student marks makes it imperative for quality procedures to be in place to ensure smooth running of exams. McKenna and Bull (2000) identified quality assurance issues and critical success factors for effective implementation of summative e-assessments and grouped them into three categories: pedagogical, managerial and operational. It is also critical for summative e-assessments to be designed in such a way that they are not only fair but also useful to students.

When implementing summative e-assessments, it is important to be aware of and plan for possible test mode effects since there is "mounting empirical evidence that identical paper-based and computer-based tests will not obtain the same results" (Clariana & Wallace, 2002. p.593). While there may be different contributory factors to test mode effect, Clariana and Wallace have identified computer familiarity as the most fundamental key factor. Equipping students with the relevant computer skills is therefore an essential step to be taken before the implementation of e-assessments. Once all students are fully computer literate, computer familiarity becomes less important.

Online summative assessments have some security challenges that can "militate" against effective implementation. Apampa (2009) has highlighted four main requirements for authenticating remote candidates: Identity, Authenticity, Electronic Integrity and Presence (the physical and online existence of a learner from the beginning to the end of an assessment). However, when either offline assessment is

used or when online assessment is conducted in assessment centres under the supervision of invigilators, authentication concerns are eliminated.

Blended summative e-assessments

Most e-assessments predominantly use objective testing since computers are excellent in marking objective questions and very poor in handling open ended questions. Although much progress has been made with short answer type questions (one or two sentences long) using short text marking engines such as e-rater, c-rater and Intelligent Assessment Technologies, computers currently cannot effectively mark extended essay type questions for content. Short text marking engines do not cope well with questions where "there are too many ways in which a correct response can be expressed" (IAT, 2009) or "there is an unpredictable range of acceptable answers" (JISC) http://www.jisc.ac.uk/media/documents/projects/shorttext.pdf

The over-reliance on objective testing using Multiple Choice Questions (MCQs) has been cited by some educationists as a limitation of e-assessment (Ashton, Beevers and Bull, 2004) particularly with regard to summative e-assessments. It is therefore important to include a mix of different question types in an assessment if the authoring tool used to design the assessment is capable of handling a variety of question types at the same time.

The debate on the merits of using MCQ type and essay question type assessments has raged on for a long time without agreement among educationalists. Research has highlighted problems associated with marking essays and it has long been established that even experienced markers were unreliable in their essay marking (Kniveton, 1996). While objective testing using MCQ type questions has the potential to improve on assessment reliability, "educators cannot be certain if students have demonstrated knowledge levels appropriate to their marks – guessing and looking for patterns are obvious tactics used" (O'Loughlin & Osterlind, 2007 . p 4).

In order to reap the benefits of MCQ and essay type questions, a blend of both methods in a single summative assessment offers great opportunities not only to improve the assessment process but also to ensure that e-assessments remain academically credible. A study on Blended Assessment Techniques in Online Testing conducted by O'Loughlin and Osterlind (2007) primarily used online MCQ based assessment with written follow-on questions on paper for some key questions for choices made in the MCQ.

The disadvantages of this technique are that:

- the concurrent use of online and hand written responses could be confusing to students
- the use of pen and paper to capture responses would be a drawback to the gains made by the use of technology in assessment

A more appropriate blended e-assessment technique would comprise a combination of the following:

(i) Objective testing using MCQ and other question types

(ii) Open ended questions answered using a word processor and assessed by a human marker with the aid of a software tool such as Marker's Assistant which helps the marker to concentrate on the marking and not the process (**http://www.surreal.com.au/**)

Learning objectives and new modes of assessment

Discussions on the assessment of learning would not be complete without reference to Bloom's Taxonomy on Educational Objectives (Bloom, 1956 / 1964) which have widely been adopted by educators as a guideline to classify learning objectives.

The taxonomy categorises learning into six levels, namely

- knowledge
- comprehension
- application
- analysis
- synthesis
- evaluation

Interest on Bloom's Taxonomy has been rekindled by the ongoing debate on whether e-assessment is effective in assessing higher order skills such as synthesis and evaluation. While most of Bloom's learning skills can be assessed using objective questions, it is difficult to design objective questions to assess higher order skills. Integrating different methods of assessment (objective and open ended question types) helps in enhancing the assessment of a wider range of students' skills.

Study methodology

The study utilised a naturalistic model (Guba & Lincoln, 1982) instead of a pure, basic research approach. Naturalistic enquiry offers contextual relevance in that the researcher does not search for data that fits his theory but develops a theory to explain the data.

A similar study on summative e-assessments carried out at the Chinese University of Hong Kong (Keing, Lo, Laun, and Mcnaught, 2007) used the naturalistic model. Keing, *et al*, explained that "through observing the practicality of the new strategy in a realistic setting, we expected that the lessons we learnt would be transferable to other e-assessment projects" (p. 3)

Both qualitative and quantitative data were collected. Data from students were collected through an e-questionnaire administered at the end of the first computer based exam held in December 2009.

The researcher opted for offline e-assessment because it does not have security challenges that are characteristic of online assessment. Offline assessment is conducted without using an internet connection during the test although an internet connection may well be used to deliver the test to the client computer prior to the test starting, and to upload the candidate responses once the test has completed. (JISC, 2006).

Managing practical issues of e-assessments

A framework for the effective implementation of e-assessments was developed based on the critical success factors identified by McKenna and Bull (2000) and their recommendations on the need to pay special attention to pedagogical, managerial and operational issues of e-assessments.

1. Pedagogical issues

1.1. Balanced assessment

In view of the inconclusive debate on MCQ versus open ended question types, a balanced assessment was designed made up of both MCQ and open ended type questions with a fifty percent limit on the level of contribution of objective questions towards students overall exam assessment marks. Students were required to answer open ended questions using a word processor for assessment by a human marker.

1.2. Designing effective objective questions

Pedagogical support in designing effective objective questions was provided by the University Teaching and Learning Centre since the two lecturers involved in the study did not have experience in designing objective questions. The designed questions were peer reviewed to ensure that only appropriate questions were included in the e-assessment instrument.

1.3. Development of item data banks

Development of an item data bank takes time. A strategy of developing item data banks in stages was adopted. Enough questions for an exam would be designed and then added to the data bank. In order to ensure that the

questions added in the data bank were not disclosed easily, students sitting for an objective test were required to enter a password made available at the assessment centre.

2. Managerial issues

Since currently no university policy on the management of e-assessments exists, it was therefore not feasible to fully address the following management issues related to the management of university-wide e-assessments:

- Need to establish an e-assessment culture
- Exam regulations and test protocols
- Staff development

Specific exam instructions were developed for running e-assessments and training arrangements were made for technical and invigilation staff as detailed out under Operational issues 3.3 and 3.8 below. One of the two lecturers was appointed coordinator of computer based exams. During an exam session, the coordinator was readily accessible by phone to assist invigilators and computer support staff.

3. Operational issues

3.1. Preparation of students

Preparation of students who sat for the first computer based end of semester exams in December 2009 started at the beginning of the semester in August 2009.

In order to make all students become familiar with the Teaching Templates assessment engine used for objective questions, sample practice tests were posted on the "Exercises" menu option of the University's Claroline e-learning system. Practice assignments that require students to answer open ended questions using the word processor were also posted on the e-learning system. Some practice tests and assignments were done under supervision during the two hour compulsory practical sessions held every week.

E-assessments were also used throughout the semester for coursework which contributes 30% towards the student's final mark (the end of semester exam contributes 70%).

3.2. Test Centres and equipment

Site visits were made to the three computer labs used as Test Centres to ensure that the computers met with minimum requirements and that students' performance would not be affected by the differences in the hardware found in the Test Centres. Specific minimum requirements for each computer included a working mouse and keyboard as well as good screen resolution. Network access was checked to ensure that students would be able to upload their responses at the end of the assessment session.

Each computer was also checked to ensure that not only were the required software packages installed but also of the same version (eg. MS Word 2003, MS Word 2007) used by students during the semester. Working in a different version of software from what one is accustomed to can adversely affect the performance of a student in an exam.

3.3. Exam instructions

Details of exam instructions were compiled and posted on the e-learning system at the beginning of the semester to enable students to get acquainted with the differences in instructions since instructions for computer based exams tend to be more detailed than for pen and paper based exams.

Since students were required to work offline throughout the assessment session and then upload their saved answer files to the e-learning system at the end of the assessment session, steps were taken to ensure that students were familiar with special instructions relating to the delivery and submission of their answer files and objective tests results during tests and exams.

3.4. Timetabling

The assessments were timetabled to start simultaneously in the three computer labs used as Test Centres. In view of the fact that available resources could only accommodate up to 148 students to sit for the exam at the same time, one large class with more than 148 students was divided into a two session assessment.

The two groups of students were kept separate at all times to prevent candidates from conferring. The second group was allowed to take the exam immediately after the first group had completed and no candidate from the first group was allowed to leave the Test Centre before the end of the assessment session. A large class of 437 students could not be split into a two session assessment, therefore a third group was timetabled to sit for a different exam of reasonably equivalent level since it would have been

difficult to keep three different groups separate without the risk of candidates conferring.

3.5. Contingency arrangements

Plans were established for staff to deal with contingency situations such as equipment failure. For example invigilators would either restart a workstation or transfer a student to another workstation. A minimum of seven percent of the total workstations at each test centre were reserved as standby computers. The invigilator would immediately record details of the problem against the student's name on the specially designed invigilation register and advise the student of the additional time allowed to enable him to complete the assessment without prejudice. Guidelines for students to periodically save their work during the course of the assessment were also put in place.

In case of a severe failure to conduct e-assessments, paper based formats of the exam could be printed within a short space of time to replace the e-assessments.

3.6. Security

Measures were put in place to ensure the security of exam questions and students' answer files. Since test questions were stored on CD and then uploaded onto the server or workstations just before the commencement of an assessment session, similar measures used to safeguard paper based assessment instruments were used. Test questions would be deleted from the servers and workstations after the exam session.

Since students were required to upload their answer files to the e-learning system, action to disable visibility options and links to the answer files would be taken immediately following the end of the assessment session. This would stop students from viewing and accessing their uploaded answer files after the assessment session although the marker with the relevant password would still have access to the disabled links. Students' answer files saved temporarily on workstations would be deleted before students leave the Test Centre.

Every student's uploaded answer file would be downloaded from the e-learning system after the assessment session and stored on CDs in the Department. The uploaded answer files would be deleted from the servers after the completion of the marking process.
During the assessment session students would be required to convert their answer files to portable document format before uploading to the e-

learning system. This ensures that students' answer files are not susceptible to alteration after the assessment session and also corruption by computer viruses.

3.7. Countering cheating

Various measures were established to counter any possible cheating by candidates. Since exams were conducted in an invigilated setting, standard measures to verify student identity were applied. To discourage candidates from peeping at each other's computer screens, MCQ test items for adjacent candidates were displayed in a random sequence.

Only authorised candidates with a valid account were allowed to access the special link on the e-learning system to upload their answer files. Links to course sites with learning material that candidates could use for possible cheating were disabled during the exam period.

Measures were put in place to enable markers to verify the time when students' answer files were created and uploaded to the e-learning system. Comparison software was used to detect any possible plagiarism in candidates' answer files for open ended questions.

3.8. Training of staff

Staff responsible for technical support and invigilation of computer based exams and tests were trained. Participation of staff during coursework semester tests helped to equip them with relevant skills and experience required to handle end of semester exams.

3.9. Pilot testing

Part of the computer based exam required students to record responses to open ended questions using a word processor. Pilot tests to determine the reasonable time allocation for students to complete answering open ended questions were done in order to accommodate students who type slowly.

Evaluation

In this section data collected during the study from students and technical staff are discussed. Data from technical staff were collected from their conversations with the lecturers, email communication and logs.

Data from students were collected through an e-questionnaire administered at the end of the first computer based exam held in December 2009. All 206 first year students who sat for the computer based exams were invited to participate in the survey. 124 responses were collected and this represents a response rate of 60%. The gender

composition of the respondents was 61% male and 39% female. The 124 respondents represents 38% of the total number of students who sat for the computer based exams.

Acceptance by students

The following three survey questions comparing computer based exams with pen and paper based exams were asked:

- Which type of exam do you prefer?
- Is a computer based exam more interesting than a pen and paper based exam?
- Is a computer based exam more stressful than a pen and paper based exam?

Responses to the above survey questions are presented in Figure 1.1 below. The results suggest that students have a high preference of computer based exams compared to pen and paper based exams. Students regard e-assessments as being not only less stressful but also more interesting than pen-and-paper based assessments. Analysis of preferred exam by gender (Figure 1.2 below) shows a slight difference between male and female students. 6% more female than male students reported that they preferred computer based exams to pen and paper based exams.

Responses to the survey question "When did you first use computers?" are presented in Figure 1.3 below. Figure 1.4 presents a comparison of the students preferred exam and their computer literacy background. The results in Figure 1.4 seem to suggest that computer literacy background has little effect on preference for computer based exam. 74% of students who first used computers at University reported that they preferred computer based exams to pen and paper based exams.

86% of students also reported that they supported the suggestion that the use of e-learning should apply to all courses at University compared to 7% who were against and 7% who were undecided on the issue.

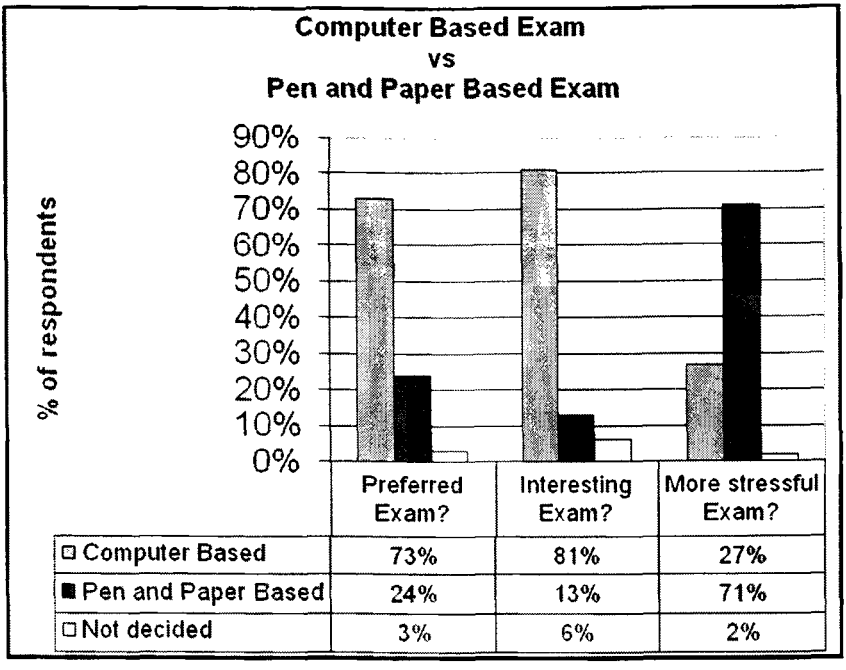
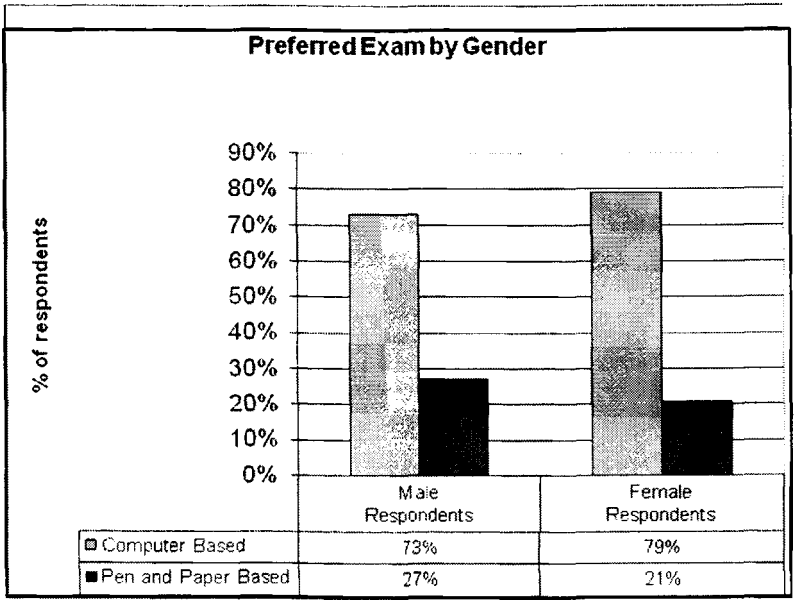


Fig 1.1



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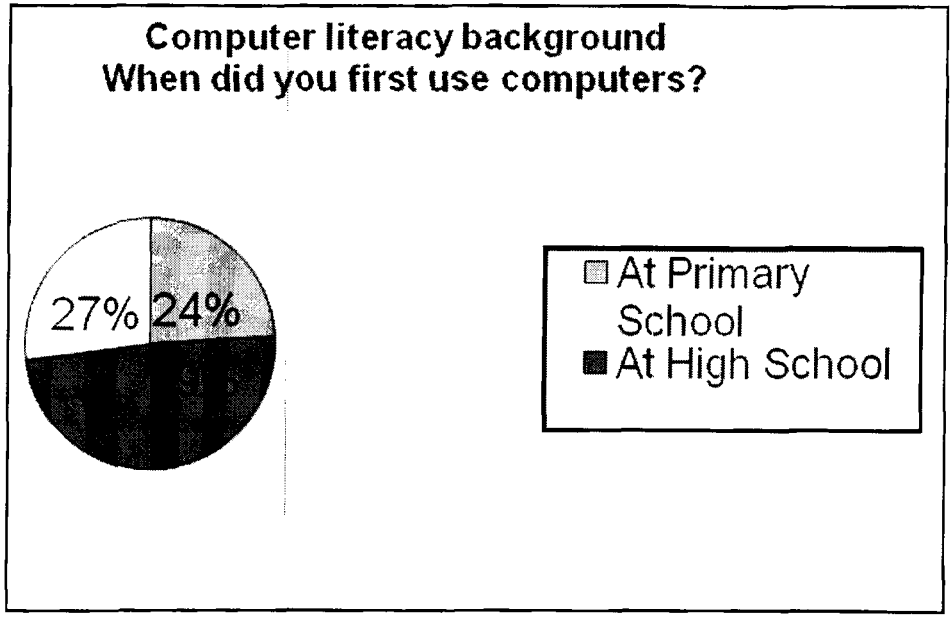

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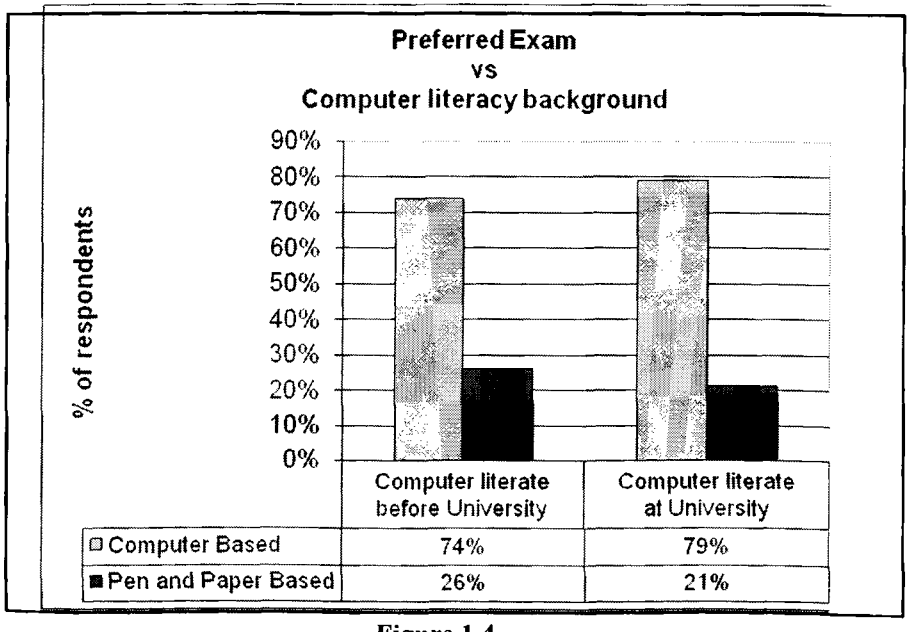

Figure 1.4

Level of student preparedness for computer based exams

Responses to the survey question "How prepared were you for computer based exam?" are presented in Figure 1.5 below. Figure 1.6 presents a comparison of the students level of preparedness and their computer literacy background. The results in Figure 1.6 seem to suggest that computer literacy background has little effect on the level of preparedness for computer based exams. 67% of students who first used computers at University reported that they were well prepared for computer based exams.

An issue which needs further investigation is the extent to which computer literacy background affects a student's achievement in a computer based exam.

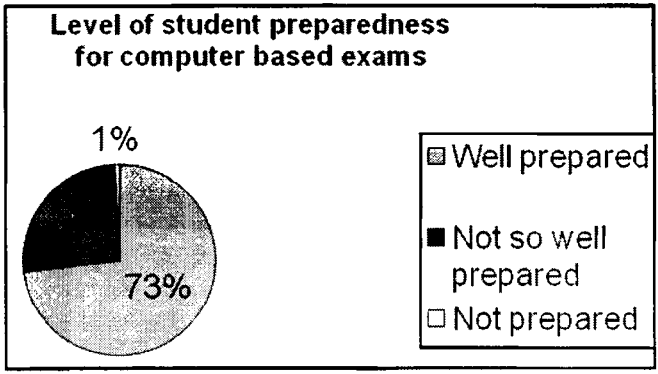

Figure 1.5

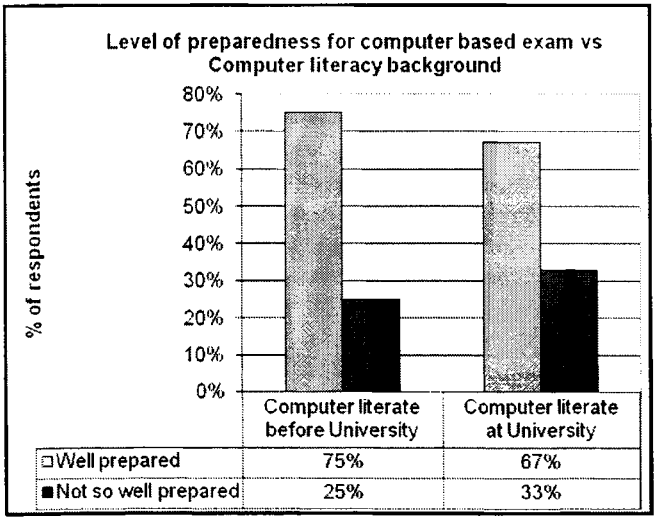

Figure 1.6

Benefits

An overwhelming majority of students (94%) reported that the use of e-learning had enhanced their learning of the course Information Processing compared to 3% who did not think so and another 3% who were undecided on the issue. The big positive response of students who reported that e-learning had improved their learning and also supported the suggestion that the use of e-learning should apply to all courses offered at University seems to confirm the widely held view that there should be an increased use of both e-learning and e-assessments in higher education (Brown et al, 1997).

The two lecturers for Information Processing and Accounting Information Systems confirmed the expected benefits of e-assessments to both markers and candidates. The use of objective questions in the exam significantly reduced the marking load since the assessment of each student was done by the computer, leaving the marker with the easier task of compiling the assessment results. Computer marking is more reliable than human marking. Students have also cited the immediate reporting of assessment results as one of the advantages of objective e-assessment.

The use of the word processor in answering open ended questions in the exam made the marking process to be faster and more user friendly than pen and paper based assessments. It is faster to read typed responses than hand written responses and the marker also has an added advantage of being able to change the screen font size to suit his needs. Typed documents have the advantage of eliminating problems associated with illegible handwriting. Illegible handwriting is a common cause of failure or low exam scores for students and the marking process can be extremely slow for the marker who might sometimes have no option but to skip parts of the answers to the detriment of the student.

Storage of computer based students' answer files is also easier than paper scripts and there is an added advantage that copies of computer files can be made as a safeguard against misplacement or accidental damage.

There is potential to improve the marking process of open ended answer files. In this regard, considerations are being made to make use of Marker's Assistant software tool with a view to reducing the time spent on managing assessment data.

Challenges encountered

There were some challenges and problems encountered during the running of the first computer based exams. The main problem was to do with the equipment used.

Technical problems

Responses to the survey question "What technical problems did you encounter during

the exam?" are presented in Figure 1.7 below. Figure 1.8 also presents responses to the survey question "Assess the level of assistance by technicians in resolving technical problems". While the majority of students reported encountering one sort of technical problem or another, the level of assistance offered by technicians to resolve the problems was commendable, judging by the 10% of the students who reported that the level of assistance was either below average (8%) or poor (2%).

Contingency measures aimed at ensuring that a student's achievement in the exam is not adversely affected by technical problems were called into play as evidenced by the invigilators' log entries in the invigilation sheets, copies of which were made available to markers. Technical problems increased the workload of technical staff and invigilators.
There were also reports by technical staff and invigilators of some students raising false alarms and blaming the equipment. After some checks the equipment would be found to be working perfectly. This could be attributed to the anxiety that typically characterises most exam centres including pen and paper based exams.

Despite the aforementioned technical problems, most of the students reported that they preferred computer based exams to pen and paper based exams. It is therefore important that efforts are made to equip computer assessment centres with reliable equipment so that students' performance is not affected by the technology. The most frequent responses to the survey open ended questions were (slightly edited):

- "The University should buy new computers"
- "The University should buy more computers"

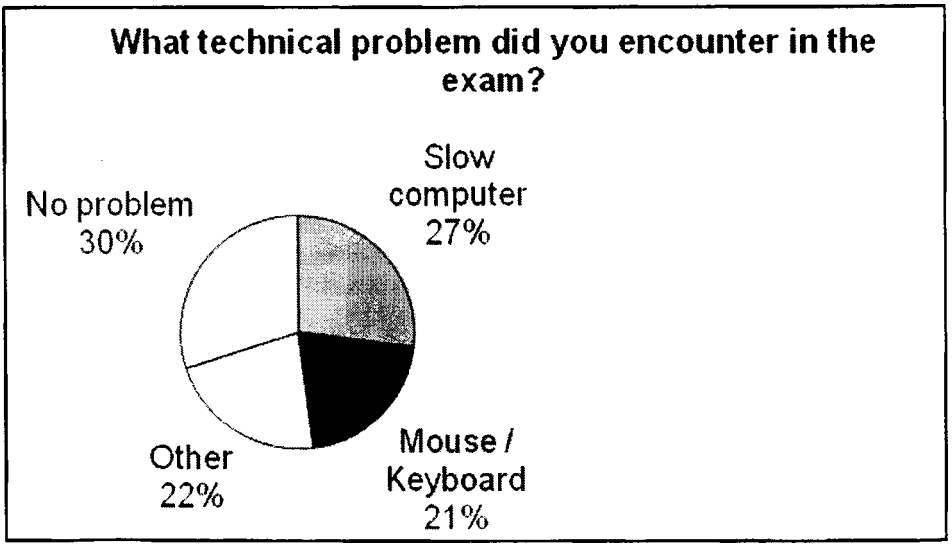

Figure 1.7

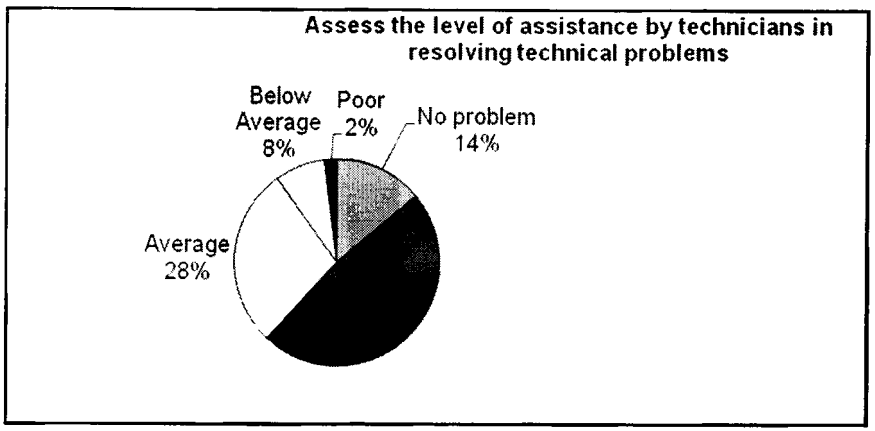

Figure 1.8

Handling large student groups

Handling of two session exams posed some challenges since more invigilation staff were required to keep the two student groups separate at all times. Deciding on which group to start was also not easy since most students preferred to be in the first group. The possible stress that Session 2 students are put under by having to wait for the first group of students to finish needs further investigation. A strategy of rotating student groups in two session exams was subsequently adopted. Students sitting for a two session exam in the first group during the first semester would be moved to the second group during the second semester and vice versa.

During a two session exam, close monitoring of candidates in the first group proved to be more effective than concentrating on both groups. A candidate who finished the exam early in the first group was not allowed to leave until the end of the exam session together with the rest of the candidates in the group.

Lack of University policy on e-assessments

Two main challenges encountered were related to the unavailability of resources and the additional administrative burden placed on the coordinator of computer based exams. Computer resources were not always available when required. The coordinator needed to form personal work relationships with computer lab staff and e-learning system support staff to ensure that resources were available for computer based exams. The administrative burden of arranging exams, dealing with invigilators and managing the security of exam questions and students' answer files was handled by the coordinator since the other lecturer worked for the University on a part-time basis and was only available to attend administrative meetings and face to face lectures with the students.

Conclusion

The experience gained in running the first computer based exams in December 2009 has helped in minimising potential challenges faced in subsequent exams. The number of students sitting for computer based exams has increased from 330 in December 2009 to more than 700 in June 2011.

Although careful planning and administration are key factors in the successful implementation of e-assessments, student preparation has been identified as the most fundamental key factor. Since evaluation has revealed that students prefer e-assessments to pen-and paper based assessments, serious efforts should now be made to start developing and implementing a university wide e-assessment strategy. Such a strategy could incorporate recommendations by King (1997) for the implementation of Computer Assisted Assessments at the University of Portsmouth summarised below:

- ✓ Adopt a policy to use university-wide e-assessments
- ✓ Promote awareness and understanding of the e-assessment policy
- ✓ Designate an E-assessment Officer with responsibilities for implementing standards and quality in e-assessments
- ✓ Commitment to the evaluation, purchase and maintenance of suitable e-assessment software on an institution wide basis
- ✓ Prioritisation of e-assessment support through centralised University computer services
- ✓ Initiation of a programme of staff training in the use of e-assessment software
- ✓ Develop a protocol for managing e-assessments (King, *et al,* 1998)
- ✓ Institute a programme of evaluation and feedback on the use of e-assessments

Where sufficient financial resources may not be available to purchase commercial e-assessment software, the University can consider evaluating and utilising suitable open source e-assessment software.

References

Apampa, K.M. (2009). Towards Security Requirements in Online Summative Assessments. In T. Bastiaens et al. (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2009* (pp. 2104-2109)

Ashton, H. S., Beevers, C. E., Bull, J. (2004). Piloting e-assessment in Scottish schools – Building on past experience. *International Journal on E-Learning, 3*(2), 74–84.

Bloom, B., & Krothwohll, D., (1956, 1946), *Taxonomy of educational objectives: The classification of educational goals, London : Longman*

Brown G, Bull J and Pendlebury M (1997) *Assessing Student Learning in Higher Education,* Routledge, London

Bull,J., & McKenna, C., (2000) *Quality Assurance in Education, 8(1), 24-31*

Bull, J. and McKenna, C. (2004) *Blueprint for Computer-Assisted Assessment.* London: Routledge Falmer.

Clariana, R., & Wallace, P. (2002). Paper-based versus computer-based assessment: Key factors associated with the test mode effect. *British Journal of Educational Technology, 33*(5), 593–602.

Dochy, F. (2005), Learning lasting for life' and assessment: how far did we progress?Presidential address, EARLI 2005 at the 20th anniversary of the European Association for Research on Learning and Instruction, Nicosia, Cyprus,August23.http://perswww.kuleuven.be/~u0015308/Publications/EARLI2005%20presidential%20address%20FINAL.pdf

Guba, G., & Lincoln., Y., (1982), Epistemological and Methodological Bases of Naturalistic Inquiry, *ECTJ 30(4), 233-252*

IAT(2009), E-Assessment of Short-Answer Questions
http://www.intelligentassessment.com/pdf/IAT%20Free%20Text%20White%20Paper.pdf

JISC, Short answer marking engines
http://www.jisc.ac.uk/media/documents/projects/shorttext.pdf
JISC (2006), E-assessment glossary
http://www.jisc.ac.uk/uploaded_documents/eAssess-Glossary-Extended-v1-01.pdf

Keing, C., Lo, J., Lam, P. & McNaught, C. (2007). Summative eAssessments: Piloting acceptability, practicality and effectiveness. In C. Montgomerie & J. Seale (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007* (pp. 486-495).

King, T. (1997), ``Recommendations for managing the implementation of computer-aided assessment", Active Learning, No. 6, pp. 23-6.

King, T., Billinge, D., Callear, D., Wilson, S., Wilson, A. and Briggs, J. (1998), ``Developing and evaluating a CAA protocol for university students", in Wade, W. and Danson, M. (Eds), Proceedings of the 2nd Annual CAA Conference, Loughborough, pp. 17-23.

Kniveton, G.H. (1996), ``A correlation analysis of multiple choice and essay assessment measures", Research in Eduction, No. 56, pp. 73-84.

O'Loughlin, E & Osterlind, S (2007) A Study of Blended Assessment Techniques in On-line Testing. AISHE Conference 2007, Teaching and Learning in the Changing World of Higher Education. **http://www.aishe.org/events/2006-2007/conf2007/abs/abs-25.html**

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