AN ACADEMIC PERSPECTIVE OF ASSESSMENT QUESTION BANK

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ABSTRACT

There are several electronic assessment systems being used in institutions of higher education (HE), especially in Open and Distance Learning (ODL) institutions. Some of these institutions built their assessment system into their institution's Virtual Learning Environments (VLE). Most of these assessment systems are for general purposes where assessment questions are in the form of simple multiple choice question (MCQ) or short-answer questions. In practice, these types of assessment questions do not match many of the current learning requirements and learning outcomes. The concept of an assessment question bank that can be used by academics to share assessment content within or across an institution is not new, but the advancement of technology and technical developments now have made such a repository realizable than ever before. A question bank is now a specialized repository that can be accessed via a web interface for platform independence. The use of technology in developing the question bank provides much relief for the chores associated with preparing assessments, which in turn enhances the quality of the questions and improves the quality of the assessments. This paper presents the experience of Open University Malaysia (OUM) in developing its own Question Bank (QBank). This QBank system is designed to help the Subject Matter Experts (SMEs) who need to develop, classify and store their assessment such as MCQ and essay-type exam questions. This software is integrated with the OUM's Virtual Learning Environments (myVLE) in order to allow easier and wider access to the SMEs and faculty.

I. INTRODUCTION

The concept of a question bank that can be used by academics to share assessment content within or across an institution is not new, but technical developments now render such a resource far more realisable than ever before. A question bank is a specialised repository that can be accessed via a web interface for platform independence. It is defined as a relatively large collection of assessment items or test questions and associated software that enables the storing of test items to support the assessment of student learning. The question bank could be part of an assessment management system that incorporates tools for authoring and delivery of assessments, reporting of results and storage of data.

There are several electronic assessment systems being used in institutions of higher education (HE), especially in Open and Distance Learning (ODL) institutions. For example, some institutions have adapted to a system called Computerised Adaptive Test (Embretson & Raise, 2000; Olea, Ponsoda & Prieto, 1999; Sands, Waters & McBride, 1997; van der Linden & Glas, 2000; Wainer & Steinberg, 2000). Most of these assessment systems are general in purpose where most assessment questions are simple multiple choice questions (MCQs). However, in practice these MCQs do not match many of the learning requirements and learning objectives. These issues were among the key discussion in Baker (1989) and Roid (1989) articles on educational measurement, where they provided a good overview on the use of computer technology in testing and usage to cater for the different needs of each institution. Due to these differences, some institutions decided to build their own question bank that is able to tailor to their institution's assessment objectives and format. The use of technology now provides much relief for the chores associated with assessments, such as questions entry, tagging and storage, on-demand questions retrieval, and maintenance of the question history, which in turn enhances the quality of the questions and improves the quality of the assessments.

This paper presents the Open University Malaysia (OUM)'s experience in developing a question bank for its assessment purposes. The question bank system is designed to help the academics to develop, classify, tag and store their assessment as MCQs and essay-type exam questions. This system is integrated with OUM's Virtual Learning Environments (myVLE) in order to allow easier and wider access to all faculties.

II. DEVELOPMENT OF QUESTION BANK

For the past few decades, academics went through the process of developing test questions manually. Figure 1 gives the general overview of the major components needed in a test development process. Although data acquisition (collating and analysing test data) maybe efficient, the process of test development; especially for larger testing groups, is tedious and less efficient.
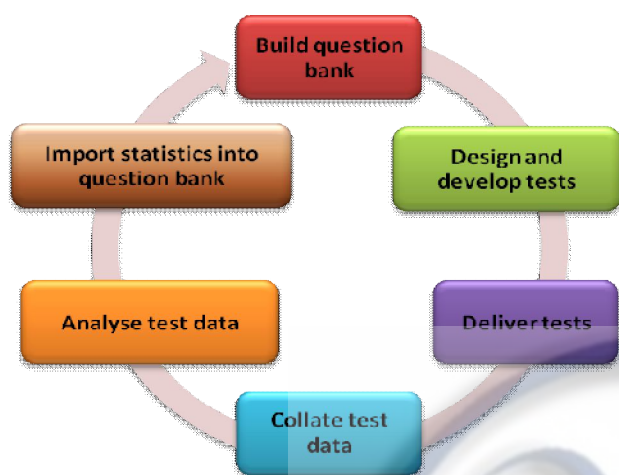

Figure 1
Major Components of a Test Development Process.

Most academics find that maintaining a collection of questions for any testing is a tedious process fraught with numerous possibility of error. Test questions are frequently written or typed, delivered and kept. These test questions are normally kept in drawers, sometimes separated into content classifications. When item statistics are available on these questions, they are frequently written on the back or next to the questions. The result of the test questions is normally analysed according to the test date and kept separately. These may lead to the questions getting lost, misplaced or misfiled. Hence, a well designed database for storing, maintaining and analyzing these test questions are the answer to eliminate these problems.

There are several functions that a question bank can have. Ideally, a question bank must be able to handle these three major functions:
1. depositing questions and tagging them accordingly (item entry and storage);
2. retrieving questions for examination purposes (item retrieval for reviewing, formatting, editing and updating); and
3. maintaining questions' history (scoring and analysis).

With these three major functions, any academics who are involved in preparing assessments on regular basis will find question banking technology very useful. What are the options of setting up a question bank? The possibilities of establishing a question bank could range from using a 'ready-made' question bank to programmes that generate questions from algorithms and create tests to specification.

In OUM's case, a question bank, known as QBank, is developed by a team of in-house programmers. The advantage of developing our own system is that the programme can be tailored to provide specific characteristics according to OUM's assessment format. Figure 2 provides an overview of the major functions associated with QBank. Some of the main features in this question bank are listed below:

- Manage development of new assessment questions and improve on old test questions: Each question is tagged according to its topic, Bloom's Taxonomy of Learning Domains and ID number;
- Share content within the institution and Subject Matter Experts (SMEs): This allows the academics within OUM to share content and check for quality of questions (moderation process) with the external SMEs;
- control access to items: Different users are assigned with different level of security access
- manage valuable assessment resources at organisational level;
- facilitate reuse of assessment items, for example release of items from summative assessment for subsequent reuse in formative assessment;
- reduce potential for cheating in summative assessment by delivering different sets of test questions to different sets of candidates; and

provide a single point of access to information and resources needed to construct assessments (this could include results data or analysis from individual items or assessments).
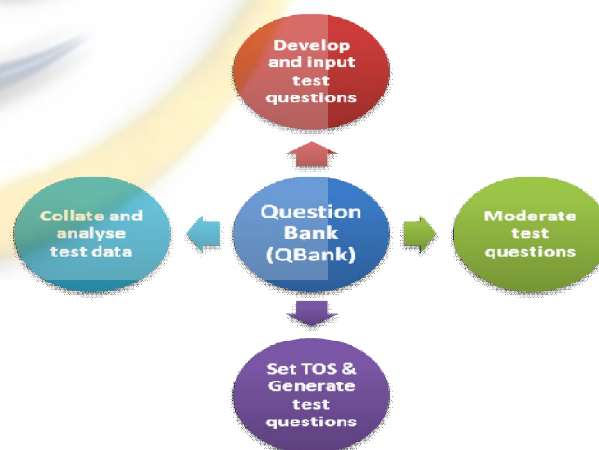

Figure 2
Major functions performed by QBank.

In order to control the security level of the system, different roles are assigned at different level of users. Among the roles assigned by the QBank are:
1. Data Entry (DE)
   Upload questions and answer schemes into the system.
2. Subject Matter Expert (SME) or Question Developer (QD)
   Develop and upload questions and answer schemes into the system.
3. Moderator (M)

Moderate and approve questions and answer schemes which have been created by SME or QD. A Moderator will check on the quality of the questions and approve the questions for permanent storage in the system. The Moderator could be the Program Coordinator, Deputy Dean or Dean of the faculty.

Figure 3 shows the difference between the SME/DE and Moderator functions during the login procedure. A DE can only upload pre-prepared questions into the question bank. As SME or Question Developer, the academic can only add question and answer scheme by typing in or uploading the question and answer scheme.

Figure 3
Sample of the screen capture for SME/DE and Moderator.

In order to help the academics locate their courses easily, a search tool has been incorporated into the system. This search option allows the SME or Moderator to choose Faculty and Course which has been assigned to them before they start to upload or moderate the questions, as shown by Figure 4 below.
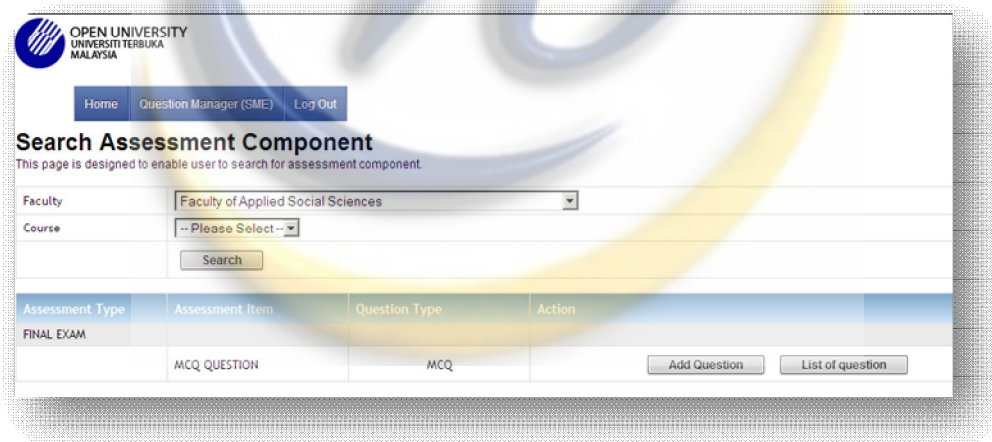
Figure 4
Search Option

Once the search for faculty and course is completed, the SME will be ask to set the topic, taxonomy and marks distribution for each question as demonstrated in Figure 5. It is very important to set the criteria for each question in the beginning of the uploading process so that the faculty and the examination unit could easily retrieve or set test papers later according to the Table of Specification (TOS) of the relevant subject.
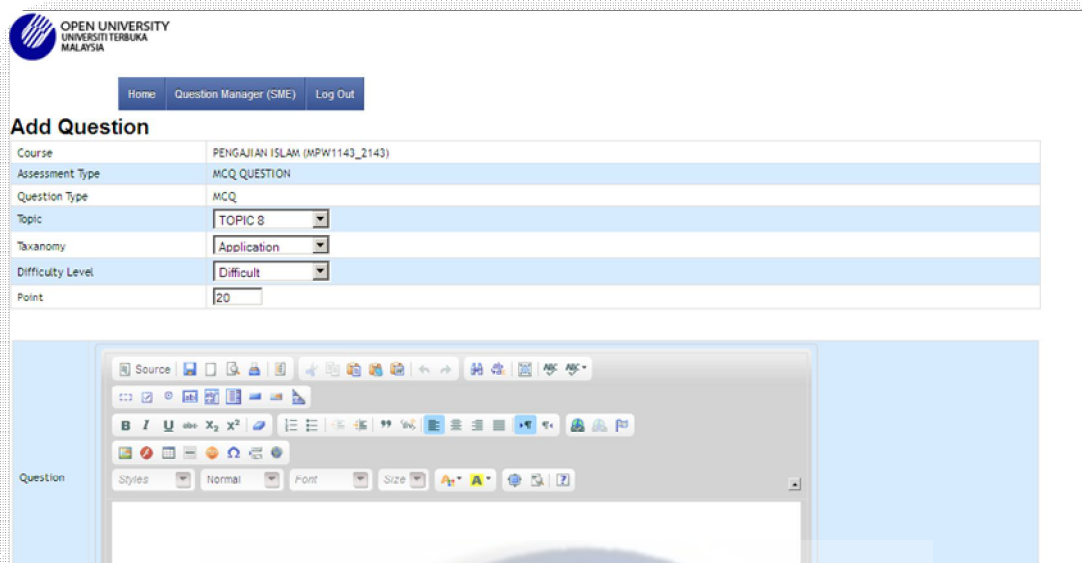
Figure 5
Options for Faculty, Assessment Type, Topic, Taxonomy and Marks Distribution.

Figure 6
SAVE Options in QBank.

Once the topic and taxonomy has been set, the SME can start to upload or type-in their question and answer scheme. Once completed, the SME have the option to "Save as Draft" or "Save as Ready to Moderate" as shown in Figure 6. Once the questions are uploaded into the question bank, each question is subjected to a review process by an experienced staff, identified as Moderator. As a Moderator, the academic will evaluate each question and answer scheme in terms of content and quality. The Moderator then approves the question for permanent storage or sent it back to the Question Developer if he finds the question did not meet the standard set by OUM. This review mechanism, which must necessarily act as a gatekeeper to the bank, presents a demanding challenge. There is significant pressure to review large volumes of questions, hence several workshops were organized specifically to monitor and evaluate the quality of the questions. Each question is examined to ensure that it is:

- pitched at a level appropriate to specific learning outcome and taxonomy,

- logical and correctly structured,
- written with correct answers and appropriate feedback.

III. ISSUES AND CHALLENGES

From OUM's experience, there are several issues and challenges in developing the question bank. Among the issues and challenges faced are:

1. Limited number of questions:
   Ideally, a question bank must have a large number of questions for each course in order to avoid the questions from being used repeatedly. In the initial stage of the QBank development, we are faced by the limited resources and time constraint in order to produce enough number of questions. To overcome

this, past year questions are being upgraded to suit the purpose of the question bank. Several workshops were conducted with SMEs. In these workshops, the SMEs were grouped according to their expert area and worked on improving the past questions to the standard and criteria set by OUM.

2. Lack of skills in some SMEs/Question developers:
   It is found that the ability to develop good exam questions and identify level of difficulties fit for specific learning outcomes varies among the SMEs and Question Developers. Hence, trainings were provided to the SMEs and Questions Developers on developing test questions that cater for specific level of learning domain.

3. Maintaining quality of questions:
   Another big challenge in developing question bank is the quality of the test questions. Since the SMEs and Question Developers could be from various institutions of higher learning, most of them carried their own common practices when developing the questions; which sometimes do not adhere to OUM's assessment format. In order to maintain the quality of the test questions, Moderators are assigned to every course. These Moderators will vet through every question and determined the quality of the questions.

4. Graphic interface and equation editor compatibility:
   During the uploading of the test questions, it is found that question that is written using certain mathematical editor does not appear in the screen as it is originally prepared. The same compatibility issue occurs for certain graphical image. To overcome these, the programmers have to incorporate certain programming codes so that the equations and graphics appear as they are intended to.

IV. WAY FORWARD

Based on OUM's experience, one of the advantages in having a question bank is that academics do not have to develop new questions for every examination. In addition, the question bank is more complete in covering the domain than will test questions written on an ad hoc basis. The questions can be edited and corrected periodically, so that questions in the bank are usually much better quality than those written hurriedly just for a single test. Other advantages are that it is easy to put an examination together, and to get the scoring and analysis done quickly. The question codes (identification number, topic allocation and taxonomy tagging) facilitate selection of questions to fit a given assessment format or area of content. The codes also help to get the desired balance between different skill levels identified by the Bloom's Taxonomy. This in turn helps the university to maintain the quality of the examination. Currently, OUM is expanding the bank by including more courses to the question bank and embarking on the question bank for postgraduate level, specifically for all MBA courses. There will be further expansion in the question bank programme code to include the analysis of the data on students' performance and test results. This data will help the university to maintain and monitor the standard of the questions.

V. CONCLUSIONS

The description of the Qbank system developed by OUM is presented in this paper. It is clear from the description of the system, most of the design specifications have been achieved for the four main tasks involved in building a question bank, that is

1) edition and visualisation of the information for the item bank;
2) moderation of the items in order to maintain quality and standard of the questions;
3) selection of item bank subsets through the Table of Specification and generation option;
4) collection of item response data and analysis.

The QBank described in this paper has integrated all the requirements involved in developing and maintaining a good question bank. It is hoped that this QBank will help the academics and university not only in terms of storing, organizing examination questions, and producing tailored tests, but in keeping up with the quality of the test questions according to the standard set for the desired test profile.

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