CHAPTER 1

INTRODUCTION
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1.0 INTRODUCTION

Teaching is a complex art, learning too. The educators and educational researchers have taken utmost efforts to simplify teaching-learning process by various means. The change from teacher dominated methods to learner chosen methods shows the efforts taken by the teaching and learning communities to simplify learning. Interestingly, Information and Communication Technology (ICT) has been flexibly twisted with educational requirements to achieve simplicity, effectiveness and efficiency. Yet the unexplored areas of ICT based educational applications are more and obvious. Smooth transition from yesteryear educational technologies to ICT oriented technologies have been made by providing suitable training to the teachers to fit the current environment (ICT Academy of Tamil Nadu, 2010a). Now, the importance of ICT in education is recognized and accepted by all stakeholders i.e. students, teachers and educational administrators.

Information travels at the speed of light in this digital era. Simultaneously, higher education institutions face various major challenges to provide maximum knowledge in minimum time. The challenges are multifaceted and the major ones are as follows:

- Emergence of multidisciplinary and interdisciplinary subjects
- Overlap of formal and non-formal educational systems
- Enormous student population
- Technological inventions
- Cross-boundary education

1.1.0 ICT IN HIGHER EDUCATION

Not only is social life identical with communication, but all communication (and hence all genuine social life) is educative (Dewey, 1923). Education is empowered to make any social change and ICT has also contributed for that during the past decade. ICT’s role in education has made a significant transformation in
our society, and that cannot be denied. Despite the efforts of teachers to adopt recent technologies, the awareness regarding ICT among the new generation learners has automatically pulled its implementation in education. The intervention of ICT has given too many options for teaching, learning and educational administration. Failing to manage fittingly, will lead to a chaotic environment. At the same time, too many options are necessary to satiate the present requirements. The blend of systematic application of technology and appropriate educational knowledge always yields a professional teaching and mastery learning.

The implementation of ICT in education and challenges in higher education has changed the educational scenario in several aspects. The increasing use of portable devices and campus networks has gained the attention of many institutions. E-learning, the teaching-learning process through electronic devices, has become integral and essential part of the research and studies in many developed nations. However, the impact of globalization and change in educational governance throughout the world has shrunk the boundaries of education with digital technologies to promote equity. The technologies which were mostly supporting the non-formal education system now have become part of formal system to converge the conveniences by bridging the gaps between those systems.

1.1.1 Web-based Learning

Several studies were done on computer-based and web-based instructions to prove its effectiveness. The web-based instruction is becoming popular in higher education for its wide support of virtual learning. Virtual Learning Environment (VLE) consisting of teaching, learning and evaluation features are used to support the students and teachers of formal and non-formal systems. The gap between formal and non-formal education systems are slowly disappearing with these technologies. Particularly Learning Management System (LMS) and Virtual Classroom (VC) are the mostly implemented VLEs. The Government of India has taken initiative to link the educational institutions (schools, colleges and universities) throughout India. EDUSAT, a satellite launched by ISRO during 2001 is the outcome, and now VCs are conducted in this network, while steps are
already taken to establish LMS. The availability of higher internet bandwidth motivates the Indian institutions to push multimedia-based learning contents through websites. To quote a few, initiatives were already started by Indira Gandhi National Open University (IGNOU), University Grants Commission – Consortium for Educational Communication (UGC-CEC) and Tamil Nadu Agricultural University (TNAU) through their websites ignouonline.ac.in, cec-econtent.edu.in and mms.tnau.ac.in respectively.

The extensive growth in internet has promoted the e-learning to be more web-based. Major contents in web-based environment are user-oriented which allows both students and teachers to interact from distance. The increase in web oriented learning environment is obvious from the students’ preference to online learning in the United States. A study conducted during 2008 in 2500 colleges shows the increasing trend towards online courses; nearly 17% enrolments are more than the previous year. There is a rapid growth in students taking online courses as 1.6 million students in 2002 jumped to 4.6 million in 2008 (Table 1.1). Also, one-fourth of the students are undergoing minimum one online course. The public institutions (74%) and the larger institutions (81%) have agreed that online education is a part of their long term strategy (Sloan Consortium, 2009).

Table 1.1: Online enrollment in higher education institutions of the United States (Sloan Consortium, 2009)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Enrollment</th>
<th>Students Taking Minimum One Online Course</th>
<th>Annual Growth Rate of Online Enrollment</th>
<th>Online Enrollment as a % of Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>16,611,710</td>
<td>1,602,970</td>
<td>NA</td>
<td>9.6%</td>
</tr>
<tr>
<td>2003</td>
<td>16,911,481</td>
<td>1,971,397</td>
<td>23.0%</td>
<td>11.7%</td>
</tr>
<tr>
<td>2004</td>
<td>17,272,043</td>
<td>2,329,783</td>
<td>18.2%</td>
<td>13.5%</td>
</tr>
<tr>
<td>2005</td>
<td>17,487,481</td>
<td>3,180,050</td>
<td>36.5%</td>
<td>18.2%</td>
</tr>
<tr>
<td>2006</td>
<td>17,758,872</td>
<td>3,488,381</td>
<td>9.7%</td>
<td>19.6%</td>
</tr>
<tr>
<td>2007</td>
<td>17,975,830</td>
<td>3,938,111</td>
<td>12.9%</td>
<td>21.9%</td>
</tr>
<tr>
<td>2008</td>
<td>18,199,920</td>
<td>4,606,353</td>
<td>16.9%</td>
<td>25.3%</td>
</tr>
</tbody>
</table>
1.2.0 OPEN EDUCATIONAL RESOURCES (OER)

In the midst of web revolution, availability of sophisticated tools to calibrate any kind of web applications has brought several achievements through web-based education such as virtual classroom, online distribution of learning materials, anytime-anywhere teaching/learning and online assessment. Simultaneously, web has been proved as the best destination to fulfill the UNESCO’s concept of Open Educational Resources (OER).

Since 1998 when Tim O’Reilly conducted the Freeware Open Source Summit, the term open source has become very popular (Rossum, 1998). Open source refers to the source materials of end product. Software supplied with the source code/program is called open source software. The design and development of open source software provide the flexibility to use, reuse, modify and add users’ interests without restrictions. The development of free digital contents and tools as resources in educational domain (formal, non-formal and informal educational settings) is the underlying idea behind OER.

OER are digitized materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research. OER includes learning content, tools and implementation resources.

Learning content

Full courses, courseware, content modules, learning objects, collections and journals are the learning contents that are useful to students and teachers.

Tools

Tools are the software like learning management systems and content development systems that used to support development, use, reuse, search, organize and deliver the content.

Implementation resources

Design principles and intellectual property licenses are considered as the implementation resources.
Several institutions have already started offering OER services, and the major contributors are Massachusetts Institute of Technology, Rice University, Carnegie Mellon University and Utah State University (Organization for Economic Co-operation and Development, 2007).

1.2.1 National Knowledge Commission of India

In 2009, the National Knowledge Commission of India recommended promoting open educational resources to overcome issues such as lack of high quality teachers, inadequate infrastructure in the universities/colleges and more specifically their libraries, and the poor quality of educational resources utilized at various colleges and universities. The Committee stated that the dissemination of educational contents as OER through internet will be the only solution, and also pointed out that OER creation initiatives like National Program on Technology Enhanced Learning (NPTEL) carried out by seven Indian Institute of Technology (IIT), Ekalavya by IIT-Bombay and E-Grid by Indian Institute of Information Technology and Management (IIITM)-Kerala focuses on basic sciences and engineering areas. More OER is required to cover all other subjects. Also, the committee has recommended creating question banks with the OER. The major suggestions made by the committee are as follows (National Knowledge Commission, 2009):

- To create distributed repositories of educational content.
- To increase the availability of educational applications through internet.
- To create open-standard and service-oriented facilities for distribution of educational content.

1.3.0 EDUCATIONAL REFORMATION IN INDIA

Reformation in education is a continuous process. Education was exclusively in the list of States and during 1976 it was included in the concurrent list. Now, the finance and administration is shared by Government of India and respective States. Government of India has undertaken more responsibility to monitor and maintain the quality and standards at all levels of education.
1.3.1 Uniform Education System in Tamil Nadu, India

In 1964, a committee was formed by Government of India under the headship of Dr. D. S. Kothari to point out the issues of education in India. The committee had suggested various remedial measures and a noteworthy recommendation was to create a common school system. Recently the Government of Tamil Nadu has introduced the uniform education in schools based on Muthukumaran Committee report submitted in 2007. The state with 73.5% of literacy rate during 2001 census has taken immense efforts to bring uniform pattern of education within the state and eliminate the discrepancy in different school boards. The state has Matriculation, Anglo-Indian, Oriental and Tamil Nadu State school boards with individual syllabus for each board. According to the recommendations of Muthukumaran Committee, the state has started offering education with a common curriculum ensuring an equitable school education throughout the State (Bandhu, 2009; Subbiah, 2010).

1.3.2 Common Higher Education Format in Tamil Nadu, India

The higher education in India is provided by universities, deemed to be universities, colleges and institutes of national importance. The complete higher education system is controlled by various means with public-private partnerships. Central universities are established by the Act of Parliament and State universities by State Legislature. Deemed to be university status is certified by Ministry of Human Resource and Development (MHRD)-Government of India, based on the recommendation of University Grants Commission (UGC). The private university status is given by State governments on the recommendation of their respective boards/ministries of the State. Institutes of national importance, premier management institutes and medical/statistical institutes that are empowered to award degrees are declared by MHRD.

The colleges are managed by respective State governments. The colleges are affiliated to the State universities within its territorial jurisdiction of the concerned State, and some of the colleges are declared by UGC as autonomous colleges. The curriculum design, conduct of examination, evaluation and award of
degree for the affiliated colleges are managed by the respective State universities. The autonomous colleges are also affiliated colleges with autonomy to create own curriculum and conduct examination. The degrees of autonomous colleges are awarded by the State university to which the college is affiliated. All higher education institutions offer undergraduate, postgraduate and research courses in regular mode. Additionally, Distance Education Council (DEC) approves the universities to offer undergraduate and postgraduate courses in open and distance mode.

India has 42 central universities, 259 State universities, 130 deemed to be universities, 65 private universities, and 49 institutes of national importance which includes IITs, NITs, IIMs and medical/statistical institutes. The State universities control more than 22,000 affiliated colleges among which 324 are autonomous colleges. Nearly 90% of undergraduate students, 66% of postgraduate students, 84% of faculty members are in the affiliated colleges. The higher education institutions barring affiliated colleges contribute much in research because only 13% of the research scholars are in affiliated colleges. Specifically, Tamil Nadu State has 23 State universities, 29 deemed to be universities, 1 central university and 2 institutes of national importance. It has 2076 colleges affiliated to State universities with more than 5,40,000 students in all courses (Government of Tamil Nadu, 2010; University Grants Commission, 2010a). Hence, the higher education is mostly offered by affiliated colleges and the State universities affiliating them play an important role in conducting examinations to majority of the students.

During 2008, Tamil Nadu State Council for Higher Education (TANSCHE) implemented Choice Based Credit System (CBCS) and introduced a common course format for the Under Graduate (UG) and Post Graduate (PG) courses offered by State universities and its affiliated colleges. The format describes the structure of various components of a course i.e. number of subjects, number of credits, internal/external marks and minimum pass mark. Immediately the universities in Tamil Nadu adopted the format for each course and added the subjects to their regional need. This is a preliminary step to bring uniformity in higher education.
1.3.3 Reformation in Examination System

Evaluation is important as teaching-learning in our educational system. The examination reformation boards and testing service centers are taking efforts to synchronize evaluation with technology oriented teaching-learning. Recently, Central Board of Secondary Education (CBSE) has taken initiative to emphasize uniform summative evaluation by sending the CD with model question paper to its schools. The schools were asked to set question papers in the mentioned format. The format includes total marks, number of sections and descriptive/objective questions. Uniform examination system brings even-handedness to different groups, but regional interests may be hidden (Noah & Eckstein, 1989). Hence the changes in a system must be checked to see that did not disturb the objectives.

Generally in India, examinations are conducted in three major categories viz. written examination, oral examination and practical examination. The written examination plays a vital role and it is most commonly used. The issues in written examinations are memorization oriented, subjectivity, poor content coverage and administrative shortcomings. Many of the issues addressed were overcome in the past years while the system is still improving. The corrective measures to overcome these issues were as follows (Srivastava, 1979):

- Identification and definition of instructional objectives for the subject in question.
- Giving proportionate weights to the instructional objectives in preparation for framing questions which will test status of progress towards the objectives.
- Framing questions of different forms which are most suitable for testing the abilities associated with the particular instructional objectives.
- Designing specific directions regarding the dimensions of the question paper.
- Defining major areas of content and giving proportionate weights to each area.
- Including numerous short answers and objective-type questions.
- Restricting the number of options to essay-type questions.
• Giving precise directions to the setters for setting and to the examiners for scoring.

1.4.0 EDUCATIONAL ASSESSMENT

Question bank is a collection of examination questions, also considered as one of the major aspects of educational reformation, especially in examination reformation. It helps to improve the standard of educational assessment and a useful service supporting students, teachers and examiners. Professionally developed question bank can influence curriculum development, guiding in interpreting syllabus, writing objectives and constructing valid questions. The printed question bank books have limited potential than the large scale question bank developed with computer (Thiyagarajan, 2009). Moreover, the computerized question bank would be helpful to majority of students and teachers in a uniform education system.

Preparing a question bank requires a detailed understanding of various types of assessments and its characteristics. Assessment in education can be thought of as occurring whenever one person, in some kind of interaction, direct or indirect, with another is conscious of obtaining and interpreting information about the knowledge and understanding, or abilities and attitudes of that other person. To some extent or other it is an attempt to know that person (Rowntree, 1997). Assessment is a systematic basis for making inferences about the learning and development of students... the process of defining, selecting, designing, collecting, analyzing, interpreting and using information to increase students’ learning and development (Brown & Knight, 1994). On whole, the assessment is measuring knowledge, skills, attitudes and belief of the individual learner, the learning community, the educational institution, or the educational system.

Institutional policies on assessment and instruments are adjusted to address validity, reliability, transparency and authenticity. Valid assessment is measuring which we should about to measure. Reliability, with reasonable error limits, is measurement of a work equally by several assessors. Transparency is the extent to
which learners know their actual learning outcomes. Authenticity is confirming the work assessed belong to the respective person (Race, 2010).

1.4.1 Types of Assessment

In India, the assessment in higher educational institutions is conducted in annual, semester and trimester patterns. Most of the institutions here follow semester pattern. The assessment is classified into formative and summative assessment based on the modules/lessons/units considered for the assessment. Recently the Indira Gandhi National Open University (IGNOU) has introduced on demand examination system in which the students are allowed to select their date and venue of term-end examination.

Formative assessment

Formative assessment is a tool employed to continuously monitor students' achievement. It provides effective feedback to the students regularly and helps to improve their performances. It facilitates as a diagnostic and remedial means to adjust and adopt teaching for the students. The formative assessment is done through quiz, conversation, interview, visual test, project, practical, assignment, presentation and written. This is also called as internal assessment or continuous assessment. The marks allotted for internal assessment ranges from 20% to 60% and mostly depend on the curriculum design of subject or course.

Summative assessment

The Summative assessment is the terminal assessment of performance at the end of instruction. This is termed as end-semester examination or external examination and it is widely conducted during the end of the semester/trimester/year. The summative assessment is done through written, practical and presentation. As prescribed by the curriculum designers the marks allotted for this assessment ranges from 40% to 100% for a subject.
1.4.2 Students' Participation in Assessment

The students are allowed to participate in the following assessments as prescribed by the curriculum designers for the respective courses and subjects.

Written examination

In Indian higher education system, the colleges and universities give much importance to written examination, especially in arts and science courses. More credits are allocated to written examinations than practical examination and presentation. The students are given question papers for which they write answers in answer sheets.

The written examination questions comprise of testing the cognitive and affective domain related learning outcome. Three categories of questions are used in the present written examinations viz. objective-type questions, short answer questions and essay type questions. The types of questions and learning outcomes according to the educational objectives are shown in the Table 1.2.

Table 1.2: Types of questions and learning outcomes (Naidu, Saxena, & Jauhari, 2008).

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Question Type</th>
<th>Answer Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Domain: Knowledge, Comprehension</td>
<td>Objective-type questions (True-False, Multiple choice, Matching questions)</td>
<td>Very short answer</td>
</tr>
<tr>
<td>Cognitive Domain: Application, Analysis, Evaluation</td>
<td>Short questions</td>
<td>Short Answer</td>
</tr>
<tr>
<td>Affective Domain: Interests, Values, Attitudes</td>
<td>Essay type questions</td>
<td>Long Answer</td>
</tr>
<tr>
<td>Cognitive Domain: Application, Analysis, Evaluation</td>
<td>Essay type questions</td>
<td>Long Answer</td>
</tr>
<tr>
<td>Affective Domain: Interests, Values, Attitudes</td>
<td>Essay type questions</td>
<td>Long Answer</td>
</tr>
</tbody>
</table>
Practical examination

The students are asked to perform experiments and activities in real time. The results of the experiments and activities are observed to award the marks. This method of assessment is vastly seen in science and engineering related courses.

Presentation

Presentation is a popular method in which the students are asked to present a topic before a group or experts. Usually, the classroom seminars are conducted for this assessment. The report of the project work undergone as part of the coursework is asked to present before the experts.

Computer-based test

The ICT innovations such as computers, networks and multimedia are used to flexibly and interactively assess the performance of students. Generate unique questions, manage punctuality, ask multimedia-based questions, provide immediate feedback, create repository and store results are the abilities of computer-based test that are pushing away the traditional paper-based assessments. However, the scarce infrastructural facilities do not motivate computer based tests in the present Indian educational environment.

1.4.3 Measurement in Assessment

Measurement is the act of measuring by assigning symbols or numbers to something according to a specific set of rules. Educational measurement deals with the process of obtaining a quantitative degree of achievement of objectives that were set for an educational setting. Generally two types are used viz. criterion and norm referenced measurements.

Criterion referenced measurement

This type of measurement is used to determine the achievement of specific skills or concepts identified by the teachers and curriculum designers. A predetermined minimum and maximum acceptable standard is fixed before
assessing the achievement and one student’s achievement is not compared with another. Each student is compared against the predetermined standard to determine the achievement, and the marks obtained are calculated in percentage. This method of measurement is used by universities and colleges in formative and summative assessments.

Norm referenced measurement

This type of measurement is used to rank each student with respect to the achievement of others in broad areas of knowledge. After measuring the students individually, the scores are used to compare one with another to form various groups. Usually the result is reported in percentage or grade. This method is used in entrance/competitive examinations to rank the candidates.

1.4.4 Testing Service Organizations

Testing service organizations like Educational Testing Service (ETS) – USA, National Testing Service (NTS) – India, and National Testing Service (NTS) – Pakistan, pursue research to improve the educational measurement and education. The research area includes statistics, educational evaluation, psychology and any other areas related to educational measurement. The results of the researches undergone also make major reforms in examinations. Testing service organizations concentrate on written examination questions and other examination test items. Particularly, ETS has developed question bank consisting of 60,000 items for school educators to use in formative assessments i.e. classroom tests and district tests.

1.5.0 QUESTION BANK

Question bank is a large, systematic collection and organization of examination questions pooled by an institution for the use of evaluators, academics and students in partial fulfillment of the requirements of the teaching learning process. The question bank is an essential aspect of educational models and utility service designed to fulfill the predetermined purposes i.e. to enrich the
instructional aspect and to judge the learners' instructional efforts (Biswas & Pradhan, 2002).

The valid, reliable and transparent questions depend on the purpose of examination, examination specifications, appropriate questions, and order of questions. Thus prepared questions and its collection are used for the following purposes.

1. Pre-testing, development, review and revision of a lesson.
2. Preparing review exercises in text books.
3. Facilitate question paper setters and conduct formative/periodical assessment.

1.5.1 Scope of Question Bank

Question banks are available for questions posed in interviews, competitive examinations and classroom/semester examinations. Coaching and tuition centers effectively make use of past/previous examination questions to prepare candidates for the forthcoming examination. Numerous coaching centers exist for preparing the students for examinations like GRE, TOEFL, NET, SSC, UPSC, TNPSC, CAT, etc. Also, numerous tuition centers exist to train students to score maximum marks and secure minimum pass marks. Though some educationists argue that previous examination questions encourage rote learning, the counter argument also exists that systematically developed question banks encourage learning. In April 2009, Central Information Commission (CIC) of India asked the major competitive examination conducting bodies like UPSC, SSC, UGC and CSIR to disclose the past examination questions (PQ), since that do not encourage rote learning and examiners need to improve themselves to challenge students.

Some students write wrong answers by misinterpreting the questions. Also, many students write same answers for different cognitive level questions. It is important to analyze every aspect of teaching-learning process to make more effective and efficient, and if PQ can help the teaching-learning even at very minimum level, that too should not be left away. Obviously the practices of
coaching and tuition centers show that the PQ can be used positively in our educational system. Hence the exploration of various utility factors of PQ is important to explicitly make use of its advantages in structured educational setting.

1.5.2 Users of Question Bank

PQ help students to know thrust areas of a subject, understand questions' depth, write appropriate answers, plan timings for each section of question paper, avoid examination fear and brainstorm among peer groups. It helps to find out the expected standard of the questions and plan for short and sharp answers (Race, 2003).

Teachers shall use the question bank to conduct mock examinations, conduct formative assessments, help low scoring students to concentrate on thrust areas, and guide high scoring students to write more appropriate answers.

Question setters can ask more critical questions, need not repeat questions, know other question setters’ views and be specific to objectives of the course. The question bank will eliminate some of the defects in question setting. They are as follows (Dash, 2004).

- Very often questions for the examinations are set by persons who do not teach the subject for particular students.
- The question setters do not get adequate time for setting the questions.
- The questions are sometimes ambiguous and not properly framed or edited for clarity.
- Examination questions of various schools and colleges lack uniformity.

1.5.3 Types of Question Bank

The present evaluation system in educational institutions is dominated by written classroom/semester examinations. School, college, university and competitive examinations consist of objective and descriptive type questions. Some competitive examinations consists only objective type questions, but descriptive type questions share more marks in school, college and university examinations.
The private parties (coaching centers, tuition centers, and publication companies) and institutions’ examination centers/libraries are involved in preparing question bank. Question bank books are printed for competitive examinations and school examinations. These books are printed to cover huge population. But very few such books are available for universities/colleges. Publishers avoid since this will not be commercially successful due to limited population, various courses and course sub-divisions. However, certain engineering courses covering more students have such books. The following types of question banks are available for university/college written examination preparation.

1. All possible questions
2. Selective/most frequently asked questions
3. All past examination questions

All possible questions
This is prepared by individual or group of subject experts. Considering the topics in a subject/syllabus, maximum possible questions are prepared. The questions are limited to the views of the expert team. This will help as a study guide for the students and do not project any thrust areas.

Selective/most frequently asked questions
This is prepared by class teachers, tuition centers or publishing companies from PQ. This type usually consists questions and answers, and helpful for the students who struggle to secure minimum pass marks. Also, helps students to score high marks by concentrating on certain topics alone. But indirectly discourages students to consider all topics equally.

All past examination questions
Examination centers (or) library of the institution/organization prepare this kind of question bank. This consists of all subject-wise PQ from a particular year, and helps to know thrust areas, understand various types of questions and analyze
answers to be written. It suits well for higher education as it supports students struggling to score minimum marks and those enthusiastic to score high without avoiding topics.

The question banks with answers will not encourage students in higher-order learning rather it may motivate for rote learning. But many students use question bank to see the repeated questions and unaware of its exact purpose. Discussing the PQ in classroom by the teachers with different perspectives and explaining the expectation of the question would provide clear understanding among the students about the real purpose of question banks. The moderate and high-scoring students will try to score more marks by appropriately answering the questions. At the same time, this will help the low-scoring students to concentrate on important and essential topics to gain at least minimum knowledge.

1.5.4 Delivery Medium of Question Bank

The success of question bank depends on the accessibility features which will determine the effective use among target population. The following mediums are used to distribute ‘All past examination questions’ question bank.

1. Paper-based question bank
2. Disk-based question bank
3. Intranet based question bank
4. Internet based question bank

Paper-based question bank

The question papers distributed in the examination hall are collected and kept as paper-based volumes in library by the institutions. Also, the publication companies type the entire questions and print as books. The paper-based question bank is portable to carry but very difficult for searching questions under a topic and new book is required to know further updates. Some publications may adhere to a type of ordering (i.e. units, topics, years, frequently asked, marks) that may not be convenient for students and teachers.
Table 1.3 shows list of question bank books. *Question Bank of Biochemistry* is not a past examination question bank but contains all possible questions. *Galgotia Question Bank in Electronics and Communication Engineering* is a competitive examination question bank. *Question Bank in Economics for Class XI* consists of past examination questions for school subject. Some books have sample past examination questions at end of the book. There are no proper published sources of past examination question bank for colleges and universities. Very few books like *Success Series Anna University BE (ECE)*, especially for engineering subjects are available.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Book</th>
<th>Author</th>
<th>Name of the Publication</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Question Bank of Biochemistry</td>
<td>R.A. Joshi</td>
<td>New Age International (P) Ltd., New Delhi</td>
<td>2006</td>
</tr>
<tr>
<td>5</td>
<td>Success Series Anna University BE (ECE)</td>
<td>Selva Publications</td>
<td>Selva Publications, Chennai</td>
<td>2010</td>
</tr>
</tbody>
</table>

**Disk-based question bank**

This is a digitized form of paper-based question bank distributed through CD/DVD. The disks consist of questions database and linked to an application/software. Some disks consist of scanned images of question papers. If it is an application/software linked to a database, the software has to be installed in a computer before viewing the question bank, and every time the question bank has to be viewed through the application. The disks are portable but require new
disks to update further questions. IGNOU distributes disk-based question bank with scanned images of question papers to its students.

**Intranet-based question bank**

This is developed by institutions and accessible within the entirely networked campus. Scanned images of question papers are uploaded to a server and web browsers are used to view the questions through a web application. Usually, a username and password is given to the students and teachers to access this facility, but the access is restricted within the institutional premises.

**Internet-based question bank**

This is similar to intranet-based question bank, but installed in an internet server allowing anyone to access from anywhere through internet connection. Since ‘web’ is one of the services communicated through Internet, the PQ offered by this communication is referred as Web-based Past Examination Question Bank (WPQB). This type of question bank is created by private parties and institutions. Many institution-based question banks ask for username and password to restrict outside students and teachers. This is a suitable medium of delivery for Indian conditions which do not have sufficient campus network structure in many universities/colleges to install intranet based question bank.

Ipomo, an Information Technology (IT) company has started its first mobile learning software service ‘Interactive Platform on Mobile (IPOMO) Teachmate’ to download past examination question papers of competitive examinations (CET and IIT-JEE) on mobile phones (Zavery, 2010).
Table 1.4: List of WPQB developed by private parties

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Website link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>myacca.wordpress.com</td>
</tr>
<tr>
<td>2</td>
<td>questionpaper.in</td>
</tr>
<tr>
<td>3</td>
<td><a href="http://www.70620.com/tag/anna-university-tirunelveli-question-bank">www.70620.com/tag/anna-university-tirunelveli-question-bank</a></td>
</tr>
<tr>
<td>4</td>
<td><a href="http://www.clickindia.com">www.clickindia.com</a></td>
</tr>
<tr>
<td>5</td>
<td><a href="http://www.exampreparationservices.com">www.exampreparationservices.com</a></td>
</tr>
<tr>
<td>6</td>
<td><a href="http://www.indiastudychannel.com/">www.indiastudychannel.com/</a></td>
</tr>
<tr>
<td>7</td>
<td><a href="http://www.srikumar.com/education/question_papers.htm">www.srikumar.com/education/question_papers.htm</a></td>
</tr>
<tr>
<td>8</td>
<td><a href="http://www.annaunivonline.com/qbank/index.html">http://www.annaunivonline.com/qbank/index.html</a></td>
</tr>
</tbody>
</table>

Private WPQB do not cover all subjects and courses offered by numerous educational institutions. Table 1.4 shows few private WPQB and these are not well organized, does not contain easy search facilities, entire subjects are not covered and not up-to-date.

The WPQB developed by institutions are maintained by course teachers, libraries, educational technology/e-learning units. Some universities/colleges like Cork Institute of Technology (Ireland), Indira Gandhi National Open University (India), Massey University (New Zealand), University of Kent (UK), University of St. Andrews (UK), University of Technology – Sydney (Australia) and University of Ulster (Ireland) has question banks comprising huge collection of questions ranging from 5 to 10 years, also the bank is up-to-date. But many WPQB, specifically Indian institutions’ are not up-to-date and do not have large collection.
Table 1.5: List of WPQB developed by institutions

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Institution</th>
<th>Country</th>
<th>Website link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>American University Washington College of Law</td>
<td>USA</td>
<td><a href="http://www.wcl.american.edu/exams/">http://www.wcl.american.edu/exams/</a></td>
</tr>
<tr>
<td>2</td>
<td>Anna University</td>
<td>India</td>
<td><a href="http://www.annauniv.edu/academic/MQP.htm">http://www.annauniv.edu/academic/MQP.htm</a></td>
</tr>
<tr>
<td>3</td>
<td>Baba Banda Singh Bahadur Engineering College</td>
<td>India</td>
<td><a href="http://www.cs.bbsbec.ac.in/?q=qbank">http://www.cs.bbsbec.ac.in/?q=qbank</a></td>
</tr>
<tr>
<td>4</td>
<td>Cork Institute of Technology</td>
<td>Ireland</td>
<td><a href="http://www.cit.ie/exampapers/">http://www.cit.ie/exampapers/</a></td>
</tr>
<tr>
<td>5</td>
<td>Hong Kong Baptist University</td>
<td>Hong Kong</td>
<td><a href="http://libproject.hkbu.edu.hk/was40/search?channelid=55988&amp;searchword=catergories='Examination">http://libproject.hkbu.edu.hk/was40/search?channelid=55988&amp;searchword=catergories='Examination</a> Papers'</td>
</tr>
<tr>
<td>6</td>
<td>Indira Gandhi National Open University</td>
<td>India</td>
<td><a href="http://www.ignou.ac.in/prevyrpapers/pyq_papers.htm">http://www.ignou.ac.in/prevyrpapers/pyq_papers.htm</a></td>
</tr>
<tr>
<td>7</td>
<td>Madurai Kamraj University</td>
<td>India</td>
<td><a href="http://www.mkudde.org/exampq.php">http://www.mkudde.org/exampq.php</a></td>
</tr>
<tr>
<td>8</td>
<td>Massey University</td>
<td>New Zealand</td>
<td><a href="http://kea.massey.ac.nz/screens/exams.htm">http://kea.massey.ac.nz/screens/exams.htm</a></td>
</tr>
<tr>
<td>10</td>
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<td>Australia</td>
<td><a href="http://wwwlib.murdoch.edu.au/exams/">http://wwwlib.murdoch.edu.au/exams/</a></td>
</tr>
<tr>
<td>12</td>
<td>University of Aberdeen</td>
<td>Scotland</td>
<td><a href="http://www.abdn.ac.uk/library/exampdb/">http://www.abdn.ac.uk/library/exampdb/</a></td>
</tr>
<tr>
<td>13</td>
<td>University of Birmingham</td>
<td>United Kingdom</td>
<td><a href="http://www.as.bham.ac.uk/exams/pastpapers.shtml#about">http://www.as.bham.ac.uk/exams/pastpapers.shtml#about</a></td>
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<tr>
<td>14</td>
<td>University of California – Hastings College of the Law</td>
<td>USA</td>
<td><a href="http://library.uchastings.edu/library/">http://library.uchastings.edu/library/</a></td>
</tr>
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<td>16</td>
<td>University of Essex</td>
<td>United Kingdom</td>
<td><a href="http://courses.essex.ac.uk/about/exampapers.aspx">http://courses.essex.ac.uk/about/exampapers.aspx</a></td>
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<td>17</td>
<td>University of Kent</td>
<td>United Kingdom</td>
<td><a href="http://www.kent.ac.uk/library/online/exams/index.html">http://www.kent.ac.uk/library/online/exams/index.html</a></td>
</tr>
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<td>18</td>
<td>University of Kerala</td>
<td>India</td>
<td><a href="http://www.keralauiversity.edu/questionbank/">http://www.keralauiversity.edu/questionbank/</a></td>
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<tr>
<td>19</td>
<td>University of Leicester</td>
<td>United Kingdom</td>
<td><a href="http://www.le.ac.uk/lil/learning/exampaper.s.html?searchterm=past">http://www.le.ac.uk/lil/learning/exampaper.s.html?searchterm=past</a> exam paper</td>
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<tr>
<td>20</td>
<td>University Of St Andrews</td>
<td>United Kingdom</td>
<td><a href="http://www.st-andrews.ac.uk/physics/pandaweb/past_papers.htm">http://www.st-andrews.ac.uk/physics/pandaweb/past_papers.htm</a></td>
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<tr>
<td>22</td>
<td>University of the Witwatersrand</td>
<td>South Africa</td>
<td><a href="http://web.wits.ac.za/Library/ExamPapers.htm">http://web.wits.ac.za/Library/ExamPapers.htm</a></td>
</tr>
<tr>
<td>23</td>
<td>University of Ulster</td>
<td>Ireland</td>
<td><a href="http://library.ulster.ac.uk/exampapers">http://library.ulster.ac.uk/exampapers</a></td>
</tr>
</tbody>
</table>
1.6 WEB-BASED QUESTION BANK IN INDIAN HIGHER EDUCATION

The digitization and internet has influenced the developments in many educational institutions. Many international and a few national level (India) higher educational institutions had developed WPQBs to combine the benefits of web technologies and question bank.

The structure of Indian higher education system shows majority of the students are in affiliated colleges. The State universities play an important role in creating courses and conducting examinations. The students scattered in various colleges attend end-semester/external examination (summative assessment) in their college with questions framed by the affiliating university. The question papers are prepared by the university and the examinations are conducted simultaneously in all affiliated colleges. Implementing a WPQB by State universities will support enormous student population studying in non-autonomous affiliated colleges. However, the importance of question bank for students and teachers in other institutions cannot be ignored.

The institutions spend money and time to prepare questions for the examination. After the examination is over, the institutions keep a copy of a question paper in the library for use. The restriction in library timing and insufficient copies for enormous student strength are not encouraging the PQ use. With rapid improvements, the internet has reached to the maximum parts of our country. Making the question banks as an OER would help enormous student community in India and eliminate participation of private parties. Even if the internet has not reached some parts of our country and that cannot be considered a reason for not creating question bank OER.

Many WPQB archives were created with least priority. The papers are simply scanned and uploaded to the website without providing customized search facility. The digital archives require customized search facilities to locate the information easily. A very few WPQBs have such facility; however, no systematic studies were undertaken on evaluating those features and such question banks. Moreover, this is a necessary element for affiliating universities in India to support enormous students and teachers. Realizing its necessity in Indian educational
environment, the present study was carried out to create a model WPQB and evaluate its utility.

1.7 SUMMARY

Question bank provides an opportunity to improve evaluation, learning and answering pattern among the students, questioning logics among the teachers, and examination patterns among curriculum designers. The question bank is not a learning material but supports as self-evaluation guide.

Bharathiar University, a State university of Tamil Nadu, situated in Coimbatore is a well-reputed, widely acclaimed and a prominent educational institution in India serving the society for 29 years. The university and its affiliated institutions conduct arts and science related courses. With 29 university departments, it has 97 affiliated colleges and 19 recognized research institutes. Among the 97 affiliated colleges, 12 colleges are autonomous colleges which determine the courses and examinations by their own structure. The university creates courses and conduct examination for 85 affiliated colleges except the 12 autonomous colleges (Bharathiar University, 2009).

A survey conducted during 1989 in Bharathiar University shows 11 among the 42 respondents emphasized the use of computers for the purpose of question bank (Achuthan, Agarwal, Shah, Soni, & Thakore, 1993). Presently, the students and teachers of Bharathiar University who are interested to access the past examination questions have no proper sources. One set of question papers stacked in the library is not sufficient due to increase in number of students, difficulty to write/photocopy all questions, difficulty to search, restricted timings, spoilt papers and non-availability of question papers. Considering the flexibility of web technology and anytime-anywhere feature of internet, a WPQB is implemented and evaluated.