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CHAPTER 2 – REVIEW OF RELATED LITERATURE

2.0 INTRODUCTION

Literature is the primary or original research studies in verbal or written documents, which consists of empirical, theoretical, critical/analytic, or methodological nature of the studies. Consideration of the original research studies does not report new primary study itself, yet the literature seeks to describe, summarize, evaluate, clarify and/or integrate the content of original reports of the study (Cooper, 1988).

Primarily, analysis and synthesis of past research works and its outcomes is essential to justify the significance of undergoing research. Literature of several related studies guides the research to proceed in right track. Systematic integration and evaluation of research outcomes and existing systems will bring out the perspectives that were not explored. Similarly, theoretical and methodological review supports to conceptualize and confirm the perspectives.

Several studies related to Question Bank, Open Educational Resource (OER), Web Engineering, Web Survey and Sampling Techniques were reviewed to determine the need of this study, define the statement of problem, write the research questions and set objectives.

2.1 STUDIES RELATED TO QUESTION BANK

Report of the Committee on Economic Education

The Committee on Economic Education (CEE) was constituted during 1969 for the improvement of teaching at undergraduate and secondary school level, in USA. This worked with Joint Council for Economic Education (JCEE), an operating agency and recommended certain activities to undergo. One of the recommendations was to establish a national ‘question bank’. It planned to invite faculty members throughout the country to create test questions which was further screened, classified by type, and distributed to the economics teachers. The questions were designed especially to test problem-solving ability in economics and the applications of economic principles to complex problems. Special prizes
were awarded for the questions which proved most imaginative and successful (Bach, 1970).

A Computer Program for Multiple Choice Questions

At Middlesex Hospital Medical School, the Research and Services Group (RSG) for Medical Education collaborated with over 70 departments in Faculties of Medicine throughout Great Britain, during 1970. A very important part of the information generated by the RSG was related to the multiple choice questions and associated test statistics. In order to manipulate and retrieve the data, the group developed computer programs and sets of procedures. The question bank system was complementary to the procedures for scoring and analyzing examinations. The system was capable of expansion and also of diversification to other fields (Buckley-Sharp & Harris, 1970).

Computerized Educational Delivery Strategies in Nine North American Colleges

The high technology educational delivery systems in nine post-secondary two-year educational colleges—five in the western United States and four in Canada, were considered during the study. Emphasis was on the use of computers to provide alternative delivery systems for traditional classroom teaching. The study reflected a natural overlap with open education and self-paced (fleximode) learning, here defined as an approach to programmed computerized and traditional learning which permits a flexible mix of time, location and teaching strategies. The term 'fleximode' was used generically to include Computer-Assisted Learning (CAL), Computer-Managed Learning (CML), Artificial Intelligence (AI), teleconferencing and other educational delivery modes. Teachers were allowed to draw conclusions about the relative merits of the delivery systems, their advantages and disadvantages, and the cost. This was expected to encourage educationalists to develop a clearer conceptual understanding of alternative delivery systems and their possible value to Australian education. For example, it discussed educational software capable of simulating laboratory and workshop
situations, generating tests randomly from question banks and relieving teachers from many classroom management tasks. Although it referred to Australian or North American technical and further education, the views expressed were of relevance to educationalists generally (Bowles, 1988).

Examination Reform in Traditional Universities (In India): A Few Steps Forward, Many Steps Back

After a brief discussion of the historical background, the article examined the national attempts to reform the examination system in India. Reform attempts were discussed under eight categories: Syllabus review and revision; increased frequency of public examinations; introduction of internal assessment; development of question banks; changeover to a grading system; semesterisation; improving the efficiency of public examination bureaucracy and creation of autonomous colleges. The article expressed that the impetus for reforming the examination system came from the availability of western experts at very little cost to India and admiration for American and British practices among Indian higher education authorities. The failure of most of the reforms provides salutary lessons regarding educational borrowing for reform.

The intention of question banks was that the teachers and students would use questions from the bank to guide lesson plans or review sessions and produce classroom tests or laboratory activities. Further, examination boards would use the better questions from the banks for their public examinations. The Association of Indian Universities in its pioneering question bank development project in second half of 1970s had produced 25 books on 25 subjects at the undergraduate level. Later, 8 universities have introduced question banking as part of a package of examination reforms. But, students used the question bank to guess possible public examination questions (Zachariah, 1993).
Integrating Computer Assisted Assessment with Textbooks and Question Banks: Options for Enhancing Learning

Computer assisted assessment (CAA) can play both formative and summative roles in teaching and learning (e.g. practice questions and exams). In either case, the creation of questions is often a time consuming task, and changes in course content or textbooks can necessitate rewriting of questions. One solution to the problem of creating large number of questions is provided by textbook publishers, who sometimes provide question banks to teachers as an ancillary material when textbooks are prescribed for students in the teacher's course. In past decade, computer software has been included for the presentation of material from question banks, but those were stand-alone computers and often not user-friendly. Advantages of using the web for integrated question banks and software systems include easier dissemination of questions, greater flexibility for teachers in constructing and editing questions, easier sharing of questions among teachers (both within and between educational institutions). As a result, it was argued that the integration of web-based assessment software, question banks and textbooks will be a major development in the coming decade for publishers and teachers. This will lead to higher quality questions, better software tools, and greater sharing of questions among the teachers (Dalziel, 2000).

Learning Difficult Content Using the Web: Strategies Make a Difference

A website was organized around a theme of testing the knowledge of descriptive chemistry. Detailed study on nearly 14,000 web transactions showed that providing representative test items followed with immediate feedback increased learning descriptive chemistry. Nearly half of the students using the site were found to engage in an unanticipated study strategy of dealing with test items one at a time rather than in traditionally derived groups. The ability of these students to respond to new items increased at a rate twice that of other students not engaging this strategy (Brooks & Crippen, 2001).
Computer Assisted Teaching System (CATS), Kansas

During early 1970s, University of Kansas Medical Center developed Computer Assisted Teaching System (CATS). It was an interactive computer-based program for the medical school pharmacology course. It included an extensive question bank in pharmacology and toxicology, and used to generate examinations almost on demand to respond to student request. In 1974, a consortium of CATS users began holding annual meetings to encourage growth of the program. During the early 1980s, over 60 medical and dental schools plus some graduate schools used all or part of the 166 interactive teaching programs that were available in CATS. Through the cooperation of the partners in CATS, there were over 26,000 questions in the exam database (Doull, 2001).

The increasing use of computer-assisted instruction may expect the librarian's function in constructing a computerized question bank database. The responsibilities of the librarian are to edit, index, and reference items for inclusion in the data base; maintain the currency of the Item Library; search the collection; and construct examinations, including a comprehensive quarterly examination, required of all students in this six-year school. Since 1973, the question bank Library was composed of over 12,000 multiple-choice questions in the basic sciences and clinical medicine. All questions were indexed with up to fifteen MeSH descriptors and referenced to literature sources. The questions may be retrieved using any single MeSH term or combination of terms. The collection was available at all times on terminals, and students were encouraged to make use for self study. Selected examinations were made available to other institutions by arrangement. That has proved both the value of resource for self study and student evaluation, and the necessity of establishing and continuing the librarian's role (Gerrity & Willoughby, 1982).

University of Southern Queensland (USQ) Distance Education Model

USQ used a team approach to design and develop external study materials. The team was normally comprised of a team leader and other content experts from within a Faculty; and an Instructional Designer (ID) and a Materials Development
Officer (MDO) from a separate department called the Distance Education Centre (DEC). Faculty members deliver the course content, normally based on their on-campus teaching materials, while the ID assists in the design of the educational process, and the MDO looks after the formatting of materials to a USQ standard.

The flexible delivery policy of 'study package' aimed to provide educational materials independent of place and time and in a medium best suited to the students. The study package consisted of a number of different materials which is divided into four sections – introductory booklet, study book, ancillary material and general administration correspondence. The introductory booklet contains the course specification, course overview, lecturer communication policy, assessment and general information, a copy of all assignments and at least one past examination paper. Moreover, availability of internet pushed the online delivery of courses and its contents. The study concluded that this model achieved successful outcomes (Fulcher & Snook, 2003).

Search Facilities in Centralized Question Bank

Although E-learning has advanced considerably in the last decade, some of its aspects, such as E-testing, are still in the development phase. Authoring tools and test banks for E-tests are becoming an integral and indispensable part of E-learning platforms and with the implementation of E-learning standards, such as IMS QTI, E-testing material can be easily shared and released across various platforms. With this extensive E-testing material and knowledge comes a new challenge: searching for and selecting the most adequate information. This proposes about using recommendation techniques to help a teacher search for and select questions from a shared and centralized IMS QTI-compliant question bank. The Exam Question Recommender System used a hybrid, feature-augmentation, recommendation approach. The recommender system used Content-Based and Knowledge-Based recommendation techniques, resorting to the use of a new heuristic function. The system also engaged in collecting both implicit and explicit feedback from the user in order to improve on future recommendations (Hage & Aimeur, 2005).
Textbook Publishers' Website Objective Question Banks: Does Their Use Improve Students' Examination Performance?

This study was a survey of students' usage of the objective question bank section of an academic publisher's textbook website. The findings were based on a survey of 239 business and management undergraduates conducted using a quantitative research methodology. The results suggested that increased use of the objective question bank improves students' examination performance only where it matched exactly the course assessment format. Other factors, such as usage cross-tabulated with gender and off-campus internet access were also examined. On the basis of this survey, the authors recommended the use of textbook publisher's objective question banks in teaching business and management subjects at university (Johnston & Huczynski, 2006).

Web-Based 'Question Bank' System to Improve E-Learning Education in Qatari School

This study described the analysis, design and implementation of the Question Bank system that allows the students of primary, preparatory and secondary schools to take web-based quizzes and exams, to download course reviews and previous exams. The system facilitated generation of automatic, balanced and different exam sheets, that containing different types of questions, covering the entire curriculum and displaying gradually from easiness to difficulty. The exam sheet produced by the system takes into account the different levels of the students from excellent, good, to fair and avoids any mistakes of language and non-clear terminologies. The design and development used the V-model, the model started by specifying the system requirements, analyzed and classified the requirements into functional and non-functional requirements, constructed the use cases and domain model, the system design was started by determining the database tables and appropriate interfaces and finally, the implementation phase was launched by implementing functionalities of the system. This system was used successfully in distance learning as well as in self-training. The system was tested with different type of courses taught in the schools, ranged from primary to
Changing Trends of Medical School Curriculum, Effect of Technology and Role of Libraries: A Case Study at the Caribbean Medical Schools

It is an era of 'Gen Next' and those seeking admission into a professional school are millennium students. The medical school curriculum in US and Caribbean is going through toughest reviews and scrutiny. It keeps on refocusing regularly. The technological advances that have influenced medical education have created demands for suitable shift in the curriculum of medical schools from traditional to incorporate several aspects like evidence-based medicine. The libraries are trying to keep up with changing trends in medical education to acquire all that is needed to support teaching, research, and healthcare. Off-shore medical schools, irrespective of what the LCME, the AMA and the AAMC consider of these, are crucial part of the US medical system which largely depends on the graduates of these schools to fill the physician void by allowing them to enter the mainstream of American medical system. Since the establishment of the first medical school in one of the Caribbean states - Cuba in early part of the 18th century; and later at Montserrat in 1978, at Dominica in 1979, medical schools in other Caribbean islands were established on a regular basis. Each medical school in the Caribbean region has adopted a typical curriculum that will prepare students to be better qualified, knowledgeable, and skilled professionals. Most of schools in the Caribbean region do have an excellent library system offering traditional as well as state-of-the-art services - digital and web-based. However, there are a few amongst these that lack a sound library system to augment medical education and teaching. The author presented a brief account of his experiences in the establishment of health sciences libraries at the two different medical schools, which are now considered as the major schools in Caribbean region viz. Ross
University School of Medicine and American University of Antigua. The article narrated the efforts, challenges, and problems encountered while establishing and upgrading libraries to the acceptable International standards.

The article continued that the most unique feature of the American University of Antigua (AUA) library was the availability of Question Banks in all courses of Basic Medical Sciences. Nearly 40,000 tested objective-based questions were available, and AUA was considering the acquisition of software for online examinations (Pathan, 2009).

2.2 STUDIES RELATED TO OPEN EDUCATIONAL RESOURCES (OER)

Models for Sustainable Open Educational Resources

This paper depicted the sustainability of Open Educational Resources (OER) in terms of the three models: funding, technical and content. Discussion and recommendations were focused on the sustainability of OER and the requirement of OER. The major requirements considered were volunteers and incentives, community and partnerships, co-production and sharing, distributed management and control (Downes, 2007).

The Open Learning Object Model

This study was a part of the activities of the EU-funded project SLOOP: Sharing Learning Objects (LO) in an Open Perspective, aimed at encouraging the definition, development and management of Open Educational Resources based on the Learning Object paradigm. A model of Open Learning Object (OpenLO) was presented for a greater awareness in the use of LOs by teachers, giving them a more active role in the evolution of educational resources; the OpenLO model extended the concept of reusability, providing pedagogical sustainability. Moreover, FreeLOMs (a Learning Object Management System that implements the proposed OpenLO model) and traditional tools for handling LOs were compared (Fulantelli, Gentile, Taibi & Allegra, 2008).
Open Source Software, Open Educational Resources and Digital Scholarship

Colleges and universities are increasingly aware of the necessity to use technology to meet the academic mission of the institution. Technology is the key to create learning environments, both in person and online, that will prepare students to be productive citizens and workers in the twenty-first century. Students in the sciences and the humanities equally need experience with and understanding of technology, especially in an increasingly interdisciplinary world. Solving complex problems such as climate change requires scientific research as well as an economic, cultural, and historical framework. Increasingly, open source software (OSS) and open educational resources (OER) are seen as viable options for meeting these challenges, especially as a component of cyber infrastructure. Many campuses are recognizing the importance of the interplay or overlap between OER and OSS as an important feature for providing high quality teaching and educational experiences that prepare students to be knowledge workers in a knowledge society (Bernard, 2009).

2.3 STUDIES RELATED TO WEB ENGINEERING

Web Engineering Model

The author argued for a disciplined, engineering approach to the creation of business critical web based systems. Web engineering is an adaptable, incremental (evolutionary) process populated by a set of framework activities that occur for all business-critical WebApp projects, regardless of the size or complexity. The following framework activities might be considered for web engineering work: formulation, planning, analysis, modeling, page generation and testing, and customer evaluation. These activities are applied iteratively as a web based system evolves. Project management for web engineering is governed by the unique characteristics of WebApp projects. These characteristics precipitate questions whose answers can make or break a project (Pressman, 2000).
Web Application and Web Engineering

Web engineering is the application of systematic, disciplined and quantifiable approaches to development, operation, and maintenance of web-based applications. It is both a pro-active approach and a growing collection of theoretical and empirical research in web application development. This paper expressed an overview of web engineering by addressing the questions: a) why is it needed? b) what is its domain of operation? c) how does it help and what should it do to improve web application development? and d) how should it be incorporated in education and training? The paper also discussed the significant differences that exist between web applications and conventional software, the taxonomy of web applications, the progress made so far and the research issues and experience of creating a specialization at the master's level. The paper reached a conclusion that web engineering at this stage is a moving target since web technologies are constantly evolving, making new types of applications possible, which in turn may require innovations in how they are built, deployed and maintained (Deshpande, Murugesan, Ginige, Schwabe, Gaedke & White, 2002).

Web Engineering: Managing the Complexity of Web Systems Development

In the last few years, our knowledge about how to develop large complex web systems has grown rapidly. This paper attempted to arrange this knowledge into a schema based on how the knowledge gets matured as one get more experience in developing large complex web systems. A systematic approach was proposed for developing large complex web systems. The knowledge consisting of technologies, methodologies and standards facilitate to successfully develop large complex web systems by web engineering (Ginige, 2002).

Four Perspectives on Web Information Systems

Many authors argue that web development is new and different. The arguments are, however, both debatable and debated, and often it is not clear. Often-suggested special characteristics of web development do not seem special after all. A model was presented with four archetypical perspectives on web
Information Systems; the perspectives being characterized by different views on what the system is intended to communicate and on the direction of the communication. These perspectives (information provider, information system, advertisement, and community) explained some of the quite opposite opinions on web development (Holck, 2003).

Web Application and Development Methods: A Comparison

With the increasing expansion of web applications, as well as the increase in the complexity of their development, several development methods (i.e. HDM, RMM, OOHDM, HMBS/M, UWE, WebML, OO-H, W2000, WAE, SWM, and OOWS) for this class of application have been proposed. However, the majority of these methods only support the project stage satisfactorily. It is easy to notice that there are some problems related to the form of functional and information aspects are treated in conjunction. Besides, development methods for web applications give very few attentions for the conception, planning, testing, and client evaluation stages. Considering the fact that most of the methods present several problems, a case study that used a specific web application was presented to describe the advantages and/or disadvantages of some selected methods (Domingues, Bianchini, Costa, Ferrari & Maldonado, 2007).

2.4.0 STUDIES RELATED TO METHODOLOGIES

2.4.1 Ex-Post Facto Method

Science, Technology and Mathematics Education Resources in Junior Secondary Schools for the Attainment of the Millennium Development Goals

This study investigated the resources allocated to Science, Technology and Mathematics Education (STME) in junior secondary schools in Anambra State between 2003 and 2006. The study, which was based on three research questions and one null hypothesis, adopted the ex-post-facto research design. Twenty-six schools were selected using proportionate stratified sampling from 261 junior secondary schools in Anambra State. A twenty-one item researcher-developed questionnaire titled “Science, Technology and Mathematics Education Resource
Allocation Inventory (STMERAI)" was used in collecting data. Mean scores were used in answering the research questions while the Analysis of Variance were used to test the null hypothesis at the 0.05 significance level. The findings of the study indicated that the resources allocated to the STME subjects (integrated science, introductory technology and mathematics) were highly inadequate irrespective of the subject. This implies that, the allocation of experienced teachers, materials, laboratory equipments and books to these subjects needs to be improved (Onwuachu, Ngozi & Eyiuche, 2010).

2.4.2 Web Survey Method

Internet-Based Surveys

Internet-based surveys have moved from being in the form of emails to emails-plus-attachments of the questionnaire itself, to emails directing potential respondents to a website, or simply to websites. While emails have the attraction of immediacy, the potential for web-based surveys to include graphics has been too great for many researchers to resist. Often a combination of the two is used: emails direct potential participation to a website at which the survey questionnaire is located in HTML form. Although email surveys tend to attract greater response than web-based surveys, web-based surveys have the potential to reach greater numbers of participants, so web-based surveys are advisable; emails can be used as an addition, to contact participants to advise them to go to a particular website (Cohen, Manion, & Morrison, 2007).

Web Survey Design and Administration

Many claims are being made about the advantages of conducting surveys on the web. However, there has been little research on the effects of format or design on the levels of unit and item response or on data quality. In a study conducted at the University of Michigan, a number of experiments were added to a survey of the student population to assess the impact of design features on resulting data quality. A sample of 1,602 students was sent an e-mail invitation to participate in a web survey on attitudes toward affirmative action. Three experiments on design
approaches were added to the survey application. One experiment varied whether respondents were reminded of their progress through the instrument. In a second experiment, one version presented several related items on one screen, while the other version presented one question per screen. In a third experiment, for one series of questions a random half of the sample clicked radio buttons to indicate their answers, while the other half entered a numeric response in a box. The overall implementation and outcome of the survey was described with the results of the imbedded design experiments (Couper, Traugott & Lamias, 2001).

A Comparison of Web and Mail Survey Response Rates

The internet (also called the World Wide Web or the Web) is increasingly looked at as a means of surveying the public. Possible advantages of using the internet include cost savings associated with eliminating the printing and mailing of survey instruments as well as time and cost savings of having returned survey data already in an electronic format. For special populations that regularly use the internet, the web has been found to be a useful means of conducting research. In some instances, a mixed-mode strategy has been suggested as a means for exploiting the advantages of web surveys and minimizing non-response. To reliably use a mixed-mode strategy (e.g., mail surveys and web surveys) or to select among alternative survey modes, researchers must understand and demonstrate the equivalency and complementarity, or relative strengths of alternative modes.

Some studies suggest that in populations with access to the internet, response rates for e-mail and web surveys may not match those of other survey methods. Apparent differences in response rates for web surveys and mail surveys have many causes or explanations. One explanation for these differences in response rates may be the fact that less time and attention have been devoted in developing and testing motivating tools to increase web survey response, compared to the time spent studying tools employed in mail surveys (e.g., the use of personalization, pre-contact letters, follow-up postcards, and incentives). The widely followed elements of the "tailored design method" for mail surveys were
the product of years of research and intensive study. However, the implementation approaches that are beneficial for mail surveys may not translate directly to response rate benefits for web surveys. For example, research has revealed concerns on the part of potential survey participants that are particularly salient for web users, including internet security and the receipt of electronic “junk mail” or “spam”.

This study found that a web survey application achieved a comparable response rate to a mail hard copy questionnaire when both were preceded by an advance mail notification. A reminder mail notification had a positive effect on response rate for the web survey application compared to a treatment in which respondents only received an e-mail containing a link to the web survey. Reminder mail notifications did not produce higher response rates to the web survey for respondents who had received a pre-notice. The cost differential between the mailed hard copy questionnaire treatment and the web survey treatments with mailed advance notice was substantial.

The findings of this research suggest that, in a population in which each member has web access, a web survey application can achieve a comparable response rate to a questionnaire delivered by surface mail if the web version is preceded by a surface mail notification. Further, considering web survey applications alone, the findings suggest that a mail pre-notice can increase response rates (Kaplowitz, Hadlock & Levine, 2004).

Use Of Web and In-Person Survey Modes to Gather Data from Young Adults on Sex and Drug Use: An Evaluation of Cost, Time, and Survey Error Based On A Randomized Mixed-Mode Design

In a randomized test of mixed-mode data collection strategies, 386 participants in the Raising Healthy Children (RHC) Project were either (a) asked to complete a survey via the internet and later offered the opportunity to complete the survey in person or (b) first offered an in-person survey, with the web follow-up. The web-first condition resulted in cost savings although the overall completion rates for the 2 conditions were similar. On average, in-person-first condition
participants completed surveys earlier in the field period than web-first condition participants. Based on intent-to-treat analyses, little evidence of condition effects on response bias, with respect to rates or levels of reported behavior, was found (McMorris, Petrie, Catalano, Fleming, Haggerty & Abbott, 2009).

### 2.4.3 Judgmental and Snowball Sampling Methods


This study discusses some of the issues and challenges of implementing appropriate and coordinated District Health Management Information System (DHMIS) in environments dependent on external support especially when insufficient attention has been given to the sustainability of systems. This study used a combination of purposeful/judgmental and snowball/chain sampling procedures. Only three study areas were chosen based on purposeful/judgmental sampling procedure, considering the time and other resources. Snowball sampling was used for locating information-rich key informants (Odhiambo-Otieno, 2005).

**Post-Colonial Indonesia: A Study of the Impact of Foreign Aid on Public Sector Institutions in West Kalimantan**

Prior to 1998, Indonesia experienced remarkable growth and was considered one of the leading under developed countries in Asia and a newly industrializing economy. This study investigated the impact of the colonial legacy and the inflow of foreign aid on the development of Indonesia’s public sector institutions. The research reported was based on 29 semi-structured interviews with active and retired civil servants including some persons of expert status and some who formally held positions of considerable authority. The technique used for the selection of the interviewees was basically a combination of a purposive/judgmental and snowball sampling techniques (Budiman & Roan, 2005).
2.5 DISCUSSION

The recommendation to establish a national question bank by CEE during 1970 and construction of computerized question bank in University of Kansas Medical Centre during early 1970s shows the importance given to question banks from earlier days. Bowles’ (1988) study emphasized the use of computers as alternative delivery systems for traditional classroom teaching, and also discussed about randomly generating computerized test question banks as one of the many features. Many research studies are involved only with objective-type/multiple choice question banks that are used for computerized/online tests, as mentioned in the studies of Gerrity and Willoughby (1982) and El-Sofany et al. (2009). Zachariah (1993) critisized the use of question bank in Indian environment, but the article records the right intention of question banks were misused. Dalziel (2000) found that the stand-alone computerized question banks are not user-friendly, and web has greater flexibility and easy dissemination features. Though some institutions have systematic and up-to-date web-based past examination question bank (WPQB), no studies were involved in analysing its utility among students and teachers. Also, the existing WPQBs do not provide flexible search facilities like the objective-type question bank studied by Hage and Aimeur (2005).

Fulantelli, et al. (2008) identified the initiatives and efforts of certain institutions on creating OER are towards Learning Objects (LO). But still well-structured WPQBs of many educational institutions are available only to their students and teachers. The open perspective on WPQBs will refine other ill-structured examination systems, and simultaneously support students, teachers and question setters of other institutions.

Question banks are used in educational institutions since the examination system, especially written examinations system was formed. Obviously, computerized question banks are used and researched for the past four decades. Due to the immense growth of internet technologies, nowadays question banks occupied the web spaces too. The researches continue to shape an effective question bank and define its characteristics from time to time. The changes happened in teaching-learning and educational administration over the past decade
is witnessed by OER and web-based education, simultaneously reflected on question bank also. Therefore implementing an open access WPQB is considered as essential part of the educational institutions.

Deshpande et al. (2002) and Ginige (2002) had expressed the importance of systematic design and development of web application, in their article. The design models and methods described by Domingues et al. (2007) is a useful resource to depict the structure of the application, before development. Among the existing several web engineering models, the convincing iterative model of Pressman (2000) and refined one proposed by Pressman and Lowe (2008) well suits the systematic engineering approach to develop web application.

The ex post facto survey design is appropriate to evaluate the WPQB in wide population after its usage. The study of McMorris et al. (2009) also complements the equivalence of in-person and web-based survey, consequently the web survey is more suitable for evaluating a WPQB. Additionally, Kaplowitz et al. (2004) found that pre-notice through mail (letter by post) regarding the web survey produced higher response rates, and Cohen et al. (2007) suggested using emails to contact participants which would attract responses. Further the review shown that combination of judgmental and snowball sampling methods used by Odhiambo-Otieno (2005) is the most appropriate methods to cover the selective group of users interested on web-based question bank.

2.6 NEED FOR THE STUDY

In Indian higher education system, 259 State universities are administering examinations for more than 22,000 colleges. The past examination questions prepared by these universities are not electronically archived for future use, except very few institutions. The existing electronic question bank models are also not evaluated for further understanding of its utility among users. Universities keep a copy of question paper in library, but question papers stacked in the library are 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. Hence the students, teachers and question setters who are
interested to access the past examination questions have no proper electronic sources. The web, which is considered to be a flexible electronic medium, is not yet used to deliver Past Examination Questions (PQ) effectively.

In this circumstance, blending anytime-anywhere accessibility feature of web technology with past examination question bank is considered as vital requirement. The systematic and organized WPQB archive with semester-wise, unit-wise and keyword-based question search options will be much useful. These customized search facilities would allow the students to access the resources effectively at anytime from anywhere. Eventually, the WPQB would result in understanding questions, achieving more marks, knowing thrust areas, improving questions and question patterns. Further, a scientific evaluation of WPQB and its utility is also essential.

2.7 STATEMENT OF THE PROBLEM

Two aspects were considered during this research work. First, development of a website with past examination questions, further validation of its functionalities and features. Second, conduct of a survey to evaluate the utility of website among students and teachers after they were allowed to use. Synchronization and significance of these two aspects was stated in the present research title “Development and Validation of Web-based Question Bank and Evaluation of its Utility among Students and Teachers of Bharathiar University.” Additionally, the involvement of personal variables in expressing the utility of website was also measured.

2.8 RESEARCH QUESTIONS

Research questions are the scholarly, answerable and inquisitorial questions raised at the beginning of a research work (Andrews, 2003). The following research questions were raised at beginning of this research.

1. Is it possible to design, develop and implement a valid and reliable web-based past examination question bank (WPQB)?
2. Is it possible to construct a valid and reliable tool to evaluate the utility of WPQB?

3. Is the WPQB useful to students and teachers of Bharathiar University?

2.9 RESEARCH OBJECTIVES

The objectives were classified into general and specific objectives to clearly indicate the systematic nature of work. The formulated research questions supported to set the general objectives of this research. Later the specific objectives were elaborated from general objectives.

General objectives

1. To design, develop and validate past examination question bank website.
2. To construct and validate a survey tool to evaluate the utility of WPQB.
3. To study the intervention of personal variables in expressing the WPQB utility.
4. To study the utility of WPQB among students and teachers.

Specific objectives

1. To design, develop and implement a valid and reliable website (semexam.com) containing past examination questions (PQ) of Bharathiar University.
2. To construct a web-based past examination question bank utility survey (WPQBUS) tool and upload it to the website.
3. To identify the dimensions of WPQBUS tool using exploratory factor analysis method.
4. To study the effect of personal variables in expressing the WPQB utility with respect to WPQBUS dimensions.
5. To study the utilization of website by the students and teachers of Bharathiar University.
2.10 SUMMARY

Review on various studies that are related to the present study identified a solution to close the gaps in attempting research work. The conceptual review done on different studies helped to critically analyze the ideas generated after previous chapter. The methodological review further assisted to create a path for achieving the crystallized ideas. Design, development and implementation of WPQB to achieve the objectives of this study are presented in chapter 3. Application of the methodologies and results of the study are presented in chapter 4 and chapter 5 respectively.