CHAPTER 1

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1.1 EDUCATIONAL TECHNOLOGY

Alfred Russell Wallace (1871), who with Charles Darwin formulated the theory of Natural Selection, said:

"Man is the only animal capable of purposeful evolution; he makes tools. These tools bespeak human needs and values. They give us new performance and new survival capacity. They make us, in effect, a different animal. Then, they pose new human options, create new opportunities and demand new answers."

Technologies are not created by nature. They are created by humans, to be used by humanity.

"Great new adventures and exploration have often, through history, concealed beneath the initial excitement and novelty, the hard core of real utility and practical benefit to mankind. The discovery of new continents, and of new technologies, has commonly followed a pattern in which the form and scope of application emerge slowly as man gains knowledge, experience and confidence in the new field". (Lewis, 1969).

According to Ashby (1967) there have been four revolutions in education as mentioned under:
First Revolution: Revolution of shifting the tasks of educating the young ones from parents to teachers and from home to schools.

Second Revolution: Revolution of adoption of the written word as a tool of education.

Third Revolution: Revolution as a result of invention of printing and availability of books and other teaching-learning materials.

Fourth Revolution: Revolution on account of developments in electronics, chiefly involving radio, television, cassette recorder and computer, and development of systems concept.

In Ashby’s own words, the implication of the Fourth Revolution may be summarized as, “Any technology, which increases the rate of learning, would enable the teacher to teach less and the learner to learn more”.

The term “Educational Technology” was recognized in 1967 with the establishment of the National Council for Educational Technology in the United Kingdom. In the United States it was the Department of Audio-Visual Instruction of the National Education Association for Educational Commissions and Technology in 1970. Educational Technology is now firmly established as a field of study including in its ambit, Instructional Development, Educational Communications, Educational Resources etc.
Educational technology is a system in education in which machines, materials, media, men and methods are interrelated and work together for the fulfillment of specific educational objectives. 'Technology Explosion' has yielded several new machines, materials and media which have great potential for use in the educational enterprise. A judicious use of these together with new functions and roles of educational personnel can bring about more efficient and effective teaching-learning. An adequate knowledge of theory and practices of educational technology and their proper use would enable the teacher to understand and effectively discharge his new roles in the educational system in an age of 'information explosion', 'knowledge explosion' and 'population explosion'.

DEFINITIONS OF EDUCATIONAL TECHNOLOGY

There have been a series of definitions of the term "Educational Technology" in the last forty years.

The National Council of Educational Technology, UK defines Educational Technology as the development, application and evaluation of systems, techniques and aids to improve the process of human learning.

According to Bloomer, Educational Technology is an application of scientific knowledge about learning to practical learning situations.
A very restricted definition refers to Educational Technology as “the Art of using tools and machines” or “the new media and technological systems employed for instructional purposes” Actually much more is involved in the concept of Educational Technology. The Association for Educational Communications and Technology (AECT) Task Force (1977) makes a comprehensive definition: “It is a complex integrated process involving people, procedures, ideas, devising, implementing, evaluating, and managing solutions to those problems involved in all aspects of human learning”. Saettler (1968) a well known historian of Instructional Technology states, “The word technology … does not necessarily imply the use of machines, as many seem to think, but refers to any practical art using scientific knowledge”

Though there are subtle differences, the terms Educational Technology and Instructional Technology are often used interchangeably. The Commission on Instructional Technology (1970) defines Instructional Technology as:

“The media born of the Communications Revolution which can be used for instructional purposes alongside the teacher, text book and black board” and “a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communications,
and employing a combination of human and non-human resources to bring out more effective instruction."

In the words of Tickton (1971) the purpose of Instructional Technology is "to make Education more productive and more individual, to give instruction a more scientific base, and to make instruction more powerful, learning more immediate, and access more easier." From the definitions given above, it is clear that educational technology has several dimensions as it is a new discipline. A careful study of the above definitions, leads us to infer that educational technology is the use of different principles, methods, devices and techniques to make the teaching-learning process easier, inspirational, interesting and effective besides bringing about desirable changes in the students.

Considered against the above definitions, educational technology is far from new. The first teacher to employ an abacus in his mathematics class was making use of educational technology, as has every educator who's used overhead projectors, tape recorders, television, movies etc. to help their students better learn the content of their course.

Everybody is aware that the field of educational technology is currently attracting intense interest due to two reasons: Firstly, the proliferation of the Internet, which is impacting upon just about every aspect of human life, education included. Secondly, the impact of technology as a whole, which is creating a society of rapid change and
exponentially increasing complexity Numerous commentators have described the emergence of information and communication technologies as bringing about a transition as marked as that of the industrial revolution. We are said to be moving from the industrial age to the information age, in which radically different rules apply to every aspect of society, education being no exception. Just as previous centuries experienced their technological revolutions—the ‘agricultural’ and ‘industrial’ revolutions that radically changed the worldwide patterns of production and distribution—so the twentieth century is said to have experienced a ‘communication revolution’ that is affecting the world situation, not least the world of learning. The rapid breakthroughs in new information and communication technologies are changing the way knowledge is developed, acquired, and delivered. The development and implementation of Information, Communication Technologies (ICT) forces today’s educational institutions to respond to societal trends that point to a transformation of our society into a knowledge society. Globalization and applications of ICT have placed new demands on educational institutions and make significant impact on their teaching and research functions.

Some aspects of the communication technologies are established, like radio, television and telephones. Others such as satellites, optical fiber, microcomputers and video recording on tape or video disc and
internet are quite new. Among the older ones, radio and television broadcasting have been improved, adapted, put to new uses or linked with newer communications technologies. The result is wider distribution, greater accessibility and more clarity, consumer control and economy.

There have been spectacular recent developments in telecommunication links that carry signals for telephone, broadcasting and other purposes. The range has been extended by the use of satellites to achieve worldwide links, covering even the remotest islands and, overcoming difficulties of terrain or distance to unify countries hitherto fragmented by their geography. Satellite, microwave, optical fiber and other forms of telecommunication linkage give speed and dependability that, in their turn permit new forms of communication to occur, notably the flow of digitally controlled data from computer to computer. The rapid evolution of computer technology resulting from developments in microchip technology has made possible the storing of information at levels of complexity, and its transmission at speeds, that challenge the imagination.

Instructional technologist Edgar Dale reported in his "Cone of Experience" that people remember 10% of what they read, 20% of what they hear 30% of what they see, 50% of what they hear and see, 70% of what they say and write, and 90% of what they say and perform at a task.
Confucius makes the same point even more succinctly: "Tell me and I'll forget. Show me and I'll remember. Involve me and I'll understand."

Experts point out that there are differences between the terms, "Technology of Education" and Technology in Education". The term 'technology of education' is inherent in education itself. It refers to the application of principles of behavioural sciences like psychology to educational problems relating to teaching-learning. It is not concerned with the use of technological instruments in education. Broadly speaking, technologies of determining, educational objectives, planning curriculum, instruction and teaching behaviour are covered under the concept of technology of education. In technology of education, principles mostly derived from psychology of learning find an important place.

The term 'technology in education' implies the use of implements, instruments, machines and tools in education in the same manner as we use for the development of agriculture and industry. In fact in our daily life, we reap the fruit of scientific and technological developments. Technology in education involves the use of a wide range of audio-visual equipments, hardware and sophisticated electronic devices like film projectors, radio, television, tape recorder, teaching machines, computers and internet, world wide web etc. Basically, technology in education involves the use of hardware technology in education. Both types of technologies have an important place in the teaching-learning
process. Both are complementary and supplementary. Both must be used side by side. Each has its own area of operation. Softwares without hardwares have little use and vice versa.

It is true that technology can do a number of teaching functions quite effectively but this does not imply that it can diminish the role of the teacher. Even when education is imparted through technology, teacher is very much there. Rather, there may be more than one teacher. In the television lessons, students are taught by some expert teachers. A lot of initial and follow-up work is done by subject teachers. In the programmed instruction and computer assisted instruction also, a student is interacting with an ‘invisible teacher’ who has developed programmes. In the use of educational technology, it is the teacher who determines the objectives of education and plans programmes which can achieve best results. He develops the appropriate educational content and determines the process by which the content is to be conveyed to the students. He monitors the progress of the students and evaluates their achievements with reference to the objectives and modifies the programme if needed. Functions like planning, organizing, operating, evaluating and re-planning the educational programmes in which technology may play an important role are performed by the teacher and other educational personnel.

New term “Technology integration” almost synonymous with “Technology in Education” and “Instructional Technology” has cropped
up recently. The concept of technology integration has evolved during
the last 30 years, from one of teaching programming, to utilizing drill and
practice programmes to building computer literacy, and to participating in
electronic communities.

Technology integration is the incorporation of technology resources
and technology based practices with the daily routines, work and
management of schools. Technology resources are computers and
specialized software, network based communication systems and other
equipment and infrastructure. Practices include collaborative work and
communication, Internet based research, remote access to
instrumentation, and network based transmission and retrieval of data
and other methods (National Center for Educational Statistics (NCES,
2002)

Technology Integration is a continuous process aimed at bringing
about improvement in learning, "developing a culture that embraces
technology" (NCES, 2002). "The culture created by having powerful tools
accessible to teachers and learners is one in which the lines between the
teachers and learners are blurred as teachers recognizes that they can
no longer be fountain of all information and direct all learning
(ISTE, 2000, p.44).

Integration should become part and parcel of the teaching-learning
process, efficiently and effectively supporting the school goals and
purposes. Technology should be as accessible as all other classroom tools. Effective Integration is said to have taken place when students are able to select technology tools to obtain, analyze, synthesize and present information (Morrison and Lowther, 2002; NCES, 2002).

The rationale for using technology in education, according to Roblyer and Edwards (2000) has the following elements: 1) Motivation of learners; 2) Unique instructional capabilities such as linking learners to information sources and learning tools, helping learners to visualize problems and solutions; 3) Support for new instructional approaches such as Cooperative Learning, shared intelligence and problem solving; 4) Increased teacher productivity; 5) Required skills for an information age, such as, technology literacy, information literacy and visual literacy.

Hawkridge, Jawonski and Mc Mahon (1990) described four types of rationale that were used to support technology integration is schools: a) Social – that the learners should be prepared to understand computers and be aware of their role in society; b) Vocational – In terms of career opportunities for individuals who have computer skills; c) Pedagogic – considering the beneficial effects of technology on teaching and learning and d) Catalytic – technology affording change, progress and reform.

Concomitant to the above, the ideas about organizing technology resources have also evolved regarding the location, the number and access to computers, and, there has been a shift from the use of
computer labs to computer workstations in the classrooms where students can work in small groups (US Congress of Technology Assessment, 1995). According to Becker (2001), the concept will keep on evolving and several years form now, there will be new mantras about the ways computers should be used in schools, and they will take us far from those of today.

Recognizing the significance of technology integration issues in the classroom within a broader context of developing knowledge based society, in which creativity and problem solving are at a premium, several research studies have examined various aspects of technology enhanced education. While some concentrated on social issues arising out of technology integration, such as, the "digital divide" problem (Swain and Perason, 2001) others dealt with cognitive and personal issues, for example, the influences of goal and self evaluation on self regulatory processes during computer skill acquisition (Schunk and Ertmer, 1999). Recently there has been a proliferation of studies spearheading the technology integration movement in education (Black and Mechlintock, 1995; Specific illustrations include the use of technology as cognitive tools (Jonassen, 1994) and the pervasive role of context in learning and instructional design (Tessmer and Richley, 1997).

The Internet, and particularly the World Wide Web, has, within the last decade, created a world in which a vast amount of knowledge is
available, on demand, free of charge, to a vast number of individuals located virtually anywhere. That may initially appear a godsend to those who extol the value of education. The reality is that the net offers neither the promise of unlimited knowledge on demand, nor will it make redundant the business of education. It serves certainly as an irresistible catalyst to change.

Though the web contains a huge amount of information, it resembles something of an untamed jungle for those seeking knowledge on a particular subject. There is genuinely valuable content, but too often it is obscured by commercial sites and homepages of little interest to anyone. Search engines exist, and these can be useful, but searching for just about any sensible topic will result in thousands of hits, most of which are of low value. There certainly remains a need for some guidance (i.e. a teacher) to locate that which is valuable for a specific context. However, the teacher’s role will change radically. Traditionally the teacher’s role has been both to generate the learning materials and to support their students in their efforts to master them. The vast amount of ready made learning content in the public domain together with the ease of adding new content means the best teachers will be either as providers of content, or as supporters or guides of the learning process. The teacher will move from being the "sage on the stage" to become the "guide on the side" as new technologies serve to place greater power
and responsibility in the hands of learners themselves. As technology is changing the mechanisms of delivering education, so too is it changing the world in which the products of that education are employed.

Some Facets of Educational Technology

- Animated explanations of technical concepts, possibly with voice-overs, bringing to life printed explanations and static diagrams.
- Interactive self-assessment activities enabling students to identify their personal strengths and weaknesses. Ideally results should be stored and progress mapped over time.
- Interactive models allowing students to change input parameters and observe results.
- Facility to annotate study materials by means of notes, highlighting, creation of personal bookmarks, creation of personal notebook combining elements of the course with other resources.
- Facility to search course materials in a flexible way - e.g. phrase searching, Boolean conditions, Thesaurus matching. Lengthy blocks of text should be viewable on screen, printable and available in printed form.
- Hyper glossary - i.e. clicking on (highlighted) glossary terms reveals definition.
• Consist of Learning Objects, drawn from a database to enable maximum reusability and ease of content management. Learning Objects should be appropriately packaged, customized and added to in terms of overall course objectives, assessments, unifying case studies etc., some of which will become learning objects in their own right.

• Available both online and as a hybrid CD (usable off-line but with links (online) to VLE etc.

• The visual style of the course is appealing and also carries a sense of identity, both of the institution and of the nature of the course material.

Sometimes it is believed that educational technology with all its gadgets can be a panacea to all our educational maladies. What matters really is how systematically new media like the radio, television; cassette recorder, computer etc. are yoked to the teaching-learning process. It is the systems approach that can put the technological developments to the best use in education as in other areas. There is no doubt that technology with all its force will be applied to the educational process in the years to come. As Skinner puts it, “Almost all our major problems involve human behaviour, and they cannot be solved by technology alone. What is needed is technology behaviour”.

In India, the importance of technology for improvement of educational system was recognized by the Government in 1974 when it was included in the 5th Five Year Plan. The establishment of an educational technology unit in the Ministry of Education and Social Welfare, Educational Technology cells in various states, introduction of Satellite Instructional Television Experiment, launching of INSAT for Education Project in 1982 and the formation of a Central Institute of Educational Technology and State Institutes of Educational Technology were some of the major steps taken by India to tap the advantages of the advances in science and technology for bringing about qualitative improvement in and widening the access to education.

Kalam, as Chairman of Technology, Information, Forecasting and Assessment Council (TIFAC) led India with the help of 500 experts to arrive at Technology Vision 2020. His observations on Technology Enhanced Education are worth quoting here:

"...there is a need for a working Digital Library System that alone can in the long run, provide the kind of access required for a Knowledge Society. Technology Enhanced Education is the solution. It attempts to exploit the rapid developments in Information and Communication technology. As the communication bandwidth continues to increase and as the cost of computer power continues to drop Technology enhanced learning will become an economically viable solution. Virtual classrooms
Technology is all set to change the Education landscape. At a basic level it increases the reach that a teacher would like to have, like the idea of virtual classrooms and distance learning. And more importantly, it brings a vastly increased source of knowledge from across the world to the student. Appropriate technology also enables the provision of this at a far lower price than other options. For its most effective and beneficial adoption, planners and policy makers, teachers and students, in every stage of Education-pre-school, primary, secondary and Higher Education- must work together.

1.2 STATEMENT OF THE PROBLEM

The importance of Technology and its impact on all dimensions of the society, including the field of Education, have led to the emergence of Educational Technology as a distinct field. It is imperative on the part of educational researchers, planners and policy makers to keep abreast of the latest developments and research findings in this emerging area. The aim of this study is to communicate to the interested researchers the pattern of communication among the scholars in the field of Educational
Technology This is to be carried out by applying bibliometric techniques to recent published literature on Educational Technology under the title:

“Educational Technology Literature: A Bibliometric Study”

Since the study is an inter-disciplinary one involving the field of Education and Library and Information Science, a brief overview of the concept of Bibliometrics, which originated from the field of Library and Information Science, is given below:

1.3 PURPOSE OF THE STUDY

The purpose of this study is to apply bibliometric techniques to Educational Technology Literature published as articles, in the journals covered by SCOPUS, a leading online database with a very wide coverage in many disciplines. Such a study will be of immense benefit to the Educational Technology scholars and researchers.

1.4 AN OVERVIEW OF BIBLIOMETRICS

The term 'Bibliometrics' coined only in 1969 lies in the border areas of social and physical sciences. This technique has gained tremendous popularity among the Librarians, Documentalists and Information Scientists and has also attracted the attention of behavioral and social scientists as well as scientists from ‘Big Sciences’
Bibliometrics is an emerging thrust area of research involving researchers from different disciplines. Ranganathan's Librametrics, the Russian and the FID concepts of Scientometrics and Informetrics, though not synonymous with Bibliometrics, are supplementary and complementary to each other. The FID has attached so much importance to the Informetrics technique as to from a FID committee for Informetrics. The Mathematics professor turned Librarian par Excellence Ranganathan argued that on the lines of Biometry, Econometrics, Sociometry, etc. 'Librametry' concentrating on the application of mathematical and statistical concepts to Library activities and services may usher in, a new era for 'quantifying the quality'.

DEFINITION OF BIBLIOMETRICS

It was Pritchard (1969) who first coined the term Bibliometrics, in his article "Statistical Bibliography or Bibliometrics" in the Journal of Documentation. Though the term is of recent origin, its application and practice may be traced back to 1917 through literature survey. The term has its roots in 'biblio' and 'metricus' or 'metrikos' meaning book and measurement respectively. Pritchard has defined bibliometrics as 'the application of Mathematics and Statistical Methods to books and other media of Communications". Fairthrone (1969) defined it as "Quantitative treatment of the properties of the recorded discourse appertaining it". Potter (1981) elaborates it further: "The study and measurement of the
publication pattern of all forms of written communication and their authors”. Britain, J. M. has brought out the difference between Librametry and Bibliometrics in the following words-

“All Bibliometric studies follow the systematic approach to documents where the unit of analysis is the document and its characteristics and not the user”.

It can be summed up that Bibliometrics is the quantitative study of all aspects of the literature of a subject and the Bibliographic variables of the documents, both the sources and their references.

The Bibliometric study of a journal or a collection of journals can go a long way in throwing light on the various aspects of the contributions i.e., articles such as the dispersion or distribution of the various subject-areas within a field of interest; the trend of authorship, whether towards single authorship or multiple authorship; the citation pattern of the contributors and so on.

The focus of bibliometric studies is generally on the regularities associated with the distribution across some defined body of literature. Illustrative bibliometric studies include the study of communication patterns (Cline, 1981), the identification of research fronts (Sparrow & Sparrow, 1991), the study of the development of a discipline (Loy.1979), and the evaluation of research activities (Ingwersen & Christensen, 1997). Bibliometrics is also an approach to understanding a body of
Bibliometrics has grown from the study of the characteristics of texts to the development of scholarly networks. The expansion of bibliometrics in recent years relates to the increase in the number and accessibility of electronic databases (Paisley, 1990). Greater accessibility to the methods of bibliometrics has contributed to the development and formation of conceptual frameworks. These conceptual frameworks, in turn, have been predicated on a communication process that is represented by bibliometric data.

Bibliometrics have evolved through three phases While no specific beginning and ending dates have been assigned, the first phase was one in which researchers used bibliometric methods to examine the characteristics of the literature base (Osareh, 1996; Paisley, 1990). This text-based bibliometric research has been and continues to be applied in many ways; (a) measurement of the occurrence of identified concepts in the literature as indicators of the influence of one researcher, or a group of researchers, on subsequent researchers, (b) measurement of high frequency concepts to profile the research concerns of a discipline, and (c) use of longitudinal shifts in clusters of concepts to characterize the shifts in theoretical paradigms (Paisley, 1990).
The second phase of bibliometrics began in the 1980s with a focus on the environments in which information was being exchanged. Gradually, this focus gave way to the establishment and maintenance of scholarly networks (Paisley, 1990). Studies included efforts to examine author-to-author and journal-to-journal linkages. A concern that national investments in research efforts were being undermined by poor communication between researchers was a primary force in this research trend (Paisley, 1990). Through the use of bibliometrics, it became possible to identify the relatively small communities of researchers whose information and opinions were shaping and guiding research (Kuhn, 1962; Osareh, 1996; Price, 1963).

The third phase of bibliometric research is requiring researchers to answer some of the fundamental questions addressed by earlier research (Paisley, 1990). This return to previous research priorities may be due to the increased use of text available through databases, Internet, and compact discs. The process of examining document content for clues concerning research influence will reemerge as the major emphasis of bibliometrics. Movement away from citation oriented research is suggested by researchers citing methods and processes within the text of their online documents (Paisley, 1990). As sources, and all of the relationships inherent in them, become more evident, citations will be less relied on to answer questions of theoretical orientation.
A theme running through bibliometric literature in all three phases is that data produced by bibliometric studies can be of practical assistance. These data provide a scientific basis on which to make decisions regarding the selection, retention, and location of items in a collection (Wallace, 1985). Collection is taken to mean any body of literature, such as the literature of a given subject, regardless of whether it has a well defined physical existence. This collection can be maintained in a library, an office, or in a discipline’s collective storehouse of knowledge. Bibliometric analysis is useful in collection management. Two of the methods more commonly used are Bradford’s Distribution (Bradford, 1948), and Price’s Law (Price, 1970).

The Bradford Distribution is related to serial productivity (Bradford, 1948). Serial productivity refers to the relative contributions of serials to a subject literature. A serial is defined as a publication made up of a number of separate and successive parts with a constant title. A serial is published for consecutive issues at a regular interval over an infinite time period (Nicholas & Ritchie, 1978). According to Diodato (1994), a few serials publish most of the articles in a field, while other serials publish only a few articles each. This distribution of articles, according to the serials contributing them, has been reported, first by Bradford (1977) and later by others (Aiyepeku, 1977; Basu. 1992; Bernal, 1948; Egghe, 1990; Kendall, 1960), to take a very regular pattern. This consistent pattern
holds for nearly any body of literature, regardless of discipline (Pontigo-Martinez, 1984). Bradford (1977) described the phenomenon as a law of scattering. The term scatter describes the widespread distribution of articles among serials. The most productive serials are those that are, in some way, most important to the professional discipline. The extent of this importance is determined without regard to the age, or date of the articles and their citations (Bradford, 1977).

Price’s (1970) Law is an example of citation analyses. Citation analysis is an area of bibliometrics that analyses the relationships between documents, authors, journals, or organizations (Diodato, 1994). Types of citation analysis include the citation records of major authors or researchers; mapping of specialities, schools, and disciplines; or online gathering of data (White, 1990). Citation analysis is becoming a focus of research for individuals seeking to develop an understanding of the relationship between authors or researchers (Osareh, 1996; White, 1990).

Citation analysis, in the form of publication counts, dates back to 1917. Applications of citation analysis include journal selection for prospective authors (Robinson, 1991), journal rankings within a discipline (Viswanathan, 1998), to reveal the linkages of writings over time (White, 1990). These linkages provide insight into the intellectual structure of disciplines by mapping the relationships between individual works.
There are two types of citation analysis. Document citation analysis illustrates the links between individual articles on the basis of joint citations by later authors. Author citation analysis produces maps of prominent authors in selected areas of scholarship (White, 1990). Whether citations are used as an illustration of good or poor research, the authors may, depending on the number of citations, emerge as significant figures within the discipline by bibliometric standards.

Bradford's Distribution and Price's Law provide "snapshots" of literature at a specific point in time. Combining several of these snapshots into a series allows decisions to be made about changes within the body of literature. Research is the foundation for decision making in any discipline. To apply research findings to education, it is necessary that individual solutions be developed for specific situations. Two questions that need to be considered are whether the quality of the research is adequate and whether the research results are applicable to the situation. All members of a discipline should work together to ensure that the research being conducted serves the purpose of expanding the knowledge base, while maintaining high standards of quality (Doll-Tepper & Depauw, 1996).

A bibliometric analysis of the literature in Educational Technology would provide assistance in determining who is conducting research and
what is the type and quality of the research and the pattern of communication between the researchers.

A bibliometric study of Educational Technology literature should be thorough to yield meaningful results. To increase the thoroughness of a bibliometric study, it is common to limit the scope of the examination by restricting the time period covered (Sittig, 1996). In recent studies involving the use of bibliometric analysis, researchers have examined periods of publications ranging from 3 to 10 years. Vishwanathan (1998), in a study of periodicals that published medical informatics articles relevant to library and information science, included articles retrieved from three databases during a 3-year period. Patil and Kumar (1998) presented a citation analysis of pedagogical literature from the Journal of Indian Society of Soil Science that covered a 6-year time period. A 5-year time period was used in a study to examine variables related to frequency of publication and number of years of publication during a particular time span.