CHAPTER V

Information Explosion and its Management.
"In Library and Information Science, information explosion is a term used for the ever increasing rate of publication" (Wikipedia, 2005). Information explosion is a term that describes the rapidly increasing amount of published information and the effects of this abundance of data. As the amount of available data grows, the problem of managing the information becomes more difficult, which can lead to information overload.

The idea of "information overload" has been discussed for decades, but never before has it seemed so relevant. Today, ideas and discussions are broadcast not at a prescribed time on a specific channel via a single medium, but all the time, on millions of forums, discussion groups, blogs and social networks. And they occupy a growing piece of our consciousness, thanks to RSS feeds, Twitter messages, mailing list and newsletter subscriptions, instant messaging, e-mail and Web surfing.

According to market research firm IDC, by 2011 the digital universe will be 10 times the size it was in 2006. IDC forecasted that the amount of digital information we generate will exceed our ability to store it this year. This situation is despite amazing improvements (greater than 100% per year currently) in disk density and capacity over the last 50 years.
A study conducted by the University of California at Berkeley differentiates between information that flows and that which is stored. Flowing information is that which is transmitted over the airwaves, on the internet, and on through the telephone. Stored information is that which is printed, on paper, film and other physical media. The study estimates that almost 800 Megabytes of stored information are produced per person, per year (Lyman and Varian 2003). So, even in recent years, the production of information has increased to the extent that we are now seen to be in the midst of an information explosion. This explosion has implications to the environment in which we live, to the workplace, the academic world, and our own peace of mind. Most research agrees that, as a result of this explosion of information, we are experiencing a state called “information overload.”

Hanssen (2001) was critical about this use of the term information explosion. He wrote: "If to inform (or INFORMATION as an act or process) is to mean something other than to talk or to write, the INFORMEE will be an indispensable factor (even though he need not be known by name). In other words: a person cannot reasonably be called an INFORMANT unless he has at least an intention to INFORM (someone). Nevertheless, one of the most popular expressions relating to documentation work, namely the INFORMATION EXPLOSION, disregards the INFORMEE(S). What is called the information explosion can in the first place be termed only the publication explosion, or even the paper explosion: the number of printed pages in
professional journals and books is increasing at a rate that can be described by an exponential function, like explosions. This, however, does not form an explosion of information, unless the number of printed pages is proportional to the amount of information resulting from the production and the distribution of these pages. In other words, when using the expression “the information explosion” we tacitly assume that professional papers contain information to a constant degree, regardless of their number, and regardless of their being utilized by informee(s).

The underlying conception of information is not particularly useful. It might be, e.g. that the users are able only to utilize a limited amount of literature, regardless of how much literature is produced; in that case the total outcome of information processes cannot exceed the limit set by the informees, and no information explosion can take place. One might even imagine that an explosion-like growth of produced literature would have a lowering effect on the total utilization of the literature, i.e. would tend to decrease the total outcome of information processes: people could react as if they were being choked.

Even in other respects the growth of the number of printed pages seems to be too primitive a measure of information. Scientific and other professional papers are not produced exclusively for informative purposes, but also as tokens of activity and as means of increasing some status; the need to publish – in order not to perish – seems to play a more important role.
part than earlier. It should also be noted that professional papers become obsolete as means of information at a much quicker rate than earlier. This means that even if the number of pages per year doubles every ten years, the total number of pages relevant today may not to a correspondingly high degree exceed the total number of pages relevant ten years ago. The quick "death" of much professional literature is not to deplore; actually many professional papers are nowadays meant to be only temporary means in research and instruction – it is just a pity that they are not printed with vanishing ink! As documentalists we shall remember that users are normally badly assisted by obsolete information. The relativity of information even applies to time.

Over the last 50 years, the computer and communications revolution has changed radically the way many organizations do their business. According to Charles Jonscher (2000), we are now living in a wired world. With old-style twisted pair telephone wiring, co-axial cable, and optical fiber there are physical communication networks almost every where on the globe, and the places these do not reach can be covered by satellite. Business and military communication needs have promoted most of the telecommunications developments, and the rapid growth in mobile telephony, fax and e-mail have transformed business and financial transactions.
But the greatest recent advance in communications technology was initially an academic development: the world wide web was invented by Tim Berners –Lee in the late 1980s in order to improve the storage and currency of electronic documents at CERN, the European particle physics laboratory. The rest as they say is history. But history has much to tell us about technological change and its effects on human society, which we would do well to note as a background to the changes affecting libraries that we are considering here. Humanity has always used technology. The wheel is technology, a flint to light a fire is technology, and anything that has been developed to do work so that human effort is easier is technology. In recent years, information and communication technologies have generally been referred to as ‘new’ or ‘high technologies’ – they’re highly visible, and have not yet, despite their pervasiveness, become part of the natural infrastructure of society which, according to Borgman is invisible when it functions adequately and only becomes visible upon breakdown (2000, 19–20).

‘Technology’, as the computer scientist Bran Ferren memorably defined it, ‘is stuff doesn’t work yet’ (Adams, 1999). Interestingly, Jonscher sees the development of information and communication technologies as a ‘curious turn’ that society took four decades ago away from mechanical and engineering developments and into microelectronics, giving birth to the digital age (2000, 4).
The influence of new technologies on future developments is often wildly miscalculated, and human ingenuity is such that tools are often employed for purposes other than those for which they were designed. To give some examples, in 1876 Western Union suggested that telephones have too many shortcomings to be seriously considered as a means of communication and was inherently of no value to them and in 1943, Thomas Watson, chairman of IBM, opined that there would probably be a world market for around five computers. More recently Bill Gates whose life works seems to be aimed at providing Watson wrong, famously stated that he couldn't imagine that anybody would need more than 640K of memory in their computer.

The internet was developed in the 1960s for a very restricted and specific purpose: the maintenance of communication in the USA in the event of a Soviet invasion: for Castells, it was ‘the electronic equivalent of the Maoist tactics of the dispersal of guerrilla forces around a vast territory to counter an enemy’s might with versatility and knowledge of terrain’ (1996, 6). Who could have predicted the myriad uses it would be put to within less than three decades?

On the other hand, huge social changes have been predicted, mediated by technologies, which have not come about: supersonic aircraft, for instance, which in the 1970s, when Concorde was first designed, were supposed to revolutionize the speed of global travel, have
remained a rare and expensive luxury. The infrastructure cost of supersonic flight has remained very high, while the cost of computing is reducing to that of television ownership owing to the social imperatives driving the technology cost down. As Castells points out, ‘technology does not determine society …technology is society and society cannot be understood or represented without its technological tools’ (1996, 5).

Society also has to be ready, both technically and psychologically, for major technological change to happen. For instance all the underlying theories and algorithms for the stored program computer were available by the 1850s, but mechanical limitations of the time meant that it could not be built until almost 100 years later (Swade, 2000). Progress is not a matter of smooth linear change, but ‘a series of stable states, punctuated at rare intervals by major events that occur with great rapidity and help to establish the next era’ (Gould, 1980, 226), a progress characterized Kuhn as ‘paradigm shifts’ (1970). Gleick (2000) suggest that these happening with greater rapidity than ever before, which is probably while we currently feel change as a process of constant acceleration.

With the digital revolution, data and information can now be transmitted to all corners of the world, and that is significant for almost all. Humanity and it is significant for libraries. But though many predict that We are reaching a halcyon period of cheap access for all; there are still political, cultural and financial issues that prevent this in many strata of society and many of the worlds. The digital divide exists and could further...
disadvantage the poor, the under-educated and those in developing countries as the better–off, the better educated and the economically developed race ahead into the digital future.

Views on the democratizing nature of electronic networks vary wildly and we need to be cautious in our evaluation of these: for some we are on the verge of global utopia, an’ age of optimism ‘(Negroponte, 1995, 227), for others the internet ‘continues to remain an expensive western toy’ in a world where less than 2% of the population is connected to it (with London having more internet accounts than the whole of Africa) and where 80% of the population has never even made a telephone call(Taylor,2001,35).

In southern Africa,’for the ordinary citizens, who are in the majority, the financing of bread and butter needs takes a precedence over information’ and the levels of charging ‘impose a form of censorship’(Muswazi , 2000,78) . indeed, we are more likely to see information equality being promoted by libraries than by other information organizations, as libraries, especially academic libraries, have been the great information levelers for centuries, providing more [generally free] information to there users than the letter could ever have by purchasing it.
Libraries need to continue to provide this role in the digital age even though many users are questioning the need for libraries and libraries in an era of massive free information resources available at the click of a mouse button. However, as we demonstrate in this volume, the information management skills of trained professionals are needed more than ever as we are overwhelmed by data of questionable provenance and unknown value. As Borgman (2000, 194) so cogently points out: The claim that the internet will replace libraries often is based on questionable assumptions. Three common misconceptions are that all useful information exists somewhere on the internet, that information is available without cost, and that it can be found by anyone willing to spend enough time searching for it.

As if there is more information around us and that information overload is a reality, but how much unique information is actually created each year and is it new or are we just being drowned in copies? Studies by Lyman and Varian at the University of California estimate that the world produces about 1.5 billion gigabytes of unique information per year. Apparently this equates to roughly 250 megabytes for every man, woman and child on earth or the equivalent textual content of 250 books each. The study investigated the amount of new information stored in the four storage media (print, optical, film and magnetic), and asked how much storage would be required if it were all presented in digital form.
Of course, this study does not tell us whether there is actually more information now than 10 or 20 years ago although that seems extremely likely. We have to look to a tightly controlled intellectual community to see in more human terms the actuality of the information explosion as described in this insight into chemistry: It is estimated that the amount of information in the world doubles every 20 months. The amount of information being published is increasing exponentially. For instance let us take the examples of "Chemical Abstracts" and "Mathematical Reviews". During 1995, 5,62,955 Papers and 3,620 Books were abstracted which were published in total 1,55,910 pages in Chemical Abstracts. But, during 2007, it increased to 8,16,778 Papers and 4,526 Books abstracts published in total 3,91,079 pages.


<table>
<thead>
<tr>
<th>Year</th>
<th>Papers</th>
<th>Books</th>
<th>Total Abstracts</th>
<th>Total Pages Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>7994</td>
<td>0</td>
<td>11847</td>
<td>3437</td>
</tr>
<tr>
<td>1927</td>
<td>25037</td>
<td>582</td>
<td>33491</td>
<td>5511</td>
</tr>
<tr>
<td>1947</td>
<td>30461</td>
<td>902</td>
<td>39288</td>
<td>5547</td>
</tr>
<tr>
<td>1967</td>
<td>202684</td>
<td>3046</td>
<td>242527</td>
<td>39521</td>
</tr>
<tr>
<td>1987</td>
<td>386466</td>
<td>4493</td>
<td>476178</td>
<td>95187</td>
</tr>
<tr>
<td>2007</td>
<td>816778</td>
<td>4526</td>
<td>1086941</td>
<td>391079</td>
</tr>
</tbody>
</table>
When so much of information is being published, we need some system to help us in managing such a huge pile. Here comes the role of information management, and subsequently, management information systems in libraries to facilitate efficient and effective use of library resources.

Digital futures are considered to be the new answer for the information age. For example, this year chemists will publish a hundred times as many papers than in 1901, when Van’t Hoff received the first chemistry Nobel Prize, (Schummer, 1999). In 1961 the doubling period for the total amount of information in science was between 12 and 15 years.
(Price, 1961), by 1990 it was down to every six years (Braukmann and Pedras, 1990). Now some think it is as short as one to two years or less, although providing this for science is difficult now the internet is a major publishing point. The information explosion can also be measured in economic terms.

America's industrial output weighs about the same as it did 100 years ago, even though real GDP (Gross Domestic Product) is 20 times higher, reflecting the higher knowledge content of contemporary goods and services, (Cronin, 1998).

This explosion in information, services and resources, whether appropriate to the users' needs or not, consumes attention. Information has to be selected or discarded, read or not read, but it cannot readily be ignored. The actual downside of the information explosion is a deficit of attention, known more popularly as 'information'.

In order to understand the changes taking place in our information activities, it is vital to understand some of the underlying structures and principles of the digital world. All digital data, from whatever original it derives, has the same underlying structure, that of the 'bit' or the binary digit. A bit is an electronic impulse that can be represented by two states, 'on' or 'off', also written as '1' or '0'? A 'byte' consists of eight bits, and one byte represents one alphanumeric character. A ten-letter word, for
example, would be ten bytes. Bits and bytes are linked together in chains of millions of electronic impulses; this is known as the ‘bit stream’. A ‘kilobyte’ is 1024 bytes, and a ‘megabytes’ 1024 kilobytes. Digital images are represented by ‘pixels’ or picture elements – dots on the computer screen or printed on paper. Pixels can carry a range of values, but at the simplest level, one pixel equals one bit, and is represented in binary form.

Computers and access to the internet and local resources, together with generic computing applications, have enabled the user to access the library from anywhere in the world. The library at Vassar College, which reopened after major refurbishment in May 2001, has developed ‘e-carrels’ for students to use. This is a revolutionary approach to library architecture and digital resources, and is described as ‘an active networked portfolio, workspace and repository of intellectual activities and connections for each student’ – a true hybrid library environment. The down side of many of the new developments is that we now live in an age of what has been designated as ‘continuous partial attention’, where there are so many interactions and devices competing for our attention that we can give only a small part to each (Friedman, 2001). This is predicted to worsen over the next years.

We will see a convergence of wireless technology, fiber optics, software applications and next-generation Internet switches, IP versions
that will permit anything with electricity to have a web address and run off
the internet. This will allow us all to be online all the time from everywhere.

The burgeoning mass of information now available everywhere, and the pervasive nature of information technology, is among the complex social forces that are making modern life ever more rushed and pressured. From the beginnings of human society, individuals, corporations, and nations have perceived the personal, financial, and political advantages of exchanging information ever more rapidly (and usually discretely). Information is power, and control of the means to inform allows one to secure maximum advantage from it. Broadcast technologies were developed to inform the many by the few, interactive technologies to connect more directly. Current information and communication technologies are a mixture of both.

The development of all communications technology is predicted on the need to communicate faster, further or more durably with those separated by space or time. So African drums, runners and riders, smoke signal, semaphore and many forms of ground transport like the railways were aimed at transporting that most valuable of commodities, information, that little bit faster, that little bit further. The book developed so that the preservation of information over time was not reliant on the human memory, but could be recorded more durably. Cultural memory relies upon the durability of some medium upon which it can be inscribed.
for future generations. The paradox of the digital world is that the durability of cultural memory is made problematic by the impermanence of the medium.

These roots of the current communication revolution were firmly established during the last century and life and culture were transformed then as much as they are being transformed now by new technologies. The telegraph was the first communications technology to enable complex messages to be delivered faster than they could be carried by the fastest means of physical transport (at that period, the railways). From one relay point to the next messages were, for all intents and purposes, instantaneous, and even in the world of the internet, you don’t get much faster than that. In the 1970s, messages could be conveyed on the telegraph to Bombay and back within four minutes, which caused the Daily Telegraph newspaper to pronounce ‘Time itself is telegraphed out of existence’ (Standage, 1998). Gorman offers some interesting and salutary comparisons between the information revolutions in libraries happening at the end of the 20th century and those which occurred in the last quarter of the 19th century, and points out that the rhetorical statements used then ‘could be and are used by pundits and sages today concerning the cyber future’ 2000, 5).

In predicting the digital future he urges caution lest we lose the traditional values of librarianship, something we wholeheartedly endorse.
There are many problems inherent in the increasing desire for speed. As the production of information gets faster, the total volume increases, and therefore the speed at which it can be processed decreases – another paradox. Sifting through the mass takes ever longer. So there is no smooth transition from initial complexity to eventual simplicity and stability, as we would like to believe, but an ever faster dance to keep up with the pace. The result is shrinking attention spans, and an ever greater need for the stimulation that speed brings, along with which goes a feeling that however much we read or sift, the mountain of the unread and the unsifted is even larger.

When a smorgasbord of information and entertainment lies at the touch of a finger, how long can we concentrate on any one train of thought? Can we allow ourselves the time to reflect, or resolve an emotional conflict? Both the speed of the net, and the wealth of information it offers, militates against certain thought processes. We become good at multitasking and skim-reading, but less good at the kind of reflection and contemplation which is essential for true originality and emotional wisdom. The biggest danger of the net is its urgency; can we ring fence the internal space and silence essential for having something original and wise to communicate? (Bunting, 2001)

It is our belief that in this world of speed and continuous momentum, libraries and librarians can come into their own to create
some order and some important signposts. As Kunny and Cleveland (1998) suggest: One important consequence of the information revolution is that the costs of organizing information are beginning to match the costs of producing the information. In this view, it is the context not the content that will be locus for value.

Kunny and Cleveland (1998) pointed out quoting Dyson, that: value shifts from the transformation of bits rather than bits themselves, to services, to the selection of content, to the presence of other people, and to the assurance of authenticity – reliable information about sources of bits and their future flows. In the digital world, librarians are finding innovative ways to add value to bits to help users create knowledge out of information, just as they have always added value to information in the non-digital world.

With advancement in technology, the University library provides vital opportunities to the youth to acquire and enhance their information in emerging fields and helps to undertake research in advanced systems. Our education system should re-align itself at the earliest to meet the needs of present day challenges and be fully geared to participate in societal transformation through innovation, which is the key to competitiveness. It should also develop a global outlook. India has much strength. It has to reach out and make our individuals and institution capable of succeeding in a competitive world.

INFORMATION EXPLOSION & ITS MANAGEMENT
The systematic process of finding, selecting, organizing, distilling and presenting information, improves any reader's comprehension in a specific area of interest. Information management helps an organization to gain insight and understanding from its own experience. Specific information management activities help focus the organization on acquiring, storing and utilizing information for problem solving, dynamic learning, strategic planning and decision making. It also prevents intellectual assets from decay, adds to firm intelligence and provides increased flexibility.

Knowledge creation has two dimensions, one is explicit knowledge and the other one is implicit knowledge. Explicit knowledge comes from published books, written materials, proceedings, presentations etc., whereas the implicit knowledge is derived through the systematic observation and capturing of data from the tacit knowledge available among the individuals in the organization, through their approach to problem solving, bottle-neck removal, goals setting, interactions etc. We need a systematic mechanism to capture this knowledge to make the library a truly learning organization, which makes use of existing knowledge judiciously and efficiently.

The digital library is an important component for capturing the explicit knowledge. This has to be supplemented with implicit knowledge
to the digital library system, which will eventually get transformed into a knowledge management system. This may be relevant to all states.

The 21st century is about the management of all knowledge and information we have generated and the value addition we bring to it. We must give our students the skills with which they find a way through the ocean of information that we have created and continue with life long learning. Today, we have the ability, through technology, to really and truly teach ourselves to become life-long learners.

The management of information in the 21st century is beyond the capacity of a single individual. The amount of information that we have around is overwhelming. The management of information therefore must move out of the realm of the individual and shift into the realm of networked groups. Librarians must learn how to manage information collectively. When the information is networked the power and utility of the information grows as squared as predicted by Metcalfe's law. Information that is static does not grow. In the new digital economy information that is circulated creates innovation and contributes to national wealth.

In the midst of all of the technological innovations and revolutions we cannot think that the role of the librarians will be diminished. In fact the librarian will become even more important and the whole world of

INFORMATION EXPLOSION & ITS MANAGEMENT
education will become librarian assisted and would help in "tele-porting" The best librarian to every nook and corner of the world and propagate knowledge.

In sum, inquiry, creativity, technology, entrepreneurial and moral leadership are the five capacities required to be built through the education process. If we develop these five capacities in our students, we will produce an" Autonomous Learner" a self-directed, self-controlled, lifelong learner who will have the capacity to both, respect authority and at the same time is capable of questioning authority, in an appropriate manner. These are the leaders who would work together as a "Self-organizing Network" and transform any nation into a prosperous nation.

Now I understand all the eight Universities will be working together to connect among themselves through high bandwidth network thus creating Virtual University Library GRID. This step will enable the students of these Universities and their affiliated colleges and post-graduate departments to have a collaborative and interactive learning experience with the faculties of any of the Universities on the fly. The benefit of the Virtual University which was demonstrated for the urban regions has to reach the rural areas.

Any University Library is judged by the level and extent of the research work it accomplishes. This sets in a regenerative cycle of
excellence. Experience of research leads to quality teaching and quality teaching imparted to young in turn enriches research. Research brings transformation and development and also enhances the quality of education.

The eight University libraries may consider creating Chhattisgarh Virtual University Library GRID by networking the Universities from Chhattisgarh. Specific areas of research and Development to meet the regional mission requirements of Chhattisgarh state and also for capacity building in each state. This Chhattisgarh Virtual University Library GRID will provide, the best of education to its member universities based on their core-competence, hence it will ensure the best education of Chhattisgarh will reach its member states through universal tele-education delivery system. It will also ensure collaborative learning leading to the creation of an information society in the region. Such a Virtual University Library GRID will have the following tasks:

a) Act as a hub of all Universities, related educational, and research and development centers in the Chhattisgarh region

b) Ensure collaborative learning and live interaction among students and faculties of Chhattisgarh universities.
c) Identify experts of national/international eminence in specialized areas and nominate Colleges of eminence.

d) Coordinate, organize, schedule and broadcast lectures of specialists at a mutually convenient time to all participants.

e) Impart education based on its core competence, any student from any university will be able to get quality education at his desktop.

f) Network all Teachers Training Programmers in the Universities to empower them with research inputs from all the Chhattisgarh universities and capacity building.

g) Record the live transmission of lectures with interaction details in a data bank for easy access by participants for review learning.

h) Digitize all University libraries and make it available for seamless access by all faculty and students of the University.

i) Universities need to become learner centric.

j) Collaborate with other Virtual Universities in India and abroad through the network.
India is now in the process of creating virtual universities and institutions for knowledge sharing, knowledge dissemination and knowledge reuse. While it is known that Virtual Universities provide us with technologies of the future and the most economic way of scaling high quality education in the country, they are no substitute to campus based education. The challenge before Virtual Universities is to provide the best of breed of both the worlds.

In the world of Virtual Universities equitable access to all its participants is the primary goal. Unlike in the real world, equitable access is always the democratic average, in Virtual Universities equitable access always means equitable access to the best resources? Be it teachers, be it the library, be it the laboratory, available across the network. In effect, the network brings the best of its participants to every one of its participants. The three phases of learning are lectures, library and laboratories. They require increasing bandwidth from a few 100s of kilobytes for lectures to a few megabytes for formal digital libraries and the informal world of knowledge from the Internet, to gigabits of connectivity for remote libraries in the world of high precision science and engineering. As the bandwidth becomes cheaper and available in abundance, universities should be able to run remote literature and facilities as complex as on NMR to Wind tunnels. These are applications that can make a difference in how we engage in teaching, learning, and research in higher education.
**Internet 2:** The world is moving towards internet 2 applications. Internet 2 applications require advanced networks. That is, these applications will not run across commercial Internet connections. Internet2 applications require enhanced networking functionality? Such as high bandwidth, low latency (delay), or multicast? Not available on our commercial Internet connections. Internet2 is about everything we do in higher education. Therefore, we encourage and support applications development in all disciplines from the sciences through arts and humanities. Whether you're in the classroom, the laboratory, the library, or the dorm, you should be able to access Internet applications that provide benefit.

India has established the Information GRID. ERNET in the Educational and Research Network of India connecting 1500 institutions for internet and intra connectivity for email and other collaboration. Presently ERNET is connecting around 45 institutions across the country in a high bandwidth network with 100 mbps connectivity under the GARUDA project. GARUDA will demonstrate the applications of GRID computing to solve many grand challenge problems. Many academic Institutions of high repute in India are partners in this national initiative. This will become a part of the proposed Information GRID. Grids know no political or geographical borders. Their only language is “connect” and languages like C, C++ etc which every one understands, their only mission is interoperability and their
only motto is the optimal utilization of computer power and knowledge and their only goal is to make available the entire compute power of the world to every one in the network. If we can connect Khairagarh to Bilaspur through the network and share resources and knowledge, it should be easy to connect Chhattisgarh to India.