CHAPTER 3
INFORMATION SEEKING MODEL IN DIGITAL ENVIRONMENT

3.1 INTRODUCTION

Information is anything that can change a person’s state of knowledge and physical representations of abstractions that can cause the change. Information as a concept bears a diversity of meanings, from everyday usage to technical settings. Generally speaking, the concept of information is closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation. Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the receiver. In other words, it is the context in which data is taken.

Rath (1996)\(^1\) identified the user needs are based on the requirements of current, exhaustive, every day and catching up information. According to Menzel (1966)\(^2\) argued that to study the needs and uses mean primarily to study the behaviour and experiences of scientists and technologists in confrontation with information channels”. He categorised investigations into three types as follows:

- preference to demand studies which include opinions, evaluations, requests for information, and experiments on the impact of a service;
- user studies, which include relative contributions of communication channels and critical incident studies;
- user interaction with dissemination in systems, as in studies of the flow of information at a scientific meeting.

3.2 INFORMATION SEEKING

Information seeking is a developmental behaviour and the information seeking ability continues all through the individual’s life. Information Seeking is the human
behaviour with respect to searching various sources, channels including use of that information. The process of searching information through various channels of communication is termed as Information Seeking Pattern. The terms Information Seeking Behaviour and Information Seeking Pattern are synonymous terms.

- Information seeking pattern is mainly concerned with the type of information that the user needs.
- It is an activity of an individual in pursuit of information.
- It is closely related to the personal characteristics and traits of the users.
- It is an act of searching or finding or locating information needed by an individual, be a professional, academician, researcher, consultant and so on.

According to Krikelas (1983)\(^3\) information seeking behaviour begins with a perceived need and involves the activities pursued to satisfy that need with information and ends when the need is no longer perceived. To quench the thrust for information, users adopt numerous ways and means to access the various channels of communication of information. Information explosion has necessitated the way to seek information in an increasing variety and diversity at different levels, frequency, volume and use. This situation appears to be ambiguous and heterogeneous in character so that information needs of a particular group of users and information flow from a specific situation / organisation are difficult to determine. This situation has paved the way to the concept of information search and the manner of determining the pattern of search has been considered as Information Seeking behaviour. Wilson (1999)\(^4\) defines the Information seeking behaviour as “those activities a person may engage in which identifying his or her own needs for information, searching for such information in any way, and using or transferring that information”. Information seeking behaviour depends on certain elements of the information use of environment. Taylor (1991)\(^5\) identified the following elements which are used in information seeking environment are:

- The assumptions formally learned or not, made by a defined set of people concerning the nature of their work.
The kinds and structure of the problems deemed important and typical by this set of people.

The constraints and opportunities of typical environments within which any group or subgroup of this set of people operates and works.

The conscious, and perhaps unconscious, assumptions made as to what constitutes a solution, or better said, a resolution of problems, and what makes information useful and valuable in their contexts.

The information-seeking pattern is concerned with who needs what kind of information and the need varies from user to user. The information use environment depends on the use of various elements and mostly related to the personal characteristics and traits of the users and is an activity of an individual in pursuit of information.

3.3 INFORMATION SEEKING MODELS

Beginning with early studies primarily about scientists and the practice of science, researchers demonstrated that, rather than being remote, impersonal, and rigid, scientific research was actually communal, reflecting a strong interpersonal network of interconnected scientists. There were formal and informal channels for information exchange and significant amount of the contributions of information seeking theory and models are based on assumptions or smaller-scale studies of user information needs and searching. (N. J. Belkin, N.Oddy, & Brooks (Pat 1), 1982)\textsuperscript{10}; N. J. Belkin, Oddy, & Brooks (Part 2), 1982)\textsuperscript{11}; Kuhlthau, 1991)\textsuperscript{12} These models suppose cognitive activity and the feedback given by the information search environment. Wilson (1981)\textsuperscript{13} in his model suggests that information seeking
Figure 3.1 Wilson’s Concept of Information Seeking Behaviour Model

behaviour results from the recognition of some need, perceived by the user. The user may make demands upon formal systems that are customarily defined as information systems or upon systems, which may perform information functions in addition to a primary, non-information function.

The format and the mode of access to information resources have changed because of the electronic environment in libraries and the industry brought about ICT. The librarians and the library users have to cope up with the challenges raised due to ICT and the advantages being therein where the efficient global communication results in frequent personal interaction among the users. David (2002)\textsuperscript{14} identified that the information seeking process starts with recognize the problem the user is looking for and ends with synthesizing by restructuring and repackaging the information into a new form that meets the defined problem. The steps involved in information seeking process are shown in Figure 3.2.
Eisenberg and Berkowitz (1992) proposed the Big Six Skills which represents a general approach to information problem solving. The order of the stages changes with each search venture, but each stage is necessary in order to achieve a successful resolution of an information problem. The six steps are

1. **Task Definition**: The user needs to define the problem from an information point of view and needs to define what needs to be done, what information needs to be gathered, etc. prior to embarking on information seeking strategies.

2. **Information Seeking Strategies**: Once the user clearly defined the information problem, then the researcher must decide which and what information sources are the most appropriate to solve the task. The strategy should be adopted by the user for finding information on the desired topic and need to consider various criteria such as source of information, including accuracy, reliability, ease of use, availability, comprehensibility, and authority.
3. **Location and Access:** Location and access is the implementation of the information seeking strategy. These skills involve use of access tools (bibliographic databases and print indexes), arrangement of materials in libraries, parts of a book; strategies for searching an online catalogue. The user should adopt the strategy to find the desired information with the ICT tools or by physical access.

4. **Use of Information:** Once the user found the needed information, they can employ skills to use the information. These skills involve interacting, dialoguing, reading, listening, viewing, questioning, and reflecting on the information.

5. **Synthesis:** Synthesis is the application of all information to the defined task. Synthesis involves restructuring and repackaging the information into a new and different form.

6. **Evaluation:** Evaluation is the examination and assessment of the information problem solving process. It determines the effectiveness and efficiency of the process. Evaluation determines whether the information found met the defined task. Evaluation involves reflecting on the information problem-solving process itself.

The model of Ellis (1989)\textsuperscript{16}, Ellis et al (1993)\textsuperscript{17} and Ellis and Haugan (1997)\textsuperscript{18} begins with a broad scanning followed by systematically searching for information from available resources and it resembles the big six skills of Eisenberg and Berkowitz. The steps in the model are:

a) **Starting:** Possible sources of relevant information
   - OPAC
   - Web OPAC
   - Abstracts and indexes on CD-ROM/Internet
   - Internet, using search engines

b) **Chaining:** Follow up leads
   - Cited references
Possible subject headings
Listed sources (Located by search engines)

c) Browsing: Scanning relevant documents
   Retrieving and evaluating relevant documents

d) Differentiating: Selecting documents
   Selecting from among relevant documents by bookmarking, copying, etc.

e) Monitoring: Keeping abreast of developments
   Regular scanning of possible sources of relevant documents
   Receiving site updates through push technology, SDI profiles, etc.

f) Extracting: Reading a particular source and selecting information from it.

According to Marchionini, (1995)\(^\text{19}\), information seeking behavior could be organized into four levels of granularity (Figure 3.3). The four levels are as below:

![Figure 3.3 Information Seeking behaviour; grouped by level granularity](http://www.novapdf.com/)
At the coarsest level, people exhibit information seeking **patterns**. Patterns are mostly unconscious sequences of behaviours that can be discerned over time and across different information problems and searches. They are influenced by user disciplines, domain and systems.

**Strategies** are the approaches that information seekers take to a problem. Two classes of strategies are formalised as analytical searching and browsing strategies. They are the extremes of a range of flexible combinations of strategies. Strategies mostly are consciously selected and mainly search specific.

**Tactics** are discrete intellectual choices during an information seeking session. Tactics are more focused than strategies, for example narrowing the search space by selecting a date range. Tactical skills clearly distinguish between expert and novice users of on-line systems, are often mentioned as searching skills.

**Moves** are finely grained actions manifested as discrete behavioural actions, e.g. doing search, going to advanced search, downloading a document, or even clicking a mouse. Moves are evidences of tactics. They offer observable clues for interface usage and mapping the intellectual activity at higher levels of action. This study concentrates collecting user moves data and aims to utilise it in order to build models of their seeking patterns.

Marchionini (1997)\(^{20}\) describes the Information seeking process in seven steps where the user could satisfy on identifying the right information. His model (**Figure 4**) identifies in defining the problem, formulating a query, executing the query and extracting the information is in the high probability transitions.

- Recognize and Accept
- Define and Understand the Problem
- Choose a Search System
- Formulate a Query
- Execute Search
- Examine Results
The new model of inter-disciplinary information seeking is represented in terms of three core processes and three levels of contextual interaction such as opening, orientation and consolidation which is shown in Figure 5 (Foster, 2004)\textsuperscript{21}.
The core processes of Opening, Orientation, or Consolidation take account of the interaction between the information seeker's Cognitive Approach, and their Internal and External Contexts. Figure 5 illustrates the core processes of the model along with the behaviour associated with each major component of the model. Foster (2005) indicating that the behaviour of the user is flexible and only fully understandable within a view of changing contexts. This enhances the available perspectives with which information-seeking behaviour may be viewed. Further Foster illustrates (Figure 3.6) the core processes of the model along with the behaviour associated with each major component of the model.

Byström (1999) followed on with empirical studies and based on her empirical findings, a revised model of task-based information seeking was drawn (Figure 7). This model contains eleven statements. The eleven statements drawn by Bystrom are:
S1: as soon as information acquisition requires an effort people as sources are more popular than documentary sources.

S2: the more information types are needed, the greater the share of people as sources.

S3: the more information types are needed, the greater the share of general-purpose sources and the smaller the share of task-oriented sources.

S4: the more information types are needed, the more sources are used.

S5: the internality of different source types is loosely connected to the information types.

**Figure 3.6** Non-linear model of information seeking behaviour illustrating component behaviour (Foster 2005)
S6: the higher the degree of task complexity, the more probable is the need for multiple information types: first task information, then task and domain information, and finally task, domain and [problem] solving information.

S7: the higher the degree of task complexity, the more information types are needed, and the greater the share of people as sources and the smaller the share of documentary sources.

S8: the higher the degree of task complexity, the more information types are needed and the greater the share of general-purpose sources and the smaller the share of task-oriented sources.

S9: the higher the degree of task complexity, the more information types are needed, and the higher the number of sources used.

S10: task complexity is distinctly related to increasing internality of people as sources and decreasing internality of documentary sources.

S11: Increasing task complexity fosters the use of people as sources.

Figure 3.7 A model of task-based information seeking (Byström, 1999)
Jarvelin and Wilson (2003) suggested that there are several kinds of conceptual models for information seeking and retrieval (IS&R) and discussed the functions of conceptual models in scientific research, in IS&R research in particular. They discussed at length on one analytical model of task based information seeking and its contribution to the development of the research.

For most people, Bates (2002) describes as most of the time, information-related behavior consists of absorbing and using the learning and information that comes our way during the course of our daily lives. Looking at us as a species that exists physically, biologically, socially, emotionally, and spiritually, it is not unreasonable to guess that we absorb perhaps 80 percent of all our knowledge through simply being aware, being conscious and sentient in our social context and physical environment. Considering Bates (1986) “Modes of Information Seeking” (Figure 3.8), directed or undirected refers, to whether an individual seeks particular information that can be specified to some degree, or is more or less randomly exposing themselves to information. "Active" and "Passive" refer, respectively, to whether the individual does anything actively to acquire information, or is passively available to absorb information, but does not seek it out.

![Figure 3.8 Modes of Information Seeking](image-url)
Leckie, et al (1996) reveals in his model that awareness of information sources, including accessibility, quality, timelines, trustworthiness, familiarity and previous success has a direct impact on approaches taken in information seeking. He suggests in his model (Figure 9) that a feedback loop, which highlights the benefit of the outcome of the information seeking process to the original information need or task. The use of internet by the information professionals could satisfy the need of the information seekers.

Figure 3.9: The Information Seeking of Professionals model. (Leckie, et al. 1996)

Meho and Tibbo (2003) on revisited the study of Ellis, the authors found four new features accessing, networking, verifying, and information managing besides those identified by Ellis’s generic features starting, chaining, browsing, differentiating, monitoring, and extracting. This new model groups all the features into four interrelated stages searching, accessing, processing, and ending (Figure 3.10).
Shaaban, McKechnie and Lockley (2003) in their study identified four clusters of user seeking behaviour and they described the clusters as:

- exploratory information seeking behaviour with highly interactive system usage.
- Knowledgeable users who tend to employ their domain experience in doing subject searches with inexperienced system usage.
- Fast-paced users who perform known-item searching accompanied by help-intensive behaviour.
- Passive users who experience unsuccessful short seeking episodes.
Gopalakrishnan (2004)\textsuperscript{30} developed networking of national institute of fashion technology resource centers in India based on the information seeking behaviour of faculty of NIFT Faculty. With the use of library web portal the library professionals could provide the required information to the users of the Resource Centre through the networking of the fashion institutes (Gopalakrishnan et al, 2006)\textsuperscript{31}. The behaviour of any researchers mostly depending on the professionals who could guide them in identifying the required information with the use of ICT tools.

Gopalakrishnan and Gopalakrishnan (2007) further developed a model “User Behaviour Model” based on the information seeking behavior of professionals in any subjects. The users are normally in the waving mind on accessing the desired information. The known sources and unknown sources plays an important role in finding the desired information. If the user definitely knows the source of information, firstly they approach the library or the information centres to retrieve the authentic information from the published sources. The users have an option to access the e-resources to find out from the unknown sources. On retrieving, the user access and process the collected information and ends the search. If the user is not satisfied, then the user contacts the librarian further to know about more sources of information. Figure 3.11 shows the User Behaviour Model.
Figure 3.11. Gopalakrishnan and Gopalakrishnan User Behaviour Model (2007)

3.4. APPLICATION OF ICT IN LIBRARIES

The information society has brought about developments in the way information is created, consolidated and accessed. ICT has produced larger volumes of information, new ways of packaging information and new tools for managing information. These developments require new knowledge and skills of librarians and
other information workers to meet the demands of the global economy for information resources and services. Electronic technology in general can amplify and augment our abilities and performance (Engelbart, 1963) as well as disorient and confuse us. Computer applications such as electronic text are causing changes in the fundamental processes of writing and reading (Bolter, 1991), and electronic spreadsheets have enabled iterative decision making for individuals and businesses. The digital information tools can be applied in many ways into the library or the information centres. Some of the important areas of application are:

1. Locating information on behalf of users.
   - Define the precise nature of the enquiry in conjunction with the user.
   - Create a search strategy to fully satisfy the user's enquiry.
   - Evaluate the results of the search in terms of validity of information found and its appropriateness in meeting the user's needs.

2. Supporting reader development
   - Demonstrate an understanding of reader development.
   - Identify, evaluate and use a range of online resources that promote reading to different kind of users.
   - Identify, evaluate and use a range of online resources that promote reading to users with special needs or with specific language requirements.

3. Supporting user to ensure effective learning
   - Profile user in terms of ICT competence and learning goals.
   - Select a range ICT-based package(s) to support this learning.
   - Provide appropriate ICT support to the user in the use of their chosen learning package(s).

4. Using ICT in professional practice
   - Use an automated library management system proficiently.
   - Use and evaluate online selection tools.
   - Use ICT in continuing professional development, to join in professional discussions and to improve own professional practice.

5. Supporting users in the safe and legal use of ICT
Demonstrate safe practice relating to the use of ICT for communication.
Demonstrate ways in which ICT can support users with special needs or with specific language requirements.
Demonstrate awareness of legislation relating to the use of ICT for storage, manipulation and access of information.
Demonstrate awareness of Freedom of Information legislation and information access issues.

6. Carrying Out the Net Navigator Role
- Define the detail of a complex enquiry in conjunction with the user.
- Demonstrate knowledge of search logic, search engines and features of the internet.
- Create and implement a complex search strategy.
- Evaluate websites located in a complex search.
- Review effectiveness of search strategy.
- Use ICT to set up current awareness and alerting services.

7. Carrying out the Educator Role
- Establish ICT training needs for individuals and groups.
- Select delivery approach which takes account of learner's preferred learning style and is appropriate for learning content.
- Design learning materials and programmes on ICT-related topics.
- Utilise appropriate skills to support individuals and groups in their use of learning materials and programmes on ICT related topics.
- Evaluate and revise learning materials and programmes on ICT-related topics.

Even though the application of ICT tools in the library satisfies the user needs, while the library endeavours to offer accurate and current resources and to maintain the security of its computer systems, the Library does not:
guarantee the authority or accuracy of any information found in electronic resources; or

accept responsibility for any losses arising from the use of, or technical difficulties with, the library’s information and communication technology systems (including loss of and unauthorised access to user’s data)

3.5 DIGITAL ENVIRONMENT

Digital Environment is about achieving the age-old objectives and applications of information and communication in new and more efficient ways which facilitate the process of identification, collection, storing, processing and disseminating of information. The library and information science professionals are utilizing ICT and digital environment to keep pace with the problem of information explosion. The benefit of instant access to digital information is the most distinguishing attribute of the information age. It affects personal information infrastructures at all levels. Most obviously, technology affects the material resources of our personal information infrastructure by presenting new objects such as CD’s, online databases, e-bulletin board, optical databases and other e-forms. The physical changes that electronic technology brings are highly dependent on material wealth and dependent on individual ability.

Information in digital form is both enabling and complicating. The electronic information is more accessible and available any where in the world with a few key strokes or mouse clicks. On the other hand, it is less accessible because it is not directly perceivable to humans unaided by technology. In the high end technological era, the ICT environment, in particular for the users of the library has shifted:

- **from print to digital**: from where the information available has been characteristically print, linear, of defined text types, with some mixed media, to an electronic environment that is characteristically hyperlinked, image intense, inclusive of multiple media, and often with different text types present in any one document;
from local to international: from an information environment centering on the local school library, public library and sometimes the set of encyclopaedias at home, to one where the availability of information is international in scope and seemingly knowing no boundaries of quantity and scope;

from secure to uncertain: from an information environment where each information resource has been carefully selected by teachers and librarians using quality criteria to ensure appropriateness and authority in supporting the curriculum objectives of the school, to one characterised by ambiguity, misinformation, malinformation, messed-up information and useless information and where there is no control of the authority and reliability of the information;

from poverty to overload: from an information environment where any search in a school library catalogue typically reveals a limited and manageable set of retrieved items, to one where a simple search can generate millions of potentially useful sources of information; and

from service to empowerment: from an information environment where information intermediaries [such as] librarians and teachers have played a central role in connecting people and information, to one with an increasingly "do it yourself" approach. It is a move from emphasis on transmission and exchange of information to being self-motivated expert navigators and interrogators of this information.

Librarians should take a leading role in demonstrating information searching techniques generally and validating resources on the Internet (Kerins et al, 2004)\(^6\). Mastering the Internet and making it known for what it can and cannot do should be the responsibility of the information professionals (Agha, 1997)\(^7\).

3.6 BEHAVIOURAL MODEL OF INFORMATION SEEKING

Few information seeking model based on the behaviour were shown in Table.3.1. The model, author and theory were shown in the table.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>User Acceptance Theory</th>
<th>Author</th>
<th>Model</th>
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<tbody>
<tr>
<td>1</td>
<td>Theory of Reasoned Action (TRA)</td>
<td>Davis, F.D., R.P. Bagozzi, and P.R. Warshaw</td>
<td><img src="" alt="Diagram 1" /></td>
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<tr>
<td>2</td>
<td>Technology Acceptance Model (TAM)</td>
<td>Davis, F.D., R.P. Bagozzi, and P.R. Warshaw</td>
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<td>3</td>
<td>Theory of Planned Behaviour (TPB)</td>
<td>Ajzen. I</td>
<td><img src="" alt="Diagram 3" /></td>
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<tr>
<td>4</td>
<td>Computer self efficacy model (CSEM)</td>
<td>Compeau, D.R. and C.A. Higgins</td>
<td><img src="" alt="Diagram 4" /></td>
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<td></td>
<td>Decomposed theory of planned behavior (DTPB)</td>
<td>Taylor and Todd</td>
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<td>5</td>
<td>TAM Augment with experience</td>
<td>Taylor and Todd</td>
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<tr>
<td>6</td>
<td>Pre implementation Version</td>
<td>Davis, F.D., R.P. Bagozzi, and P.R. Warshaw</td>
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<td>7</td>
<td>Post Implementation Version</td>
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<td>8</td>
<td>Extended TAM</td>
<td>Hartwick, J. and H. Barki</td>
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![Diagram of TAM and extended TAM models](image-url)
3.7 CONCLUSION

The format and the mode of access to information resources have changed because of the digital environment in libraries. Librarians and other users of information must adapt to the changing new technological environment. The professionals should be able to use the electronic resources and access tools. They should respond to new user information needs and identifying their seeking behaviour. Information searching is the behavioural model of information seeking.

The mode of information seeking using ICT is distinguished by the nature of information needs, information seeking tactics, and the purpose of information use. The information seeking tactics characterizing each mode were revealed by recurrent sequences of browser actions initiated by the information seeker. The various information seeking model (ISM) are related to the new environment where the libraries are heading and the seeking behaviour of the user are based on searching, accessing, processing and ending.

References:


References:


