Information Retrieval: A Communication Process in the 21st Century Library

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ABSTRACT

Communication is a process involving a group of interrelated elements working together for the purpose of information transfer. This paper discusses information retrieval as a communication process in the 21st century library. The difficulties associated with access to recorded knowledge through bibliographic control devices have been exacerbated by the interposition of additional encoding processes in the library and further decoding by the users. In addition, the innovation of internet/web has revolutionized the means and mode of communication process in the library by flooding information seekers with information and creating an illusion of self-sufficiency in many users. With these changes in information seeking behaviour and pattern, a cybernetic approach to information retrieval has emerged emphasizing adaptive control mechanisms and feedback processes. This paper argues that libraries should strive to continuously remain relevant by keeping abreast with changes in the behavior of information users. To this end, this paper proposes apomediatic-cybernetic model of communication, which illustrates information retrieval processes for the 21st-century library.

1. Introduction

Human beings always communicate with one another, friends, family members, colleagues, among others. Effective communication is vital in all facets of life. We communicate in order to persuade, inform, influence relationship, discover information, or to entertain. The essence of communication is the transfer of information from one person or group to another. It is a process that involves interrelated and interdependent group of elements working together to achieve a desired goal.

Communication is defined as a message exchange between people through which symbols, emotions, thoughts and knowledge are transferred (Yildiz, 2012). Martin (1988) and Hybels and Weaver (2001)

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defined communication as a process involving exchange and sharing of information, ideas, experiences, or attempting to exert an influence on the behaviour of others. They stated that communication may involve written, oral, body language, personal mannerism, and styles. Losee (1999) defined communication as information that enters a process and eventually leaves it in inverse process. He stressed that communication occurs if and only if information moves from the input of one process to output of another process, the later being the inverse of the first process. Communication is composed of two complementary informative processes the second of which *undoes* (inverse) what the first process *does* (Losee, 1999). Hearing/listening, for example, *undoes* what talking *does*. This definition is particularly important in the field of librarianship, especially in information storage and retrieval systems. It recognized that information transfer is the major objective of communication, and that both the sender and the receiver participate actively in the communication process. Thus, the minimum definition of communication is that somebody has something to say or share with someone else. However, in real life, communication goes beyond this. There is a definite purpose for every communication. The sender has something to communicate to his intended audience to achieve a particular purpose.

The library as an embodiment of refined information resources and services is the hub of communication between patrons and processes of information search and retrieval. However, the essence of the library and functions of a librarian are threatened by the presence and activities of internet/web as information users feel sufficient enough in information verification, classification and retrieval. Although vast information is available on the Web, users often face difficulties in finding the needed information due to lack of information related skills, such as assessment, search, and retrieval.

Hence, this study aimed to examine the librarian's roles in the technology-driven 21st-century library. In particular, this paper reviewed various communication processes relevant to the information retrieval processes.

2. Theoretical background

2.1 Components of communication process

Communication is composed of some elements working together for a purpose. The elements include: source/sender, message, channel, decoder/receiver, feedback, and noise.

- ***Source/Sender:*** Source/sender initiates the communication process. He generates his message through research, past experiences, perception, feelings, and thoughts, and he is, equally, responsible for the encoding process according to Shannon – Weaver Model of Communication in 1948 (see Fig. 1).
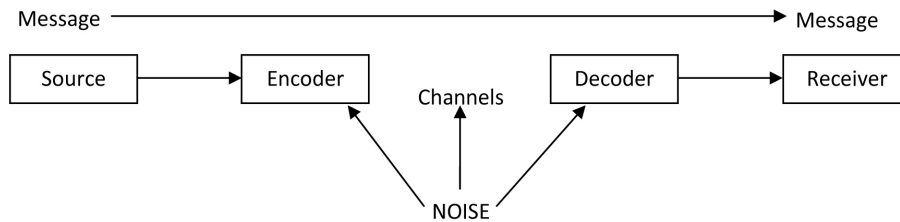
Fig. 1. Shannon－Weaver (one-way) model of communication process in 1948

Other one-way or linear models of communication include: Aristotle model, Lasswell's model in 1948, which is similar to the Shannon－Weaver model, and Berlo's model in 1960.

- *Message:* the second element in communication process is the message. According to Hybels and Weaver (2001), message is made up of ideas and feelings which the senders want to share. For effective communication, the source must try to encode the message in a way that the receiver understands to enable him decode (interpret) the message accurately.

- *Channel:* It is a means through which a message is communicated. Stueart and Moran (1993) defined channel as the link between the source and the receiver. The sender will consider the appropriate medium through which his message would get to the targeted audience. The medium could be on oral basis, electronic media, public addressing system, display boards, mobile technology, video conferencing and so on. The sender must consider the audience and their situation before choosing a suitable channel that will result in effective communication.

- *Decoder/Receiver:* The decoder/receiver is the recipient of the message. He decodes the message for it to be understood. The act of interpreting the message for comprehension is called decoding. The basic idea in decoding and receiving process is the ability to interpret and understand the message. Receivers decode messages based on past experiences, perception, thoughts and feelings.

- *Feedback:* Receivers decide what and how to respond to a message in a given situation. In communication process, we are both senders and receivers of messages, and thus, it is a two-way process (see Fig. 2). The two-way models of communication were postulated by Schramm (1954) based on Shannon-Weaver one-way model, and Westly and MacLean (1957). Receivers interpret messages and encode a response back to the sender depending on the situation and the existence of interference. This return process is called feedback. Feedback tells the sender how the receiver has interpreted his message. Feedback is a vital component in communication process, because though it, messages are modified for clarity and comprehension.
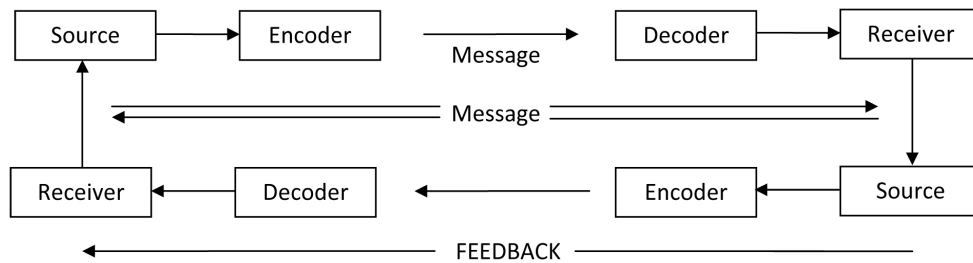
Fig. 2. Two-way model of communication involving a feedback

- ***Noise:*** Any obstacles, barriers, interference in communication that distort or prevent the message from reaching its destination intact can be referred to as noise. Noise can emanate from any of the components in the communication process; it may originate from the sender, message, channel, and receiver. The source of information may be insufficient or ambiguous, or the message may be inaccurately encoded, or the message may be in a language that is not understood by the receiver. The receiver may not have the ability to comprehend the message and may fail to send a feedback to the source for clarity. There are many types of noise including linguistic interference, faulty translation of messages, low level of education, cross-cultural factors, format or media, and inferiority complex (Jenkins, 1999; Owoeye & Dahunsi, 2014). Noise, regardless of its source and types, leads to communication failure. This paper discusses information retrieval as a communication process in the 21st century library.

2.2 Access points and retrieval process in the library

One of the major tenets of librarianship has been to support the acquisition and transfer of knowledge to enhance societal growth and development through the provision of excellent information resources and services. Consequently, libraries acquire resources and organize them to create order for the purpose of recall and retrieval. Hence, before any material is displayed in the library for public consultation, it has to be carefully documented which knowledge has been through bibliographic control devices. Libraries are concerned with an effective control and access to recorded knowledge, which has been through bibliographic control devices.

Information retrieval is a form of communication in the library. According to Aruleba, Akomolafe, and Afeni (2016), it informs the user of the existence or non-existence and the whereabouts of documents relating to his request. The most frequently cited model of communication process is that postulated by Shannon – Weaver model in 1948 as illustrated in Fig. 1. However, communication is not a one-way process.

In information retrieval process, the source is the author of the document we are handling. The message is the subject matter of the document. The encoding process involves choosing appropriate words and their translation into appropriate format. The channel is the medium through which the message moves from the source to the user; and the decoding process involves the user and his ability to interpret and understand the message in the form in which it is presented to him. Then

the noise is the obstacles, barriers, interferences on the original message as it moves from the source to the user. The idea of noise interfering with the message raises the issue of two concepts: entropy and redundancy. Forskett (1979) defined entropy as a measure of degradation or disorganization of the universe and may be used to refer to the degradation of message by noise. He also defined redundancy as a measure of the amount of superfluous words in a message which can be omitted without loss in meaning. With the undesirability of noise on a message, redundancy acts to minimize its effects to avoid total communication breakdown.

For effective communication, senders can function as receivers and vice versa through feedback illustrated in Fig. 2. Feedback enhances the fidelity of the message. According to Forskett (1979), if the message becomes distorted as it moves from source to receiver, the receiver can then send the message back to the sender for clarity. However, in information retrieval process there is little or no feedback from the user to the originator (author). The user may not understand the message correctly or may not be able to locate the document containing the message. Thus, physical and intellectual access to the recorded knowledge is usually a serious problem. This problem is exacerbated by the library which requires further decoding processed by the user (see Fig. 3). These additional encoding processes involve classifying, cataloguing, indexing and abstracting of documents.


Fig. 3. Interposition of additional encoding processes in the library

Access points to materials in the library are usually assigned by cataloguers and indexers using subject headings and classification schemes (for paper-base devices), Online Public Access Catalogues (OPACs) and keywords (for online devices). However, regardless of the type of access devices, many users are still not able to access relevant documents. Cataloguers have to interpret and translate concepts in the books, journals, and other documents into appropriate subject headings. The problem with concept interpretation is that it is influenced by social construct of one's background, previous knowledge and experiences, in addition to the required training. According to Chu (2003), retrieval, using library access tools, tends to be based on an "exact match" paradigm dependent on commonality of understanding, expectations, goals and concepts interpretation. He further observed that the nature of a society does not provide such a homogeneous approach among cataloguers and library users. Written texts are subject to personal interpretation in the process of cataloguing; the interpretation of texts is compressed into call marks and catalogue entries. Catalogue entries yield highly codified citations and many users have problems understanding these codes. There is no doubt that catalogue entries and call marks give a great deal of information about a document, but they form additional complications in the chain of communication and, therefore, additional source of noise. Misshelving of document and misfiling of catalogue cards add their quota of noise to the communication process in the library. Most often users come to the library seeking for information on particular subjects and expect the system to provide the necessary response. As shown in Fig. 4, the user becomes

the sender encoding a message in form of a question.
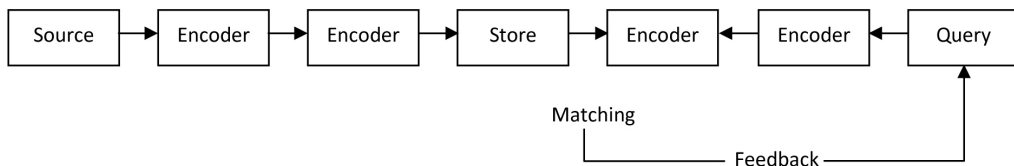
Fig. 4. The query situation: Feedback through the matching process

2.3 Cybernetic approach to information retrieval process

The innovation of internet/web has revolutionized the means and mode of communication process in the library. This notwithstanding, reference services have remained vital aspects of the library and information profession because it is still the librarian's job to provide researchers with expert assistance in locating the most useful information. The noise (distracters) in the information retrieval process has increased with the issue of information overload made possible by internet/web. With the continuing development of web resources and Internet search utilities, the traditional reference desk service is changing, as the internet/web has become the first port of call in information retrieval process so much so that users can access a lot of information at a click of a button. According to the concept developed by Koll (2000), information retrieval process and internet/web, are best described as:

- a known needle in an unknown haystack
- any needle in a haystack
- all the needles in the haystack
- things like needles in every haystack
- where are the haystacks?
- needles, haystack − whatever

The list could continue because with an unguided use of internet/web in information retrieval process, the illusion of total self-sufficiency among users is more pronounced than ever. Ayeni (2015) stated that the ubiquity of the Internet has affected not only how patrons use (or do not use) the library, but also how they conceive of the library and information, and perhaps more importantly, how they conceive of themselves as entirely self-sufficient. He further explained that ICT has not relegated reference librarians to the background, but has only changed their roles, activities, and their nomenclature and made their jobs more effective, user friendly and yet challenging. With these in view, reference librarians are faced with the daunting task of performing electronic reference services and digital reference services. For the reference librarian to carry out these new and challenging roles, they will stay in advance of need, believe in themselves and what they can offer, not take their existence for granted, develop themselves, learn from each other, seize

the opportunities, lift up their heads, get out more and engage, be confident and claim the future (Ayeni, 2015).

2.4 The way forward: the librarian in the web

With the changes in information seeking behaviour and pattern, new approach to information retrieval referred to cybernetic approach has emerged. This involves a complex system of communication where the interacting elements influence each other. The cybernetic model of communication process emphasizes adaptive control mechanism and feedback process. It has three essential elements: receptors, interpreter, and effectors. The receptor receives information and interprets it before doing something as a consequence. In the cybernetic model, information is processed by the adaptive control mechanism which reduces entropy and interprets information in relation to the knowledge structure and concepts already available in the individual. The librarian is usually absent in such information retrieval communication process, because, information seekers can remotely interact with others via the internet/web and share information in professional and non-professional virtual environment. The internet could potentially distort the message as it mixes with other messages and could be confused with irrelevant sources that receiver may not get the full message. The intricacies of internet and World Wide Web have created a monopoly of communication that in most cases the issue of feedback to the sender remains lost. Users no longer sought the intervention of information retrieval process because the feel self-sufficient to adequately attend to their information needs. However, Kwanya, Stiwell, and Underwood (2015) stated that the internet does not have everything, and that the concept of information contained in the web is overrated.

Consequently, this paper proposes an apodmediatic-cybernetic model of communication in information retrieval process. This model illustrates a communication process where the message does not move straight to the receiver. As depicted in Fig. 5, the sender, as the originator, sends a message using the internet as a medium, the internet encodes the message and sends it to the effectors (Web, databases and library repository) where actions are taken on the message. The message does not lose its original form in the effector, but it gets mixed up with previously stored messages where they would be categorized as related. It is based on this that the traditional role of librarians in assessing credibility and cataloguing of information becomes imperative. The librarian acts as the interpreter to encode message and decode feedback in information retrieval communication. The librarian as the interpreter, receives information resources and encodes them for storage before sending the information resource to the effectors for storage. Upon request, the receiver initiates a search query on the internet via search engines, the librarian decodes the query before forwarding it for onward processes. It becomes easy for the effector to pull up series of response as classified by the librarian back to the receiver in a specific or most times pool of related responses to select the appropriate response.
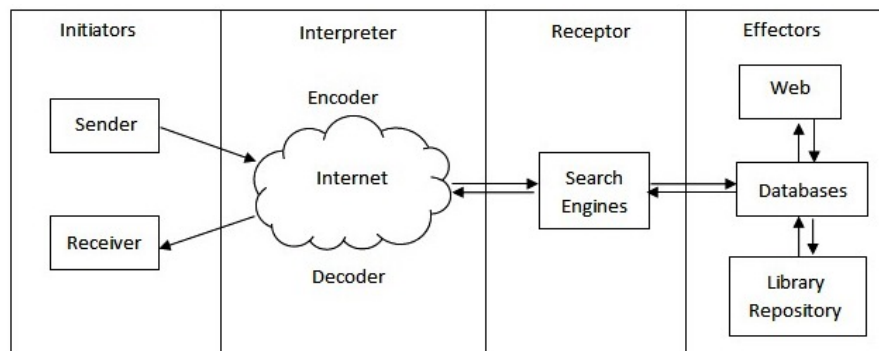
Fig. 5. Apomediatic-Cybernetic model of communication

3. The role of the librarian in information retrieval in the 21st century library

The internet floods information seekers with information and creates an illusion of self-sufficiency in many users. In such a situation, there is an urgent need to advocate for the intervention of the library in allowing counseling and retrieval processes to go hand in hand in reference services. Counseling is imperative in this situation. Librarians, as forbearers of refined information, should at all time, through virtual reference service, assist information users find the needle in haystack among a lot of information on the web. 'Intervention' to information seekers are at all times necessary, although in varying degrees. Information as a communication process in libraries cannot be bereft of the counseling services from the librarians.

Library 3.0, as explained by Eysenbach (2007), placed reference librarians' side by side with information users as apomediators. This changed the *sine qua non* status of communication and counseling in information retrieval process to a 'if needed' state. The implication is reduced visibility of reference services and may affect patronage. However, librarians are campaigning for the adaptation of internet/web in providing a redefined 21st century e-reference services. Ajidahun (2007) stated that the wonders and innovations of technologies are being propagated in all circles of life. Perhaps, the intricacies of internet/web have presented the opportunity to embark on some aspects of Library 4.0 through intelligent, and contest-awareness e-reference services that involves asking questions electronically and getting answers electronically.

The intelligent and content awareness e-reference service is an online interface linked with local library website, programmed as typical physical reference counseling, designed with intelligent advanced search capability, and works remotely. The interface receives search queries from a user, analyzes every part of the content in the connected databases (institutional repository, electronic databases, and other search engines), and synthesizes the result with the request to produce result by subjects grouped according to the query, and spam the rest. In this sense, the relevant and usable needle in the haystack makes reference service the center (intermediary) point in information retrieval communication process. The 21st century reference librarians must, therefore, develop themselves and acquire the necessary skills to stay afloat in 4th generation of internet/web. Apart from

tracking latest happenings in users' information interest areas, they would need to keep track of user's online visits to the internet through the interface. Such record would lead the librarians to collaborate with information agencies, electronic databases, and commercial publishers for provision of personalized information resources. This demands librarianship with virtue of systematic and dedicated practices and would revalidate the importance of reference librarian as a digital resource person.

Some elements in the electronic mode of communication in information retrieval process in the library include:

- Sender/Receiver - the user
- Channel - the interface (real time web-based library e-reference service)
- Encoder - the librarian (reference librarian)
- Database (internet/web, search engines, repositories)
- Feedback - response to query

However, if a user does not possess the necessary knowledge structure and concepts for information identification and retrieval for various reasons such as level of education or searching in a new field (discipline), then counseling is needed. Reference librarians should take cognizance of individual difference in response to user's information query because each user's information quest may require different approaches. Kingrey (2002) stated that librarians, in addition to their traditional role, may need to dialogue intensively with users about how they envision solving their problems. He further stressed that assisting users in search of information is more than a matter of locating appropriate materials. It should include seeking to understand the situations that gave rise to the needs and giving him or her necessary counseling. Thus, counseling is needed to assist a user for knowledge structure and concepts development. A piece of information does not exist independently, rather, the success on information search and value of information found depends significantly on the relevancy and meaning of both the process and the product to the individual (Kingrey, 2002). Hence, libraries, recognizing the learning aspect of retrieval activities, should function as places where users with the help of professionals, could question, speculate, and experiment in ways that make sense to them instead of having a standard strategy and answer determined for them (Kingrey, 2002).

Information literacy is increasingly important in the contemporary environment of rapid technological change and proliferating information resources on internet/web. Information literacy is expected to equip information users with set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. It is very necessary that information users in the digital age acquire the skills to:

- Determine the type and extent of information needed
- Access the needed information effectively and efficiently
- Evaluate information and its sources critically
- Incorporate selected information into one's knowledge base

• Use information effectively to accomplish a specific purpose, and
• Understand the economic, legal, and social issues and use information ethically and legally.

Libraries should strive to continuously remain relevant by keeping abreast with the changes in the behaviour of information users. Users cannot be stopped from the use of internet/web rather the technological trends are being optimally maximized to suit the current information needs. In this regard, digital reference services as a supplement of the traditional desk reference service has become a general term for contemporary librarians.

4. Conclusion

Effective communication is vital in all spheres of life. The essence of communication is the transfer of information from one person or group to another. Information retrieval process is a major communicative activity in the library. This has come under threat by the innovation of the internet/web which has revolutionized the means and mode of communication process in the library by flooding information seekers with information and creating an illusion of self-sufficiency in many users. Through virtual reference services, librarians assist information users find the right information and by combining counseling and retrieval process, users are assisted in cognitive and concept development.

To this end, this paper proposes an apomediatic-cybernetic model of communication, which illustrates information retrieval processes for the 21st-century library. This model implicitly includes virtual reference services that assist information users with finding the needed information from the haystack. In a broader sense, users are assisted through counseling that encourages cognitive and concept development. From this perspective, understanding the retrieval processes is important for both the librarian and the user.

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