

# A study on the contributions of hypertext to the flux of information in an electronic medium

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## ABSTRACT

This work establishes a historical, conceptual and technical correlation between hypertext and the electronic flux of information. It begins with a discussion on the historical retrospect of hypertext from a perspective that considers it a part in the evolving processes of registration and dissemination of knowledge, a position in disagreement with the authors who defend the visionary character attributed to Vannevar Bush; thus, the first conceptual discourses that came close to what would later be materialized as the hypertext, are attributed to other important names, such as Paul Otlet. The article approaches the importance of hypertext, as a resource that allows greater correlation between users and the stocks of knowledge, presenting some of its most important characteristics, such as interactivity. It proceeds with a brief presentation of a bibliometric analysis of scientific production on hypertext, in the area of Information Science, published in Brazilian periodicals and international databases during the years 1990-2002. The results were published in a periodical specialized in the area. This article also discusses the correlation between the utilization of hypertext resources and the processes of information (construction, communication and utilization), presenting a review of the literature that includes, besides the conceptual debates, reports on the experiences in the utilization of hypertext. And it concludes with the systematization of its contents.

**KEYWORDS:** Hypertext; Electronic Information; Hypermedia.

## RESUMEN

Trabajo que relaciona historicamente, conceptualmente y técnicamente el hipertexto en el flujo informacional electrónico. Empieza discutiendo el retrospecto histórico desde una perspectiva que le considera como parte de un proceso evolutivo de registro y diseminación del conocimiento, siendo esta posición discordante de autores que defienden el carácter visionario atribuido a Vannevar Bush, y a otros nombres importantes como Paul Otlet, son atribuidos los primeros discursos conceptuales que se quedaban próximos de lo que posteriormente se materializaría el hipertexto. Se aborda también la importancia del hipertexto como un recurso que posibilita una relación mayor entre los usuarios y los estoques de conocimiento y presenta algunas de sus características más importantes como la interactividad. El trabajo continua presentando sucintamente una análise bibliométrica de la producción científica de la área de la Ciencia de la Información sobre el hipertexto hecha desde de periódicos brasileños y bases de datos internacionales entre los años 1990 a 2002, los resultados obtenidos fueron publicados en periódicos especializados en la área. Se debate también la relación de la utilización de los recursos hipertextuales en los procesos de la información (construcción, comunicación y utilización) presentando una revisión de la literatura que incluye, más allá de los debates conceptuales, relaciones de experiencia que utilizan el hipertexto. Y se concluye sistematizando el contenido presentado.

**PALABRAS-CLAVE:** Hipertexto; Información Electrónica; Hipermedia

## 1 Introduction

This study is the result of a research developed by the Information Science graduate program of Pontifícia Universidade Católica de Campinas (PUC Campinas) whose main goals were to make a critical observation of the contribution offered by hypertext resources towards the flux of information in the electronic medium, as well as an analysis of hypertext's primordial constitution through a historical retrospect. The idea for this investigation sprang from noticing that hypertext, contrary to what is commonly reported in scientific literature, did not appear as an isolated idea, but as consequence to the human search for better ways of recording gathered knowledge. Thus, this work starts exactly by tracing a historical retrospect, followed by an analysis of the characteristics that are inherent to hypertext as an informational resource, and proceeds by presenting part of a bibliometric analysis that can be read in its entirety in Silva and Santos

(SILVA 2004), and, before the conclusion, it explores, in what Le Coadic (LE COADIC 2004) referred to as the three processes of information (construction, communication and utilization), the relationship between hypertext and these processes for an understanding of the advantages offered towards the flux of information.

## 2 The hypertext in its historical context

Amidst the evolution of forms in the enunciation of human perception over the universal reality, the passage from an oral culture to a written culture is a landmark without precedents in terms of contribution to the access to knowledge, distinguished by an apparent spatial autonomy in terms of our cognitive abilities, and, particularly, by the possibilities it generated through the substantial and viable, technically and economically, multiplication of mechanisms used in recording collective memories. In this sense, Barreto (BARRETO 1998) compares that landmark achievement to the recent passage from written culture to electronic culture, explaining that both forms were greatly effective in terms of the transformation they allowed.

Nevertheless, McGarry (MCGARRY 1999, p.74) does not believe that this fact meant an immediate end to the oral tradition, since it continued to exist despite the production of manuscripts. It is evident that transitions from one phase to another do not always happen as a simple process, and, as it seems, the passage from spoken to written language did not occur in a different manner. At least that is what Harnard (HARNAD 1991) points out by reminding us that spoken language was well adapted to the transmission and reception of human thoughts, contrary to written language, which is slow and incapable of being simultaneous to thoughts. It is acknowledged that in thoughts there is no rigid sequence of reasoning, and in conversations, issues may vary frequently according to the interlocutor. On the other hand, the act of writing demands a preestablished sequence of rules that are a part of written language, forming blocks of text (paragraphs) that are successively chained together.

In this sense, by establishing a linear form of externalizing thoughts, writing has conditioned those on both ends, transmitters as well as receptors, to a new model of communication, a more rigid and formal one. Therefore, It is plausible to anticipate that one of the reasons contributing to the creation of hypertext was the attempt to soothe this rigor by associating non-linear texts.

As for the book as a support, to reach its actual layout, it has passed through a few technical changes, such as the inclusion of abstracts, quotes, summaries, keywords, bibliographies, references, notes, glossaries and lists of contents. These elements, though not part of the text itself, served (as they still do) as auxiliary in exposing the author's opinion (CHARTIER 1994). Books stopped being the work of a single author and began to include references to the knowledge of different authors. It became more obvious then that universal knowledge was shaped by a web that gradually expanded, turning into something more difficult to set limits in its expansion.

In that sense, the disadvantage of synthesizing thoughts in a linear structure was being slowly attenuated by the user's ability to create a particular path for reading, and allowing the author to insert associations between parts that were not necessarily in the sequence of the text. One may understand then that the evolution in ways of registering knowledge has happened as a succession of episodes, which, if analyzed individually, may seem revolutionary, but if taken as a whole, appears to be continuous and well chained together.

Contrary to what literature confides in by attributing to Vannevar Bush the creation of hypertext, it has been observed that its appearance happened through a process of advances in ways of registering and disseminating knowledge. It is irrefutable, though, that the publication of his article "*As we may think*" in 1945 was of great relevance, since, among other reasons, it called attention to the "*incompetence of the apparatus involved in production, management and diffusion of scientific knowledge and the fragility of human resources before this new situation*" (SANTOS 2002). But historical records show that it was unlikely that such difficulty passed unnoticed by other researchers.

Among the most incisive records, Paul Otlet's stands out, which in the **Universal Documentation World Congress** in Paris, 1937, called attention to the expansion of sciences, and the new problem it posed, which was the need for rapid and easy assimilation of knowledge,

"[...]in view of the end biggest, or either, that the spirit, instead of being placed ahead of a multiplicity of you discipline, without clear relations between itself, if sees ahead of an established universal science on universal methods" (OTLET 1937).

Such objectivity and clarity of manifestation leads to some reflection on Vannevar Bush's proposals, which, despite being largely mentioned as a visionary, could not be claimed as unprecedented and exclusive. After all, it is intriguing that Bush never made reference to other scientists (with the exception of Leibniz and Babbage). Perhaps it is this lack of reference to other authors that credited him as the forerunner on the idea of hypertext.

To better illustrate the statement above and offer it consistency, a list was elaborated, with studies that have some relationship to theories and principles of this universalization of scientific knowledge aiming at mankind as a whole. It may

begin with H.G. Wells, who became popular by the early 19<sup>th</sup> century through his writings on science as well as fiction. His ideas were meticulously analyzed by Rayward (RAYWARD 2002), especially those from his book **“World Brain”**, published in 1938, in which he discussed a certain metaphor of universal knowledge. Wells, who called himself Diderot’s successor, glimpsed at the creation of a “modern encyclopedia” that would serve as a designing tool for organizing and providing new guidance in terms of education and information to all mankind.

One reason that led Wells to imagine this global system was his perception that “great new world is struggling into existence. But its struggle remains catastrophic until it can produce an adequate knowledge organization...An immense, an ever-increasing wealth of knowledge is scattered about the world today, a wealth of knowledge and suggestion that – systematically ordered and generally disseminated – would probably give this giant vision and direction and suffice to solve all the mighty difficulties of our age, but the knowledge is still dispersed, unorganized, impotent in the face of adventurous violence and mass excitement.”. (WELLS apud RAYWARD 2002).

To make this association viable, though, the creation of a mechanism, which would make possible the effective link between documents, was necessary. For that matter, Bush imagined the prototype of **MEMEX**<sup>1</sup> based on the technologies that were being developed then. In fact, the inspiration for MEMEX had its origins in other projects that Bush took part in, **‘Rapid Selector’** (BURKE 1992) being the most prominent of them. While the dream of MEMEX was never made real for lack of support, **Rapid Selector** had the financial support and help of other researchers, and was officially launched in 1949 by Prof. Ralph R. Shaw, who was a librarian. It was a device that recovered data recorded in microcards, and was developed by a project named ERA, in the laboratories of MIT between 1938 and 1940 (BUCKLAND 1992).

But Buckland (BUCK LAND 1992), based on reports from literature that make evident the pioneer contribution of Emanuel Goldberg<sup>2</sup>, questions the originality of this invention. According to Buckland, this inventor had already registered a patent in 1927, in Germany, for a device similar to that of MIT. In spite of that, when patented also in the United States of America, Goldberg’s invention was classified as a “statistical machine”. Another curious fact is that project ERA, at MIT, had the codename “GOLDBERG”. For Buckland (BUCKLAND 1992) this may or may not be just an ironic coincidence.

Putting aside issues concerned with the technology, and focusing on the more conceptual aspects, the studies of Paul Otlet, the Belgium lawyer born in 1868 who worked together with peace Nobel Prize winner Henri LaFontaine, are brought to attention. Both men were engaged in the cause of peace and also acted in bibliographical work, but while LaFontaine dedicated himself more to politics, Otlet was more involved with those issues regarding documentation. One of their most noted achievements was the invention of the *Universal Decimal Catalog* (UDC), that over the years, according to Talamo (TALAMO 2002), lost its original concept, by being frequently used in organizing books in shelves.

In spite of LaFontaine’s irrefutable contribution, we shall focus only in Otlet, who Le Coadic (LE COADIC 2004) considers a visionary as well as a pioneer in the field of Information Sciences. Incidentally, Otlet conquered great admiration from this field of science. Rayward (1994) did not spare praise for his work, and also suggested that he may have been the first systematic discussion on the general problems of organizing information. Buckland (BUCKLAND 1992) states that Otlet has provided a concise sketch for a personal system of information that comprised an anticipation of hypertext. This association (between the **Traité Documentation** and hypertext) is also accepted by Talamo (TALAMO 2002) and Vilan Filho (VILAN FILHO 1994, p. 296), to the point of Vilan Filho saying that Otlet and his colleagues “developed a complex system of organization functionally similar to hypertext”. From this point on, three other important researchers are added to this retrospect. They are: Douglas Engelbart, Ted Nelson e Tim Berners-Lee. The contribution of these came after the publication of Vannevar Bush’s article.

Engelbart is considered to be the creator of the first electronic system to be actually held as hypertext, besides having also developed the device referred to as the ‘mouse’ (RADA 1991). In the opinion of Lévy (LÉVY 1993) the value of Engelbart’s work was not just in the materialization of some software, but also in society’s use of computing technology, allowing better interaction between man and machine. Theodore Nelson (more known as Ted Nelson) was the one responsible for the term hypertext. Nelson says he thought of this word in 1962 having in mind the idea of hyperspace, influenced, above all, by the jargon of mathematics, which define the prefix “hyper” as ‘extended and generalized’ (BARDINI 1997). Finally, Tim Berners-Lee had his great share of contribution by proposing, in 1989, the creation of the **World Wide Web** (WWW), which, for this matter, represented the trivialization in the spread of hypertext systems. By analogy, Gutenberg did not invent the book, nevertheless, it was his idea that allowed books to become such trivial objects, in the same way, Berners-Lee’s proposal was based on existing, but yet not widely used resources.

<sup>1</sup> A microfilm reading device capable of incorporating audio and visual media, associating, in a nonlinear form, the contents gathered in the system.

<sup>2</sup> Born Russian, he concluded his studies in Germany and was largely persecuted for being Jewish., that being the reason for the existence of just a few records on his work.

### 3 What new things did hypertext bring?

In this actual text, the concept of **knots** is assumed as “points” in a document that may associate suggestive units<sup>3</sup>. These units take form as words, sentences, images, numbers and any other symbols, which only mean something if understood by the observer. Therefore, a knot is not an object, it is an abstraction, and it is that feeling of being reminded of one thing while reading something else, or maybe even an unusual state of knowledge that raises questions. The materialization of such is provided by **links**. In the opinion of Vilan Filho (VILAN FILHO 1994), the **link** is the most important basic concept of hypertext, since it is a vital technical resource in constructing hypertext systems. The **link**, as the word suggests, is a connection, it is understood then that a connection happens between at least two parts. And, in hypertext, links are bridges between knots, providing a passage from one point to another.

With hypertext, these new models of reading and writing promise, according to Landow (LANDOW 1998, p. 230), to reshape concepts on text, author, copyright and other issues related to human nature. In this author’s view, through hypertext connections, a work turns into “an open and pervious text where the bakhtinian multivocality seems more appropriate than characteristic the univocal voice of the written workmanship”. One may see, after careful observation, that these different models of reading and writing make evident the interaction as one of the particularities in the principles of hypertext. This ‘bakhtinian multivocality’ mentioned by Landow (LANDOW 1998), reveals then the wish for some dialogue in the composition of the text, since, for Bakhtin, dialogue orientation is a natural phenomenon in all discourses. Thus, it is clear that dialogue opposes to a unidirectional communication process, since it happens when both the transmitter and the receptor are able to exchange their positions.

In order to be interactive, it is recommended that a hypertext system should not condition its use to linear sequences of navigation, otherwise its organization would be the same as the traditional model. Contrary to hypertext, the usual printed model is based on a structure that is **physical** (in a long sequence of words, divided in lines and pages) and **logical** (combining and transforming words into sentences, sentences into paragraphs, paragraphs into chapters, and so on), and so it is more chained to a linear model in its presentation of knowledge (LE COADIC 2004).

It is possible to say that interaction and non-linearity are characteristics that complete each other, since non-linear reading in a hypertext document can only be achieved when the subject establishes a constructive relationship with the essence of all visited paths. One does not jump from one text to another by dissociating his thoughts from the visited texts. However, there are printed books, such as encyclopedias and dictionaries, which are also organized in a non-linear model. In fact, they are physically structured from independent linear units, with a more complex logic structure than that found in conventional books.

Nevertheless, there are also disadvantages in hypertext systems, mainly since they depend on technologies that still seem unstable, such as equipment performance and the assurance of data preservation. However, the most complex issue has to do with the production and utilization of knowledge by those subjected to their own values, creeds, abilities and contexts. It seems obvious that the flux of information, in electronic or printed media, is not achieved through just the needs, but also the reality in which the subject is found. In this aspect, the temporal and geographic limitations of oral language allowed communication to take place at the moment of action, since transmitter and receptor were found in the same environment and shared the experience mutually. With the advent of writing, thoughts have lost some of their original contexts, and with the aid of technologies such as books and magnetic media, the amount of information stocked outside the transmitter’s context grew, and so did the possibilities for accessing these stocks.

Computing is another step of the way, and hypertext, as suggested by Lévy (LÉVY 1996), gives continuity to a process that is now old in the synthesizing of reading, that includes, besides the technical processes of digitization and presentation of the text, the human exercise of interpretation. Reading leads to interpretation, and interpretation leads to formulation and reformulation of judgment about the world, absorbing and shaping knowledge to individual expectations and abilities of interpretation. If one registers, one contributes to the volume of existing knowledge, being able to form connections with other individuals, with their own history and their own set of personal values. But for these connections to happen, the flux of information is necessary, and hypertext, as said before, is an alternative resource to this aim. However, without a policy in the construction of these connections, hypertext systems tend to offer awkward associations between contents, leading to navigation that doesn’t contribute very much to the flux of information.

### 4 Approaches of hypertext by Information Science

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<sup>3</sup> Here, unit does not express a single element. A sentence, for example, may represent a single concept, in the same manner that data base descriptions may represent a whole book.

Due to the mass popularization of the hypertext resources throughout the 90's and the Information Science's interest in researching them, we find extremely important to identify the characteristics of the studies published by this area during such period. Therefore we evaluate scientific articles using appropriate bibliometric techniques for the analysis of the scientific production.

The analysis of quantifying indicators raised the scientific production of Information Science (in Brazil and abroad) on hypertext in the time frame between 1990 and 2002. Methodologically, to raise Brazilian scientific production, national scientific periodicals in the field of Information Science were selected, and, for the study of foreign literature, bibliographical records were recovered from electronic repositories by access through DIALOG Provider. The strategies of search observed the same descriptors (keywords) of the previous syntax: HYPERTEXT and HYPERMEDIA.

For the study of the indexes of international scientific production, bibliometric handling was performed and maps of representation of information were made using specialized applications, such as Dataview, Mastrine, Microsoft Word and Microsoft Excel. The handling was made through calculations of appearance and co-appearances of main descriptors, authors, titles of periodicals, years of publication and databases, varying the combinations among these. Lists of frequency (univariable indicators) and lists of pairs (multivariable indicators) were generated, allowing the construction of matrixes of descriptors, authors, periodicals, databases, temporary distributions and webs of connections.

Since Brazilian literature did not show enough representation to allow a quantitative analysis, the qualitative reading of abstracts from articles were chosen. In terms of international literature, data recovered from databases, with the support of specialized applications consecrated in the generation of quantitative and relational scientific indicators, were sufficient to the conduction of a bibliometric analysis.

All the performed analysis was effective in producing an acceptable degree of consistency, and the relational scientific indicators allowed the observation of trends of changes in the focus of studies in a theme that, traditionally more oriented to the assessment of computing systems, begins, during the time covered by the study, to observe reflections more oriented towards hypertext itself and its future applications in the flux of information. Nevertheless, for a detailed reading of this bibliometric analysis, the text of Silva and Santos (SILVA 2004) is recommended.

## 5 Relationships in the Construction, Communication and Utilization of information

From the perspective of the utilization of hypertext resources as a tool favoring the flux of information, the actual study observed three topics that are based on the processes of information suggested by Le Coadic (LE COADIC 2004), thus they are: **Alternatives for the representation (the construction of information); The interaction in the communication of information (the communication of information); Knowing the dweller to build his dwelling: what are the user's needs? (or the utilization of information).**

### a) Alternatives for the representation (the construction of information)

In the opinion of Dias (DIAS 2001), there is no more way of manually handling all information coming from digital stocks, confirming thus the importance of automated systems of search. However, for him, that does not preclude human participation in processing information, but suggests the combination of automated (natural language) and manual (controlled vocabulary) systems. To give examples of this combination, Dias (DIAS 2001) mentions **Yahoo** and **Altavista**, but making use of the experience gathered from the traditional models of handling information, such as: *"[...] more defined targets, judicious selection of electronic resources that form the digital library, and the use of powerful mechanisms of theme description, such as Dewey's classification system"*.

Campos (CAMPOS 2002), regarding the organization of units of knowledge in hyperdocuments, suggests an analysis of models and theories to reflect the mechanisms that allow the representation of themes, not in a linear form, but fragmented and associative, granting coherence between concepts and, consequently, among the knots in a hypertext.

In the field of Computing Science, the models researched by Campos (CAMPOS 2002) were those of **Object Orientation** (with a theoretical basis applied to the methodology of the Object Oriented Hypermedia Design Method (OOHDM)) and **ontology**. In this field of Information Science, the theories analyzed by the author were associated to the representation of systems of concepts, such as the **Faceted Classification Theory** (Ranganathan) and the **Concept Theory** (Dahlberg). The principles established by **Terminology Theory** were equally analyzed to determine concepts and their relationship.

If from one perspective, *"discarding the necessity of documentary language and, therefore, systems of classification, shows great ignorance in the functions of these systems"* (DIAS 2001), from another perspective, there is no more room for discussing whether automated systems are important or not, since the issue is actually understanding how to

act, in the process of the construction of information, amidst the interaction between traditional resources and the digital context.

The work of Ihadjadene (IHADJADENE 1998, p. 199) establishes an appreciation of the conception and development of a hypertext interface that allows the navigation through a controlled vocabulary in the level of information recovery systems. According to this work, hypertext resources allow users to learn about the descriptors or the subjects found in a database, making simpler the strategy of the search, since the navigation, through controlled vocabulary in the hypertext model, “[...]it allows the users to assign the terms of which need instead of searching them mentally”. The study of Ihadjadene et al is divided in 3 topics: **Classification and Hypertext**; **Thesaurus and Hypertext**; and **Hypertext and List of Authority**.

In the topic regarding **Classification and Hypertext**, there are references to experiments using Dewey’s Decimal Catalog (DDC) (the projects Dewey Decimal Catalog, Dewey Online Retrieval System e System Library Catalog<sup>4</sup>), Universal Decimal Catalog (UDC) (ETHICS and HYPERLIB<sup>5</sup> systems) and the Library of Congress Catalog. In the topic of **Thesaurus and Hypertext**, the work of Pollard (who developed a version of the ERIC thesaurus, which, when an existing term in the search is found, shows this term with all its connections (general term, specific term and associated term), Johnson (who developed an interface for the INSPEC thesaurus using a representation under hierarchy arborescence, Buckland (who developed a WWW interface to access INSPEC thesaurus), and other editors such as CD PLUS (that implemented a hypertext interface under a model of arborescence with the MESH (Medical Subject Heading) thesaurus).

In the topic of **Hypertext and List of Authority**, it is said that “heading of subjects represent we, and the different relations between heading represent the links. These links are or links of hierarchy (generic and specific relations), or links of synonymy (type relation to see a not-describer for a subject heading), or links of association (association relation enters subject heading)” (IHADJADENE 1998, p.205).

Furthermore, it points out an interesting investigation conducted inside 65 French libraries, noticing that the majority of catalogs show only the connections “see” and “also see”, but none offer the GT (General Term), ST (Specific Term) and RT (Related Term) connections, these would have been available with the implementation of the integrated InterMac model of Bibliothèque Nationale de France.

In another investigation, Rada (RADA 1991) analyzed some actions taken as means to associate different stocks of knowledge. Among some initiatives, the author describes that of the United Nations Organization in constructing a unified language for the classification of documents in areas such as those of the Social Sciences. The Armed Services Technical Information Agency and the Atomic Energy Commission created connections between their languages of indexation, and the National Library of Medicine developed a unified system of language for the medical fields.

The author referred to these initiatives to explain that there are difficulties in connecting different contents, and the major one is safeguarding the original sense of a document. In the case of hypertext, he says that links and knots form a language, and different stocks have different languages.

At last, based in the work of Alvarenga (ALVARENGA 2001), there are commentaries on projects in the line of research of ‘Handling Information’ from the Information Science Department of Universidade Federal de Minas Gerais (UFMG), which aim at the creation of digital files and libraries and the modeling of data using Ranganathan’s categories of analysis. These researches intend to propose, making use of Ranganathan’s categories, a model for - a way of handling based on principles to be applied in a certain area of knowledge that may serve those who create hypertext as “[...] instrument that it makes possible to construct conceptual structures that guide the relations between the concepts and elements concepts creator express in links of the hypertexts”.

#### **b) Interaction in the communication of information (the communication of information)**

The transformations that took place in the flux of information due to the advent of electronic communication are obvious. However, it is important to expose some of these to understand which were the implications of these facts in the process of the communication of information. Initially, the flux is explained based on printed documents, the traditional flux, as regarded by Barreto (BARRETO 1998, p.125), for it has “*strong characteristics and an internal ideology that has been settled for at least 50 years*”. The author mentions five items that are markedly part of this flux, among these five, three stand out: **unidirectioning**, **intermediation** and **relevance of information**.

In **unidirectioning**, the user’s interaction with the stock is done individually, that is, the interaction happens with one stock at a time. While in **intermediation** it is always done by an interface professional, who is responsible for creating

<sup>4</sup> Developed under the program HYPERCARD (where information is placed in cards), it presents a graphic interface that allows hierarchic navigation through the tables.

<sup>5</sup> ETHICS shows terms in order according to UDC, and the access by HYPERLIB allows the specification of a keyword that will recover terms from the table.

interaction between the flux of information and the user. In this case, this intermediary identifies the initial question from the user having indeed a participation in the evaluation of the final product. The assessment in the **relevance of information** is “[...] *done by the receptor always in an ex-post condition after his interaction with the flux of information*”.

Barreto seems right when he says that this has been well established for more than half a century. Nevertheless, regarding electronic communication, we think that the technological readiness is advantageous to the flux of information, but for the moment, not yet enough, by themselves, to qualify the stocks to a point of making its use efficient. The author firmly criticizes what he calls “rituals of concealment”, which are in fact some methodologies used in handling information.

Further into this issue, Dias (DIAS 2001) suggests that the more selective knowledge, such as scientific knowledge, is not generated in the same speed that a variety of data can be made available in the Internet. Opinions contrary to his often come from the mistaken idea that the Internet is an information system or an information recovery system, when in fact it is neither. Dias (DIAS 2001) states that the Internet is a communication system that simply promotes better access to information and information recovery systems, whether organized by modern or more traditional methodology.

Therefore, the indiscriminate use of expressions such as “*a whole bunch of information*”, leads to the mistaken idea that communication and information technologies generate by themselves a flux of information. And so, it is imagined that information policies, meant for the association of contents in the electronic medium, will obtain a more significant progress if they are oriented primarily to those stocks of knowledge better structured and systematically organized such as those of scientific and technological nature.

However, viability in the construction of productive interactions among stocks of knowledge and users is not tied to just an adequate functional methodology. It is indispensable to have in mind that the role of the communication process is transmitting a message that carries some meaning. Authors like Tosca (2000) believe that hypertext may contribute to the construction of this meaning, nevertheless the ‘knots’ in the text need to be associated to other texts not just regarding the semantics, but also from a pragmatic point of view. In other words, not all ‘knots’ will be equally comprehensive and some may be even less effective in helping the reader to assimilate knowledge in a similar manner, since, at its arrival, information will not automatically be absorbed by the receptor.

#### **b) knowing the dweller to build his dwelling: what are the user’s needs? (the use of information)**

In some cases, an individual that wants to buy a house may end up choosing one that does not seem adequate to his needs. Contrary to the ideal, that person will have to adapt to the house. In the environment of information, similar situations are frequent when regarding the use of the stocks by the users, since not always the results obtained are the desired ones. However, a result that may not match the expectations will not just depend on some adaptation, since the discussion does not revolve around a simple question of comfort, but indeed on the difficulties imposed to the advance of knowledge.

When a user is not able to find what he looks for in the stocks, his needs for that information would not necessarily demand that he visited other sources. What happens in some cases may be the result of what Barreto (BARRETO 1998) called ‘rituals of concealment’ of information. Whether it is due to the malfunction of the tools or an error by the user, the fact is that the connection between stocks and the receptor does not always work out well.

Therefore, ignorance in what the user’s actual needs and problems are, will hurt the context, since, even the most efficient techniques and tools used in handling information, will help little if it is not identified to whom and what for will the information arrive. In a question that clearly reflects this issue, Le Coadic (LE COADIC 2004, p. 44) says that “*the book, the document and the object are the answer, but what was the question?*”. Questioning the emphasis in obtaining and providing books and documents from areas of libraries and documentation, the author states that there is no preoccupation in knowing if the anticipated needs were in fact real and whether or not they were fulfilled.

Another criticism is directed to those information specialists, librarians and documentalists, who make few or no references to the complexity of the processes of construction, communication and utilization of information. For the author, this suggests an implicit process in communication, deriving from linear and unidirectional models, oriented to one target and essentially preoccupied with the transmitter, interested “*more in the perspective of the provider of the message, than the receptor. However, without a receptor, there is no information*” (LE COADIC 2004, p. 43).

Thus, to consider that in an electronic document, parts of the text are potential knots to be associated to other parts or even other documents, demand acknowledgement of the needs as well as the context in which the user is found, to allow then, the concepts included there, to make sense for him. By creating this sense, it will be possible for the user to interact and create his own path of access to the text (FREIRE 2002).

Therefore, using hypertext to obtain efficiency in the flux of information is an alternative that, on one hand, may make the access to information easier, and on the other hand, demands intellectual work that is even greater on the part of information professionals. And so, to make use of this resource, it is interesting to know that Rada (1991) suggested a

classification for hypertext systems, dividing them in three groups: the **small** (or microtext), the **medium** (or grouptext) and the **large** (or macrotext).

The **small** hypertext, or **microtext**, is created typically by one person and is characterized by having links associated only to its own content, a link to the same text, normally made in one single document. According to Rada (RADA 1991a), a printed text may be turned into a microtext, and the success of this digitization is tied to the ways by which a document is structured, which, according to the author, are two: clearly structured and implicitly structured. In the first case, it is easier to create the links, since the logical structure is clear enough, allowing it to be made in an automatic manner. It is more usual in technical manuals, dictionaries, encyclopedias and catalogs. In the second case, the structure is more complex and the creation of links requires some human analysis (which he referred to as manual). Essays and novels are two examples of this structure.

A **medium** hypertext, or **grouptext**, is that created or accessed by various collaborators. Rada (RADA 1991) believes this system allows the creation of information of a public or private character and furthermore offers support for discussions, allowing readers to be also authors of contents. Two very popular examples are the lists and forums of discussions available in webs like the Internet. This type of hypertext is in fact a dynamic system of information that manages in real time the insertion and organization of messages. Nevertheless, despite its use being conditioned to the interaction among machines and users, the data volume formed by the messages, as they accumulate, may require an adequate system to organize all knowledge.

A **large** hypertext, or **macrotext**, distinguishes itself by associating various documents that were created by many people, however, it is an institution that answers for it and holds the management of the system. According to Rada (RADA 1991, p. 15), the United States National Library of Medicine created the first large macrotext system in the 1960's. Right at its first year, this system stocked citations for more than one hundred thousand documents. In the 1970's, more than 300 macrotexts were available, allowing the access of over 60 million citations of documents, and processing more than 5 million accesses per year. Rada states that the contents of the documents are represented in macrotext through an indexation language (a thesaurus) or using the frequency of reoccurrence of words in the text.

## CONCLUSION

The changes in the role of knowledge were closely followed by new technologies that appeared as a result of the demands from these same changes. However, these technologies did not linger on knowledge itself in the same proportion that they lingered on the tools used to disseminate knowledge. Thus, technical rigor alone was not capable of developing cultural, social and contextual aspects. Hypertext was contemplated among these devices, and the attention in this study was concentrated in terms of the flux of information. Knowledge was emphasized with the intention of explaining and justifying the origins of hypertext, since this – the hypertext – results from a long process of construction and reconstruction of models, techniques and devices addressed to the transmission of knowledge.

Therefore, the association among texts that may be physically distant allowed, besides the bond between different sources of knowledge, the instantaneous forwarding of the reader to sources that helped the author in the production of that knowledge. And the interaction, free from the limitations imposed by time and geography, symbolized the beginning of the materialization of an old dream of creating a universal library, and also the readiness of access to knowledge in a more personal way, directed to the user's needs of information. And at last, the chance to read a document in a non-linear manner, similar to the ways that human thoughts actually operate, allowing by that, the soothing, to some extent, of the difficulties found in registering these thoughts in a linear and rigid model. Nevertheless, these characteristics are related to what is considered a more significant factor in the flux of information, which is the context in which knowledge is being produced and assimilated. Thus, to disregard this context in the process of information, while using hypertext, is to overvalue the channel of communication and the document (object).

So, if there is interest in creating a flux of more qualitative information, there is also need for considerations on the social spaces in which one wishes that information to act and exert some sort of transformation. This way, it has shown the need to establish a distinction between the use of hypertext focused in communication in the electronic media, and the use of it as a device that mobilizes knowledge. In the first case, it is important to dedicate some effort towards making documents available and accessible, to study the efficiency of the channels and to aim at the reduction of all noise. In the second case, it suggests an approach to producers and users, trying to understand how the processes of information may be favored by the use of hypertext. In this case, a vision focused on people and their symbolic connections to the world becomes interesting, this issue relates to the context of knowledge.

Finally, it concludes that the changes in habits, behaviors and traditions do not favor the delimitation of the goals of the researches made on the subject of hypertext, but these will be less pronounced after a relative stability in the



environment of information is reached. Thus, the enthusiasm in digital resources will give room to a less empirical view and one more focused in concise studies of all electronic tools in terms of the context of the information flux.

## Bibliografia citada

- (ALVARENGA 2001) ALVARENGA, Lúcia. “A teoria do conceito revisitada em conexão com ontologias e metadados no contexto das bibliotecas tradicionais e digitais”. [Recurso electrónico]. *DataGramaZero*, Vol.2, Núm.6 (Dic. 2001). < [http://www.datagramazero.org.br/dez01/Art\\_05.htm](http://www.datagramazero.org.br/dez01/Art_05.htm) >. [Consulta:31 jan. 2005].
- (BARDINI 1997) BARDINI, Thierry. “Bridging the gulfs: from hypertext to cyberspace”. [Recurso electrónico]. *Journal of Computer-mediated Communication*, Vol.3, Núm..2 (Sept. 1997). < <http://www.ascusc.org/jcmc/vol3/issue2/bardini.html> >. [Consulta: 31 jan. 2005].
- (BARRETO 1998) BARRETO, Aldo de Albuquerque. “Mudança estrutural no fluxo do conhecimento: a comunicação eletrônica”. *Ciência da Informação*, Vol.27, Num.2 (maio/ago. 1998), p.122-127.
- (BUCKLAND 1992) BUCKLAND, Michael K. Emanuel Goldberg, “Electronic Document Retrieval, and Vannevar Bush’s Memex”. *Journal of the American Society for Information Science*, Vol. 43, Num.4 (maio 1992), p.284-294.
- (BURKE 1992) BURKE, Colin. The other Memex: The tangled career of Vannevar Bush’s information Machine, the rapid selector. *Journal of the American Society For Information Science(JASIS)*, Vol.43, Num.10 (Dic. 1992), p.648-657.
- (BUSH 1945) BUSH, Vannevar. “As we may think”. *The Atlantic Monthly*. Vol. 1, Num.1 (Jul. 1945), p.101-108.
- (CAMPOS 2002) CAMPOS, Maria Luiza de Almeida. “A organização de unidades de conhecimento em hiperdocumentos: o modelo conceitual como um espaço comunicacional para a realização da autoria”. En: CONGRESSO BRASILEIRO DE BIBLIOTECOLOGIA, DOCUMENTAÇÃO E CIÊNCIA DA INFORMAÇÃO (20º :Fortaleza: 2002). *Anais* (Fortaleza: Universidade Federal do Ceará, 2002). 1 CD.
- (CHARTIER 1994) CHARTIER, Roger. *A ordem dos livros: leitores, autores e bibliotecas da Europa entre os séculos XIV e XVIII*. Brasília: UNB, 1994.
- (DIAS 2001) DIAS, Eduardo Wense. “Contexto digital e tratamento da informação”. *DataGramaZero*, Vol.2, Num.5 ( Oct. 2001). Artigo 01 < [http://www.datagramazero.org.br/out01/Art\\_01.htm](http://www.datagramazero.org.br/out01/Art_01.htm) >. [Consulta: 31 jan. 2005].
- (FREIRE 2002) FREIRE, Gustavo Henrique de Araújo. “O hipertexto como instrumento de informação em redes de comunicação”. En: CONGRESSO BRASILEIRO DE BIBLIOTECOLOGIA, DOCUMENTAÇÃO E CIÊNCIA DA INFORMAÇÃO (20º :Fortaleza: 2002). *Anais* (Fortaleza: Universidade Federal do Ceará, 2002). 1 CD.
- (HARNAD 1991) Harnad, Stevan. (1991) *Post-Gutenberg Galaxy: The Fourth Revolution in the Means of Production of Knowledge*. Public-Access Computer Systems Review , Vol.2, Num.1 (1991), p.39 – 53.
- (IHADJADENE 1998) IHADJADENE, Madjid; BOUCHÉ, Richard; KURAMOTO, Hélio. “Navegação nos vocabulários controlados”. *Revista de Biblioteconomia de Brasília*. Vol.22, Num.2, (Jul/Dec. 1998), p.197-210.
- (LANDOW 1998) LANDOW, George P. “Dentro de veinte minutos, o ¿cómo nos trasladamos más allá del libro?”. 213-241. En: *EL FUTURO del libro: ¿Esto matará eso?*. Geoffrey Nunberg (Comp.). Barcelona: Paidós, 1998.p.213-241.
- (LE COADIC 2004) LE COADIC, Yves-François. *A Ciência da Informação*. Brasília: Briquet de Lemos, 2004.

(LÉVY 1996) LÉVY, Pierre. *O que é o virtual?*. São Paulo: Editora 34, 1996.

(LÉVY 1993) LÉVY, Pierre. *As tecnologias da inteligência: o futuro do pensamento na era da informática*. Rio de Janeiro: Ed. 34, 1993..

(MCGARRY 1999) MCGARRY, Kevin. *O contexto dinâmico da informação: uma análise introdutória*. Brasília: Briquet de Lemos Livros, 1999.

(OTLET 1937) OTLET, Paul. *Documentos e Documentação. (Introdução aos trabalhos do Congresso Mundial da Documentação Universal)*. < <http://conexaorio.com/bit/otlet/index.htm> >. [Consulta em 30 jan. 2005].

(RADA 1991) RADA, Roy. "Small, medium, and large hypertext". *Information Processing & Management*, Vol.27, Num.6 (1991) p.659-677.

(RADA 1991a) RADA, Roy. "Focus on links: a holistic view of hypertext". *Int. Classif*, Vol.18, Num.1 (1991). p. 13-18.

(RADA 1994) RAYWARD, W. Boyd. "Some schemes for restructuring and mobilizing information in documents: a historical perspective". *Information Processing & Management*, Vol.30, Num.2 (1994), p.163-175.

(RAYWARD 1999) RAYWARD, W. Boyd. H.G. "Well's idea of a world brain: a critical re-assessment". *Journal of the American Society for Information Science (JASIS)*, Vol.50 (Mayo 1999), p.557-579.

(SANTOS 2002) SANTOS, Nilton Bahlis dos. "A informação e o paradigma holográfico: a utopia de Vannevar Bush". *DataGramaZero*, Vol.3, Num.6 (Dec. 2002), < [http://www.datagramazero.org.br/dez02/Art\\_06.htm](http://www.datagramazero.org.br/dez02/Art_06.htm) >. [Consulta: 31 jan. 2005].

(SILVA 2004) SILVA, Fábio Mascarenhas e; SANTOS, Raimundo Nonato Macedo dos. "Artículos sobre el hipertexto que han aparecido en publicaciones periódicas brasileñas y extranjeras dedicadas a las ciencias de la información (1990/2002): un análisis bibliométrico". *Ciencias de la información*, Vol.35, Num.2 (Ago. 2004), p.45-55.

(TÁLAMO 2002) TÁLAMO, Maria de Fátima G.M. "Otlet, o criador de estruturas informacionais pela paz mundial". En: CONGRESSO BRASILEIRO DE BIBLIOTECONOMIA, DOCUMENTAÇÃO E CIÊNCIA DA INFORMAÇÃO (20º :Fortaleza: 2002). *Anais* (Fortaleza: Universidade Federal do Ceará, 2002). 1 CD.

(VILAN FILHO 1994) VILAN FILHO, Jayme Leiro. "Hipertexto: visão geral de uma nova tecnologia de informação". *Ciência da Informação*, Vol.23, Num.3 (Sep-Dec 1994), p.295-308.