

Can the concept of information be defined ?

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ABSTRACT

Most research in the field information science, information and library science or studies, if not all, has focused on conflicts regarding the definition of the concept of information. The semantic school presents the link between the symbol, the medium, the content and the proposition. The syntactic school presents the concept of information as a process which could be mental or mechanical and as a system. Other perceptions of information theory have been mentioned. Overall this paper provides a framework of understanding and drafts a proposal for a new way of defining information.

Key words: Definition, information, semantic approach, syntactic approach, information theory, system approach, alternative theory, Cameroon.

RÉSUMÉ

La plupart des recherches en science de l'information et la documentation sur le sujet de la définition du Concept d'information focalisent sur les contradictions des différentes perceptions du concept. L'école sémantique nous rappelle le rapport qu'il y a entre le symbole informatif, le support, le contenu et la proposition informative. L'école syntaxique expose la notion d'information comme processus qui peut être mental ou mécanique et comme système. Les approches fonctionnelles, structurale et la théorie de l'information ont été revues. Une théorie alternative sur la définition de l'information a été conséquence de cette revue de perceptions.

Mots clés: Définition, information, approche sémantique, approche syntaxique, théorie de l'information, approche systemique, théorie alternative, Cameroun.

I- INTRODUCTION

If one were to draw a sample of people, and conduct an experiment on their perceptions of the concept of information, the predictable outcome would be that the range of different definitions that would emerge, as a result of individual views and approaches, would be surprisingly conflicting, if not confusing. Dictionaries do not agree on what information is. In Webster's Third New International Dictionary, it is "the act of animating or inspiring" or "the communication or reception of knowledge or intelligence". In the Oxford English Dictionary, it is "that which one is apprised or told : intelligence, news." Some other dictionaries simply equate it to knowledge.

What is perhaps curious is that even people in the information science discipline, whose primary purpose is the study of information, do not have an agreed upon understanding of the definition of information. Hans Wellisch (1972), one of the key researchers who studied the subject, found that the confusion surrounding the notion of information is not restricted solely to the library / information science discipline. The confusion flows across the boundaries of sub-fields that constitute the spectrum of information systems and clusters. In other words, the definition of information will be approached differently as one moves from Electronic Data Processing (EDP) to communication, from libraries to Management Information System (MIS), from Decision Support System (DSS) to Artificial Intelligence (AI), to face terms such as data, information, knowledge, and message, which are used interchangeably.

Consequently, information is a term that is used loosely within and between information clusters to denote anything related to the accumulation of knowledge and / or its corresponding economic activities. Raw data transmitted to, or extracted by and individual, a product of imagination or observation, results of a laboratory experience, a highly organized and structured set of data recorded in medium for a handy use by information seekers or decision-makers are all information.

The process of defining information in this paper is threefold : First, set the stage of the theories by reviewing the major works associated with the subject. Second, discuss the implications of the various theoretical approaches ; and finally suggest an alternative theory by constructing a paradigm of approaches and proposing a definition of the concept of information.

II- STAGES OF THE THEORIES

II.1. Early Theories

This section include pioneering works that have contributed tremendously in raising the consciousness of the human society regarding the economic importance of information. These studies portray a typology of the information sector as a tool to measure the weight of the information sector in a national economy. Their relevance for our present concern, is that they are the first formal stratification of the information sector into economic activities, whose end product is possibly what public opinions have come to call "information" or information related products. Therefore, the knowledge of these activities and their corresponding products may well assist us in assessing what people's perception of the notion of information is. These works are those of Fritz Machlup (1962), Porat U. Marc and Rubin Michael (1977), and the OECD studies, conducted in 1978 and 1979.

II.2. Current theories

Current theories on the topic include the following : Shannon and Weaver (1949) developed the information theory or the mathematical theory of communication. The information theory is a cornerstone in the attempt to assess the nature, the measure, and the definition of information. The approach identifies three problem levels to be overcome simultaneously if one would like to understand the phenomenon of information : The engineering problem, the semantic problem (that is, the relationship between signal and designata), and the problem of the effectiveness (that is, the effect that a message has on human conduct or behavior). The rationale is that there are three distinct dimensions of information, and they should be addressed separately but with respect to each other in order to understand the information phenomenon. Boulding (1956) developed the theory of image, addressing the issues of the relationships between life and image, and society and image through these key questions : How to determine the image, and, what determines it.

Wellisch (1972) reviewed the various definitions of information science with purpose of finding a common ground of investigation of the discipline. He stated that there was none. He reviewed the various definitions of the concept of information assuming that it is the target of information science, but found no consensus on the definition of the concept as related to information science.

Wersig and Neveling (1975) disclosed the many explicit and implicit definitions. Belkin and Robertson (1976) tried to assess the scientific phenomenon of the study of information science. They ended by defining concepts related to information without touching on information itself.

Patrick Wilson (1978) attempted to define the nature of information by equating information and sentence. First, he looked at the sentence as a carrier of information and second, as a set of information symbols. He acknowledged that none of these attempts were significant.

Fox (1983) is one of the latest researchers to contribute significantly to this topic. He suggests the propositional approach to information. His analysis focuses on the relationship approach to information is neither a "type" sort of thing, nor is it a "token," but rather should be reduced to a proposition. The proposition depends on whether one is talking about information contained in, carried or conveyed by the sentence. He distanced himself from what he called the "traditional propositional approach" characterized by the following premises : propositions are : 1) bearers of truth-value; 2) objects of propositional attitudes ; 3) meaning. Fox's thesis is that "the information carried by a sentence S is a proposition appropriately associated with S. Though his analysis has touched most aspects of the relationship of sentence and information the author did not attempt an absolute definition of the notion of information.

II.3. Related Works

Some related works should be mentioned to the discussion:

Plato was a great philosopher of ancient times and his works remain the most *inspiring* in the philosophical arena. He did not deal explicitly with the concept of "information," his philosophy on "dialectic", viewed as a process by which a human being is raised from the world of *flux* into the world of *forms* or eternal ideas is necessary to understand the logic in this paper.

That philosophy depicts a world of knowledge divided in two dimensions. The first, is the *flux* dimension or the world of our everyday experiences. It is the world of our senses, the world of perceptions. The second, is the world of ideas, which is the immanent world that determines our perception of the world. The family of dichotomies depicted in this

philosophy such as forms and flux, or abstract and concrete, general and specific is perhaps the ground on which any development of the definition of the concept of information should be rooted.

Popper (1967) has a similar philosophy as Plato's, with some differences. Popper identified three worlds of knowledge : World I (W 1), the physical world ; World II (W 2), the world of states of mind or consciousness ; World III (W 3), the objective world, that is the world of established or conjectural theories. To understand (W 3), Popper (1967) said:

"Among the inmates of my (W 3), are more especially theoretical systems, problems and problem situations. And I will argue that the most important inmates of this world are critical arguments and what may be called ... the state of discussion or the state of a critical argument"

(W 3) is the fundamental argument that Popper poses against the traditional epistemology that is built on the bedrock principle that knowledge is an exclusive product of *mind*. World 3 is a scientific world, which is independent of individual beliefs. It is the world of objective knowledge. In this context, the world of books would be included in (W 3).

Emmanuel Kant has also stressed in his philosophy the dichotomy of knowledge. The knowledge that one has from his senses, that is one's intuition or what one feels and the intelligible knowledge, that is the metaphysics. Kant's thesis is that any knowledge, regardless of its label, starts as an intuition of the knower. Through "critics" or under the "reflexive analysis the intuition is transformed into knowledge of first causes that are part of the world of metaphysics"

III. DISCUSSION OF THE CONCEPT DEVELOPMENT

As far as the theory is concerned, two schools of thought seem to emerge as departure points of all the information related views and approaches, the semantic and the syntactic.

III.1. The Semantic Approach

The Semantic approach to information focuses on meaning as the substance of information. According to this approach, information is a meaning that a human expresses by, or extracts from, representations of facts and ideas by means of the known conventions

of the representations used. The meaning may bear different connotations, the meaning from the sender's prospective and that from the receiver's. Also, the physical representation may have a meaning independent of the sender's intention or the receiver's interpretations, for instance a conventional or a dogmatic meaning. The questions is what meaning are we talking about : the contained, the conveyed, or the transferred information?

The distinction between contained, transferred, and conveyed in an information environment has been mentioned already in a "direct" verbal communication context by Kripke (1977) and later by Fox (1983) in the context of "indirect communication" with sentences or records in general. In both contexts of a spoken language and / or a written record, the transfer of information is achieved through the use of symbols, such as characters of the alphabet, numeral characters, body language, voice, etc. Can physical representations of information be taken for information or carriers of some kind of flowing substance conveniently called information?

III.1.1. Meaning and Symbols

Belkin and Robertson (1976) believe that information in the context of information science is "a collection of signs." One of the most important characteristics of this collection is that it is "structured" with the purpose to change the image of its receiver. If a sentence is a collection of signs or symbols, this definition leads to a twofold controversy. On one hand, should one state that two physically distinct sets, but doctrinally identical sentences (Fig1), have two different meanings or information because it is extracted from two different collections of signs or symbols? According to Fox (1983) it is the collection of what we see as graphic inscriptions that is an instance or a "token" of what might be called the "universal" that the collection represents?

On the other hand, should one state that two distinct sentences perceived as collections of symbols with different structure or syntax, cannot have the same information since the focus is on the collection as it is

illustrated in (Fig. 2)? Is the information contingent upon the language in which it is expressed, or is it something transcending the boundaries of its human representations?

Fairthorne (1965) addressed the misuse of concepts in the field of information science. He termed the extreme of that misuse as the "corruption" of terminology. He went on and called Phlogiston theory of information the misconception that : Information [is] the name of some universal essence, that can be squeezed out of texts like water from a sponge. Fairthorne opposes the concept of information to "signals," "documents," "assertions" Further, he contends that it is not an "entity". On the basis of his assertion that "information" is a term that is misused, Fairthorne concluded that information is a "linguistic convenience" that saves researchers the responsibility of succinctly defining what they are talking about when using the concept. Vagianos (1972) suggested that its use be specific or avoided. Patrick Wilson (1978) reiterated that there was something strange about speaking of a document containing information when he said : What a document does clearly contain is its text—a string of words and other symbols [not information]

However, the logic of the position that information is neither a symbol nor an entity transmitted by it is adequately balanced by an approach which is emerging from the impact of technologies on information.

III.1.2. Meaning and Media

The view that indeed physical representations of information are the only tangible manifestations of information and therefore, perhaps might be considered as economic substitutes of information enhance the role of technological systems involved. From primitive to modern societies, information has been always associated with technology. One of the form of that technology is a language, a medium that is associated with information. The modern forms of technologies are such media as a CD-ROM, a magnetic tape or a disk, etc. The question is, can one equate information to the media with which they are associated?

Fig. 1 :

Two identical sentences as
Two collections of symbols

The room is dark
The room is dark

Fig. 2:

Two sentences as
Two different sets of symbols

The room is dark
La chambre est noire

Unequivocally, Farradane (1976) the leading proponent of the technological dimension of information, responded affirmatively and defined information "as any form of these representations or surrogates of knowledge, or of particular thought" used for communication.

In summary, we are facing two conflicting perceptions of the concept of information. One stresses the dimension of the information representations as bearing or even carrying information values. The other denies that equation. Even if an agreement could be made about which view is considered adequate, the notion of information content will still stand on the way.

II.1.3. Meaning and Content

The term summary is used in the literature to designate a meaning. An assumption should be made to equate both terms. When facts and / or representations reach the receiver, from a sender, the meaning is equal to the content, if and only if, the receiver perceives and digests exactly what the sender meant, otherwise they are different. In this later case, one should distinguish information as a twofold concept : the meaning which is carried as the content of a letter and the receiver's perception subsequent to the reception; the informative elements which are carrying information as a letter and the intent of the sender.

III.1.4. Information Proposition

Information as proposition is our final analysis of the semantic approach to information. Patrick Wilson (1978) attempted to define the concept of information, and suggests that :

"The information contained in a document cannot be identified with the text of the document. It may be identified with the sense, meaning, propositional content, or semantic content of the text."

From this development Wilson established a basis for analysis on which Fox (1983) has built his proposition theory. Fox's departure point is that all the former approaches and views, which he labelled as either "type" or "token" are erroneous because information is none of those. He therefore, suggested a propositional approach to information and his thesis is as follows : "the information carried by a sentence S is a proposition appropriately associated with S."

In addition, "propositions are not the meaning of (indicative) sentence," but are functionally determined by meaning. Fox introduced a meaning function that transforms a sentence into a proposition in certain conditions. He concluded by saying: The major goals of this essay are now achieved. However, important and difficult questions about information and its cognate notions remain. For example, the extremely troublesome, but practically crucial notion, of the amount of information carried by a set of sentences remains unanalyzed. The notion of informativeness remains unanalysed. Although Fox's analyses provide us with a good theoretical background on the topic, it fell short of supplying us with the definition that is needed for a pragmatic use

III.2. The Syntactic Approach

The syntactic approach emerges as one that focuses on the order and the sequence of informational element patterns. Within this approach, three broad categories will be suggested : 1) information as a process, 2) information as a system, and 3) information as a structure.

III.2.1. Information as a Process

The view that information is a process encompasses all the theories that approach information as a dynamic evolutionary entity. The sequences of transformation in that evolutionary process may be mental or mechanical. By mechanical we mean all processes of information or its physical changes operated outside the human mind.

III.2.1.1. Information as a Mental Process

Debons (1978) viewed information as a functional entity. One of the information functions is to change the "state" of mind of an "intelligent being" based on his/her existing "view of the world." What we did not learn from this approach is the future of information if "change" does not occur. In his remarkable intellectual work, Boulding (1968) suggested that the image, or an individual view of the world, is built up as a result of all experiences of the possessor of the image. As the image is formed, it becomes resistant to changes when confronted with incoming, perhaps conflicting messages and images.

The message may be ignored categorically, leaving the image unchanged. The message may participate in the expansion of the boundaries, scope of the image as in the child learning process in Piaget, without change in the existing structure of the image. Finally, the message

may cause a revolutionary change of image. We understand Debons' approach, as it concerns only the last case. For Pratt (1977), information is an "event" that takes place at some "unique point in time and place," when the process of "image alteration" occurs following the individual reception of the message. As in Debons analysis, Pratt takes into account only the case when a change is effective in the image.

In summary, Debons, interest is the process of change of the image. Pratt's interest is the event of the image change itself that occurs at a unique point in time and place. The common ground among them is that these processes are mental.

III.2.1.2. Information as a Mechanical Process

Debons (1978) has expressed a dual view in the nature of information both as mental and mechanical processes. The second aspect (mechanical) came into play when he contended that information is a commodity. He said : that Information, then, is viewed as a process through which data from the environment are captured and processed to facilitate interpretation by users

It seems evident in this proposition that data are captured and processed by someone else different from the user. That someone then transforms data into structured "physical representation" The physical representation may take the form of a CD-ROM, a book, a magnetic tape or a disc, and so forth. The surrogates become then, a subject of interpretation.

Taylor (1982) is a proponent of the view that a variety of processes transform useless data to productive knowledge when one adds values to data through information systems. The principle of "value-added" consists of enhancing messages that are noisy. The enhancing processes involved are things such as indexing, abstracting, organizing. What seems to be the merit of Taylor's essay, as opposed to Debon's, is that the purpose of adding values to data is the action that has to be taken for a given managerial problem. The productive knowledge, which is the highest level of processed information, provides the user of that information with "options" "advantages," and "disadvantages."

In another language, one might call this a decision support system (DSS) It is clear in this context that information is not just any data or processed data but one which is needed by an individual. One might ask what

happens to information (input) once the information need is fulfilled in Taylor's model? Levitan (1982) is the one who attempted to answer the question by suggesting the model of "the life cycle of information production." In this model, the life cycle of information consist of "generation" "institutionalization," "maintenance," enhancement" and "distribution." The model does define information in a philosophical term, that is, "information is not only dynamic in the sense of constant transfer, but also in the sense of continuous evolution." But, it approaches it in terms of accumulation of information that constitutes a resource which is "reused"

In summary, the process approach to information suggests that information is an entity in perpetual transformation and enhancement. This evolutionary process could be mental or external to the human mind. The transformed entity and its process of transformation are all lumped together into the concept of information. But research is also devoted to information as a system.

III.2.2. System Approach to Information

There is a great misconception that equates information systems to computer systems. Aktas (1987) contends that an information system may be defined as a system that provides information when and where it is needed at any decision level. It could be a vertical file in an office, a system of files based on cards, a CD-ROM, tapes, etc. Therefore, computer based information systems are instances of information systems. The concept of information as a system, is a holistic approach; it views all the information subsystems as a whole which is made up of micro-information needs of individual units. The micro-information needs are purposefully structured and interrelated in order to achieve organizational or individual goals. Two key notes highlight this approach : the information needs at the micro-level, determined by the function or role that the micro-information will play to solve a particular problem (functional information) ; the structure of the system that links and integrates all the subsystems into an information system, designed to achieve organizational goals.

III.2.3. Functional Approach to Information

The functional approach shows the successive stages the data transformation take from totally abstract in terms of "O" or "1", "ON" or "OFF", "YES" or "NO" to totally concrete and tangible in term of package of options and decisions. The functional approach

stresses the role of the information subsystems in the decision making process which, at various levels, from clerical to strategic, incorporates different kinds of information that one could call meaning levels of information. But all the levels of information are integral parts of the continuum that leads to the final decision. In their survey of definitions of the concept of information. Wersig and Neveling (1975) identified that one of the definitions surveyed depicts information as a problem-solving process which takes place in the human mind. The process itself consists of identifying a "Problem," finding useful "data" and bringing both the data and the problem into a "productive union" which yields a solution to the problem. Yovits (1969) perceived information as data of use in decision making.

This definition does not distinguish the difference between data that are used by clerks at an operational level and those used by a chief information officer (CIO) at the strategic level. At the corporate level, McLean (1982) identified four stages forming the hierarchy of the decision making process. The four stages are: 1) the transaction processing, 2) the operational control, 3) the managerial control, 4) the strategic planning. All four levels differ substantially in terms of time horizon, scope of decision, sources of information, accuracy of data, people involved and the amount of data they generate. Because the problem differ in

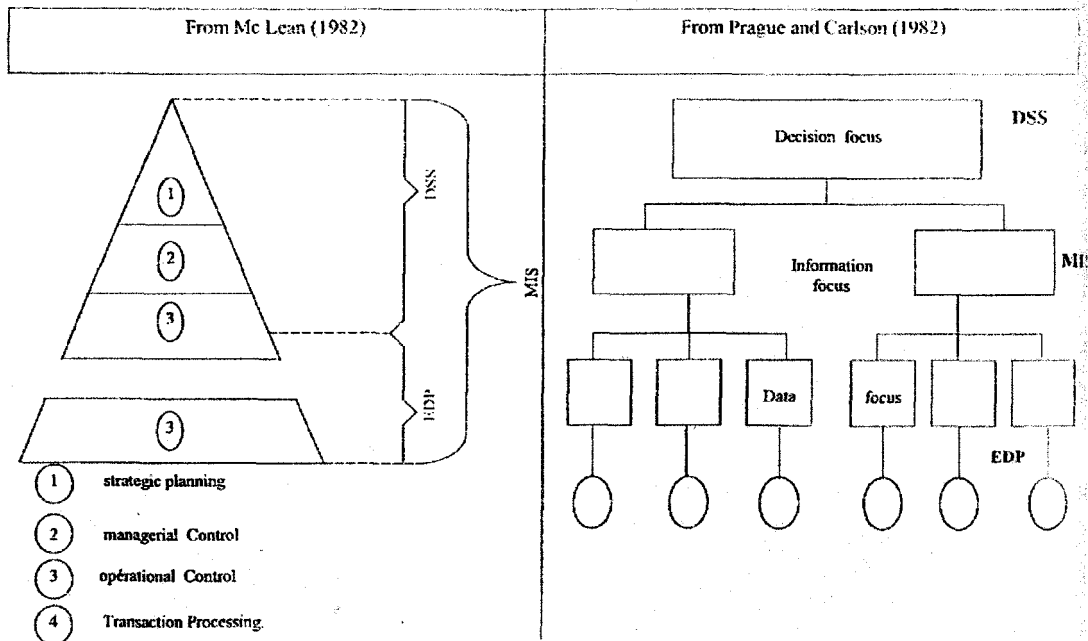
substance at all these levels, the means for solving those problems will also differ from one another in terms of amount, nature, organization, format and package. Here are two theories Mc Lean (1982) and Prague and Carlson (1982) represented in Fig-3 diagram supporting the difference in nature of information used in the decision-making process levels.

The reason for introducing these two representations is to show that even though management theories disagree in perspective, they all agree on the fact that the focus of activities that support the decision process differs from one cluster of decision to another. Information clusters incorporate and generate different kinds of information. Taylor understood the differences between the levels of decision when he introduced the concept of "value-added" as a factor of information differentiation. He believed that as one moves up the hierarchy of the decision making process, values must be added in the process until the action is taken. Adding value to data, however, does not necessarily mean adding redundant or superfluous symbols. It means tightening the structure, identifying the substance and eliminating noises in maximum.

III.2.4. Structural approach to Information

To understand what the structural approach stands for, one can imagine a city. If one looks at a city as a whole from an airplane, he/she will see mostly an association

Figure 3 RELATION SHIP AMONG EDP, MIS, DSS.



of blocks in a vast area. These blocks in a typical city will be related by a system of streets, boulevards, and highways. A block in a city is made up with houses and buildings, arranged by street number, street name, apartment number, and the room number. A block is also made of free areas, trees, and sometimes parks. The street system is made of all the highways, arranged by name, or by ordinal number. Within all these things that we call a city structure circulates the most important element of the city and that is the human being. The human being plus the structure make up the city. The city cannot exist without both. The man alone is not a city. The structure neither can exist alone as a city nor can it exist without the existence of human beings. Information in the structural approach is seen as a structure, just like a city structure. Within that information structure, flows data just as people circulate within the city structure.

Aktas (1987) acknowledged the structured approach to information systems as an alternative theory in the early 1970's and suggested that the concept of structure is related to the "order" necessary for understanding" complex systems," that it "pertains to the manner or form in which something is constructed." It is the essence of the relationship between "parts" and the "whole." One might ask, what is the structural approach that some researchers call the "structured" approach? First, Aktas differentiated the life cycle approach with the structured approach. The latter is more detailed than the former and for this reason it is called in some literature the "operational approach." Our analysis of the structural approach to information will consider the life cycle approach as a dimension of the structured approach, because of the concepts of "order" and "relation" prevailing in the life cycle approach. In this paper the life cycle approach of an information system "is a concept used to describe the major phases and their steps in the development process of the system considered as information. The life cycle, also called "classical", focuses on stages and steps within stages of the system development and has two theoretical branches : the linear and the iterative. The linear branch contends that any system including information systems, has stages and steps to be followed in the course of its development. The claim of this theory is that if these stages and steps are followed carefully, the system automatically will be successful in terms of achieving goals and objectives. The iterative branch complements the linear, by claiming that following stages and steps once is not enough for a successful information system. The designer of the sys-

tem should repeat the stages and steps, over and over, for re-evaluation and adjustment.

The merit of the classical life cycle approach mentioned in this section is that it is a contractual model and is commonly used as a standard for system development and documentation. This whole classical or operational approach has been criticized because of the lack of detailed methodology. According to Aktas (1987) Without methodology, the most important ingredient of the system, the "people" will have a hard time knowing what aspect of the design or the information system will come first and when.

III.3. Information Theory

One of the assumption in the information theory approach is that a message that is sent from one source to another is an instance among alternative messages which can be made up with all the possible combinations of the symbols of the language used in the communication process. In other words, a message is a case of equiprobable events which are constructed from a combination of symbols belonging to the communication language. This means that the communication between two information sources is a stochastic process that eliminates uncertainty by the probabilistic selection of a message among alternative messages. The measure of the probability of selection of a message is a stage in the computation of the quantity of information of that message. To achieve this measure the physical and the informatics definitions of information need to be laid out.

First, in physics, information is any discrete or continuous value which varies for data transmission, for instance, a magnetic field, a fluid pressure, an electrical current. To codify information this definition is needed. The Presence of, the electrical current, fluid pressure, magnetic field could be represented by "1" and their absence by "0".

Second in informatics, everything in a set which lead to designate a subset is information. Information could be represented by a set or subset of symbols of knowledge to be transmitted independently to their meaning. This is the technical transmission of information which ignores semantics and deals solely with syntax. The question is therefore how to measure information?

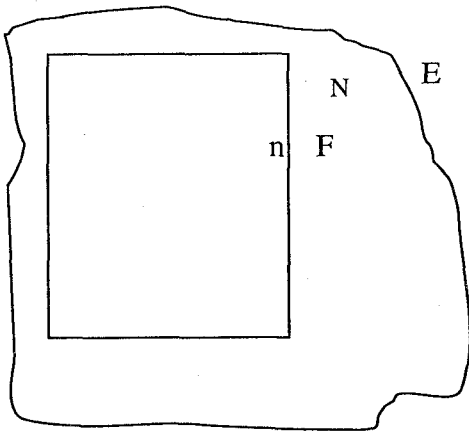
III.3.1. The Measure of the Quantity of Information

III.3.1.1. The Unique Message Case

One can estimate and compare the quantity of information contained in two messages. For instance if we know that somebody stays in apartment No.10 in a street that has 120 apartments, the information received is much greater than the case of a street with a total of 12 apartments only. Information is as greater as it reduces uncertainty. One could state that the proportion N/n in which N is the number of possibilities before receiving the message and n the number of possibilities at the reception.

So if a street has 120 apartments, the indication of number 10 is proportional to $120/10$ whereas if the street had 34 apartments the quantity of information will be proportional to $34/10$. One defines the unit of the quantity of information as the quantity of information that reduces uncertainty in half. That means the quantity of information for which $N/n=2$. By convention, the unit of the quantity of information is a "logon".

Let E be a set of messages with N elements and let F be a subset of E such that F has n elements as illustrated in the following diagram :



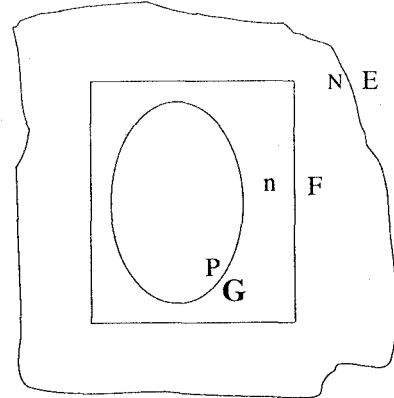
The quantity of information "I" of a given message in F is computed with the following formula :

$$I = K \log N/n$$

In which K is a constant. By convention,
 $1 = K \log 2$, so $K=1/\log 2$
 if one works in base 2
 $K = 1/\log 2$ becomes $K=1/\log_2 2=1/1=1$
 So in base 2, $K=1$ and $I=\log_2 N/n$ logons

III.3.1.2. Successive Messages

Suppose that there is a second message G with p elements and such that G is a subset of F , as illustrated in the following diagram



The message G brings an uncertainty reduction of n/p .

Let's combine the messages F and G into one. We will have the uncertainty reduction of $N/P = N / n \times n / p$. Therefore the quantity of information will be :

$$I = \log_2 (N/P) = \log_2 (N/n \times n/p) = \log_2 (N/n) + \log_2 (n/p)$$

$$I = I_1 + I_2$$

This means that the quantity of information of two successive messages adds up.

In general, one can compute the quantity of information of a message of a given length. Let's assume that the alphabet used to formulate a message has "S" symbols, if the message has "m" symbols (making up its length) the number of messages with such length is S^m . The quantity of information of a given message is :

$$I = \log_2 S^m = m \log_2 S$$

(in logons)

III.3.2. Why base two

III.3.2.1. The Codification of Information

Base two is used to codify a message. The selection of a code to transfer information is contingent upon a certain number of criteria such as: the reduction of the quantity of information to be transferred to the one strictly necessary to eliminate redundancy, the efficiency of the message and the user competency. In modern society, information transmission is mainly done by way of computers.

The computer competency is so low that it has been thought to give it an alphabet that has only two sym-

Table 1: The 36 symbols of the binary alphabet

A	001010	0	000000
B	001011	1	000001
C	001100	2	000010
D	001101	3	000011
E	001110	4	000100
F	001111	5	000101
G	010000	6	000110
H	010001	7	000111
I	010010	8	001000
J	010011	9	001001
K	010100		
L	010101		
M	010110		
N	010111		
O	011000		
P	011001		
Q	011010		
R	011011		
S	011100		
T	011101		
U	011110		
V	011111		
W	100000		
X	100001		
Y	100010		
Z	100011		

As in base 10, additions, multiplication and other operations can be proceeded in base 2.

IV. ALTERNATIVE THEORY: ESSAY ON INFORMATION DEFINITION

IV.1. Noumen Versus phenomenon Dichotomy

The underscored conflict of, or confusion among definitions of the concept of information which apparently may seem to be full of significance for some researchers, loses a great deal of its sharpness when it is examined closely. Two tendencies characterize the paradigm of research on the topic :

1) The noumenal tendency which stresses the meaning aspect of information; it presents information as an inmate of a metaworld containing the reality of the universe and the first cause of the physical manifestation of the human perceptions of information. It is assumed that this metaworld bears truth value. Here are some of the researchers promoting this view : Patrick Wilson, Christopher J. Fox , and Plato.

2) The second tendency is the phenomenal one in which can be categorized most of the available literature on the topic. The concentration of the literature on this aspect of information is due to the pressure operated by the emerging field of the economics of information which absolutely need some tangible and measurable commodity to lean on.

Proponents of this view are : Farradane, Artandi, Pratt, Boulding, Wellisch, Wersig, Karl R Popper, etc. A comparison of the two tendencies is well illustrated in (fig.4) of Plato/Popper's epistemological comparison.

The different divisions of the world identified both by Plato and Popper determine the driving forces that cause the researchers to define information the way they do. The only common ground in this joint model is the physical world that both authors view in the same way. Popper's W2 and W3 are intermediate stages

bols 0 and 1. In principle one can only designate two objects with that alphabet. But by convention one can form binary words with the same length as in base 10, just by putting side by side binary symbols. To codify the alphabet of 26 letters and the 10 figures (36 symbols), one will need binary words of six symbols called bit binary digits.

III.3.2.2. The Binary Numeration

Since the figures are codified, one can do the addition, the subtraction and the multiplication. To do this we know that any number N in base 10 can be decomposed into its elements according to the following formula :

$$N = a_0 \times 2^0 + a_1 \times 2^1 + a_2 \times 2^2 + \dots + a_n \times 2^n$$

Avec $2^0 = 1$

If by convention the tables of addition and multiplication are given as shown below.

Table of addition

+	0	1
0	0	1
1	1	10

Table of multiplication

x	0	1
0	0	0
1	0	1

of thinking vis à vis Plato's model which ignores them completely. In fact, the world of forms in Plato has interaction with none of the rest of the world divisions. The truth is that these divisions are all aspects of the same target, INFORMATION.

IV.2. Dichotomy Justification

The dualism that is observed on the process of defining information is deeply rooted in what Emmanuel Mounier or Freud would have called the human nature framed by the constant interaction between the soul and the body. These two dimensions of the human being are reflected in any human activity. The perception is a theatre where this duality is constant. In fact, two schools of perception prevail in the philosophical thought as presented by Vergez et Huisman (1987), the intellectual school and the gestalt theory school. While the first focuses on the constructed character of forms by human intelligence which synthesizes, interprets and transforms sensations into perception, the second, instead contends that the form and the matter are perceived globally because the elements are inseparable and opposites co-exist inseparably according to Plato in MacDonald (1949).

ably according to Plato in MacDonald (1949).

The intellectual school departure point is the physical object and the gestalt school's is the abstract form or meaning. Plato established that man is the measure of every thing alike of the being of things that are, and of the not-being of things that are not. Therefore; the two broad approaches to information man-made are justifiable.

IV.3. Information Concept

IV.3.1. Dimensions of Information

Figure 5 portrays a synthesis of all the views and approaches to information. Plato supplies us with two distinct and non-interacting worlds. The first, transcendental to human experience, is the world of forms or eternal ideas. This world is intelligible and unalterable.

The second world is the physical one, the world of our senses, the world of our ego. One way of bridging the two worlds is through the dialectic suggested by Plato himself. Relation R1 symbolizes that dialectic. R1 is the mechanism by which practical knowledge is

**Figure 4 : PLATO / POPPER
EPISTEMOLOGICAL COMPARISON.**

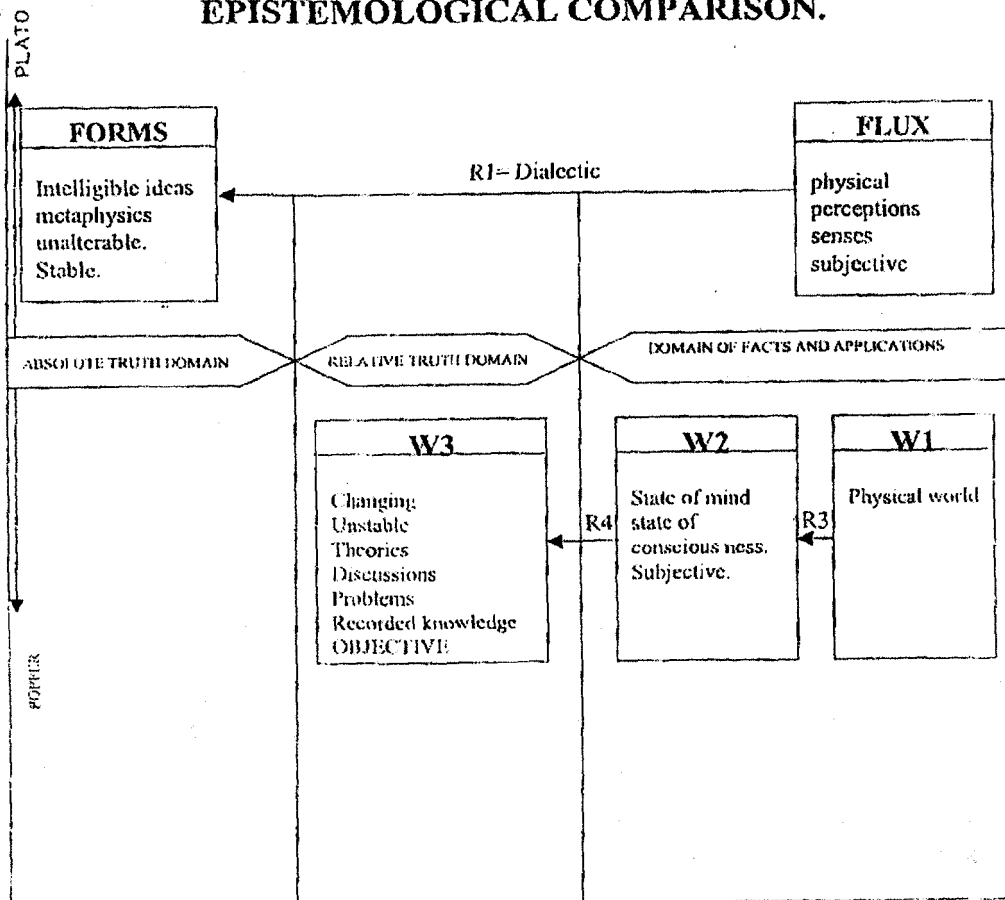
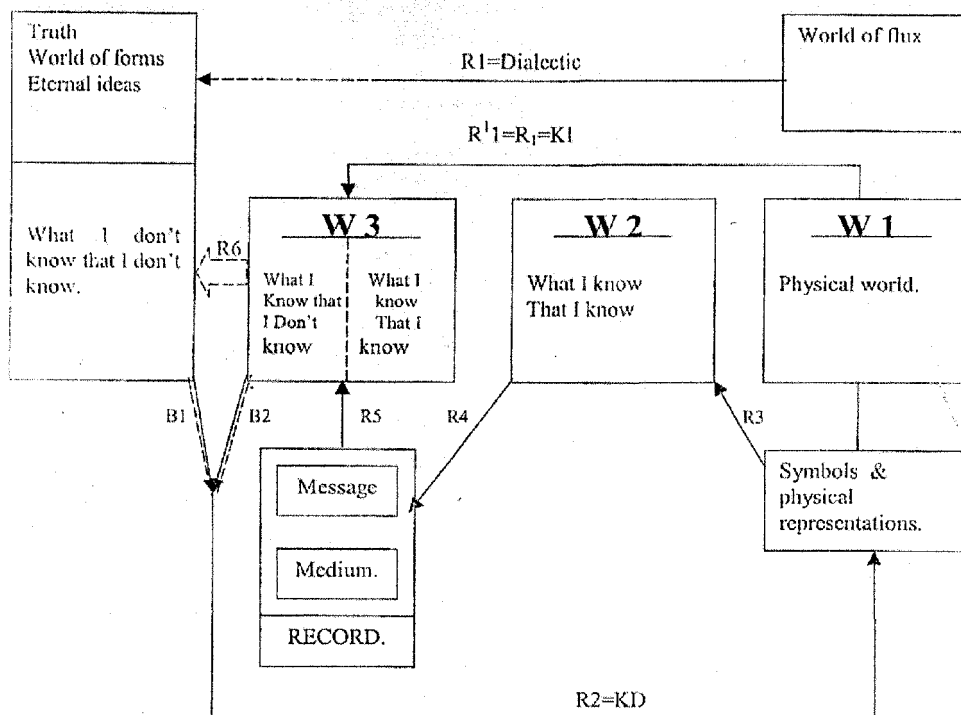


Figure 5 : Dimensions of Information



raised into intelligible knowledge or truth. The process to achieve this is the propedeutics which is teaching basically. The principle of this teaching is to put together all the pieces of the puzzle, in order to assemble the real paradigm, this is an incremental approach to seek the truth, which is only a hope for a human being.

That hope is materialized in this model by a dotted portion of R1 at the truth extreme. R6 in Popper's side would represent also the human effort to reach the absolute truth. Another possible way to bridge the two worlds, that Plato did not mention, is through what can be labelled the reverse dialectic. Its representation will be R2. this second mechanism would portray the paradigm of truth as a whole at first glance, that is, the form of truth is perceived lumped into the world of flux for INFORMATION process. With the reductionism principles of the process, pieces of the puzzle which make up the whole, will then emerge for the sake of making the truth accessible as an object of sensations as opposed to dogma. R2 is rooted both in W3 (B1) and in the world of meanings or the world of WHAT WE DON'T KNOW THAT WE DON'T KNOW (B2). A B1 relationship shows that the information may occur in the context of tested

and / or recorded knowledge. B2 shows that information may also occur in the context of a dogmatic and / or oral knowledge. Karl Popper in his counterpart distinguished W1, W2, W3.

Although the three worlds in Popper have different inmates they are organically related by the growth of knowledge movement symbolized by R'1 type of R1 relationship explained in Plato. The R'1 in Popper means growth of Knowledge with its peak in the objective W3 or the scientific world of discoveries or relative truth subject to conjecture. Opposite to Plato's world of forms, W3 in Popper is a constantly changing one, change which is caused by the trial and error process, the cornerstone of the Popper's epistemology. Plato has conceptualized that R1 can cause one to reach the truth. Obviously, this is an illusion because one can only come closer to the truth without reaching it, so R1 in Plato is in fact equal to R'1 in Popper. As we have established the congruence between R1 and R'1, lets translate the facts into our prospective. R1 becomes the NKNOWLEDGE INFLATION (KI), both in Plato and Popper perspectives. R1 can subsequently be decomposed into R3, R4, R5. R3 transforms physical sensations into perceptions that is W2 or the world of WHAT WE KNOW THAT WE KNOW. R4 is a trial and error process of our re-

corded perceptions. R5 is the adoption of the recorded perceptions as objective knowledge which may have two components, WHAT WE KNOW THAT WE KNOW and possibly WHAT WE KNOW THAT WE DON'T KNOW. R2 becomes KNOWLEDGE DEFLATION (KD). KI and KD are two opposite relationships establishing a pendulum movement between the MEANING and its PHYSICAL SURROGATES. Precisely, KI and KD constitute a loop and a self feeding process which characterizes the information function.

IV.3.2. Definition of Information

Information is a function that transforms the noumenal world into a phenomenal world for an easy understanding of the reality of things upon which depends a decision process. The noumenal world for this model could be Plato's world of forms (WF) or Popper's W3. If we choose WF as the set of departure, we will confront again the problem of definition of its inmates which we do not know. Therefore, it would be practical and wise to select unequivocally W3 as a departure set. W3 is tangible and even quantifiable, but it is *not* information. It is the domain of definition of the information function. At this stage, we may readjust our definition by saying that information is a transformation of W3 into the physical world (PW). This means that if W3 exists there exists always a PW that W3 is designed to address, or a PW that justifies the transforming function. One should notice the dramatic shift in focus. Instead of focusing on a subjective reasoning, the notion of function gives us an opportunity to analyze information objectively.

Conclusion

The key papers dealing with the topic of the definition of information have been reviewed and various approaches discussed. Due to the inclination of various discussions on perceptions of definition over the matter of defining itself, the information debate voices have suggested the abandonment of the concept for the alternative of being specific about what somebody is saying. But this solution has not been satisfactory. Our contribution has focused on identifying a paradigm based on Plat/Popper epistemology that integrates all the perceptions of the concept. From that paradigm we have forged a definition that suits the theories reviewed.

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