

**Dialectic Information Systems  
and their Connection with the New Economy**

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**ABSTRACT**

The importance of information systems, including dialectic ones, has become increasingly patent in the new economy. A study of the changes which have taken place in the concept of information, highlighting its value as an economic factor, has turned it into one of the pillars of market economy. The concept of enterprise has also undergone changes, basing its modus operandi on information as a factor of production. Information system are enterprises and are, therefore, affected by the same changes.

The study of information systems is viewed from the systems science standpoint, establishing parameters, variables, working conditions, etc. a very brief historic overview of the definitions given to dialectic will serve as an introduction to the dialectic systems. Dialectic Information systems are those which undergo great transformations.

The links between information systems and the economy establish interactions between one and the other. Information becomes a production factor, consumer goods, a factor of well-being, etc. the assumption is, for instance, that “matter” and information change into consumer goods and services and that manufacturing is a process in which information is replaced by goods. We live in a society which is interconnected, mainly though Internet, thereby, affecting the economy and leading to great changes.

## **INTRODUCTION**

We are living today in an age of transformation, of change, indeed of transmutation in all aspects, which affects the evolution of mankind on this Earth. Economic, working, scientific and artistic activities are all affected by this transmutation... and so too are the attitudes of the people themselves, as regards their emotional, sentimental and physical development.

Man is the center of his world of action, between the macro cosmos and the micro cosmos, creating his meso cosmos, adapted to his own human dimension. This idea, echoed lately by some authors, is not in fact new since even in the 16<sup>th</sup> century William Gilbert claimed that man came from the macocosmic whole, our universe – he refers to the Earth – and the micro cosmos. This man is the active and passive agent of all material and mental activities, as I have stated several times in my papers. Information comes from facts that existed before and acts as a driving force and at the same time as a source of energy which moves and promotes those activities. José Manuel R. Delgado mentions that the among of information, or impacts of useful information, which reaches the neurons in the brain, has an effect on the development of its intelligence and, as a result, in the evolution of human society as a whole. The greater the number of information impacts, the greater the degree of development and evolution... this was the case when the individual and society were able to control the amount of information received. Today, both the individual and society are overwhelmed by the information which increases daily in intensity and speed. We cannot control it, harmony is disrupted and... we are faced with the present period of transformation and transmutation.

This paper will concentrate on the changes produced in the concepts of information – already announced in my previous papers – and in information systems viewed from the standpoint of dialectic systems as a means of approaching the new economy, proclaimed, amongst others, by Paul Hawken and James Heskett, in an attempt to provide solutions towards resolving our situation of transmutation and crisis.

## **THE FEATURES OF INFORMATION SYSTEMS**

Seen from the point view of information professional, we tend to consider information systems as closed, quasi-static systems where everything works according to a uniform rhythm with very small, negligible, fluctuations. The main object is to process data and, in general, to produce information which is properly stored so as be easily accessible when eventually required by the user. This occurs mainly in those information systems which are economically dependent upon another superior body which can be, for example, either a private or public enterprise. The financial/economic results of the management and organization are controlled by entities which have nothing to do with the information system itself, that is, they are not the responsibility of the information professionals.

The situation is quite different when these information systems become financially independent and have to produce profits on the balance sheet. This subject

was dealt with at length at the ECIS '96 Conference, held in Lisbon in July 1996. We are moving from a productive society to a services society and one of the services which has emerged, within the new economy, is precisely that of information services, information system.

Information systems whose features are considerably different from our previous ideas. Max H. Boisot studies this question in detail in his book "The Information Space". Now, we are dealing with open, evolutive, dynamic, fuzzy systems; i.e. with no precise boundaries, and which are, above all, according to Juan Carlos Micó self-regulating. Within these systems information, energy and matter are interchanged and also with their surroundings. They are affected by these surroundings which determine the pace of the self-regulating process and, therefore, they should be continually updated in order to adapt to the flows and influences of their surroundings and be able to maintain their autonomous position. At the same time, inside feedback loops of opposite directions, positive or negative, are produced which favour this self-regulating process.

Information systems should be in a state of metastable equilibrium so as to be able to adapt to the surroundings and, if necessary, to move to another metastable state in such a way that their functioning is a function of their ability to adapt and their degree of metastability. According to the following formula:

$$F = \frac{f(aa, dm)}{s, t}$$

where

aa: adaptation ability

dm: degree of metastability

s: space

t: time

In every information system variations occur in the fundamental variables, as well as in the emerging ones, leading to operational fluctuations, oscillating around average values, between maximus and minimus with very little difference. Therefore, in general studies, these can be ignored, assuming an ascending linear development which facilitates global dynamics. However, under conditions of great disturbance, both inside the system and in its surroundings, the fluctuations can produce bifurcations which marks the distribution of moving to stable states or to becoming extinguished. The interchange of information → energy → matter → information is altered and it will be necessary to introduce regulatory subsystems which help and promote a return to the initial metastable states, to the metastable balance, which allows them to function in harmony.

All the above refers to a space and time which are determined and established beforehand. It is logical that an information system should vary according to the country in which it is located or the economic and technological situation of a particular social

or business sector. Moreover, the time taken to study the running of an information system is assumed to be, as well as a fundamental variable. Time consists of two components with the same direction, but with different intensity. One refers to local time closely connected to space, and would correspond to the “here and now” in the wide sense of the meaning; the other component has a historic implication related to the times to come. Its parameters are different, as are its variables, its boundaries, functions, structure, the technology used, etc.

## SYSTEM CHARACTERISTICS

Let us now study information systems from the systems science point of view, in which they consist of an open, evolutive, dynamic, reticular, conceptual system which is at the same time pragmatic and highly complex since it is made up of subsystems and sub-subsystems of sub-systems of ever increasing extent and complexity, making up a whole, inside our mesosystem, within the new systems. We could make the document the primary element, take in the general sense, on which we would build the necessary subsystems to achieve a way of functioning in line with its objectives within a set environment in the time and space, which will also have been pre-established. This approach would imply a slight simplification in the study of information systems, since the document, over an extended period of time, has connotations of stability, is not evolutive and its structure closes in on itself. However, if we take information as the first element, a holon of the system, this study becomes considerably more complicated. Information comes from the processing of data and in itself consists of a highly complex system due to the well known connotations of intangibility, variability... with ontogenic, social, economic and other values. In this paper we will take the document as the first element.

In 1995 I gave a speech, once again acting as a pioneer in the field, at a Conference held in Buenos Aires, on “Library Systemic Management”, and in 1996 I gave a class at the Universidad Complutense of Madrid on the same subjects being applied now to information services. In both papers, each system was studied establishing their working features, input and output flows, parameters and their variables and vectors.

The input flow in an information system is determined by the acquisition of information, from documents of varying typology. The energy which drives the system is, in turn, still information and has to be processed in the different sections, such as the register, data, analysis, preparation of knowledge base, etc. at the same time, information consists of matter, in other words. The output flow, for future use by whoever needs it. This makes the system even more complex. We must also take into account the subsystems which are concerned with staff management as well as with input, consumption, types of users, market conditions.

Therefore, we must establish two types of parameters or essential, fixed elements:

- **conceptual elements**  
consisting of the processes relating to data processing  
- recording of data

- documentary analysis
- preparing a knowledge base

- **pragmatic elements**

consisting of the organizational and management functions:

- general management
- financial management
- staff management
- management of purchasing policy
- management of sales policy
- management of information technology

The parameters shape the sections which are essential to an information system.

The variables are determined by the internal place of work, influenced by the acquisition of documents, input flows and output demand, such as the information requested, news bulletins, catalogues, etc. in addition, we must add space and time, which are considered to be fundamental variables.

All these components make up a diagram which allows us to study the system, when real values are given to the constituent parts, mathematical equations are formulated and solved using a computer.

## **DIALECTIC SITUATIONS**

The term dialectics comes from the Greek “dialectique Tecná” meaning the art of dialogue or argument, and which was founded by Zeno of Elea in Greece, as a philosophy means of thought which allowed him to clarify concepts using reasoned argument and dialogue. This meaning has changed over the years and, in fact, quite contrary definitions have been given to it; nevertheless, the concept of paradoxes (opposition of opponents) in mutually contradictory concordances and discordances has survived through time. By way of examples, here are some opinions which can be applied to the subject of this paper. Abelardo in the Middle Ages defined dialectics as a critical means of solving problems; R. Ruger talks about dialogue, confrontation, agreement in disagreement; for Hegel it is a synthesis of opposites; the Soviet dialectic philosophers add a new dimension which will enable us to widen the sphere of action and application of dialectics by introducing the time factor – place is also a fundamental factor, author’s note.

On the way towards widening the concept of dialectics, we should mention among others, Bogumil Jasinowski, who states that it belongs not only to the realm of philosophy but can also be applied to science. Later on authors such as F. Parra Luna, Antonio Caselles and several other researchers into systems dialectic, suggest applying it to social systems, which include the information systems. The link between dialectics and systems science appears after F. Gonseth formulated scientific and empiric dialectics, around the middle of the 20<sup>th</sup> century. From then on its applications multiply. In Spain, it was Rafael Rodríguez Delgado who introduced both the theory of systems as well as systems dialectics.

And what is the reason for deciding to apply dialectics to systems science... simply because certain dynamic systems, in general, and information system in particular, show functional anomalies which cannot be explained with systems dynamics. New types of variables, both inside and outside their environment, have to be taken into account; and these are responsible for this anomalous functioning which gives rise to the transformations; these are called “transformables”. The disturbances can occur either in the input flows, or inside the system, or in the output flows. Time and place are elements, and in some cases also transformables, which cannot be overlooked.

## NOTES ON DIALECTIC SYSTEMS

In principle and by definition, the dialectic state of an information system should always be transitory until the solution for reaching normality again is reached and always within one established period of time. A system which remains in a dialectic state for a prolonged period of time will eventually die out since it will not be able to withstand the ever changing and continual fluctuations. Another thing is that there are systems in a metastable state, showing slight fluctuations around average values which give them flexibility and dynamism.

Dialectic information system should be self-regulatable: they will go from a state of disorder entropic –to another state of order. If we take into account the principle put forth by Russell of the equipotence of the whole and the part, any changes made to the whole would affect the part and vice versa. This implies a certain flexibility when introducing external agents which would modify both the whole and the part, in order to achieve order.

These systems should follow the principles of complementary, uncertainty and transdisciplinarity which make them easier for strategic, social or entrepreneurial transformation, among others, to move from opposing and conflicting situations to ones which have a common tendency and are mutually beneficial.

Another condition which dialectic information systems should fulfil is the creativity to resolve similarly conflictive situations. This will go hand in hand with innovation. Together they constitute an ascending-descending but non-reciprocal linear influence, that is, if creativity increases innovation will increase likewise and if one decreases, so will the other. On the contrary, there can be no innovation without creativity.

Among other cases, information systems which can produce dialectic behaviour patterns are those which should face profound changes, such as when they come up against computerization, the introduction of internet systems, a broadening or narrowing of their spheres of action, merging with or breaking away from other institution, due to bankruptcy, political changes, changes in governments policies on information, etc. etc.

So far we have talked about isolated information systems, considered as single units. These situations also arise between systems which are separate from one another, but which are related to one another in their objectives, subordination, complementary

features, economic interest and various other reasons. All the above can be applied to these systems, bearing in mind that this introduces a higher degree of complexity. In both cases, when it comes to resolving specific situations, mathematical formulae have to be established, providing the parameters, variables and transformables with real values, and using a computer to solve them.

## CONNECTIONS WITH THE NEW ECONOMY

The concept of information has recently widened, following the general trends in other subjects and matters which means they should be viewed from a higher level of abstraction, as well as application. In this way, information takes on new connotations, and in the new economic processes, is considered as a product, a consumer goods, a factor of well-being. On the other hand, it is an intangible, unfinished and imperishable good. These features together with those we already know about such as being inherent to the human evolution, a first element in the production of knowledge, preserved of the cultural tradition of Mankind, etc. ... give information certain special features and a certain relevance, which justifies it being used as a basis for the new economy.

Back in 1936, J.M Keynes in his book *The General Theory of Employment, Interest and Money* was one of the first people to consider the value of information as an economic factor of production and not as a mere added value, that is, as something fundamental to business economy. However, it was only after World War II and only just recently that researchers into economics, including research into the operations and market studies areas, have based their research on these ideas and obtained results and conclusions.

What we have been saying has, in fact, repercussions on the concept of the enterprise in general, and on information systems in this particular case. In papers dated 1989 Gigch and Pipino lament that there is no paradigm for information systems... Nowadays, it would seem that the majority of economists hold the opposite idea and place this paradigm, precisely, on information. Max H. Boisot himself, in his book "The Information Space" shares this view. Partis and Stewart include information systems within the social systems, considering them as intelligent systems equipped with motivation and purpose, in which information acts as a driving force with economic value. Likewise, other authors give views and definitions of enterprise-institutions in general which follow these new trends. I mention Paul Hawken who in "The Next Economy" talks about the changes in mass and information in consumer goods and services. Here "mass" should be understood to be material equipments, human factor, etc. as a whole and which from the operational basis. James Heskett in his work "Managing in the Service Economy" refers to manufacture as the process in which products are replaced by information.

The idea that the enterprise is an economic scheme resulting from a process, production and interchange of information is similarly being introduced as a fundamental element in the new economy. Taken further, this can be made extensive to information systems. The physical energy - the mass, mentioned above - the space - time factor, and the data are the pillars for its development. Here, we refer to "data" as the potential information contents in any type of document, i.e., as a basis of knowledge. It

is not converted into information until it is used. These data should be well structured, duly coded and abstracting for more efficient and effective dissemination.

We are talking about information systems as being in themselves, isolated from their surroundings, to highlight more clearly the importance of information in the economic development of enterprises and, therefore, of the new economy. Nevertheless, one of the pillars of this is based on the interconnections between enterprises. We live in a world which is interconnected on all levels and to an even greater degree since the introduction and generalized use of the Internet system. A new knowledge emerges – perhaps it would be more appropriate to say that its use has been paved – by complex systems of information flows, which have effects on and influence society. An information metabolism is produced, a complex process where information itself is considered to be a lower level energy, far from the state of equilibrium, which complicates economic valuations and studies. On another level, these features make the information system – by exploration- more disposed to creativity, evolution and competitiveness.

We have been talking about information systems in a dynamic, metastable state, following the reasoning given in the previous paragraphs. In the case of dialectic information systems, where we have assumed them to be in a conflictive and transitory situations, both inside as well as with their surroundings, the influence of information, in the general sense of the word, can affect the new economy, especially if that situation goes on for longer than desired. The economic data which should be taken into consideration when studying the market, for example, are altered, are unreliable, are subject to fluctuations, and we cannot anticipate nor foresee how they will behave. On a microeconomic level, the economies of enterprises or related institutions are similarly affected and can even lead to complex dialectic states which are difficult to resolve. From this we can deduce that a dialectic information system should do everything to reach a metastable situation in line with its purpose and objectives.

## **CONCLUSION**

What is said here is an example and extract of recent papers showing the importance of information in the new economy, in which inter- company relationships are fundamental. There are no longer airtight compartments, we cannot view our world as made up of isolated plots. Beings, entities should be seen as interconnected, dependent on each other to a greater or lesser degree, for longer or shorter periods of time. Information, in turn, acts as a linking vehicle, as well as a primary operational element, being at the same time a fundamental part in economic issues.

This relevance of information has, as a result, effects on the importance of information systems, in their widest sense. They, too, will be pillars in the new economy, as economic factors both on a macroeconomic and microeconomic level. Economists are showing more interest in these studies, development, etc. than information science professionals and it is at the conferences and meetings on economic matters, in any of their facets, where sessions are devoted to talking about and discussing these systems.

According to this reasoning, information systems are the fundamental basis in the development of society and, therefore, in the historic evolution of mankind.

We can, therefore, conclude that dialectic information systems are not desirable in those economic relationships which should evolve towards a better quality of life and well – being for all nations.

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