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The Form and Content of the Language of Science in Relation to Dilemmas of Modern Organization and Management Theory

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"...Many indications suggest that in the coming decades, linguistics will make a particularly significant contribution to the development of science."
René Thom

Abstract:

Purpose *The content of the text concerns the fundamentals of the methodology of science (with its primary use in the pragmatic aspect, particularly in relation to the theory of organisation and management) in reference to two fundamental dimensions (approaches) of processes and objects, especially those with a complex structure. These approaches are realised through form and content. The question must therefore be posed: why are only these two approaches, or these two dimensions, considered in the present analysis? It is evident that this subject has been thoroughly explored by Plato and, most significantly, Aristotle, who have both conducted extensive research on this topic. This approach and understanding of form and content are embedded in the dilemmas of contemporary management. This is the subject matter of the article under discussion.*
Design/Methodology/Approach: *The two aforementioned philosophies of viewing the matter influence the way objects are understood and studied within the methodologies that arise from them. One methodological category includes formal models and methods, while the*

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other focuses on content. The article discusses the application of these methodologies to the study of both real and mental processes, but from the perspective of the humanities. Here, their way of perceiving the form and content of processes for management practice dominates, rather than merely through theoretical frameworks.
Findings: *The analysis of the relationships occurring in the sciences that form the foundation of science (through the classification of signs of forms and contents in the humanities) demonstrated the immense potential of science to create its language for practical purposes, including management in its broadest sense, applied in every field of human activity. It is this management, through its diverse form and content, that presents dilemmas in contemporary science when making optimal decisions.*
Practical implications: *The practical benefits derived from the theory of form and content for the practice of management and the theory of organization are invaluable, as they are capable of interpreting the results of research conducted through formal management methods. For the purposes of management, it is even obligatory required to be able to rationally interpret the content (humanities) of the results provided to management by the formal sciences (quantity reflected in words).*
Originality/value: *The originality of the authors' thoughts lies in emphasizing the coherence of three humanistic fields of knowledge in the analysis of content related, among other things, to management, but also the contents analysing the content of formal methods in sciences (especially physics and mathematics).*

Keywords: *Cognitive structures, classification of signs, knowledge systems, abstract reasoning, epistemology of science, contents, scientific language, signs and symbols, semiotics, representation, logical syntax, ontology of language, unity of science.*

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1. Introduction

The main objective of the text concerns the foundations of the methodology of science and its application, primarily from a pragmatic perspective, which also relates to the theory of organization and management. Our primary activity involves practical actions.

The knowledge we acquire about the Environment helps us to implement it, i.e., to achieve our human needs. After all, modern Humans have formally attained a level of Civilization that is universally accepted. This level has a history (for Europe) originating from Ancient Greece. In this context, the great philosophers of that time linked the concept of civilization with Matter.

The first to do so was Plato. He proclaimed that Matter (Hyle) defines what is unformed. The philosopher argued that it is an indeterminate substrate of phenomena. Form (eidos, morpho), on the other hand, defines everything that makes an entity what it is. Thanks to Form, it becomes possible to distinguish one thing from another[7].

This way of thinking expanded in scope, particularly after Aristotle, who conducted a very detailed discourse on this subject, adding the concept of substance to Plato's analysis. Furthermore, in science and everyday life, we operate with dual, complementary concepts that complement each other.

Examples of such pairs include, number and word, form and content, truth and falsehood, gender, woman, man, and many other similar concepts. Both perspectives are analysed primarily in relation to the needs of contemporary management (in the context of its current dilemmas—research tools).

However, some sections of the text, specifically the substantive analysis of the abstraction of form and the understanding of content from the perspective of logic and mathematics, go beyond this scope.

They also concern their ontology, which, in fact, is independent of even science, as it is self-contained and therefore independent of management. Although Ontology has its own management, as it functions and is defined by its Nature.

Moreover, theories of interpretation and understanding of what form and content are from the perspective of the humanities are also presented (since not only logic and mathematics have their form—after all, the humanities have been part of science for a long time, and even earlier, when science did not exist in its current form).

Therefore, the conclusion is that the humanities have a stable structure, a form for their content. Furthermore, the formal (strict) and humanistic (verbal) perspectives—independent of each other in some sense—according to the authors, influence the way management is conducted and, most importantly, the practical benefits (utilitarianism) of such management.

2. Dimensions and Directions of Knowledge (Humanistic Ontology of the Reflection of Matter, Form, and Content)

[7]*So what are these Forms, according to Plato? Forms are abstract, perfect, unchanging concepts or ideals that transcend time and space. They exist in the Realm of Forms. Although the Forms are abstract, this does not mean they are not real. In fact, the Forms are more "real" than any individual physical objects. These thoughts, along with others, are expressed in many of his works, but also in one of his most important ones (Plato, The Republic, Warsaw 1958).*

This fragment of the text concerns the analysis of form and content through matter[8] in relation to our reality, but through the Humanities, the field of soft structures. This analysis also pertains to the language of perceiving and expressing it (external representation) of categories of concepts and the classification of its signs and symbols, which play a primary role in this field, as they represent the fundamental categories of the objects and processes of our real and mental reality and their relationships with each other.

The analysis of the issues of content and form from the perspective of this field of science and in its contemporary version is much more complex and ambiguous compared to formal approaches. This is due to the lack of precision in the definitions and general understanding of its concepts.

However, this field is ontologically connected to content, and the forms of its representations are not as strict as in mathematics and logic (this is the aforementioned language-form of content representation of some part of matter). But this is not a concern of the Humanities, but rather of the exact sciences, as they deal with form.

This is their "Ontological Sin" and at the same time their "concern" in this matter. It means the formal approach to the Humanities' form. They (some mathematicians) can no longer claim that the formal approach to some mathematical theory (object) does not need to be interpreted in relation to reality, as it is only a game of formal syntax (assumptions in the spaces considered in mathematics, as if in its Ontology).

However, the medium of language and the form of syntax in logic, mathematics, and metamathematics are thought and the form of spoken language. After all, in the real world, there is no separate mathematical and humanistic form and content of its objects and processes[9].

Both parts of the presented and simultaneously modestly analysed issue of this important dimension of science show their understanding of how each of these dimensions of science can present this issue to science in its own language, i.e., in its own way. This means that these sciences see the form and content of Reality through their language (its concepts, structures, and processes described by it).

But as the creator of operationalized cybernetics, Norbert Wiener (1948; 1950), once said, humanities, at that time, constituted barren soil for cultivating mathematics. In our opinion, in order to make his thought a reality, one must understand this

[8]*Already understood in Ancient Greece (Aristotle 1983, 2013) and during the Modern Age by Descartes and others (Descartes 1993; 2002; Krąpiec 1968) for the proper understanding of reality, but this time in relation to the humanities.*
[9]*The common element of all these, as Jean Piaget said, may one day be found in our protoplasm (Piaget 1977a, pp. 126-127).*

humanistic reality from the perspective of the language of mathematics (posing questions about the ontology of mathematics and its ontological nature-structure), i.e., understanding it from the perspective of its formalization possibilities[10].

And this problem will also be addressed below (very modestly). The aforementioned shortcomings of the language of science imply dilemmas related to its practical use. This is indeed the case in modern Management and the Theory of Organization. These dilemmas likely concern the lack of resonance between the operational capabilities of mathematics and the understanding of their significance for management (by the science of Management, as well as mathematics itself, because it is not anyone's "servant").

3. The Humanities for the Needs of Management (Its Place and Role in This Science)

Formal sciences resolve the complexity of their formal structures, the degree of complexity of the relationships between the components of processes and objects, and provide knowledge about other relationships, the precision of which science is capable of providing and presenting in the formal dimension. These are three broad areas of science, three fields, logic, mathematics and metamathematics.

But even these fields are unable to fully comprehend their own nature (paradoxically, they have created themselves and are then unable to resolve certain substantive issues) - their formal ontology; and as a result, perhaps indirectly, certain aspects of the Ontology of Reality itself.

For once logic and mathematics have created their constructs, at some point they seem to stop understanding themselves - there is a lack of resolution in certain dimensions of their knowledge, a lack of formal tools capable of resolving such problems precisely, that is, unambiguously[11].

So there are also natural limits to the scientific penetration of the structure of reality through form, that is, the formalism of logic and mathematics and their understanding in the context of metamathematics, and further, the proper understanding of their form in relation to the behaviour of real processes, the

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[10]By the way, the humanities have formalised quite well since the time of N. Wiener (formal grammars of language, fractal structures of language texts, and especially the topological representation of language, as presented in many articles by R. Thom).

[11]Poetically speaking, a third party is needed in this matter, someone who stands as if above formalism, but understands it perfectly and is capable of resolving and understanding the reasons for its emergence and existence in the formal sciences. But who should this person be? Someone may also say that this question is meaningless, but let them justify it substantively, not just negate it because they don't like it, for example. To put it colloquially: one person likes this, another person likes something else. Nature is diverse, or in other words, rich in everything, and perhaps even too much to fully comprehend.

understanding of the functioning of reality and, above all, human behaviour, and, paradoxically, his (one's) thinking, which he generates from his own mind.

And then, sometimes, he himself cannot determine the truth or falsity of such a thought in the form of a mathematical, logical or even metamathematical creation. But this also applies to certain constructs formulated in verbal form in relation to the forms of language of a given humanistic scientific discipline. It could be said that somewhere in our Id there are ideas that we express, and then sometimes we cannot give any information about their truth or falsity (because, according to Freud, we do not have access to them...).

4. Humanistic Credo of Content Representation of Reality (as the Vision of its Ontology)

Renowned French mathematician (topologist) René Thom (Author of the motto), creator of the Elementary Theory of Catastrophes (Thom, 1972), as well as other great scholars such as T. Milewski (1963), D.E. Berlyne (1969), J. Piaget (1977a; 1977b; 1981), R. Dubos (1971), A.N. Kolmogorov (1988), highly valued our second signalling system, recognizing its significance and role in human thinking and in the pursuit of science to formalize this system with a cognitive and utilitarian character[12].

In the unification of science within the framework of our thoughts and human speech, abstraction with the structure of protoplasm, that is, in the concept of everything together, so that matter, content and form, word and number form a single structure (unfortunately a complex one) — a whole.

They all, together and independently of each other, place great importance on the science known as Linguistics. Therefore, what can it offer to the entire science in terms of, beyond understanding social processes and the environment, that is, reality, through the study of speech and its language as a form (structure) of speech and a medium for conveying information (through thought and also its symbols[13])?

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[12]*The second signalling systemhas only a verbal representation, yet it is so important in the human intellect. And not only that, because it was through it that N. Wiener (1948, 1950) created cybernetics.*

[13]*Some mathematicians claim that natural language generally plays a minor role in mathematics. This way of thinking is reflected in the theses of the intuitionists, as well as in some aspects related to the understanding of reality in the works of the advocates of conventionalism (Ajdukiewicz 1935, 1960). In addition to K. Ajdukiewicz, who is considered radical in this view (almost the entire language of science is conventional, and to a large extent also the language of nature - encyclopaedia), there were also other great luminaries of 20th century science, less radical, who had their own scientific opinions on this matter, such as R. Poincaré, B. Russell (1958).*

However, it is necessary to ask to what extent this Reality allows us to explore and understand it. We attempt to answer this question in the discourse of the content of the following text from the perspective of the fundamental disciplines of the humanities.

These include, linguistics (carrier of information), psychology (carrier of thought), and sociology (which, in practice, focuses on the social behaviours of people, embodying the essential features of the ontology of the previous two fields of human behaviour). Our social behaviours are, logically speaking, the conclusion (sociology) of its premises, namely linguistics and psychology (carriers of information and thought).

5. Reality in the Dimension of the Social Sciences

How, then, do the views of some of the leading figures in the humanities, and above all the theories of these sciences (as represented by their most important luminaries), relate to the issues mentioned above, namely the ways in which theories are created within the classification of concepts, the understanding of all kinds of natural systems through mathematics and logic, and now through the science created in thinking about these issues as represented by the humanities disciplines, as they are the focus here?

We place the main emphasis of our reflections on their role and place in understanding reality. This remains, after all, the most important question in relation to our understanding of the content of our environment (matter). Does mathematics play the leading role in the so-called cognitive sciences (does the queen decide everything in what she governs and manages), or are psychology and linguistics the creators and the primary ones in the understanding of natural processes[14]?

It is said that there is only one science. However, human thinking, due to its unified, coherent semantic and cognitive space, is, in mathematical terms, a continuous process (Thom, 1972; 1973a; 1973b; Berlyne, 1969; Piaget, 1981; 1977a).

Therefore, humans are potentially capable of generating a continuum of directions of thought, and this in a structural dimension, not just isolated thoughts (Ashby, 1963; Russell, 1958; Ashby, 1963), and even paradigms of science. Are they always understood (theoretically, they should be) by the paradigms of other fields[15]? Does

[14]*This important issue from a cognitive perspective will be further developed in the following discourse with regard to the role of the relationship between language and thought in understanding our environment, objects and processes contained within the reality of* R^3 *and itself.*
[15]*The following paradigms serve as empirical evidence: structuralism, systems analysis, and in recent decades, the dynamic theory of complexity has been developed.*

mathematics understand the humanities, and do the humanities understand mathematics[16]?

After all, all of these arise in the human mind. And the question arises, why did all these sciences emerge, that is, what were the reasons behind them? And an additional question, why are there so many of them? Is it the coherence of the mind that solely accounts for the state of our human science, or is there some additional factor involved (an unknown particle related to cognition?

This is, in a sense, analogous to the search for the particle of God in the structure of matter by physicists). With regard to the pragmatics of this problem related to the language of understanding our reality, paradoxically, both the language of science and natural language are at play. In both of these languages, the focus is on their forms and contents, but through thought (the content of its structure).

The form is contained in the structure of natural language (syntax) and the language of mathematics, logic, and metamathematics. The content, on the other hand, resides in semantics (in speech and thinking in a broad sense, thus also encompassing mathematical thinking in its conventional language)[17].

Although this issue can also be seen as follows: in the language of every field of knowledge, its content-semantics is embedded through the form of that field (because each of them creates its own language through this 'speech')[18].

Moreover, even in the disciplines of logic and mathematics, it is possible to provide examples of a twofold understanding of formal structures, once in terms of syntax and, in contrast, in terms of semantics. However, the crux of the matter is

[16]*Norbert Wiener once said that the humanities are barren soil for the cultivation of mathematics. But since Wiener's time, even in this singularity, the situation of the methodology of science has changed (today we know generative grammars that describe the nature of language syntax). A continuum is an ordered structure; it creates space, but what orders it? There is a theorem in set theory which says that the set of real numbers is well ordered, but its elements, the numbers, have no neighbours (Kuratowski 1965). They are dense, so perhaps our thinking is dense too - although it is ordered by its name, it has no neighbours, each is for itself. But numbers are divided into categories, and by analogy thinking takes place in the dimension of categories, and their number is finite, just as the number of categories of numbers is finite.*

[17]*This line of considerations is associated with the well-known Sapir-Whorf hypothesis. There are many scientific studies on this subject, see, for example, Kołwzan 1983.*

[18]*The languages created by their scientific experience in the individual sciences, so far, do not form a homogeneous language of science understood globally. We will want to mention this further in the discussion related to the unified language of our human science and its language (the concept and attempts at its creation).*

understanding, and this category is embedded in our thinking[19]. A few thousand years ago, there were no lectures on mathematics and logic[20].

Nevertheless, natural language and thinking have already functioned excellently in tandem. However, the question remains: from which origin does this common ground between speech and thinking originate? In addressing this subject, the Russian psychologist L.S. Vygotsky employed a pragmatic and logical approach. He proposed the hypothesis that thinking and speech developed genetically independently, but at some point, these independent developmental lines crossed, and from then on, thinking was based on words (inner speech), and speech became an intellectual activity, thinking (both paths owe something to each other, and both enriched each other with something new)[21].

The process of combining the fundamental structures of ontology (archetypes) in a mathematical way was expressed, already presented above, by René Thom in his Elementary Theory of Catastrophes, whose semantic, philosophical, and topological ideas and interpretations are contained in his numerous scientific works (Thom, 1972; 1973a; 1973b).

6. Categories of the Forms of the Locus of the Human Mind

The relationship between speech and thinking demonstrated above indicates that the structures of the semantics of language are implicated in thinking processes, and conversely, thinking is expressed through speech via its form, i.e., (language). Consequently, these two trajectories of human mental development have resulted in the establishment of what is currently referred to as the Locus of the Mind.

6.1 The Locus of the Human Mind and the Form of its Expression

The main component of language is syntax. Therefore, the category of analogy—the relation of the symbol of thought to the sign of spoken language—comes into play here. The historical emergence (somewhere in the past) of the symbol marked an important evolutionary leap in human thinking.

Human mentality changed (perhaps in a leap), the way of perceiving the world, and possibly the realization of why we are on this Earth. A different quality of life itself emerged. The conscious values of human existence appeared in the form of ethics

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[19] *As Jean Piaget once said when contemplating the language of science and the possibilities of its creation through our cognition, he concluded his thoughts by referring to our human protoplasm – there, in it, is the answer (Piaget, 1977a).*
[20] *The first historically documented university was established in Athens by Plato, with an inscription written (in colloquial English translation) on the pediment of his school, now known as Plato's Academy: '... No one who is not familiar with mathematics has the right to enter this Temple of Knowledge.*
[21] *L.S. Wygotski, 1971; 1989.*

and morality. All of this is connected with the concept of human behaviour in the context of the Environment (after all, animals exist in the same reality as we do).

This is why psychologists, particularly in the early stages of the development of behaviourism, predominantly held the view that natural language constitutes a somewhat refined system of animal language signs. Today, it is known that the differences between animal and human language manifest in many dimensions.

However, the most important of these is the creative process of information processing that is afforded to language through the human mind, which includes the aforementioned second signalling system, or in other words, two-class symbols. These, in turn, are represented by the generativity of language, which is partly expressed by generative grammars[22]. An element of this process is teaching, and furthermore, the goal of instilling in the teaching process is also to shape, in addition to the main goal of teaching, the process of creativity.

One might assume that the process of creativity is genetically assigned to humans, but nothing prevents it from being refined through Education (for example, creating, through scientific thinking, an anti-gravity car)[23].

Thus, the semantic space born through evolution, also referred to by some as social space (studied by sociology), has created a different quality in our human language wherever these conditions (causes) have occurred. The fundamental difference between biological sign space and semantic (symbolic) space lies in the fact that, with respect to the former, the number of basic signals indicating biologically significant events is small.

Social organization (social organizational structures) has limited and reduced the threat of their emergence in human life in relation to many dangerous situations. In their place, human life dynamics could have shifted towards representing new, less frequent but more complex situations, and thus artificial in relation to the first ones.

Moreover, they constituted a new quality of thinking. They replaced it in the mind with new signs and symbols of thinking and physical action. As a result, a unified geometry of the surrounding world emerged. After all, the dimension of this geometry is difficult to describe mathematically[24].

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[22]The hierarchy of language signs will be presented in further discourse on this topic, including even from the perspective of their evolution.

[23]See, for example, the article written many years ago on this topic, Cz. S. Nosal, Education for Creativity. In: Creative Information Processing. A Cognitive Approach. Delta, Wroclaw, 1992.

[24]R. Thom (1972; 1973a; 1973b) suggests that the essence of meaning, i.e., the understanding of the semantic space by humans, lies in the fact that human thought, which gives rise to a single sentence, is a form of dynamic behavior describing the functioning of the human nervous system. The individual paths (attractors) of the system represent nouns,

The necessity for new symbols (two-class signs) to describe these situations was also identified. Consequently, syntactic structures emerged, that is, language. The globalisation of space, consequent to the emergence of the symbol (facilitated by the imagination), has also been posited as a contributing factor to human cognitive passion. The cultivation of this passion is a fundamental objective of education. In a broader context, the issue pertains to education in general, and more specifically, to the process of its realisation on a global scale.

Moreover, the pinnacle of this process is creativity. This creativity is a consequence of the abstraction of the sign and symbol. It is precisely this property that facilitated the development of disciplines such as mathematics, or more precisely, its conceptual framework. It is evident that numerous facets of the natural world manifest a structural essence that can be articulated through mathematical relationships.

The following inquiry is thus proposed: in what manner does thinking manifest in practice, in relation to its fundamental dimensions, namely mathematical thinking – precise thinking – in the context of soft structures (psychology, linguistics, and sociology)?

Moreover, and perhaps most crucially, it concerns itself with the quotidian modus operandi of thought (the structural and expressive characteristics of routine, pragmatic thinking). This constitutes the focal point of the ensuing discourse.

6.2 Pragmatism of Thinking in the Aspect of Soft Structures (for Practical Management)

One might think why consider and apply, with regard to the pragmatics of thinking (management, and indirectly to the theory of organization and other sciences), where logic and mathematics must be used and are applied (for the purpose of optimizing decisions made there), any highly complicated theories from these fields, which also sometimes generate unsolvable scientific problems even within their own scope? It is enough to use simple formulas with unequivocal solutions.

Because, since mathematics and logic face problems related to their conceptual system presented above, let them resolve these within their areas, in the domain of abstractions of these sciences. Management concerns set (objects) usually with a finite number of elements and is in some sense related to ordinary human actions (a simple direction of our thinking) (Thalassinos *et al.,* 2023).

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while the surfaces separating their outlets (basins) are represented by verbs. Speech is then interpreted as a mechanism gradually transmitting the components of thought processes. The reception of speech involves the reverse mechanism. It is stimulated by a thought analogous to the original thought of the sender. The communication process occurs in the environment – subject (E-S) system.

For example, a very practical and important logistical problem associated with supply chains for delivering products to customers involves the use of pragmatism in its solution (optimization), because a finite set has a finite number of combinations (relations) occurring between its elements, and there is no need to apply concepts related to, for example, the decidability or undecidability of the system, or the necessity of utilizing the concept of infinity for a finite number of operations in this field of management.

This is sometimes true thinking, but at other times it turns out to be illusory (for example, a segment on a line of finite length contains the same number of points/numbers as the entire infinite line.

However, these points are not the same for both dimensions). Indeed, there are also such (generally speaking) sets with a finite number of elements, from which infinite sequences are generated, called their language, which is the product of a finite set of generative rules. Some of these languages are related to the aforementioned problems of decidability. Such mathematical objects are part of combinatorial systems. They are related to recursive functions (computable functions; Blickle, 1971; Grzegorczyk, 1969).

Furthermore, finiteness (finitism) was the foundation, the generator, for creating theories of properties related to the concept of infinity. These are applied in certain areas of management, particularly those related to combinatorial systems.

However, classical logic itself can also generate an infinite number of its own laws, which result from and are generated by a finite set, the axiomatization of logic (Grzegorczyk, 1969, pp. 106-107). Moreover, the concept of management extends beyond the realm of production processes and the provision of products that address fundamental needs.

Human needs are diverse. It is evident that, within the spectrum of their varied requirements, there exists a subset of highly intellectual needs that are of paramount importance. These include artistic, scientific, exploratory, and other human interests such as the study of continents. These interests are indicative of human curiosity and creativity.

Among the scientific needs, there are logical, mathematical, and metamathematical ones, related to the boundaries of human cognition, which we discussed at the beginning of our considerations (Barnsley, 1988; Chwistek, 1963). And among the artistic ones, needs related to art, culture, and music are also fulfilled. In essence, these phenomena can be regarded as manifestations of the fulfilment of human needs related to an important characteristic of the human mind.

In the field of psychology, this characteristic is termed cognitive curiosity, and it is posited that it is the result of which that creativity is born. The cognitive curiosity of

the human mind is the underlying force that has shaped the present earthly world in the realms of science, culture, art and, in general terms, civilization[25]. However, the behaviour of systems and objects, especially complex ones, contains – within its structure – an element of uncertainty (randomness). It also has its ontology defined by Nature.

Here, we face a dual problem of complexity associated with determinism and randomness. To understand the structure of such complexity, appropriate tools, methods, and theories (models) are needed, as well as paradigms, preferably of a mathematical nature (involving probability theory and mathematical statistics – it is mathematical statistics that governs the measures and tests for examining the degree of randomness in processes).

All of this comes down to possessing an appropriate system of concepts and their classification in understanding the studied reality. One of the most enlightening categories in terms of perceiving what surrounds us, in recent decades, is a scientific category sounding lofty, as it is a linguistic concept: Fractality.

7. Fractal Thinking in Management

We have already mentioned the ability of our brain to generate different ways of thinking. This has been empirically proven by the history of the development of science, especially in the 20th century. One of these brilliant ways of thinking is related to the fractional dimension of material objects and even of humanistic thinking, that is, thinking that is not only abstract but also content-based. This direction and way of thinking is the theory of fractals.

[25]*Man, as a being with free will, has the right to explore the world and even his intellectual creativity (that which is born of cognitive curiosity - ours) and, above all, the nature of his mind. To this end, formal methods are used, including (and perhaps especially) those that deal with cognitive shortcomings (paradoxes, the decidability or undecidability of certain scientific problems, and thus the possibilities and limits of knowledge). And how does all this relate to management? In science, there is a fairly broad discussion about the management of human knowledge. Knowledge management can be described as the ability to use knowledge pragmatically, i.e. to apply it in practice. And this is, in a way, our answer to this question. In other words, you have to be able to apply the appropriate knowledge of formalities, i.e. the formal systems you have studied, to different forms of management. This is because, in order to manage something effectively, one must understand what is being managed in terms of the content of its behaviour and, above all, one must know its structure, including the properties of the systems associated with the aforementioned forms of management (if there is a need to use a formal representation of the managed object). And it is at this point in our considerations that one of the most important questions arises: to which objects and, more generally, to which processes should formalisation be applied in their management, including the most complex ones, for which one can focus solely on their content, since they do not require any formal systems. In fact, in order to manage something effectively, it is necessary to understand what is being managed in terms of the content of its behaviour and, above all, to know its structure*.

7.1 Fractal Representation of Forms and Contents through Objects and Processes

The theory of fractals is essentially a branch of geometry (topology in general). The creator of this science called it the geometry of nature (Mandelbrot, 1982; Barnsley, 1988). We discuss it to ask Science what new insights this theory brings to our thinking, especially in relation to our main topic, the relationship between form and content.

Fractal thinking creates a different perspective for seeing and understanding the world, compared to the classical one, which reflects the thinking of the philosophy of the ancient Greeks, known to this day through Euclidean geometry. It can be said that the fractal representation of reality introduces an additional, even enhanced order in relation to the objects studied.

It brings to human knowledge a new, formal way of measuring the structure, behaviour and other characteristics of certain objects and processes in the real world (riverbeds, mountain peak formations, cloud layers and other phenomena of reality) as well as abstract constructs of science itself (Cantor set, Sierpiński triangle, Mandelbrot set).

It adds a new form of content measurement to science. This is an unprecedented achievement. To put it poetically, it is capable of expressing content formally and, in addition, in fractional form. In the past, people knew only integers, but they discovered fractions. The science of the previous century uncovered the fractional dimension of objects and processes present in spaces with integer number dimensions (Mandelbrot, 1982).

The ancient Greeks sought in the surrounding world of everyday life events the pure forms and order (in the spirit of today's science—forms untainted by disturbances, such as randomness). They attempted to reduce the entire structure of Nature to ideal patterns, also using the tools of mathematics.

Contemporary science (especially praxeology) also seeks patterns, currently called invariants. In nature, however, something that’s ideal in its form either occurs or does not occur - it is not realised. The explanation of this essential paradox has been explored by W. Ross Ashby (1963), Ilya Prigogine (1995), Edgar E. Peters (1997) and others.

In their research, these scholars demonstrated that Nature does not tolerate symmetry or equilibrium, which are traits (concepts) used by the creators of Greek geometry and philosophy. Even today, many scholars still understand the behavior of nature in this way.

The objects created by Nature are not perfect counterparts of Euclidean figures, as they are real, not ideal, as in the mind of their creator (in the theory of Euclidean geometry). And although the reality that humans perceive is not ideal, this does not constitute any mental obstacle to creating these ideal constructs. Due to the asymmetry in the structure of our brain, humans have unlimited capabilities in the creation of new objects, both in the real and abstract dimensions.

The contemporary way of thinking consists of so-called real and abstract realities. Human symbolism manifests itself in the ability to assign descriptions to real and abstract objects in the form of drawings, signs (symbols), and verbal representations (these are forms of representing the studied reality).

Therefore, perhaps only in the assumptions of nature (its laws) are objects ideal. In reality, the realization of objects somewhat deviates from the design (model). The cause of this state of affairs is currently attributed to so-called randomness, to the random factor involved in the behavior of processes and the creation of objects[26].

Questions thus arise: What lies at the core of the ideal of a structure, object, or process, and where does the lack of this ideal manifest? Is the random factor the third player between idealism and realism? Who or what created this factor? Where does it come from? What are the foundations of human thought structures that lead to reasoning and to the production of results in the form of objects of a mathematical nature, i.e., ideal in the sense of Euclidean geometry, or, in a broader sense, in the sense of the creation of mathematics as a language representing the human capacity for abstract thought and, consequently, for the formal representation of reality[27]?

This can be explained to some extent by the essence (structure) of human symbolism (aside from the involvement of the random factor). A sign, by its nature, is arbitrary (Milewski, 1963; Saussure, 1971; Hockett, 1968). This arbitrariness also constitutes the essence of our human thinking (Berlyne, 1969; Piaget, 1966; 1970; 1977a; 1977b; 1981).

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[26]*Where does randomness come from in the real world? Is it generated by nature, or does it come from some other source? These are questions of a purely philosophical nature. And philosophy rarely provides clear answers to the problems it poses, or rather to the problems it is asked to solve. These problems are addressed by sciences such as mathematics, physics, chemistry, biology, psychology, linguistics and others. It is studied by physicists within the framework of quantum physics (Acin and Masanes, 2016).*

[27]*The questions raised can, to some extent, be explained by the nature (structure) of human symbolism (even with the involvement of the random factor, as it also plays a role in linguistic communication). However, within the structure of language, its opposition to the random factor is represented by an important property: redundancy. A sign is by nature arbitrary (Milewski, 1965; Saussure, 1971), and arbitrariness is also an essential feature of human thought (Berlyne, 1969).*

There is also another explanation for the nature of this important problem from a cognitive perspective. This view is derived from a concept (paradigm) that is broader than the theory of fractals (of which it is only a part), namely the Dynamic Theory of Complexity. It is precisely on the basis of the Dynamic Theory of Complexity that today it is easier to explain such a significant issue as Darwinian evolution (at least certain stages of development; Peters 1997, p. 10).

The Dynamic Theory of Complexity is also applied to natural language[28]. Example: In the most general terms, when significant structural (evolutionary) changes occur in a particular process, they affect the entire area in which that process takes place[29]- the change occurs here and now.

Moreover, it is precisely this theory that aims to integrate into a single formal whole many factors that create the complexity (structure and behavior) of systems and dynamic processes of reality (Peters, 1997, p. 133 et seq.). After all, the question is not only where the laws that control the processes (globally manage them) come from, but also whether man is only able to generate (reproduce - know) them, or can he also create them? In this case, it seems that the influence of Man on the behavior of Nature is small.

Man has no great causal power here. Perhaps the laws in question are embedded in the foundations of the organization of reality (its ontology). And then, for example, both the structure of symbolism and complexity theory have one and the same ontological base, which ontological base must also be present probably in human DNA[30].

And now it is still necessary to conclude this aspect of our deliberations with a question with regard to Dynamic Complexity Theory. What new does it bring to our human cognition. The answer is as follows: The Fractal Theory is a part of the Dynamic Theory of Complexity.

But fractal theory does not answer the questions of why a given system has this and not that behavior (structure). On the other hand, the Dynamic Theory of Complexity attempts to provide an answer to how the studied system behaves, and even how it emerged.

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[28]*The Law of the Neo-grammarians (Milewski, 1965, pp. 36-37).*
[29]*The absolute validity of phonetic laws [Milewski, 1965, pp. 141-142].*
[30]*The philosophy behind this way of thinking is expressed in the publications of many contemporary scholars in the field of human sciences: Tony Plummer (1995), Edgar E. Peters (1997), René Thom (1972), as well as in the thoughts of Chinese philosophers who were engaged in science long before Europe in its modern understanding (as an organised entity consisting of independent states) came into existence. China, under the name of the Middle Kingdom, existed before the emergence of Europe.*

There is an analogy here between the structuralism perspective and the systems approach in the analysis of objects and processes. Furthermore, this theory also represents the contemporary understanding of the general systems theory[31].

What follows from our reflections for the practice of management is that, since theories are beautiful and life is without emotions, it is a reality (even a ruthless one). Therefore, our reflections will be reduced to some conclusions of both practical and theoretical nature for further research in the field of content and form of management and cognition.

8. Conclusions

The two dimensions of the relationship between form and content have been analysed: the formal dimension (mathematics, logic, and metamathematics) and the humanistic dimension (psychology, linguistics, and sociology).

From this analysis, several conclusions must now be drawn, which form the cognitive categories of both dimensions of our analysis, that is, the relations occurring between the form and content of our World and also of ourselves (Human beings). This, particularly in relation to the theory of organization and management.

[31] *We will now present the mathematical understanding of complexity theory, but only in its substantive formulation. This theory deals with a large number of apparently independent factors that can spontaneously organise themselves into a coherent system. In a set of objects of such complexity, there must be some common hidden property that manifests itself under certain circumstances. The question is how one can locate this circumstance, or, at the very least, forecast it approximately. Complexity itself may be a dynamic process or an object.As humans, we have the ability to recognize the qualitative aspect of a complex object without* being able to measure it precisely, meaning to provide (encompass) formal measures of its quantitative (numerical) and analytical aspects (forms). But we can also understand their content – meaning. Trees, handwriting, riverbeds – all of these are objects and processes that possess both individual and general characteristics. The science of complexity asserts that they differ in their details, yet they are conceptually similar (similar in content), meaning they are locally random but globally deterministic (Peters 1997, p. 10; Prigogine, Stengers 1990; Piaget 1981). Some of these objects have been called fractals. According to the definition adopted by Mandelbrot (1982), they are, generally speaking, self-similar figures. These properties can be observed in many dynamic systems, such as the global Earth's ecosystem, social processes, and the systems of speech and thought. The existence of various characteristics in systems or objects of Nature and their interaction—i.e., the creation and functioning of the mentioned structures—has been referred to as coherence. Kauffman (1993) proposed the idea that the spontaneous action of coherent structures is a more plausible explanation of evolution than Darwin's theory of gradual changes (in a certain sense, based on the concept of continuity). There are numerous examples of such spontaneous changes in nature, as well as in social behaviours, art, philosophy, and natural language (The Law of the Neo-grammarians; Milewski 1965, Gołąb et al. 1968). Traditional models are unable to cope with their complexity and the emergence (generation) of such real-world situations.

These can be briefly summarized as follows:

- The formal sciences face serious issues primarily related to the decidability of certain (yet contextually and cognitively significant) theories and concepts developed within their frameworks.

- This creates certain cognitive and interpretative problems of the theories of these sciences in practice, that is, in the pragmatics dimension of logic, mathematics and metamathematics. Problems of unambiguous understanding of certain processes described by mathematics, or only objects. This is reflected in practical management based on formal modelling.

- Humanities symmetrically to the formal sciences also faces serious cognitive problems within its theories, which are highly dependent on the formal sciences and the property of arbitrariness of the sign. This involves synonymy and homonymy, as well as the mutual translatability of terms within one language in one field of science to another (due to the arbitrariness of the sign). Translatability of the language of science into colloquial and vice versa. Colloquial understanding of the terms and systems of the language of science. Science is created for people, not just for Scientists.

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