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Ontology and Diversity of Soft Structures: Semantic Dimensions in Decision-Making

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Abstract:

Purpose: *Scientific literature addresses the essence of the diversity of Nature, meaning its ontology and structures (both hard and soft). Studying these structures provides opportunities to gain knowledge about Nature for both cognitive and utilitarian purposes. One of these purposes is broadly understood Theory of Organization and Management. This article aims to present the role of soft structures* in *explaining the representation of structures, objects, and processes expressed in formal languages—mathematics and logic.*
Design/Methodology/Approach: *In scientific inquiry, significant emphasis is placed on the concept of information, its role, and its importance in science and everyday life. This text will also discuss the second dimension of our reality—ourselves—our structures of thinking and communication in social processes, and their role in management practice. These so-called soft structures have a broad presence in reality and carry semantic significance, especially for humans in understanding our environment. The concept of information also plays a role in understanding hard structures and, therefore, in understanding ourselves. This study employs a critical analysis of the relevant literature, presenting the views of various scholars from fundamental fields of knowledge that address these issues.*
Practical Implications: *The article presents the view that fractality and generativity introduce new perspectives on soft structures compared to classical methods. These two scientific categories utilize formal operationalization (mathematical and logical).*
Originality/Value: *The article first discusses the content from a methodological perspective and then addresses the form, upon which hard structures (physics, technology, and others) are based. The originality lies in combining fractality with generativity, an approach that is absent in the existing literature in an operational sense.*

Keywords: *Social processes, linguistic communication, information and its forms, coherence of concepts, measurable dimension of soft structures.*

JEL codes: *L22, M11, O32, C80.*

Paper type*: Research article.*

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1. Introduction

In order to manage anything well (but not necessarily govern), i.e. any area, or even just some of its dimensions (human social activity), one must have some knowledge about what one is managing (because not all dignitaries who govern have knowledge about what function they represent (this is called competence - to be able to manage the best previously known structure of a given area, dimension of activity). This is what knowledge is needed for, and sometimes only information.

Knowledge is acquired by studying the structure (organization) of processes, their degree of complexity and behavior. And then through the process of explaining why this and other objects (processes) behave in this way and not otherwise, only then can appropriate decisions be made. It would be ideal if all this could be included in some whole and at the same time explained why a given process behaves differently from another and at the same time provide an answer to the question of what the nature – complexity, structure of such a process and others is, i.e., generally speaking, to know the structure of reality.

These are only assumptions (but not theses; some assumptions have theses, but we often have to wait many years for their proofs), formulated by L. von Bertalanffy in his scientific concept of including all structures within the framework of the General Systems Theory (Bertalanffy 1949, 1968, Polish edition)[4].

The developed text only symptomatically tries to indicate to what extent it is possible to solve the above problems. We dare to say that this is a new approach within the framework of system analysis to the theory of organization and management from the perspective of system analysis in terms of modern paradigms of scientific methodology, such as the dynamic theory of complexity, or in a sense its section constituting the study of the so-called fractals of real reality (objects and processes) and that also related to soft structures, this important social factor[5].

Because soft structures are not only important in linguistics and psychology, but also constitute fundamental factors in economics and sociology, in the knowledge of our social life. The presented approach takes into account diversity in the aspect of the theory of complexity of systems in their dynamic – temporal behavior. The entire text presented below concerns the nature of objects and processes of soft structures, that is, significantly originating from the areas of the humanities. They are dealt

[4]*Much earlier than L. von Bertalanffy, the concept of systemic research on the structures of science was formulated by the Russian scientist A.A. Bogdanov (of Polish origin – vel Malinowski) in 1912. After all, the creator of the General Systems Theory does not mention him in his work (Bogdanov 1912). Much later, in 1977, B.J. Brosilovskij put forward the idea of creating a theory whose elements (theory of systemic theories) are approaches within the framework of systems theory (Brusilovskij 1977).*

[5]*For the inclusion of which in their models of economic and social science, D. Kahneman and A. Tversky received the Nobel Prize.*

with, i.e., studied, primarily by psychology, linguistics and sociology (but also many other sciences, which are largely related to the above-mentioned ones).

Knowledge obtained from scientific investigations of these sciences (or at least part of it) should be of a utilitarian nature, i.e., applicable (used in the field of broadly understood management). From this point of view, it must be said that it is the science of management that is subordinated to the category of diversity – the nature of processes and objects, and through its prism it should implement and implement its main functions in management practice. Here, the direction of relations must be reversed towards ontology management, and not the other way around.

1.1 Threats and Human Needs as Generators af Soft Structures (Social, Psychological and Communication)

There was no science yet, and thus no such fields as psychology, linguistics and sociology, dealing with our human needs and threats (in the content dimension) due to their competences, and there were needs, because there was society. There were and still are threats from Nature, and above all from man in relation to their realization (needs). Both of these forms are primary (just as there are primary concepts in mathematics, so we can consider our needs and threats as primary, born together with man).

They forced people to think about creating many social structures related to their nature, content, in order to "become independent" from the laws of Nature. Why? Because reality has no consciousness, is always itself and can also be ruthless in the sense of reasoning about values created in our human consciousness and universally recognized (earthquakes, volcanoes, floods, severe winters and heat and other cataclysms delivered to us by Nature and ourselves, such as wars, as a "gift").

Man took care of his safety through acquired (or perhaps given) reason and awareness and observation of the behavior of his environment. Social structures, and generally speaking the social organization created by man, eliminated from our lives (or only sometimes merely limited) many of these listed dangerous life situations – threats (man built houses, bridges, learned to sew clothes and satisfy many other needs and thus avoided these first threats: toil, hunger and cold and compensated for them through rest, agricultural crops and built houses)[6].

[6]*Our thought dynamics could be directed towards new thinking, aimed at creating new forms of activity, through symbols and signs (created by this symbolic "detachment" from Nature) towards creating (through communication based on signs) the above-mentioned social structures - organizations that are permanent in the sense of existence, and not their names. Thinking, signs and symbols and the environment, generally speaking, created science. And it was only in the 20th century that the Theory of Human Needs was created. In a real sense, this means that we, people, were aware of needs, and individual and collective life somehow satisfied them. Someone appeared who put everything in order and created a scientific theory of our needs, but did not take into account the factor threatening their achievement.*

1.2 The Importance and Role of Social Values in the Dimension of Threats

Therefore, we can attempt to determine the most important categories of threats that should be taken into account from the perspective of the security of a given country and of a human being in general in the process of the education system, satisfying existential, spiritual and other needs seen from the perspective of the Management Theory[7].

The areas of threats related to broadly understood security concerning the state, society, education system, culture, ecology, economy, health, social norms (religion, ethics, upbringing) or prosperity can be defined in various ways, i.e. analyzed from different points of view. This can be security seen from the side of threats in the following arrangement (structure):

- *Civilizational*, which mainly include: political, social, health, economic, ecological, order, public safety, demographic, communication, information, education and others.
- *Their nature*, in particular as: natural, cultural, psychological and social, systemic, technical and others.
- *Sources of threat* as a threat: natural, economic, social, political and other of this nature.
- *Threat criterion* in the aspect: ecological, political, economic, social, military (military) and other threats from the perspective of the criterion of their origin.
- *Range* in the dimension: global, continental, regional.

1.3 Needs as Natural, Social and Fundamental Human Values

The creator of the theory of needs is generally considered to be (a Russian emigrant) Abraham H. Masłow (Maslov 1943, Polish edition 2013). He presented the theory of human needs in the form of a hierarchy of needs. This theory is analyzed primarily from the perspective of psychology and sociology. However, it finds its important place in the analysis of economic processes from the perspective of economics[8]. A.H. Masłow described the hierarchy of human needs in the following order (hierarchy):

Therefore, we will start this point of our considerations with the structure of generally understood threats, which can be somehow ordered (hierarchically). Eliminating (limiting) them from public life promotes the realization of needs of a different nature. It can even eliminate some threats to Nature (construction of reservoirs, embankments, etc. protections) against floods.

[7]Without methodically organized Social Education (World Consensus), there are no stable social structures – of any kind (there can only be wars).

[8]A good, competent education (knowledge) ensures a higher social position, and this causes economic development, generally the development of the State. Fulfilled higher-order needs cause the development of the country through educated people.

1. Physiological needs.
2. Safety needs.
3. Social needs (belonging).
4. Recognition needs (performed social functions of the state and offices).
5. Self-actualization needs (development – science, research, literature).

Physiological needs (*consumer, existential*) in the commonly known "Maslov's theory" are at the beginning of the hierarchy, which is quite natural. Based on the above-mentioned graph of threats, one can ask whether the placement of consumer needs in Maslow's hierarchy is correct. Moreover, in general terms, this means that human needs can be viewed from different points of view. Different goals for achieving them and the paths available to this goal can be taken into account.

Therefore, other researchers, including the Polish psychologist Kocowski (1982), also dealt with the theory of needs. One of the main research trends of this author in terms of human needs were the *superior goals* formulated by him, which are particularly important in relation to the dimension of *education*. Proper upbringing of an individual (child) results in an ethically and morally healthy society, capable of securing the needs of existence and the security of the Nation for its Country (and, if necessary, other Countries – Friends).

Kocowski, presenting his point of view (theory) regarding the classification of the goals of education (education is only one of them here, because there was no education, but there was raising children, preparing them for adult life), relates it to the cognitive concept of personality[9]. And that is why the relationship between the *self and the world* is an important dimension for his theory.

It means that the individual is a social being who functions in a community (a social community and beyond it, because there are also objects of matter there). This community (human and material communities) also regulates the needs of the individual. This author therefore distinguishes the following overarching goals naturally related to man (hierarchical), which at the same time constitute the guideline (goals) for the education of the human individual, or rather of society (starting from childhood):

- *Existential goal (E) – maintaining life and maximizing chances of further survival.*
- *Procreative goal (P) – obtaining offspring and providing them with conditions for full (comprehensive) development.*
- *Coexistential goal (K) – achieving a social position that provides the most comprehensive access to opportunity systems, i.e. alternative ways of*

[9]*This is an important category of human psychology. Jean Piaget dealt with this issue and included his scientific experiences in many publications. In this article we quote two of many (Piaget 1997, 1981).*

fulfilling needs generated in a given group or social system (what does opportunity mean? If I cannot study at the Sorbonne, but I have the opportunity to obtain higher education at another university - this constitutes an opportunity (replacing the original).

- *Functional goal (F) – achieving the highest possible efficiency in achieving the set goals, especially in conditions of coexistence, in fulfilling tasks resulting from the social division of roles.*
- *Happiness goal (S) – maximizing satisfaction and minimizing dissatisfaction towards lasting satisfaction in the whole of life*[10]

Looking at both theories of needs from a philosophical point of view, we can say that Maslov's concept is the basis of human needs, and Kacowski's approach is, in turn, their superstructure (something like a mathematical concept, it is their complement)[11]. Both of these theories together represent our human needs in their full dimension, i.e., both from the material side (consumption needs) and spiritual (art, science, ...), quantitative (production to meet needs and qualitative (product value – quality).

This is a complex process and very important for our lives. Important for eliminating threats. All this requires decision-makers: politicians and producers to properly look at these processes from the perspective of managing them. After all, both practitioners and management theorists often forget that in their actions, people use words and numbers, and both of these conceptual categories also include *risk*, which results from incomplete knowledge of the processes being studied and, additionally, of a different quantitative nature, as well as different qualitative differentiation.

Quantitative method specialists value only the numerical result more, while supporters of qualitative methods prefer the content interpretation of the result obtained. How to decide which of these two is correct? You can try to combine both representations into a whole and give this result the right value. The word belongs to the qualitative category, and the number to the quantitative category. Words and numbers are not independent of each other, so only together do they create the dimension of the decision made, although the weight of both of these dimensions in a specific case does not have to be equally important[12].

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[10]*The listed goals, although they represent different degrees of generality, have common features. First of all, they are in a functional relationship with the general goal, which is the maintenance and development of the species. They also constitute a set of conditions necessary for this goal, or conducive to it, realized at the individual level.*

[11]*A certain contribution to the general theory of human needs is contained in the position (Kołwzan 1991). This position combines Réne Thom's Theory of Catastrophes and the generative mechanism of nature and man. And this issue is also discussed in the text on fractals and generative systems.*

[12]*Equally does not always mean that it is a fair division. This problem is beautifully captured and solved by the field of game theory – zero-sum games. This concerns, for example, the division of $100 between a rich and a poor person. However, according to a fair division (in*

And that is why already in the 19th century the German economist Gossen (1854) drew attention to this important problem of the relationship between *quantity and quality*, but in relation to the economics and psychology of human behavior, through the dimension of the utility of products produced by man and goods purchased by the same man (i.e. some of these products), as well as those consumed by him at the same time[13].

Therefore, we should ask about the nature, or mathematical form, of this relationship in relation to quantitative research and, more generally, to making optimal decisions, or optimizing human behavior in relation to consumption. In both approaches to the theory of needs presented above, this has reference to the fulfillment of existential needs (especially in the material dimension).

The fundamental part of H.H. Gossen's theory, in the sense of the relationship between quantity and quality, are two psychological (psychophysiological) laws (called by some scientists extreme, critical).

The first of these laws states that, as the needs of a certain type of material goods are satisfied, the increase in satisfaction resulting from the consumption of these goods decreases. Gossen's second law states that: human satisfaction can be seen as a function of many variables, where these variables are the amounts of consumed goods of different types, which are expressed in terms of an equivalent, i.e. in monetary terms[14] (via a separable goods bundle, because it is the best representation in terms of exchange).

Finally, we should ask what these two Gossen's laws are in the quantitative – economic and social – qualitative sense. The formal representation of these laws allows us to formulate the idea that Gossen's laws explain the *mechanism of price formation*, which is influenced by two factors: the *value of the product* together with the *amount of human work* (one of the measures of this idea is the concept and

the sense of the mathematical concept of a bargaining agreement), the rich person should receive more than the poor person (Peters 1997). Simply put, the rich person can always impose conditions on the poor person, who must accept them if they want to win something in this game.

[13]But Karl Marx also wrote in Capital that: existence shapes consciousness. In modern times, this problem has been pointed out in many works, the participation of the social factor in making, generally speaking, decisions, although in a different dimension. And yet D. Kahneman and A. Tversky received the Nobel Prize in Economics for this.

[14]Today, one can ask from the perspective of Utility theory whether money is a good indicator of the exchange of value of one product for any other. Opinions on this subject are divided, but for now there is no better converter than money in the exchange of goods, as well as in the assessment of goods consumed by man. The invention of the Phoenicians, which is money, is still the best operator for assessing the value of products produced by man (in the economic dimension; but it is also said that man does not live by bread alone). Malicious people ask why the Phoenicians invented so little of this good.

construction of the Cobb-Douglas production function) and the *psychological attitude of the buyer*, who already has a partially satisfied need to purchase a given product. Here, the dimension of the quality (value) of consumption comes into play.

It is therefore obvious that the mechanism of price formation, which is the result of *human work* (the share of machine work was not taken into account at that time – perhaps it was not necessary to do so. The machine was the equivalent of the value of the product) and the *psyche of the buyer*. And that is why the above thoughts and other important scientific results of mathematics and economics, e.g. in the area of *quality of life* (Czapiński, Panek 2011; Dziurowicz-Kozłowska 2002; First European Quality of Life Survey 2007), indicate the need for a change or at least an additional look at the way of practicing and teaching *Quantitative Methods* in the aspect of making optimal decisions (also socially and economically beneficial), i.e., in the dimension of optimizing decision-making processes.

Because it is not only abstract science that is at stake, but also human social behavior, through the factor of individual behavior, which is located outside science (specialists in the theory of axiology call them a *posteriori values*[15].

It is science that must encompass them with some sensible social theory, and such that some of its dimensions can be measured with measures of a formal nature. At the same time, it is also about these formal results having a content interpretation (useful for our needs). And only then can such combined processes be measurably optimized, i.e., the form and content of the process as a whole can be understood.

[15] *What can be the most general method of informational formation of the concept of value in a human being? The moment a child begins to consciously realize that words carry some information, i.e. goes through an important evolutionary and mental step for him, his mind becomes aware that things have names. As L.S. Vygotsky once said: this is perhaps the greatest mental discovery of a human being made in childhood (Vygotsky 1971, 1978), because a person begins to understand that words can represent orders (slogans) and then an idea is born in him (a structure is formed in the concept of J. Piaget) about the existence of slogans of a universal nature, i.e. always carrying some information. These slogans are then given various important general names: ethics, science, culture, politics, threats, ... It should be emphasized here that the system of values shaped in this dimension in this way has a largely a posteriori character. In terms of content, this means that we are the ones who give names and at the same time values to events that have occurred. But we are also given values of an a priori nature, that is, given by nature, and among others through the above-mentioned system of representations (this was discussed from the perspective of the theory of needs and threats). But if there are values that are objectively given to man, then due to the transitivity and arbitrariness of the sign (the possibility of giving names in any way) in different civilizations they can obtain different interpretations and at the same time different valuations. This raises a philosophical question, namely whether our system of representations, as a result of acquired experiences (a posteriori), preserves the structure of a priori values?*

Therefore, the science called *Management Theory* together with *Organizational Theory*, just like any other science, must have some methodological foundation. All these sciences should base their research methodology on basic sciences (*Mathematics, Physics, Biology and Psychology*; Piaget 1977, pp. 121-126), because they are the ones who deal with the Ontology of Nature – its cognition, creating appropriate models, methods and cognitive tools for this cognition (practical way of applying science within the theory, models and methods) within the paradigms of science together with the above-mentioned ones and a specific philosophy of approach to this subject of science.

After all, such a science as mathematics deals with the form of processes, and soft structures represent their content, their specific understanding. And that is why this text is devoted to soft structures, with particular emphasis on social processes.

1.4 The Importance of Information in Social Processes

A *social process* is a community organized and exchanging information with each other of diverse content (often complex, as analytically complex are the structures of mathematics), the carrier of which is natural language as a basis for information in the sense of its transmission of this diverse content, because such are the capabilities of this carrier (*paradoxically, it has a wealth of content transmission and a wealth of information redundancy*). This issue is covered in more detail in the publications Milewski (1965), Piaget (1977), Kołwzan *et al.* (2024).

Therefore, one may ask why social processes should be discussed in the context of the diversity of communication (information exchange) and social behaviors related to this act. This is a scientific problem that is very difficult to capture within the framework of scientific accuracy (in the mathematical sense) and at the same time content unambiguity, due to the wealth of concepts and terms of the sciences related to this problem (linguistics, psychology and sociology). And this was discussed above - the humanities sometimes surpass even the Queen of Sciences - mathematics in terms of content. And yet, even the simplest social behaviors of a person cannot be properly understood without linguistic communication – communication with another person.

We talk about social communication and interpersonal communication. And what is the basis of such forms of communication? Moreover, what new things do they proclaim and bring to the fundamental linguistic communication studied by linguistics? Because what does the structure (base) of understanding the messages transmitted by speech and language (its syntactic structure, syntax) – statements (in the press, television, politics and on the so-called street) look like? All this together constitutes the diversity of language, i.e., the richness of the complexity of speech through connection with the dimension of thinking.

Thinking about the needs of an individual, organization, the needs of one's own and the Nation's security and those constituting the economic superstructure, such as: culture, science, sports, recreation and others. This issue was discussed in general terms above (theory of needs). And now we need to engage in a discourse on the more subtle dimensions of the information carrier about social processes, because they are complex, multidimensional as a structure and imply (apart from the processes of needs) other important cognitive consequences, also about Nature itself (for example, seemingly simple questions: who are we?, what and why do we need culture (theatres)?, why do we need science (universities)?, since I know how to farm and through this I satisfy my needs.

2. The Place of Social Processes in the Diversity of Nature

As has been said, language (as a part of speech and its carrier, its syntax) is, among other things, a social construct[16]. Therefore, in the structure of human behavior and at the same time (in parallel) in the structure of speech functioning, social processes also play a very important role, captured (expressed) in the structure of language (speech abstraction) through social communication processes.

Because humanity is generally a social creation. Some call this dimension of language functioning the sociology of language (Bokszański, Piotrowski, and Ziółkowski, 1977; Joshua, 2012; Głowiński (ed.), 1980; Sztompka, 2021). One of the main features of the sociology of language is – as Ch.F. Hockett wrote in his time – the drive to communicate. It manifests itself especially when many (a lot, but not too many) people are gathered for some purpose.

Then the purpose of communication (in the corridors) is often to maintain it, and the content of such discourse is secondary – people talk about anything (Hockett 1968). Nowadays, due to the variety of media, we talk (instead of the drive to communicate) about the so-called social communication and interpersonal communication. And based on the above content about types of communication (communication situations of people – Kołwzan 1992) that influence our decisions and thinking, we will now deal with a very significant problem in terms of content,

[16]*According to F. de Saussure's view, later adopted by linguistics, there is no language without society, and speaking (parole) is an individual feature of a member of society speaking a given language. All this takes place within speech (language) and these are two separate components of speech (Saussure 1961). Every member of any community acquires their language from social transmission (first from parents). Then, through social interaction, the community dies – its language dies, because why would an empty set need language (Milewski, 1965). Language therefore serves to communicate between people, and even between us and animals. In practice, this communication proceeds very differently, because, for example, human language and the language of bees differ only in one feature, our language is richer than the language of bees by this one feature, but it is difficult to communicate with bees, and even quite easy with other animals, although their languages differ slightly from the language of bees (Milewski 1963, Hockett 1968).*

namely the participation of us, people (as subjects) in the study and at the same time in shaping the image (allegedly objective) of social processes, i.e., what limitations (disorders) we (as individuals) bring to social processes, i.e., the relations occurring between us (in the study of our behaviors, i.e. these social processes).

There are people who consciously, and sometimes unconsciously, disrupt these processes. They do not comply with accepted social norms in their behavior. Therefore, they bring to such processes disturbances, often caused as a result of receiving information transmitted in the media.

We would also like these to be the results (of scientific research) of social behaviors independent of us (our individual behaviors during their study). That is, they should have an objective image of their social realizations by eliminating our influence (participation) on this image[17].

Therefore, in the context of the latest formulated thoughts, one can and should ask the question. How to effectively (and perhaps even effectively in the sense of presenting research results) study *social processes* in their objective form, i.e. as they manifest themselves, behave (as if in themselves), so that through such a path it is possible to obtain scientific results, and above all objective ones (through the applied tools of analysis of research results of these social processes) about the behaviors and structure of these processes important for humanity and in such a way as not to impose our (additional) limitations on them (eliminate them) for their diversity (structure).

Because after all, it is we ourselves who study our own form of social behavior. So, how does it look in terms of scientific methods? Obtaining an answer to this

[17]*Why? Well, there is a physical world that existed evolutionarily before man appeared on Earth (we are not deciding here the origin of evolution – God's or Darwin's), and even, as scientific research (and faith) shows – the world of plant and animal biology. That is, there was and functioned a dead and living world before homo sapiens appeared, that is, we humans in our current form. As humans, we create a community that is semantically different from all animal communities, which are also able to create them. Both categories that create their communities must communicate with each other, that is, have a language that is understandable to each of these communities. So what is the primary feature of human language in relation to the animal world? The fundamental difference comes down to the dimension of creativity. As Norbert Wiener (1960) wrote at the time, an ant is a reflection of the ant community. Its mental dimension, that is, the ability to create, is different from ours. But how should this creativity be understood? (Birds also create – they build nests, but the same ones every year). Man differs from the animal world in the feature of generativity of creation (a phenomenon of nature), i.e. generating new elements in subsequent stages of time, and theoretically this is a property that is potentially unlimited. This knowledge is provided to us by the theory of combinatorial systems, for example in the form of generative grammars (Blikle 1971).*

question is not only difficult, but even very difficult. Why? Great scientists have pondered the answer to the essence of this problem in the past (and also currently).

One of them was Norbert Wiener, the creator of cybernetics. He called cybernetics the science of control in a living organism and a machine (Wiener 1950)[18]. Why are we quoting here someone who created this science almost in the middle of the last century? What is its connection, not as a universal science, with information and communication, the most general, that is, social (because language has a social dimension, and speaking is individual)? Because it was Norbert Wiener who saw all the connections of structures, their analogies through the prism of the concept of information[19].

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[18]It is worth recalling that when Wiener published his work, this publication found a wide response, not only among scientists, but also among broader layers of people, who were often not necessarily connected with science, interested in the essence of cybernetics. And that is why they demanded a more colloquial interpretation of the assumptions of cybernetics. They wanted to have a verbal version of the mathematical assumptions of cybernetics. Norbert Wiener lived up to this task and wish by publishing Cybernetics and Society (Polish edition: Book and Knowledge, PWN, Warsaw – Wiener 1960). Cybernetics is an independent scientific discipline (in terms of form and content, because this was the character given to this science by its creator Norbert Wiener (In Plato's times there was only verbal knowledge – without taking anything away from Plato, such were the times of scientific knowledge on this subject. It was the idea of governing the State). However, since in the assumptions it was to be a science capable of studying machines and humans through the same or similar mathematical methods, Norbert Wiener did not unequivocally speak out whether this science would be able to influence its rightful place in governing society (Plato had already spoken out about the role of science in governing society and also called this activity cybernetics, but it did not have the methodological foundations that Wiener had given it). What was and in principle still is the objective mathematical foundation on which Wiener based his conclusions in relation to the study of social processes:
"In most of the social sciences," Wiener wrote, "we deal with short statistical series and we cannot be sure that a large part of what we have observed has not been created by ourselves... In short, whether our research in the social sciences is static or dynamic, and it should be both, its accuracy will reach only a small number of places and will never ultimately yield the amount of testable and important information about observed phenomena that we have come to expect from the natural sciences. We cannot afford to disregard the social sciences, but we should not create exaggerated hopes for their possibilities..." (Wołgin 1970). To sum up our analysis in relation to the study of the dimension of social processes, it must be said here that it is very difficult to determine what constitutes a limitation of their diversity, i.e. to what extent the structure of these processes testifies to their nature (the structure of social organizations, and to what extent our place in its creation also participates, and especially during scientific research, i.e. during the study of social epimorphism (on the biological model, locally, here and now). Therefore, if it all looks like this, why conduct a discourse on it? We need to think deeply about the process of repairing Nature by Us.
[19]He provided a measure that was apparently different from the one presented by the creator of information theory, C. Shennon (see: W.R. Ashby 1963).

3. Language as the Foundation and Carrier of Social Communication

In order for any utterance to be understood by its recipient and to be able to signify and represent reality, it must not only be limited (finite as an utterance), but there should also be a specific relation in which this utterance remains to the presented reality (this previously emphasized environment of the message). The signified side of individual words and their groups in a given text are representations (images, concepts, processes and other various concepts of our mind) contained in our psyche.

Therefore, a mental act must take place, which would be able to refer these representations to their place in reality. This is the resonance of speech and language with reality, which was mentioned above, in connection with the quoted theory of René Thom on this subject. This act, associated with a given linguistic form, is called modality in linguistics (Milewski 1965). This form of modality is always syntactic intonation and it is often its only form[20].

It is here, at this point, that we need to ask why we present certain features of language that are realized in the speech system in terms of the main topic, which is the category of diversity of systems and processes of Nature. One may get the impression that these are problems somewhat distant from this main stream of considerations, our discourse. But, as we wrote above, not everything is as it seems to us, as we see it. Namely, we know from earlier considerations in this text that linguistic communication plays a fundamental role in learning about reality, and that is why we are talking about it here and emphasizing the main elements of this communication.

These last threads also concern the aforementioned social and interpersonal communication. The question was asked about the role of these media in human communication[21]. Their place is special, because their duty as a *sender of information* is to objectively transmit messages (of social scope – dimension) through the means of language (through its sign structure) and through the means of publishers with a wide contemporary reach in terms of receiving information.

The features of transmitting messages indicated above serve these purposes. The question arises whether the means of transmitting information, such as *radio, television, the press, the Internet and the proverbial street*, remember about it and

[20]*It is a kind of strong emphasis on the meaning of the utterance for a given act of communication. It is also an important component taking part in social communication (communication of information – announcements on the radio, television and at election meetings). In social communication, developed socio-technics of transmitting information are used and this intonation can be used in such messages, but not always objectively in relation to the nature of language signs.*

[21]*Nowadays they constitute lecture subjects at universities.*

observe the principles provided by human speech through the structure of language (form) and human systems of values (ethics and morality – content). This is a broad topic and in an article that only concerns this topic to a small extent, it is impossible to present it exhaustively.

However, in a television news report, it is enough, for example, to take something out of context and provide a message without its context (the linguistic environment mentioned above), then it has a different meaning (content), a different distribution of form and content. These are also, among others, *fake news* messages, messages deliberately transmitted to the recipients of information by providing so-called *half-truths*[22].

Information, however, has a dynamic structure and the state of the system can change to the opposite. And this is probably the best conclusion for the concept of information flow, i.e., one can never be certain of one's state of possession (especially of emitting) of information.

A universal feature of C. Shennon's quantitative theory of information is its uncertainty (entropy). But entropy as a formalized measure of the amount of information contained in messages, expresses this uncertainty quantitatively (in bits of information). After all, as it is often said, *"there is no rose without thorns"*.

There are sometimes difficulties in obtaining a probability distribution for the studied process in order to indicate the uncertainty of its behavior. And science calls this uncertainty - the lack of probability for future expected information, a random event. And how W. Sadowski approached the solution of this decision-making situation, is discussed in the following footnote[23].

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[22]*These are the facts that such messages are broadcast by the so-called Fourth Power (by some of its publishers, fortunately only some). But this raises the question: who is to control, verify and hold accountable such media for broadcasting half-truths in a democracy (there are also such publishers – television stations, radio stations, which serve the government, are at its service). It is often the case that it is the users themselves (the greatest driving force here is false information). Therefore, other Authorities must also reckon with Internet users. Because Internet users are their Moral Judges (if such a judgment is mass). But Internet users also include members of publishers, religious sects, unregistered social organizations, etc. groups – there are two sides to every coin! What conclusion can we draw from our arguments? The universal reach of information is a game of the civilization of truth and falsehood. The winner is the one who has a wider reach (has a local – temporary advantage). But the cat will always come out of the bag, and sometimes we don't know when.*

[23]*We have considered above various conditions of the analyzed processes, generally needs, realized randomly, in conditions of uncertainty and broadly understood risk. Finally, it is necessary to say how the term: decision-making model in conditions of uncertainty or risk should be understood more precisely and what tools should be used to solve these problems. We will quote the understanding of this scientifically important issue by the Scientist quoted below. In the first case, it is assumed that the entity making the decision knows the*

4. Understanding the Concepts of Social Processes in the Context of Diversity

However, in order to somehow meaningfully conclude this sub-item related to the study in the dimension of the language of science, but also from the area of everyday life of the aforementioned social communication, it is necessary to discuss the most important and most difficult thread for scientific analysis, the *Nature* of the concepts occurring in it, i.e. their meaning, common understanding, their semantics. This problem was discussed above, but very generally.

The opinion on this subject of N. Wiener, L.N. Volgin, T. Milewski, R. Ashby and other eminent scholars who value this important problem for science was mentioned. However, these scholars did not provide, did not formulate a precise methodology apart from (Ashby, 1963; Volgin, 1970) what objective methods should be used to study processes important to us all and this from the perspective of their internal properties, the nature of their behavior, eideticity in the sense of E. Husserl's phenomenology (2012).

Here, it is also necessary to raise an important thread for all sciences related to the philosophical concept called *reductionism*. In general, it consists in separating important, primary concepts from less important, secondary concepts in each science, which can be defined (generated more generally) from the former. Formal sciences call this their axiomatization. Social sciences do this too. One of such operationalizations are the axioms of social choice given by K.J. Arrow (1951; 1979). However, as he pointed out, this axiomatization is internally contradictory, i.e. it is not ideal (Owen, 1975). Polish logician Jan Łukasiewicz provided his axiomatic system for the propositional calculus (Aristotle's logic), which meets all the requirements set for such systems by logic and mathematics.

An Example of Ideal Reductionism:

Axiomatics of propositional calculus (by Jan Łukasiewicz):

Primary terms (concepts): ~ , $\rightarrow$ (negation and implication).

Axioms:

$$A_1\text{: } (p \rightarrow q) \rightarrow [(q \rightarrow r) \rightarrow (p \rightarrow r)]$$

probability of possible states from the set of the probability distribution. In the second case – uncertainty – it is assumed that these probabilities are unknown. In our considerations, we will not distinguish between risk and uncertainty in the above sense, because, as W. Sadowski says, one can always take a statistical sample and estimate these unknown probabilities based on available tools of probability calculation and mathematical statistics, and if there is no such possibility, then there is no point in talking about either situation (Sadowski 1977).

A_2: $p \rightarrow (\sim p \rightarrow q)$
A_3: $(\sim p \rightarrow p) \rightarrow \sim p$.

A_1 – the law of conditional syllogism of the Stoics
A_2 – the law of Duns Scotus (Scotus)
A_3 – the law Clavius's

The accepted axioms, built from primitive concepts, do not contain functors $\vee$, $\wedge$, $i \equiv$. They should therefore be defined using accepted primitive concepts.

Definitions:

$d_1.(p \vee q) \overset{df}{=} (\sim p \rightarrow q)$
$d_2. p \wedge q \overset{df}{=} \sim (p \rightarrow \sim q)$
$d_3.(p \equiv q) \overset{df}{=} (p \rightarrow q) \wedge (q \rightarrow p).$

Note: *The definition of equivalence uses conjunction because it has already been defined. In the above axiomatic system, a separate directive is also adopted, which states that the definition should be used, which is as follows:* In any theorem of the theorem of the International Propositional Theorem, any part that is equiform to one side of the definition can be replaced by a part that is equiform to the other side of that definition.

This directive is called the definitional substitution directive. Applying it, for example, to axiom A2, we obtain the theorem
T: $p \rightarrow (p \vee q)$,

Replacing the expression $(\sim p \rightarrow q)$ w A_2 with the left side of the definition d_1. The set of consequences of the three axioms mentioned above, when added to the primitive rules of substitution and detachment, also the rules of definitional substitution, is identical to the classical propositional calculus.

This system generates all the laws of propositional calculus. But it does not provide an algorithm for achieving them (obtaining any of them). The system of axioms should be independent, consistent and complete. The axioms should be independent, i.e. a system of axioms in which none of them follows from the others is called an *independent system of axioms*.

If the axioms of one field are given, then we have the right to ask scientifically how it can or cannot be transferred to another science, which man created descriptively. But one can ask where all this comes from - this thinking of ours - we will try to discuss this topic in the following and subsequent points of our analysis.

4.1 The Concept of Analogy in the Language of Science and its Analyses

The approach to studying processes in our considerations based on the use of the concept of analogy has already been discussed above and this concept will be discussed in the further discourse. Here, however, we ask, for example and specifically in relation to science, through the views expressed by, for example, N. Wiener and R. Ashby, what connects the behavior of physical and social processes (through the biological dimension of man)? What is their similarity, the analogy of functioning? The similarity of concepts mutually affects their meaning, understanding in the practical dimension. Because when we know the analogy and description (formal) of the behavior of one of them, these methods can be transferred (homomorphically, or sometimes even isomorphically) to the description of the behavior of processes in the other domain (a behavior model)[24].

Formal sciences are very developed in terms of operational tools in the dimension of presenting transformations of one form into another, but formal. So, if someone notices an analogy in the functioning of two processes that are separate in terms of content, then it gives the possibility of transferring the methods of one field (if they have them) to the other (this was and still is Norbert Wiener's idea). This is also what happened with the connection between physics and sociology through the analogy of human behavior and the behavior of physical particles placed in a ferromagnetic field. What can be the conclusion for our considerations here?

Physical processes (physics) were before social ones, so the discovered analogies are like a natural expression of the behavior of the Ontology of everything that surrounds us. Nature, whenever it deals with a new situation for it, if it can be included in one of its previous schemes, does so, but if it is something new, it also creates from its resources a scheme (new structure) appropriate to this situation. The dynamics of the ontology of Nature allows for all this. Nature has the character of behavior, asymmetric development. This ontological property has a generative character, the character of creating something new, i.e., it has the property of being open to new situations (Peters 1997; Prigogine, Stengers 1990).

4.2 The Nature of Science Concepts in the Concept of Coherence

The last sentences of the above paragraph are a kind of link to the considerations of this point, due to the diversity and sometimes apparent analogy of the structure of

[24]*A simple but telling example on this subject was given by Ross W. Ashby in reference to the model: a natural frog and a tin frog (Ashby 1963). However, it is necessary to recall here the view of J. Piaget regarding the role of morphisms (representations), and even transformation processes taking place in our minds during information processing and, above all, learning about the reality surrounding us (Piaget 1981). On the other hand, W.R. Ashby dealt with this problem from the perspective of transformations taking place in nature (changes in physical and biological structures) (Ashby 1963).*

other fields of science and their concepts. Some time ago, the concept of coherence was born in science – oherent participation of even qualitatively different components (scientific concepts) related to the studied process, in which these factors occur and function, and which must be expressed in a coherent language creating a uniform content for seemingly different concepts (because, for example, an ontologically complex – materially object creates a whole, and science describes it with a variety of concepts.

And how to combine this qualitatively different terminology into a meaningful whole, because the described object is a whole regardless of its description)? Initially, it referred to the study of the behavior of natural systems with many degrees of freedom, which are subject to numerous influences. These influences can be combined into groups and treated as order parameters (Callan and Shapiro, 1974)[25].

Such an order parameter sums up external influences, i.e. reduces their number (degrees of freedom). In the operational dimension, factor analysis, principal component analysis, correspondence analysis and canonical analysis are used for this purpose (these are known, classical methods of combining, i.e. reducing their dimension, since they are similar, they are in one group, in one dimension (Morrison, 1975; Panek, 2009; Kołwzan and Pieronek, 2012). All these methods, similar to each other, consist in reducing the set of variables (detailed components of the studied process) and combining them into categories with a similar effect on the given process[26].

We referred to the concept of coherence in order to sensibly locate somewhere and in some way the concepts (and even categories of concepts) that we used in the text.

[25]*The cited authors applied E. Ising's model in social sciences (Ising 1925). They stated that the interactions of communities such as flocks of birds or schools of fish can be described in terms of the Ising model. Their main goal, however, was to investigate the ways (causes) that people succumb to the influence of imposed fashion or introduced manias that are then practiced collectively. They called their conclusions the theory of social imitation. This theory assumes that there is a strong similarity between the behavior of people and the behavior of particles (Ising's model) in magnetized iron.*

[26]*For example, principal component analysis involves transforming a given set of variables into a new set of uncorrelated variables, called principal components. Principal components are linear combinations of the original variables, where each subsequent principal component explains as much of the variability in the data as possible (however, it is not impossible that each original component takes a similar share in this new set). Yet another concept (similar to the coherence of natural processes) was developed by Vaga (Vaga 1991) in relation to the broadly understood market. His Coherent Market Hypothesis is a nonlinear statistical model. The basic premise of this hypothesis is the assumption that the probability distribution on the market changes over time depending on: the fundamental, i.e. economic environment of the market and the degree (amount) of group (social) thinking. When these combined factors change, the market (process environment) changes as well. The functions representing the given processes change their density, shape, i.e. their previous nature.*

These include continuity, discreteness, generativity, fractal dimension and many concepts from the area of mathematics and its branches, such as, mathematical analysis, mathematical statistics and probability theory. All these concepts came from different areas of knowledge. We used many of them in the analyses. Some of these terms are in opposition to each other (content-wise, they are somewhat contradictory).

However, the cited concept of coherence allows us to see them all together, because some manifest themselves in an advantage over others when the environment has (occupies) a certain phase of its own in a given period of time. Moreover, certain sectors of the economy or other areas of life (social, cultural, scientific) may be in phases different from each other in the same period of time. In such cases, various concepts are needed to describe their behavior.

And this is where the complexity and coherence of processes generally end through the nature of their nonlinearity and multidimensional statistics (Prigogine, Stengers 1990; Peters 1997; Aczel 2010). And all processes are always located (placed) in some topological capacity (space, information channel). So they must somehow coexist with each other[27]. Additionally, the diversity of concepts of the analyzed process is a feature of its structural complexity.

5. Reality and Human Thinking

The mathematical branch of Game Theory even operates with algorithms for playing some games between humans and humans (von Neumann, 1928; 1944; 1947; 1961; Nash, 1951; Kofler, 1963; Owen, 1975; Dixit and Nalebuff, 2009). But they are also formulated within this theory of the game between humans and Nature. And in this matter the problem becomes a bit more complicated, because humans cannot order or forbid Nature to do anything. But it, our Nature, is always itself and behaves according to the *rules* it has established (generally speaking, they are not fully known to us).

The choice of one of the possibilities, i.e. the player's behavior, in the language of game theory is generally called the strategy of the given player's behavior. So how does the game between humans and Nature (our learning about it) take place? What strategies do we have in this game? In general, we will try to deal with this problem

[27]*Burze, wichury, huragany, susze, powodzie występują niekiedy razem, albo czasowo w bardzo niewielkich odstępach czasu. Ale wszystkie te osobliwości są elementami natury, nie wychodzą poza zadaną im przestrzeń, poza wymiar. Czyli tworzą koherencję tej przestrzeni, są jej elementami. A przecież są tak odmienne pod względem różnorodności. Więc, dlaczego czynniki ekonomiczne miałyby być tylko jednorodne. Trzeba zbadać ich złożoność na wzór złożoności, ale i jednocześnie jedności, natury. Kto (co) ma tego dokonać. Otóż, stworzony przez naukę język nauki, zdolny rozumieć ontologię procesów natury (Piaget 1977; Galanc i inni 2017).*

from the perspective of the tools of cognition. Nature has basically equipped us with these tools, but has not provided rules so that we can play with it.

Through our reason, sometimes discovering some of its strategies. And our reference to formalized game theory was only symbolic. Because below we will deal with the game of man with Nature in an unformalized dimension, i.e. one where algorithms either do not exist or are not known to us (in the field of psychology we speak of heuristics of learning about reality). We can say that Nature also assigns us other than just formal skills and forms of solving content problems. They can be generally called semantic means, which are represented through thinking and speech, and expressed in specific acts of our behavior, our specific conduct.

5.1 Man as a Partner in the Game with Nature (through Thinking and Speech Strategies)

In several previous places of our considerations in relation to the concept of diversity, we have discussed the role (participation) of language in its understanding (conscious reception of its content), both through the language of science and in the aspect of the so-called everyday language and social and scientific communication.

It is through natural language and our senses and the cognitive tools created thanks to them that we very often owe the spontaneous discovery of many laws (social, psychological and other laws – physical, biological and chemical) that are present in Nature and thanks to their knowledge (awareness) we understand better our functioning within these laws and thus we get to know better or worse social processes (and satisfy our needs discussed above thanks to this)[28].

Moreover, we humans, thanks to the senses given to us, can penetrate our thoughts and thanks to this thinking discover and create various laws (theorems, e.g. the Lindeberg-Lévy theorem) and discover truths about the world of plants (Carl Linnaeus's taxonomy of plant botany). Our thoughts and language constitute the basis of our knowledge.

Therefore, due to the discussed problem of the diversity of Nature and the limitations related to it, we must also ask what are the limitations related to the structures of language (more broadly, human speech) and thinking, imposed by Nature on its knowledge. And through natural language and through speech and thinking, there is a kind of feedback in the relationship between *man and reality*. Nature gives us senses to learn about it, and on the other hand, it imposes some limitations, established for its reasons, on its knowledge (inherent in the structure of these senses).

[28]*In the matter of needs and life, humanity has formulated the following formulation: man eats to live, or lives to eat.*

And there is the other side (of the coin) of learning about reality... Man, having senses, transforms the Nature surrounding him (in a certain dimension). He creates new objects unknown to it (a plane, a washing machine, a computer). Does it accept all of them? This is a problem to be solved.

Because man may think that he is able to set the conditions for Nature to maintain itself and enforce them[29]. It wants to establish the rules of the game with Nature. And we must remember that the rules of all games are usually established by the stronger, dominant player. So what role do our senses play in learning about the laws (invariants) of Nature? What strategies are available to invariants, and what to us, who also play and have our invariants (strategies) weaker than Nature's strategies? Science tries to learn them.

But does Nature, as a player, want to beat us, i.e. does it have senses? It is not a human being? So what game are we playing with It (or maybe it is not a game, but a different variety in relation to the game paradigm)? And we will deal with this problem below (in our opinion).

5.2 The Participation of the Mind in Discovering the Laws of Nature

The existence of any principle (invariant, scheme, pattern and algorithm, and above all some heuristic) in a certain set of phenomena testifies to the existence of a limitation of diversity. The fact of the occurrence of one of them means that the entire area of diversity (combinations of their components) for those phenomena where such principles occur cannot be exhausted, from some given limitations, usually by Nature.

Therefore, the entire theory of invariants falls within the area of the theory of limitations of diversity[30]. Moreover, because every law of Nature is some kind of invariant, so *every law of Nature is a limitation of diversity (philosophically we can say: there is nothing without limitations, there is no order in us and our environment without limitations. And, is chaos without limitations? Why did science create the phrase: deterministic chaos (determinism is the strongest limitation of diversity)? The concept of chaos may be illusory, because we do not see the organization of its components hidden in it. The aim of science is to discover laws using cognitive tools*

[29]*Some scientists create something new, and then sometimes others depreciate it. Recently, there has been a problem related to the disposal of wind farm equipment (windmills). There are also problems with the storage of waste from nuclear power plants and many others related to the modern achievements of our civilization (waste from electric cars supposedly being a salvation for a clean atmosphere). Many expert opinions of scientists are contradictory to each other. Which of them are the truth?*

[30]*The theory of invariants, and in general any human actions, is the subject of praxeology. The creator of this direction of science in relation to human actions was the Polish scientist Tadeusz Kotarbiński (1965, 1982).*

and language in the form of concepts, terms and theories, i.e. means and tools that were mentioned only above, and in particular – laws occurring in Nature.

Therefore, it is concerned with searching for the limits of diversity. To conclude the above discourse, we can say that science considers the totality of phenomena with all its richness of possibilities and then asks as an observer, through the means available to him (language, tools and cognitive possibilities of his mind – if he is a person), why are real events limited to only a certain part of all possibilities (Ashby, 1963)?

Many of these events as laws, science can explain. Many of them are still being studied, and with regard to many others, the answer has not yet been found as to why they are like this, how they came to be, and why they behave this way and not differently. These are usually so-called complex processes (objects).

However, regardless of the invariant that this law is entitled to, it still constitutes a certain limitation, i.e., it creates its own, different from other structures, its own organization. And it is this structure that constitutes the essence of the invariant of Nature. One of the researchers of the world of senses, animate and inanimate matter, V.B. Dröscher (Dröscher 1971) wrote that when new situations (systems) appear in Nature, it tries to use the invariants it operates with (for example, through analogy) for them. However, when this is impossible, only then does it create a new invariant (perhaps from this resource, the warehouse of redundancy). Nature imposes certain limitations on the objects it creates. But on the other hand, it also has potentially unlimited possibilities of generating (creating) the diversity of their occurrence[31].

It introduces into the material circulation those that it wants (philosophically speaking: those that it needs). And this can be shown with an operational example. Many contemporary computer scientists and people practicing logic talk about *so-called worlds*. So let's take a logical world consisting of a finite number of premises (the foundation of this world). From a logical point of view, these premises are the cause of their consequences, and therefore logical consequences – conclusions.

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[31]*This can be shown using examples of systems of logical variables. C.E. Shannon proved the theorem that every logical system (the structure of its logical network) can be realized in an infinite number of variants (ways). Below we demonstrate only a simple example of such a system: The logical syntax of these networks is as follows:*

$$\alpha = (x \wedge y)$$
$$\beta = [x \wedge (y \vee \sim x)]$$

Using the appropriate laws of logic (propositional calculus) it is easy to prove their equivalence. We will show that $\beta \equiv \alpha$ *:*

$$\beta = [x \wedge (y \vee \sim x)] \equiv [(x \wedge y) \vee (x \wedge \sim x)] \equiv (x \wedge y) = \alpha.$$

From this logical analysis, a conclusion of significant significance follows that the behavior of a system (process) does not uniquely determine the relations between its parts, components. For details, see: (Shannon 1949, Ashby 1963, Kołwzan 2012).

Logical operationalization allows us to capture the entire possible structure of connections between premises and their possible consequences (the entire possible world of premises and their consequences, although in a specific event only one consequence is realized, one implication consisting of premises and conclusion)[32].

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[32]*EXAMPLE: If we have a conjunction of a number of premises, each of which can be any logical expression other than a false expression and such that no two premises contradict each other, then we can ask what conclusions can follow from these premises. We reserve the non-contradiction of the premises, because anything can follow from false premises. This is a well-known property of logic (Socrates runs and Socrates does not run, so you are in Rome).*
PROCEDURE FOR GENERATING CONCLUSIONS FROM PREMISES
The conjunction of premises is brought to the conjunctive-alternative normal form, and then each term of the conjunction, or only some of them, is supplemented with the variables missing from them, which appear in the premises, and therefore in their conjunction. We obtain a new conjunctive-alternative normal form, but such that in each term of the conjunction all the variables from the entire set of premises appear, but only in one form (with negation or without negation). We are given a set of two premises: $S = \{(p \rightarrow q), (\sim (p \vee q)\}$. *We create their conjunction* $(p \rightarrow q) \wedge [\sim (p \vee q)]$.
We transform the conjunction into normal form (conjunctive-alternative)

$$[(\sim p \vee q) \wedge (\sim p \wedge \sim q)] \equiv [(\sim p \vee q) \wedge (\sim p) \wedge (\sim q)].$$

The last two members of the conjunction do not contain the desired form. We supplement each of these members with an expression that will not change its logical value, and will also contain the missing variables. So: $\{(\sim p \vee q) \wedge [\sim p \vee (q \wedge \sim q)] \wedge [\sim q \vee (p \wedge \sim p)]\} \equiv$
$\equiv [(\sim p \vee q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q) \wedge (\sim q \vee p) \wedge (\sim q \vee \sim p)]$
We arrange the members and get rid of repeated ones.
$[(\sim p \vee q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q) \wedge (p \vee \sim q) \wedge (\sim p \vee \sim q)] \equiv$
$[(p \vee \sim q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q)]$.
Member $((\sim p \vee q) i (\sim p \vee \sim q))$ *was repeating. Ultimately the expression* $\alpha = [(p \rightarrow q) \wedge \sim (p \vee q)]$
is equivalent to the normal form $\alpha' = [(p \vee \sim q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q)]$.
What conclusions can we obtain from our premises written in normal form?
They can be:

1. $((p \vee \sim q) \equiv (q \rightarrow p))$
2. $((\sim p \vee q) \equiv (p \rightarrow q))$
3. $((\sim p \vee \sim q) \equiv (p \rightarrow \sim q) \equiv (q \rightarrow \sim p))$
4. $((p \vee \sim q) \wedge (\sim p \vee q)) \equiv ((q \rightarrow p) \wedge (p \rightarrow q)) \equiv (p \equiv q)$
5. $((p \vee \sim q) \wedge (\sim p \vee \sim q)) \equiv (\sim q \vee (p \wedge \sim p)) \equiv \sim q$
6. $((\sim p \vee q) \wedge (\sim p \vee \sim q)) \equiv (\sim p \vee (q \wedge \sim q)) \equiv \sim p$
7. $((p \vee \sim q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q)) \equiv (\sim p \wedge \sim q)$

These conclusions follow from the properties of the laws of propositional calculus. It can be shown that the premises and the conclusion resulting from them always together form some law of logic (tautology). If we have n terms of a conjunction, then we obtain 2n – 1 conclusions. The normal form quoted here has the property that it is unique for a given expression α. Therefore, the conclusions are also unambiguous. The desired type of normal form is called in logic the complete conjunctive-alternative normal form (canonical). Moreover, the set of premises is not a contradictory set (falsehood, because in logic

And that is why below we will deal with the nature of worlds in the world of reality (its objects and processes). And the concept of *redundancy* is used in its considerations by the mentioned *Information Theory* (Kołwzan *et al.,* 2024) to analyze the uncertainty of the behavior of a system from the perspective of its random structure (distribution of random events). In the humanistic sense, it is only a measure of the form of a given content. And one can also ask why language needs such an excess of information in the communication process, because mathematical algorithms contain zero redundancy.

But, if even one element falls out of such an algorithm, the system implementing such an algorithm will stop working, and natural language functions with such disturbances, because redundancy reduces this noise from the resources of this redundancy. *Thinking through the natural language of speech is not algorithmic. So it is, that it balances the loss of information from redundancy. And here opens up for research an important cognitive methodological problem. In what relation do the limitation of diversity and redundancy (the ability of a process to create redundancy under the conditions of the limitation of diversity for this process, i.e. the conditions of its functioning imposed by nature) have to each other? The human mind is able and often reproduces thanks to redundancy a transmitted, disrupted by fate, message, while the computer cannot. So computer scientists should also start thinking about programs with redundancy within artificial intelligence.*

6. Objects of Nature as Realizations of its Laws (Generating Objects and Processes from the Ontology of the Laws of Nature)

A clear and unequivocal limitation of diversity is represented by all real objects and processes, i.e. those occurring in the space surrounding us[33].

We are so used to them (especially to these real objects) that we accept most of them as something completely natural, or rather obvious, as if we were not aware that they exist at all, they appear around us. It is as if thanks to them we perceive the vastness of the space surrounding us. Therefore, it is something of a paradox, because it is as if these objects were marking our space for us, because thanks to them we are aware

everything follows from falsehood. The laws of logic are determined, but their realization by Nature can be random and subject to different probability distributions. And this also applies to soft structures. They are no better than the so-called hard ones.

[33]They are, in their fundamental dimension, a consequence (realization) of the laws of Nature, i.e. the laws of physics and biology, and as a result of this, of the human mind, because humans also create physical objects – a car, but also abstract ones – science in general (mental objects, but recorded in the texts of our language together with concepts defined within the framework of disciplines of knowledge (fields of mathematics – topology, for example).

of it and perceive it. Therefore, we become aware of the space surrounding us thanks to objects, although they are immersed in it[34].

After all, looking at it all from the other side, the world without limitations would be chaotic and we would not be able to distinguish objects, and even ourselves. Science additionally convinces us of this awareness in a scientific way. Today we know well that the physical world around us, together with nature (organisms and plants) and with us, create a symbiosis together. Consequently, this means that somewhere at the foundations of physics and life, all these limitations have been somehow encoded (maybe given in advance) so that the organic world immersed in the physical, could maintain this limitation (or rather realize it), i.e., its structure together with the psycho-semantic world of man.

It is as if there were a mechanism (generator) that allows for the realization of only selected (given) combinations from the system (set) of variables, and eliminates others. At this point in the analysis, one can also ask: why do these potentially unnecessary elements exist? Maybe they have to be so that others could create their structure, and when it changes, it will take on some of the previously remaining ones in its new shaping. This was mentioned above, but from a different perspective.

However, these constraints together create a reasonable structure of objects in nature. After all, this mechanism can also act randomly in relation to the selection of combinations of variables. But the stability of the invariants of our world also shows that this randomness has a limited character (it has only a local scope, a local dimension). This property is indicated by significant publications by many outstanding scientists of both the 20th and the present century and from many areas of science (Prigogine and Stengers, 1990; Peters, 1997; Ashby, 1963; Acin and Masanes, 2016; Colbeck and Renner, 2012).

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[34]*There is an analogy here in relation to signs. An excellent analysis of their place in space was conducted by the already quoted T. Milewski (Milewski 1965). And here we will connect his analysis of space and signs placed in it (through an example, an analogy of the functioning of systems) with the relation of material objects to space occurring in it. He wrote:*
"... The form of a sign, like any other phenomenon, is recognized by the fact that it differs from other phenomena. A sign differs primarily from that which is not a sign and does not direct our attention anywhere. The red light (object) of a railway signal followed complete darkness and is surrounded by it. This darkness (space) is not a sign, but we recognize the red light of the signal by its opposition to it. If everything were flooded with red light (object), the railway signal would be unrecognizable (the dimension of the object is then equal to the dimension of the space placed in it). Usually, however, a sign (object) is opposed in our consciousness not only to that which is not a sign, but also to other signs (objects that have a different variety in relation to each other), which direct our attention to content other than it (for example, an oak and a birch in a forest - this constitutes a variety of signs immersed simultaneously in one space, in the same surroundings of them)".

If the structure is well organized, then a random factor can disturb it, but only to a certain limited extent – locally. This is a feature of randomness and Peters wrote about it (Peters, 1997). A disturbed object (structure) is in most cases still identifiable (recognized as before, before its distortion). Even for random distributions, the rules (in the form of theorems) of their joint behavior apply[35].

After the general examples cited above related to the limitation of diversity from the perspective of its various dimensions (physical, biological, semantic), one should give one of these listed limitations for objects as a specific (spectacular) example of the law of limitation of diversity. For example, in relation to nature (biology). One of these law-limitations is related to the Fibonacci sequence, widely known in mathematics[36].

And we will give another significant and important example of limiting diversity in relation to both hard and soft process structures[37].

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[35] *For example, given a random variable X with a distribution N (0, 1) and a function Y = 2X + 1, then by virtue of the theory of probability calculus we claim that the variable Y is random and has a distribution N (1, 2). But how can this be verified on a real plane, i.e. which form will be dominant, variable X or variable Y. Because we know about their relationship, a mathematical relation. And their actual behaviors can be independent of each other (have such behavior, the relationship of which is captured by this function.*

[36] *As a mathematical object, it has its properties discovered by it. These are the so-called golden proportions of this sequence occurring between its elements. There are several of them, but the most important one (because some others are its derivative) is related to the limit of the quotient of the next term to the previous one. This quotient in the limit is exactly 1.618. It has been shown that some growth structures of plant organisms (sunflower) or animals (the shape of a snail shell) dynamically realize (grow) in accordance with the above value of the relation. And if, for example, this quotient had the value of two and represented a geometric sequence, then such an organism would reach monstrous dimensions after a fairly short period of time (it is enough to compare the values of the terms of both sequences). And this is a good example of a specific operational limitation of diversity for some natural objects. The Fibonacci sequence also has its reference (the size of 1.618) to the dimensions of proportions in human height. Many features related to this sequence have also been discovered in the behavior of financial processes. The Cheops pyramid was built on the basis of a rectangle with the ratio of its sides 1.618. However, such a geometric figure as a rectangle also has this property, if we choose its sides in the right proportions (the Cheops pyramid was built on the basis of a rectangle with the ratio of its sides as 1.618). The Fibonacci sequence was not yet known at that time. The golden ratios of the Fibonacci sequence also found application in the analysis of biological, financial and stock exchange processes, but only in the 20th century. The Fibonacci sequence is presented in many publications. A reader who wants to familiarize himself with this sequence from the perspective of its content meaning can refer to (Plummer 1985).*

[37] *It is connected (specially selected) with two processes far apart in terms of content, that is, what they are connected with by their nature, what they represent. But in terms of their logical structure, they can have it the same with respect to sometimes only a part of the behavior of one of them.*

7. Conclusions

The last point of our considerations could be at the same time a summary of the whole, because all real and abstract objects are the product of principles, laws of Nature, and therefore soft structures are their result. But in addition, we can add that soft structures are more difficult to isolate and study their complexity than hard and smooth structures, which can be described in the language of mathematics. Moreover, their complexity indicates that perhaps human thinking operates many different, in terms of ontological, operating systems, and some generate our soft structures, and others generate structures that can be captured in the language of mathematics and logic, and can even be described algorithmically[38].

And only together do these systems create the human mind, or the possibilities of diverse thinking, the highest level of which is the human ability for diverse creativity. Generally in the dimension of science, art and technology and in the dimension of everyday life. Science did not exist, and everyday life functioned, that is, it is primary (earlier) in relation to science and other forms of creativity. All these forms are secondary, genetically later than social behavior, the social feature of human language.

For example, it is thanks to this feature of our creativity (our open mind), its openness to the diversity of dimensions of thinking (Berlyne 1969), that we have the heliocentric theory of Nicolaus Copernicus, or the wonderful piece of music composed by Fryderyk Chopin *"Polonaise in A flat major Op. 53"*, the tower in Paris designed and constructed by the technical engineer Eiffel, the law of gravity discovered and formulated by Isaac Newton and the literary text by Victor Hugo *"Les Misérables"* and finally prose and poetry, the apogee of which is, in a way, in terms of scope and time of creation: *"Iliad"* and *"Odyssey"* written by Homer.

X: (scheme: adding implications) *Y: (scheme: multiplying implications)*

$$\frac{p \rightarrow q \quad r \rightarrow s}{(p \vee r) \rightarrow (q \vee s)} \qquad \frac{p \rightarrow q \quad r \rightarrow s}{(p \wedge r) \rightarrow (q \wedge s)}$$

The content of these two logical systems (schema) in the content dimension concerns a journey from A to B with means of travel (train, plane) and the second system concerns weather with features (cold, rain). The point here is that different contents can have the same logical form and then they are represented from a logical point of view by the same logical scheme, but it can also be the case that one of them is richer in its diversity and can be represented by both schemes, and the other only by one. In our example, the journey is accompanied only by the scheme of adding implications (you can travel by only one means of transport), and in relation to the weather, it has the behavior possible with respect to both schemes, it is simply more diverse with respect to the means of travel (it can only rain, it can only be cold and both atmospheric phenomena can occur simultaneously). In the logical dimension, the scheme of adding implications or the scheme of multiplying implications.

[38]*Modern artificial intelligence uses algorithmic operations in its broadly understood programming processes (systems).*

Or the painting by Leonardo da Vinci from the area of poetry of painting *"The Last Supper"*. These examples represent features of thinking from the area of hard and smooth structures (hard: technology, smooth: science, mathematics) as well as soft structures (painting, music, literature and poetry). Or can such conceptual diversity as Lindeberg-Lévy's central theorem in relation to the aforementioned musical piece by Fryderyk Chopin be placed on a scale of comparison in terms of their importance in the area of all structures of human creativity? Some do this.

Here, our human creativity should be seen in the aspect of the concept of coherence, that is, to perceive unity in diversity. Because there are bridges and literary works, musical notes and mathematical theorems, which were created by the mind of Man. Moreover, much of this creative magnificence of man was born from pragmatics – ordinary human needs (communication: roads and bridges, protection from the cold: houses, entertainment: dance and music, cognitive curiosity: science broadly understood today, etc.).

And others were created in defense against threats from Nature and wars: weapons, dams, power plants, factories and other forms supporting the satisfaction of our needs and existence for survival.

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