

Information as a Medium of Law

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Information and entropy

Cybernetics tends to be described as the science of systems control, process management, manmade organisms, etc. Although all that is true, lawyers will most likely appreciate the simple and brilliant definition by Neff, who states that cybernetics is about the nature of life and its artificial simulation.¹

At present, cybernetics is known as a theoretical and, more often, an applied science of a technical nature. It is for this reason that it is not especially interesting to lawyers – who find it of interest only when it brings something useful to facilitate the routine legal practice. Originally, however, cybernetics was at the boundary of natural sciences and philosophy, as is attested by the preoccupations of Norbert Wiener, the founder of the discipline. His publications deal not only with specific technical issues but also with the actual conception and orientation of the discipline from the point of view of philosophy. The original goal of scholars in the field was, as mentioned above, to understand the nature of life and attempt its artificial simulation. If the most visible sub-fields of cybernetics today consist of robotics and mechanical engineering, then this is a continuation of the original course, i.e., the inspiration by life and the construction of its artificial (i.e., man-made and inorganic) simulations.

The research of living organisms has been, since the very beginning, led by the effort to discover their unique features in comparison with non-living, inorganic nature. It was discovered that life, unlike everything

else, is not subject to the second law of thermodynamics, i.e., entropy.

Entropy, as a universal law, causes that any system, when left without any interference, gradually loses its organisation and starts to disorganize. Lawyers – for whatever reason – frequently use the example of flat beer (cf. cited in a previous article by the author)²: if a pint of beer is properly drafted, i.e., organized in the glass, it has a certain degree of internal organization. However, the beer loses this with the passage of time, i.e., the beer becomes flat, loses its taste,³ etc. Similarly, various chemicals have their half-life: after the passage of such a period of time, the chemicals disintegrate into their components (which are subject to further disintegration).

Entropy is essentially a thermodynamic law, which means that this phenomenon is, physically, related to the temperature of a given object. One may, thus, easily conclude that entropy can be subdued by freezing a given object. When frozen, it will not be affected by anything and will remain identical forever. If we, thus, succeeded in freezing the beer to absolute zero and keep it at such a temperature, it would retain its (excellent) qualities forever.

The notion of entropy in relation to living organisms is explained in an excellent way by the Nobel Prize winner for physics Erwin Schrödinger.⁴ He states: "Let me first emphasize that it is not a hazy concept or idea, but a measurable physical quantity [...] At the absolute zero point of temperature (roughly -273°C) the entropy of any substance is zero. When you bring the substance

into any other state by slow, reversible little steps [...] the entropy increases by an amount which is computed by dividing every little portion of heat you had to supply in that procedure by the absolute temperature at which it was supplied – and by summing up all these small contributions. [...] You see from this, that the unit in which entropy is measured is cal./ °C.”

It might be objected that every living organism grows old and that all life ends in death. This is, of course, true for every individual organism, but life itself does not have a natural tendency to perish. By contrast, it tends to develop and evolve. This tendency is manifested by the procreation of living organisms, their generational evolution reacting to changing conditions,⁵ etc. It is not accidental that the strongest instincts of living organisms include the sexual urge and the instinct for self-preservation. These are, in actual fact, not incidental urges of single individuals but natural manifestations of life as such.⁶

Leaving aside speculations about the strength of life to face entropy,⁷ let us focus on what means life uses towards such an end. In other words, what tools may stop entropy or even lessen its effects. The answer to this question is quite simple: the tool is information. According to one of the definitions of information, it may even be considered as a direct opposite of entropy. Norbert Wiener himself writes the following about information: “Just as the amount of information in a system is a measure of its degree of organization, so the entropy of a system is a measure of its degree of disorganization: and the one is simply negative of the other.”⁸

Information as a proposition and as a rule

It is not surprising that information operates similarly in natural processes and social environments. One may not describe the situation in terms of the laws of thermodynamics, but the organizational role of information among people is the same as it is anywhere in living or non-living nature. Any social system where information is created, processed, and distributed is more organized, adaptable, and, consequently, more likely to survive and reproduce.

If Hume’s system⁹ is used, one may distinguish between two types of information: information that describes reality (i.e. the ‘is’) and instructions (i.e., information about the ‘ought’). Information about reality (‘is’) is given the value of truth, which indicates, next to the quality of the information itself, its ability to organize the system of its addressees. Whenever an addressee receives truthful information, her ability to react to the external environment is thus increased, while the probability of a wrong decision is reduced. A typical example consists of weather forecasts: where the information is truthful, the addressees of such information

are more likely to choose appropriate clothing and, consequently, be safer, more efficient, or more satisfied.

The second type of information consists of information that describes obligations rather than reality, i.e., rules. Even such information has a crucial role when organizing social life, because it is also on its basis that society is internally organized. At the same time, however, this does not concern only norms assembled within the particular normative systems, but also other rules such as principles, policies, standards, etc. In this sense, law may be seen as one of the systems of rules which is characterised by its regulatory nature, state origin, and mechanisms of state enforcement. Other systems of rules, such as social and ethical rules, may have a self-organizational nature (unlike law), having their origin as natural or spontaneous and with different mechanisms for potential sanctions.

The information dichotomy has its stable place in law as well: the processes of authoritative application of law typically deal with the issue of finding the facts and their subsequent legal classification, i.e., the specification of corresponding *ad hoc* duties.¹⁰ While information about facts makes our decision-making more precise, enabling us to adapt our efforts to the circumstances of a given case, normative information provides outcomes for its prospective authoritative solution.¹¹

From the point of view of information theory, the entire process of the application of law may be seen as an information procedure. The input information consists of the findings about the facts of the case and information about the rules, the output produces – after a sufficient processing – information about the *ad hoc* normative consequence. If one wanted to specify the procedure further, then the following will be the sources of knowledge on the side of the legal act:

- Evidence (in the event of facts that can be proven)
- Evidence of the presumption + legal norm (in the event of presumed facts, i.e., assumptions and fictions)
- Archives (in the event of known facts)

Based on the above-mentioned, one may discover the obvious problem of applied information theory of law quite easily. The founder of modern cybernetics Norbert Wiener was inspired by the methods of mathematical logic¹² and his followers – including those in the field of legal cybernetics – drew on the same kind of inspiration. A logic whose organizing principle is truth and truth value, however, operates only with the binary conception of truth. Propositions may thus be only described as either true or false.

The binary conception of truthfulness is well-suited for didactic examples of the type “It is 5 o’clock” or “It is raining outside.” Life, however, does not bring propositions which can be labelled as one-hundred-percent true or one-hundred-percent false. Such information is

then assessed by a probability assessment, i.e., we treat them as metaphors. From the point of view of mathematical logics, these are not propositions (they cannot be classified as true/false) but are often the only thing we have for ascertaining the facts of a case. Even such didactic examples as “A mole can fly” can almost always be made relative,¹³ regardless of such statements as “I am a faithful husband” or “I did not want to break the chair against his head.” This indicates that the information conception of factual information makes sense only where we process such information on the basis of both the probability of its intended meaning and its truth value (i.e., not with the ambition to simply state whether it is true or false).

The problem of the representation of reality by means of formal features (propositions, expressions) is also discussed in the excellent Czech four-volume monograph titled *Artificial Intelligence*. The book states that¹⁴

“probably universal statements made in common life have numerous implicit (unstated) assumptions which often cannot, despite the best of efforts, be enumerated. This includes, for instance, all kinds of exceptions which are one of the sources making everyday thinking free of monotony. Of course, such experience motivated the formation of other formal systems, such as non-monotonous logics.

Another problem [...] consists of the uncompromising character of the only two permissible truth value formulas – true and false. It is very often the case that our judgement is based on a probabilistic assessment of the situation. In such a case, it is necessary to consider a much broader scale of possible values – this generalization is dealt with by fuzzy logic.”

Similar to propositional calculus in the event of factual information, the information theory law operates with deontic logic as a method of processing information whose nature concerns obligation. Instead of categories like true/false, it operates with the binary contrast of valid/invalid.

Even if one disregards the permanent problem of the interpretation of legal rules, one must conclude here as well that the methods of logic – in this case deontic logic – cannot grasp and process the law in its complexity. As with propositions, one cannot assign the categories valid/invalid to a whole range of rules. The category of absolute validity/invalidity can be assigned only to ideal norms but not to legal principles, standards, and other categories forming the inseparable part of the system of law.¹⁵ Evidence of the above-mentioned may be, for instance, the point of contact between the otherwise competing theories of legal principles by Ronald Dworkin and Robert Alexy, i.e., the logical distinction between the legal principle and the legal norm. While the norm may be assessed in terms of the binary con-

trast valid/invalid, the principle cannot be assigned such values on account of its fundamental nature.¹⁶

Moreover, as long as the final implication of the validity of law is its binding nature, the binary model of assessment cannot be used. Again, the absolute dichotomy of binding/not binding appears only in the case of ideal norms, while practical legal norms often manifest features of relative argumentative binding nature.¹⁷ The use of the methods of logic is again not ideal in this case; their application is eventually limited to a relatively small group of legal problems.

These conclusions were consistently refused by the logic-oriented branches of legal thinking, heavily represented in former socialist Czechoslovakia. The *prima facie* simplicity and logicity of Communist legality were the bases for frequent straightforward publications, where quite obvious conclusions were derived by logical deductions (often quite complicated). As late as 1985, one may, thus, come across explanations – spread over fifteen pages of text – about why a judicial decision is “the function of the given facts of the case (Ss), and the normative regulation of the given facts of the case, i.e., the legal situation (Np), and the judge’s procedure when assessing the facts and law of a case (Hsp).” This surprising and truly genial conclusion is supplemented with the final statement that “the elaboration and assessment of the individual arguments of this function, including its values, would require an entirely separate elaboration due to its complexity.”¹⁸

The fundamental points of departure of information conception of law

Summing up the above-mentioned, the information theory of law represents a theoretical reflection of the organizational nature of the system of legal rules. The information conception of law is, thus, based on the assumption that law consists of a set of state information of a prospective nature (obligations) that regulates the life of human communities. Given this perspective, all legal procedures have the character of collecting, processing, and distributing legal information.

Legislation may then be characterised as the processing of information about the needs of society into the form of the organizing information, i.e., the law. Even the judges may, in this sense, be seen as processors of information about a case and the law, from which they subsequently construct an imperative for the parties and, in the case that the decision is published, also a general rule. We may thus, for instance, form the following sequence of steps through which the legal information flows:

Social order – a politician (who formulates the social order) – legislative intent (the infor-

mation source communicated within the framework of the drafting of laws) – legislator (who transfers the legislative intent into individual provisions of the law) – lawmaker (who discusses and passes the law) – collection of laws (the information source communicated to the public) – judge (who interprets the law) – judicial decision (information source communicated to the parties) – recipient of the decision.

It is clear that the definition of law as an information system is problematic as regards the basic disproportion between the ideal (theoretical) category of information and its (practical) communicable form. In connection with the legal norm, Kelsen mentions the necessity of separating the norm and the form, through which the former is manifested and communicated, i.e., the normative utterance.¹⁹ In other words, an analysis must separate the content of a law and its text – in the sequence above, one must further distinguish between the content of the social order and the legislative intent on the one hand, and the content of the judicial decision and its written text on the other. The reason is simple: the limitation of the linguistic means of the law to simple expressions, i.e., the monotonous representation mentioned above.

In comparison to other disciplines aiming to provide society with organizing information,²⁰ the law suffers from a painful deficit of means for its expression. Because of its ambition to be monotonous and to have mathematical (or rather, logical) precision, the legal system has deprived itself of the opportunity of using practically all common means of expression available elsewhere, except for simple language. Thus, the addressees of legal norms cannot understand their duty or the liability of their offences from the imposing fresco painting or the tones of a musical composition, and not even by means of figurative language conveying legal information. It is then rather difficult to transfer an ideal rule (be it a simple norm) into the form of a terse linguistic expression. It is also for this reason that the law basically avoids numerous statements made *expressis verbis*.²¹ Where the legislators attempt a precise expression of a given meaning, this often results in “a cold sauce,” as in the following example:²²

Section 9(c) of the Regulation No. 331/1997 Sb.: “[For the purposes of these Regulations] a cold sauce or dressing is understood to be any liquid or emulsified product used as a taste supplement to food and salads, produced, above all, from edible oils, thickeners, stabilizers, emulsifiers, vegetable, fruit, spices, and milk products.”

Just as we are forced to shape ideal rules into often unsuitable linguistic expressions, so we must fit individual pieces of legal information – regardless of their complexity – into simple logical categories of “true/false” or “valid/invalid.” The reason for this is the

above-mentioned attempt to ensure simple expression and objective precision of the law, which would, among other things, also enable the subsequent automatization of legal information processes.

Both of these problematic issues, i.e., the curtailment in law of means of expression and the limitation of qualifying legal information into simple binary categories, constitute a not insignificant threat to law and its quality (including its actual legitimacy). On the other hand, these tendencies stand witness to the formation of simple causal mathematical-logical methods for the processing of legal information. Thus, the logical and logic-oriented conception of law enables its encoding into a form which can be processed by machines, thereby opening the door for tempting the possibility of replacing the live processors of legal information (lawyers, policemen, etc.) with tireless machines.

Since law – be it on the theoretical, legislative, or applied levels – consistently and successfully resists such trends, it is apt to ask what makes it so. Despite politically-motivated attempts to tie law up with simple categories and then hand it over to machines, there has been no situation when it could be stated that law will suffer being tied up in such a way. The reason why law is naturally idealistic (not formal) and why it refuses to accept the simple categories of validity and truthfulness may consist – once again – in its information nature. Thus, we are completing a circle and coming back to information as the fundamental unit of law and its natural properties.

A final note on the value nature of information and the information society

As mentioned above, law may be conceived of as an information system which takes over certain generic properties of its fundamental unit, i.e., information. Although information is a simple message, sometimes even a simple number, one watches in amazement the properties manifested by systems organized on the basis of information. Some remarkable effects also occur in any place where spontaneous formation, processing, and exchange of information is allowed, i.e., in the context of the information society.

Thus, it is not theoretically but empirically that we arrive at the surprising conclusion that the information society is not, *per se*, valueless. Regardless of regions or political backgrounds, one may see that where information exchange is not hampered, the physical and logical information infrastructure leads to the development of natural fundamental social values. Without having to introduce such values into the information society actively and on purpose, they appear against the background of common, everyday communication. The analysis of information exchange – be it the transmission of information about the weather, the exchange of

greetings, the communication of what is new in one's personal life, or student advice about examinations – this leads to the conclusion that such particular communication results in the complex tendency towards equality, decency, order, solidarity, etc.²³

The somewhat pompous but still rational conclusion that follows from all this is that letting individuals communicate freely means, among other things, providing for the opportunity to develop the fundamental values of human society. This conclusion is a paradox, because both the information infrastructure and the Wienerian mathematical-logical method of processing information are, in themselves, valueless. The fact that the information society, which comes into existence with their help, has a strong value-oriented nature leads us to speculate that such values are the complex effects of information and its unexpressed, yet natural content. Just as information was connected with life at the beginning of this article, so can it now be connected with the fundamental values of human society.²⁴

The above-stated natural connections are not, of course, welcome in political systems based on authoritative government and the suppression of such values. Authoritative regimes did not take long to understand that a free exchange of information means a direct threat to the non-democratic state establishment. It is, thus, clear that states with authoritative governments strive to limit maximally the possibilities of mutual interpersonal communication, common elsewhere, such as the various services of the internet. Where it is impossible to block access to the information infrastructure, regimes will at least attempt to monitor the mutual information exchange and interfere in such situations which lead to explicit manifestations of the values mentioned above. Even in these cases, however, the natural character of information is so strong that information channels – wherever it is at least possible – are kept open, allowing a maximum passage of information.²⁵

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¹ Cf. Neff, V. *Filozofický slovník pro samouky [Self-Study Dictionary of Philosophy]*. Praha: Mladá fronta, 1993, p. 84.

² Cf. Kühn, Z., Bobek, M., Polčák, R. *Judikatura a právní argumentace [Case-Law and Legal Argumentation]*. Praha: Auditorium, 2006, p. 143.

³ It must be stated in this connection that this criterion may be rather subjective and is used merely for illustrative purposes. It is indisputable that there are numerous beer brands which are not negatively affected by going flat. On the contrary, when one lets such beer (prior to pouring it down the drain) go flat a bit, it might even seem that its taste is slightly improved.

⁴ The citation is taken over from Schrödinger's brief book *What is Life* (Cambridge: Cambridge University Press, 1992).

The book is available online at <<http://home.att.net/~p.caimi/Life.doc>>.

⁵ The ability to adapt is even considered by some authors to be the most important property of life – cf., among other, Grand, S. *Creation – Life and How to Make It*. Cambridge: Harvard University Press, 2001, p. 104 and subsequent pages.

⁶ These instincts may be observed not only in the case of living organisms but also in their individual elements. It may be striking to observe the effort to survive and reproduce at the most basic level of life, i.e. the individual parts of the genetic code – for more details, see, for instance, the fascinating discussion of the human genome in Ridley, M. *Genom. [The Genome]* Praha: Portál, 2001, p. 109 and subsequent pages.

⁷ Theoretical physics, for instance, tends to be of the opinion that the momentum that causes the movement is the mysterious effect of complexity – cf., for instance, the popular publication by Peter Coveney and Roger Highfield – see Coveney, P., Highfield, R. *Frontiers of Complexity: The Search for Order in a Chaotic World*, New York: Fawcett Columbine, 1996.

⁸ Cf. Wiener, N. *Cybernetics: Or the Control and Communication in the Animal and the Machine*. Cambridge: MIT Press, 1961, p. 11.

⁹ For the basic distinction between 'is' and 'ought', see Hume, D. *A Treatise on Human Nature*. Project Gutenberg, 2003. Available online at <www.gutenberg.org/etext/4705>.

¹⁰ Obviously, the ascertainment of the facts of the case and its subsequent inclusion within the hypotheses of the relevant norms does not represent some a kind of rigid sequence. Rather, it is a two-way complex process of gradual formation of the legal reflection of the reality – cf., e.g., Holländer, P. *Filosofie práva [Philosophy of Law]*. Plzeň: Aleš Čeněk, 2006, p. 206 and subsequent pages.

¹¹ Such a solution, in turn, becomes another form of organizing information, because, depending on its quality, it brings another regulation into the law. This principle underlies not only legal systems based on precedent but also continental judiciary, which operates with the argumentative binding nature of previous judicial decisions.

¹² Wiener pays homage to Leibnitz in his major book by stating: "If I were to choose a patron saint for cybernetics out of the history of science, I should have to choose Leibniz. The philosophy of Leibniz centers around two closely related concepts -- that of a universal symbolism and that of a calculus of reasoning." See Wiener, N. *Cybernetics: On the Control and Communication in the Animal and the Machine*. Cambridge: MIT Press, 1961, p. 12.

¹³ In this case, the propositional character of such a statement may be dismissed by pointing out that if a person manages to catch a mole in a garden, then teaching it to fly is not so difficult – even such a statement cannot actually be subjected to a true/false value and does not constitute a "proposition."

¹⁴ Mařík, V. Štěpánková, O. Lažanský, J. *Umělá inteligence, 1. díl [Artificial Intelligence, Volume 1]*. Praha: Academia, 1993, p. 97.

¹⁵ Cf. Dworkin, R. M. *Když se práva berou vážně [Taking Law Seriously]*. Praha: OIKOYMENH, 2001, p. 43.

¹⁶ For a comparison of the two conceptions of legal principles with an emphasis on logical distinction, see Holländer, P. *Filosofie práva [Philosophy of Law]*. Plzeň: Aleš Čeněk, 2006, p. 143 and subsequent pages.

¹⁷ As an example, one may mention the binding nature of stabilized judicial interpretation, i.e., judicial decisions – a ru-

le formed or modified by judicial decisions becomes binding to such an extent that, when changing it, arguments must be given for any such change. The binding nature is not, however, absolute, as in the case of a precedent; it merely concerns the duty of the court to deal with such a rule in its arguments. For more details, see Kühn, Z., Bobek, M., Polčák, R. *Judikatura a právní argumentace [Case-Law and Legal Argumentation]*. Praha: Auditorium, 2006, p. 39 and subsequent pages.

¹⁸ This is the actual (and only) conclusion of the article by Steiner, V. *Logická formalizace právních norem a vztahů [Logical Formalisation of Legal Norms and Relations]*. *Právník*, Volume 124, 1985, No. 11, p. 1008.

¹⁹ Kelsen literally states the following: "A norm, which is the sense of a volitional act, is the meaning of the sentence, which is the product of the act of speaking, whereby the sense of the volitional act moves towards its expression. We must similarly distinguish the act of finding, whose sense is a proposition, from the act of stating, whereby the sense of the act of finding is expressed." Cf. Kelsen, H. *Všeobecná teorie norem [The General Theory of Norms]*. Brno: Masarykova univerzita v Brně, 2000. p. 175.

²⁰ Such disciplines include, for instance, fine arts, dance, film, and television broadcasts.

²¹ Thus, for instance, there is no definition of the signature. Although it is one of the most frequently used legal institutes,

its shape is not delimited anywhere, and it thus not, paradoxically, a typical legal institute.

²² The "cold sauce problem" is elaborated in a sophisticated way by Dworkin, who describes the interpretative dilemmas of unhappy Hercules – cf. Dworkin, R. *Law's Empire*. Oxford: Hart Publishing, 1998, p. 313 and subsequent pages.

²³ In this connection, it must be admitted that opinions differ in regard to the issue of whether to actively code fundamental values into the information structures of the information society. For a discussion of the defence of the natural ability of the information society to create and protect such values, see for instance in Polčák, R. "Code and Complexity: Can the code stand Lessig's challenges?" in *Medien und Recht International Edition*, Volume 4, 2007, No. 3, p. 9 and subsequent pages. For the contrary opinion, see Lessig, L. *Code V.2*. New York: Basic Books, 2006, p. 6.

²⁴ An artificially created information environment (cyberspace) may serve as an excellent model for the information society. The manner of organization of social groups within cyberspace by means of implicit values is described by Pierre Lévy, *Cyberculture*. London: University of Minnesota Press, 2001, p. 165 and subsequent pages.

²⁵ See, for instance, the operation of citizen information structures in such countries as Belarus and China.