

The value added of organized information: from Floridi to Bennett

Claudio Gnoli
University of Pavia
claudio.gnoli@unipv.it

Abstract

Recently, Floridi has proposed that ethics be centered on the notion of information, which would represent a value in itself. As anything contains information in some form, this stance would imply that anything has intrinsic value. While this perspective is intriguing as it would make information science an even more important domain, it needs to be refined by distinguishing between different levels of organized information. Instances of matter, of life, of minds, of civil society, and of cultural heritage are all different kinds of *informational systems*, each formed through an evolutionary path that has built on the previous levels, with a corresponding increase in what Bennett has defined as *logical depth*. This process makes the logically deepest phenomena especially valuable, as they could not be recreated without repeating the whole path. Personal experiences of individual humans, either shared orally or recorded in diaries, as well as collective knowledge and knowledge organization systems, that can be documented in texts or in images before disappearing, are especially precious sorts of information and should be acknowledged the highest value.

1. Introduction

Luciano Floridi's philosophy of information has been gaining a wide popularity in recent years. Among many important issues, Floridi's approach proposes a view of information as a value, which seems to be of special interest to this conference as a possible rationale to claim the objective value of information services and knowledge organization. Indeed, if information is a value in itself, then any activity aimed at the acquisition, conservation, and provision of information has to be considered and treated as intrinsically valuable, too.

This paper discusses Floridi's basic claim in the light of notions provided by other theories of information, with special reference to the notion of logical depth, in order to attain a more detailed understanding of the value of information and of its implications for information services and knowledge organization.

2. Floridi's ontocentric ethics

According to Floridi (2010), any entity may be viewed as a bearer of information in some of its various forms: physical, biological, economical, etc. The phenomena occurring in the world would not just be *described by* information, as it is usually conceived in the framework of information science; rather, they would themselves *consist in* information, taken as the most fundamental element of the universe diversity.

Similar views are also suggested by an increasing number of information theorists as they are realizing that information can be considered as a basic physical quantity, even more fundamental than energy or matter. Their slogan is "it from bit": that is, any material phenomenon can be seen as the result of particular configurations of information, conceived as some pre-existing unit (Wiener 1961; Landauer 1967; Wheeler 1990; Davies 2010).

In this perspective, Floridi equates information to existence itself, and claims that

"being/information has an intrinsic value", as "any informational entity has the right to persist in its own status and to flourish". Hence any entity in the universe deserves to be considered as valuable because it is a bearer of information; while the ultimate evil is entropy, meant as "any kind of destruction, corruption, dispersion and consumption of informational objects [...] that is any form of impoverishment of reality" (Floridi 2010, Ch. 8; see also Floridi 2013).

This "onto-centric" ethics is presented by Floridi as a broadening and replacement of the bio-centric ethics widely supported nowadays, that recommend caring for all living forms and their environment; and even more of the anthropo-centric ethics preached in most traditional beliefs, that limit value to humans as a privileged descent. Indeed, living beings and humans are but special cases of information as expressed in the variety of the world. A *panphilia* reminding us, as also noticed by Hongladarom (2008), of Spinoza's ethics, according to which the nature of each thing, and its way to accomplish itself, is to try to "persevere in its own being" (Spinoza 1677, part 3, propositions 6-8).

Such a proposal has the potential to suddenly put information science, taken in a broad meaning, into the centre of philosophy and the sciences. While, until now, information science has mostly been conceived as an ancillary discipline providing principles and techniques that help researchers to study some other subject, it would now become, as noticed by Bawden and Robinson (2013), the science of something fundamental and very general in both ontological and ethical terms.

3. The different forms of information

Before exploring the consequences of information having such an absolute value, we may wonder whether the claim is justified. Is it reasonable to state that anything has a value in itself as being some kind of information? Apparently, this may imply a quite paradoxical ethical stance, that is, giving the same value to everything...

After all, if we had to care for anything in the same way, we would have no particular ethical choice to make any more in order to decide what to save against what other, besides keeping ourselves aware of the general value of what is around us. Why, then, do we feel that some information items, such as a complex treatise or the archaeological remains of Nimrud, are especially worthy of consideration and preservation as compared with more trivial ones, such as a line of ants or a handful of sand?

Though mentioning that his information ethics may refer "to more or less evil or moral goodness, to moral thresholds, and to higher or lower degrees of flourishing and well-being", Floridi explicitly states that they "cannot be seriously quantified", as the only ethical duty is a generic contribution "to the well-being of the infosphere" (Floridi 2013, p. 317).

Still, as information comes in many forms, it can be worth investigating the ontological relationships holding between each of them, in order to ascertain whether any form may be more precious and worth more than others. This will be of help in cases where we have to make a choice between different kinds of information.

Several authors have acknowledged that information occurs in different classes of phenomena, including physical, biological, mental, technological, and cultural ones (e.g. Fleissner and Hofkirchner 1996; Capurro 2009; Gnoli and Ridi 2014). These can also be arranged in an order of increasing "freedom": in physical information, such as a set of balls, the arrangement of elements is determined only by external mechanical causes; in biological information, such as a DNA sequence, the arrangement is also determined by the self-organization of the system, and affects its own fitness; and in social information, the arrangement can be determined by free choices by the system itself, which is also capable of affecting its own external environment (Fleissner and Hofkirchner 1996).

More generally, each kind of information belongs to one of the organization levels –matter, life, mind, society, etc. –that have been acknowledged by many philosophers, each based on the lower levels but also showing its own emergent properties (Hartmann 1940; Feibleman 1954; Blitz 1992; Poli 2001).

In many cases, levels themselves can be described in informational terms, as sets of elements of some nature – amino-acids in proteins, fixed action patterns in behavioural sequences, letters in alphabets, figures in dances, etc. – connected according to combinatorial rules so as to produce a large number of different configurations. Such systems of mutually replaceable modules I propose to call *informational systems*. Others have also described them as "information processing systems" (Haefner 1992) thus emphasizing their internal dynamics. If some replication mechanism is available, a population of configurations will then be originated and an evolutionary process will take place, as the configurations most stable in the current environment will be selected and will in turn replicate more often than others (Bickhard and Campbell 2003).

Levels and evolutionary relations between them are often considered as a principle to organize the subject matter of information resources, usually by listing primitive phenomena before evolved ones (Gnoli 2006). Here, however, we are considering levels to discriminate between different kinds of information itself, prior to their treatment in documents. Indeed, information can be observed to occur in primitive forms, such as arrangements of material bodies, as well as in partially evolved forms, such as sequences of amino acids and nucleotides, or in further evolved forms, such as neural, social, and cultural systems.

The main levels of informational systems can be summarized (provisionally ignoring further subdivisions of each major level into finer layers) in Table 1.

<i>system</i>	<i>modules</i>	<i>variability</i>	<i>memory</i>	<i>pressure</i>	<i>selection</i>
matter	particles	random motion	negentropy	probability	stability
life	characters	mutation	genome	environment	fitness
mind	notions	learning	remembrance	experience	relevance
society	symbols	innovations	tradition	competition	success
heritage	works	hypotheses	documents	critics	acceptance

Table 1: Major levels of informational systems (slightly modified after Gnoli and Ridi 2014)

4. Logical depth

Now, are all these sorts of information – material, genetic, neural, socially-shared, documental – all valuable in the same way?

At a recent Philosophy of Information Workshop, different views on the value of information, mainly taken in a physico-mathematical sense, have been represented. While according to some authors information would only have an instrumental value, in that it allows people to make useful choices (Caticha 2013), others consider both the instrumental value and an intrinsic value:

In a universe in which everything in the end reaches a state of maximum entropy a structure that manages to maintain its integrity or form over time, whether it is a human being, a work of art, or a written meaningful message seems to be something that is intrinsically valid, independent of the fact whether there exists any agent to appreciate this value. (Adriaans 2013)

In order to evaluate the amount of information, and its value as a consequence, Adriaans (2013) refers to the principle of minimum description length: to be described in a satisfying way, structures richer in information need longer formulations than structures with less information. This appears to be a promising direction.

An important contribution to an explicit definition and quantification of such "description length", and of its variation in entities of different complexity, comes from another notion of fundamental information theory. It is the concept of *logical depth*, introduced by IBM computer scientist Charles H. Bennett (1985; 1988; 1990).

Logical depth is the computational resources (chiefly time) taken to calculate the results of a program of minimal length. [...] Bennett uses it to formalise the level of organisation in systems. All present-day organisms can be viewed as the result of a very long computation from an incompressible program and are thus *by this definition* complex. (Edmonds 1999)

Kampis (1991, p. 319) discusses logical depth as an interesting way "to capture history as an element of complexity" in the evolution of self-modifying systems, such as life as emerged out of molecules in the primordial soup. He points out that actual historical systems do not evolve simply according to a minimal algorithm that can be represented by such measures as logical depth, but along more complex and redundant trajectories.

Along the evolution of informational systems, while information and material particles are always there, some of them also get organized in novel ways, giving birth to the "logically deeper" phenomena that we are more used to care about: organisms, minds, societies, and cultural heritage. This development has required a long evolutionary path, which makes these phenomena more and more "logically deep".

A way to grasp logical depth is to consider what is lost when a given phenomenon is destroyed. When bonds holding a molecule together are broken, the molecule dissolves into simpler elements (atoms or ions of which it was formed); however, it would not be very long, under appropriate conditions, to reconstitute an identical molecule. On the other hand, when an old wise human dies, all her individual experience is lost, which is much more difficult to be rebuilt, even impossible to be done in exactly the same individual combinations. This is even more true with artifacts. A particular castle of cards is logically deeper than a common pack of cards. When the information of a rare manuscript or a unique monument is destroyed, what we lose is not just the object itself, but the whole historical path that had been necessary for it being eventually produced, including the technical knowledge and work of many individual humans, and the cultural context in which it had developed.

Similar insights have been expressed by Feibleman while discussing his laws of integrative levels:

The physical properties are more enduring than the constructions raised over them. Destroy the physical properties in any object and the entire object goes, but the reverse is not true. A man run over by a street-grading machine is no longer a man, no longer even an organism but merely a collection of decaying cells, eventually to be reduced to still lower levels, to carbon compounds. (Feibleman 1954, Law 3, p. 60)

Evidently the more complex the organisation the more unstable, so that advances are not achieved without a price and advanced positions are not easily held. Hence duration is a function of the integrative levels. (Feibleman 1954, Law 7, p. 62)

These approaches suggest that Floridi's ontocentric ethics, claiming the value of any phenomenon in that it is an informational system, can indeed be refined by discriminating between systems at different levels of organization. In particular, informational systems with a greater logical

depth will have a greater value. Molecules are valuable, but monuments are much more.

5. Documenting valuable personal knowledge

The enlarged view concerning the value of information that has been sketched above can provide a rationale for what information science usually takes as a basic implicit assumption: that is, the fact that documents are taken to be valuable resources, especially in the case of documents reporting knowledge not available through other resources.

Indeed, documents are informational systems laying at the highest level of organization; they convey the result of long processes of information accumulation across all the previous levels – stable configurations of matter, genes, minds, and oral communities. Knowledge recorded in documents is the product of a long path of unconscious, personal, and collective experiences that has been patiently distilled and made available. Its destruction would imply a big loss in terms of logical depth. Clearly, the notion of *document* is to be taken here in the sense of anything intentionally gathered in order to convey some knowledge, thus including not just a written product but also a painting, a film, a specimen kept in a museum or a living animal in a zoological garden (Buckland 2014).

An important case of valuable "deep" information is the personal knowledge of an individual. As every person has crossed different combinations of events and environments that have made her knowledge unique, she has become the bearer of a logically deep heritage; this is especially the case with those who have lived many years of meaningful experiences and have condensed them in a well-developed wisdom.

In most cases, this kind of information is transmitted by aging people to their close relatives and friends, but this process covers only a limited neighbourhood, and much information can be lost after the teacher's death.

One way to save such value and make it available to more people is through diaries. This is so especially when they are published, or at least kept and organized in a diary archive, such as Archivio Diaristico Nazionale founded in 1984 in Pieve Santo Stefano, Italy. Diaries collected at this institution are studied and often reused for cultural initiatives, such as a recent website on World War I produced on the occasion of its 100th anniversary, where excerpts from first-person narrations of the war are put into relationship with photographs and other historical resources by applying principles of information architecture (Badaloni 2014).

In some cultures, public sharing of personal experience is regarded as a high form of spiritual practice. This happens for example in various Christian movements developed in English-speaking countries (Kors 2002). As the Religious Society of Friends accords the status of minister to every follower rather than only ordained priests, it considers journals and other personal writings as a primary source for spiritual growth (Brinton 1983), often publishes them, and keeps old and new ones in libraries and archives. Examples include the Quaker Journals and Diaries collection at Haverford College and Triptych, the Tri-College Digital Library, both based in Pennsylvania, USA. Independently from specific beliefs, they are interesting examples of how information can be given a special value just because it is the result of a logically-deep individual path, that could never be replicated in exactly the same way by other knowing agents, while it can be preserved to some extent through documentation.

Images are another powerful means to render people's experience. Another example of preservation of depth are archives of amateur films, such as Archivio Nazionale del Film di Famiglia operating in Bologna, Italy (Edmonds 2007). Major film critic André Bazin believes that a basic function of such documents as photographs and films is "to save the being through appearance". This is a way to cope with a primordial human need of preserving what tends to disappear, described by Bazin (1967) as the "mummy complex", as it seems to be the same

motivation that persuaded ancient Egyptians to mummify corpses so as to preserve them. Like mummies, documents would be antidotes against our instinctive fear of *oblivion* (from Latin stem *liv*, "to darken").

6. Documenting valuable collective knowledge

Moving from personal experience to whole cultures, we come to consider their material or intellectual products as the result of accumulation of knowledge among societies. This is one more step in the development of logically-deep information.

An aspect of knowledge especially difficult to preserve, or to reconstruct if lost, is its conceptual organization in a particular epoch or place. The task of knowledge organization is to summarize available knowledge into consistent schemes, that is into knowledge organization systems (KOS). These are very logically deep entities themselves, as they condense a whole culture in a compact network of relevant concepts and of relationships between them.

While we shape our modern life based on a variety of KOSs, we are also gradually losing wisdom contained in KOSs that are falling into disuse, such as traditional terminologies and local classifications. Angelini (2005) has reported how old farmers in a mountain region of Liguria, Italy are able to discriminate between local potato varieties that are indistinguishable in official agronomic classifications, and consistently give them different names: they clearly use a different KOS not recorded in any scientific publication.

As agricultural practices are changing quickly, such KOSs are deemed to disappear, just as the old local varieties of vegetables they organize. Avoiding loss of information contained in an oral KOS and accounting for its complexity, so to preserve it at least as a historical document if not as a living tradition, is a purpose of ethnographic documentation, again making use of detailed reports, audio recordings and documentary films.

While speaking of the intrinsic value of artifacts and documents, some considerations may be appropriate. If one follows Floridi in claiming that information is not just one value but also the good itself, then it should be concluded that collective knowledge and cultural heritage have ethical precedence even on individual persons, because the former are logically deeper. In the case of extreme ethical dilemmas this could have questionable implications, such as concluding that a human should be sacrificed if this is useful to save a precious document. However, this should probably be reconciled with other ethical principles. This paper is limited to discussion of the relative value of the different kinds of phenomena in which information occurs, and to its implications to information science.

7. Conclusion

The thesis according to which information is a value in itself has been examined. While it introduces an important perspective, having the potential to broaden the scope of information science and to make it an even more relevant domain of research, it also needs to be articulated in more precise ways.

As information occurs in many different forms, their nature and reciprocal relationships need to be understood better, before assessing the value of each of them. Bennett's logical depth and Feibleman's integrative levels provide useful conceptual tools to analyze these forms, and to sort them in an order of increasing organization as the result of successive, complex evolutionary processes.

Recorded knowledge, the system of all information produced by humans as consistently stored in documents, appears to be the logically deepest informational system. This makes it especially precious as compared to simpler and more common forms, such as a segment of DNA or

an occasional idea in an individual mind. In turn, this provides a rationale to claim the intrinsic value of knowledge organization, as condensed in both oral and recorded systems, being greater than that of scattered information elements.

Acknowledgments

The first part of this paper builds on a previous paper co-authored with Riccardo Ridi, Ca' Foscari University of Venice (Gnoli and Ridi 2014). Both he and Sara Iommi, PhD at the Department of Music and Performing Arts, University of Bologna, have kindly contributed several suggestions, examples and references.

References

- Adriaans, Pieter 2013. Does information has intrinsic value? In: *[Second] Philosophy of Information Workshop: Washington, 26 April 2013*. Available at <<http://www.american.edu/cas/economics/workshop/>>.
- Angelini, Massimo 2005. Varietà tradizionali, prodotti locali ed esperienze. *L'Ecologist italiano*, 1(3), 230-275.
- Badaloni, Federico 2014. La Grande Guerra nei diari dei soldati: un sito, un'architettura di relazione. In *Snodi: costruire contenuti, significati, reti*. 4 July 2014. Available at: <<http://federicobadaloni.blog.kataweb.it/snodi/002217>>.
- Bawden, David, and Robinson, Lyn 2013. "Deep down things": in what ways is information physical, and why does it matter for LIS? *Information research*, 18(3), paper C03. Available at <<http://www.informationr.net/ir/18-3/colis/paperC03.html>>.
- Bazin, André 1967-1971. *What is cinema?*, University of California Press, 2 v.
- Bennett, Charles H. 1985. Dissipation, information, computational complexity and the definition of organization. In: D. Pines ed., *Emerging syntheses in science*. Redwood City: Addison-Wesley, p. 215-233.
- Bennett, Charles H. 1988. Logical depth and physical complexity. In Rolf Herken ed., *The universal Turing machine: a half-century survey*. : Oxford University Press, p. 227-257.
- Bennett, Charles H. 1990. How to define complexity in physics, and why. In: W.H. Zurek ed. *Complexity, entropy and the physics of information*. Redwood City: Addison-Wesley, p. 137-148.
- Bickhard, Mark H., Campbell, Donald T. 2003. Variations in variation and selection: the ubiquity of the variation-and-selective-retention ratchet in emergent organizational complexity. *Foundations of science*, 8, 215-282.
- Blitz, David 1992. *Emergent evolution: qualitative novelty and the levels of reality*. Dordrecht etc.: Kluwer. 233 p.
- Brinton, Howard Haines 1972. *Quaker journals: varieties of religious experience among Friends*. Wallingford (PA), Pendle Hill. 130 p.
- Buckland, Michael 2014. Documentality beyond documents. *The Monist*, 97(2), 179-186.
- Capurro, Rafael 2009. Past, present, and future of the concept of information. *TripleC*, 7(2), 125-141, available at <<http://www.triple-c.at/index.php/tripleC/article/view/113/116>>.
- Caticha, Ariel 2013. Belief and desire: on information and its value. In: *[Second] Philosophy of Information Workshop: Washington, 26 April 2013*. Available at <<http://www.american.edu/cas/economics/workshop/>>.
- Davies, Paul 2010. Universe from bit. In Davies, P. and Gregersen, N.H. eds., *Information and the nature of reality: from physics to metaphysics*. Cambridge: Cambridge University Press, p. 65-91.
- Edmonds, Bruce 1999. What is complexity? The philosophy of complexity *per se* with application to some examples in evolution. In F. Heylighen and D. Aerts eds., *The evolution of complexity*,

- Dordrecht: Kluwer. Also available at <<http://bruce.edmonds.name/evolcomp/>>.
- Edmonds, Guy 2007. *Associazione Home Movies, l'Archivio Nazionale del Film di Famiglia: an interview with Paolo Simoni and Karianne Fiorini of Italy's Amateur-film Archive*. *Film History*, 19(4), 423-428.
- Feibleman, James K. 1954. Theory of integrative levels. *British journal for the philosophy of science*, 5(17). 59-66. Republished in Lois Mai Chan et al. eds., *Theory of subject analysis: a sourcebook*. : Libraries Unlimited, 1985, p. 136-142.
- Fleissner, P. and Hofkirchner, W. 1996. Emergent information: towards a unified information theory. *BioSystems*, 38(2-3), 243-248. Also available at: <<http://igw.tuwien.ac.at/igw/menschen/hofkirchner/papers/InfoConcept/EmergentInfo/EmergentInfo.html>>.
- Floridi, Luciano 2010. *Information: a very short introduction*. Oxford: Oxford University Press. 152 p.
- Floridi, Luciano 2013. *The ethics of information*. Oxford: Oxford University Press. 384 p.
- Gnoli, Claudio 2006. Phylogenetic classification. *Knowledge organization*, (3), 138-152.
- Gnoli, Claudio, Ridi, Riccardo 2014. Unified Theory of Information, hypertextuality and levels of reality. *Journal of documentation*, 70(3), 443-460. Also available at <<http://mate.unipv.it/gnoli/jdoc2014uti.pdf>>.
- Haefner, Klaus ed. 1992. *Evolution of information processing systems*. Berlin: Springer. 369 p.
- Hartmann, Nicolai 1940. *Die Aufbau der realen Welt: Grundriss der allgemeinen Kategorienlehre*. Berlin: De Gruyter.
- Hongladarom, Soraj 2008. Floridi and Spinoza on global information ethics. *Ethics and Information Technology*, 10, 175-187.
- Kampis, George 1991. *Self-modifying systems in biology and cognitive science: a new framework for dynamics, information and complexity*. Oxford etc.: Pergamon. 543 p. Also available at: <http://hps.elte.hu/~dept/Books/SMSCB_Kampis.pdf>.
- Kors, Alan Charles ed. 2002, Diaries and memoirs. In *Oxford Encyclopedia of the Enlightenment*. University Press.
- Landauer, Rolf 1967. Wanted: a physically possible theory of physics. *IEEE Spectrum*, 4(9), 105-109.
- Poli, Roberto 2001. The basic problem of the theory of levels of reality. *Axiomathes*, 12(3-4), 261-283.
- Spinoza, Baruch 1677, *Ethica ordine geometrico demonstrata*. Amsterdam: Rieuwertsz. English tr. by W.H. White, *Ethics*, Ware: Wordsworth, 2001. Various p.
- Wheeler, John A. 1990. Information, physics, quantum: the search for links. In W.H. Zurek ed., *Complexity, entropy, and the physics of information*. Redwood City: Addison-Wesley, p. 3-28.
- Wiener, Norbert 1961. *Cybernetics or control and communication in the animal and the machine*, 2nd ed. Cambridge (Mass.), MIT Press. 232 p.