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*Article*

# How Should We Understand That a Map of Information Concept Is Created?

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**Abstract:** The definition of information concepts has been approached in various ways. Previous studies have classified these definitions into three categories: (1) reductionism, (2) antireductionism, and (3) non-reductionism. The map of information concepts developed by Luciano Floridi organizes information concepts in terms of (3) non-reductionism. However, the map is often criticized due to misunderstandings, since neither the specific method for constructing the map nor its structure is described in detail. The purpose of this paper is to reconstruct the map using the method of levels of abstraction (LoA) and to make its structure explicit. First, Section 2 reviews previous studies and organizes the definitions of information concepts based on the above classification scheme. Next, Section 3 explains the method of LoA and applies it to information concepts. As a result, it becomes clear that the map differs from the well-known DIKW pyramid in that each element is arranged by adding observables in order from higher to lower degrees of abstraction. This work allows us to demonstrate the relationship between the map and the method of LoA, and to re-evaluate Floridi's achievement.

**Keywords:** informativeness; information concept; abstraction level; Floridi

## 1. Introduction

The concept of “information” is one of the key words that describe modern society. It is used in a variety of settings, from daily life to academic research, and it is now difficult to understand modern society without it. On the other hand, the independent use of the concept in various situations has led to the polysemous nature of the concept, and even when the same term is used, it has different meanings in different areas of usage. The fragility of these conceptual foundations is one of the central concerns in the philosophy of information. Thus, the “analysis and organization of information concepts” emerges as an important task in the philosophy of information (cf. Adriaans and van Benthem eds. 2008; Floridi 2011). The importance of this task is not limited to simply analyzing and organizing concepts, but also includes resolving the differences that arise between different domains (concerning information concepts).<sup>1</sup>

Various definitions of information concepts have been given. Some have attempted to organize the currently used information concepts in a descriptive manner, while others have attempted to give new definitions that are comprehensive and unified, as it is undesirable for them to be polysemous. As discussed in detail in Section 2.1, according to previous studies (cf. Floridi 2004; Floridi ed. 2016, Introduction), information concepts can generally be classified in the following three ways. Namely, (1) “reductionism,” in which multiple information concepts are viewed in a linear hierarchical structure; (2) “anti-reductionism,” in which multiple information concepts are viewed as completely independent; and (3) “non-reductionism,” in which multiple information concepts are viewed as

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<sup>1</sup> For example, the meaning of “information” differs between fields that focus on the concept of information as semantic content, such as fake news, and those that focus on the topic of genetic information, which requires that responses be well-formed as a minimum. One of the possible misunderstandings that can arise in the absence of an organized concept is the misunderstanding that genes have information as semantic content.

distributed networks related to each other. Perhaps there is no single correct method among these, but rather it is important which aspects of information concepts are considered important (or discarded) based on what purpose, and this will change the appropriate classification method.

By the way, one often referenced way of organizing information concepts is Floridi's "a map of information concepts" (Floridi 2010) (cf. D'Alfonso 2012; D'Alfonso 2013). This is a map of information concepts organized in the form of a floor plan from the standpoint of (3) above. However, Floridi only states that this "can be explained in several ways depending on the LoA applied" (Floridi 2011, p. 81) and does not say anything about "how the the method of Level of Abstraction can be used to create an information concept map" or "what the structure of an information concept map is. What is the structure of an information concept map? This situation has helped to explain why not a few of the criticisms against Floridi are based on a misunderstanding of the map of information concept.<sup>2</sup>

Therefore, this paper aims to give answers to more questions than Floridi has not mentioned as of 2025. In other words, we will structure the process of creating an information concept map through the actual application of the method of Level of Abstraction, and we will make explicit the structure as an interrelated, distributed network in the information concept map. To achieve this, this chapter is structured as follows. First, Section 2 serves as a review of previous research, organizing the definitions of information concepts that have been made so far based on the three classification methods already mentioned. In Section 3, after explaining the method of Level of Abstraction that Floridi employs as his methodology, he applies it to information concepts and actually creates an information concept map. The above work will enable us to further advance Floridi's results and to properly reevaluate Floridi's position in previous studies.

## 2. Classify Various Information Concepts

In Section 2.1, we will organize how information concepts have been organized so far. First, we will introduce previous studies on how to classify information concepts, and based on this method, we will classify the various information concepts that have been proposed so far. Then, we will discuss Floridi's information concept map, whose structure we hope to clarify in this paper, and clarify its position in the academic context of the classification of information concepts.

### 2.1. How to Classify Information Concepts

It has been pointed out by many commentators that the concept of information is polysemous, just as many other concepts are polysemous. For example, we read "information" in online articles and newspapers, gather "information" about the weather from the black clouds in the sky, are misled by fascinating "information" about conspiracy theories, and worry daily about the amount of "information" we can communicate on our smartphones. All of these are described by the same term "information," but intuitively each is imbued with different nuances. In other words, if we take a set enclosed in parentheses by the label "information concept," we can say that it is composed of several (at least one, two if it is polysemous) elements (Figure 1).

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<sup>2</sup> The following are typical examples. For example, Scarantino and Piccinini criticize Floridi for his positive support of the Veridicality Thesis by pointing out that the concept of information is polysemous, and that he is a monist regarding the concept of information (Scarantino and Piccinini 2010). However, it is clear from reading the map of information concepts that this is a misunderstanding, and Floridi himself refutes this claim by saying that he himself is a pluralist (Allo ed. 2010, p. 157). Lundgren also criticizes the Information Concept Map, saying that it should be distinguished from truth-neutral information by establishing a subcategory that represents true (veridical) information, and the author believes that the Information Concept Map attempts to make an arrangement that includes exactly that distinction (Lundgren 2019).

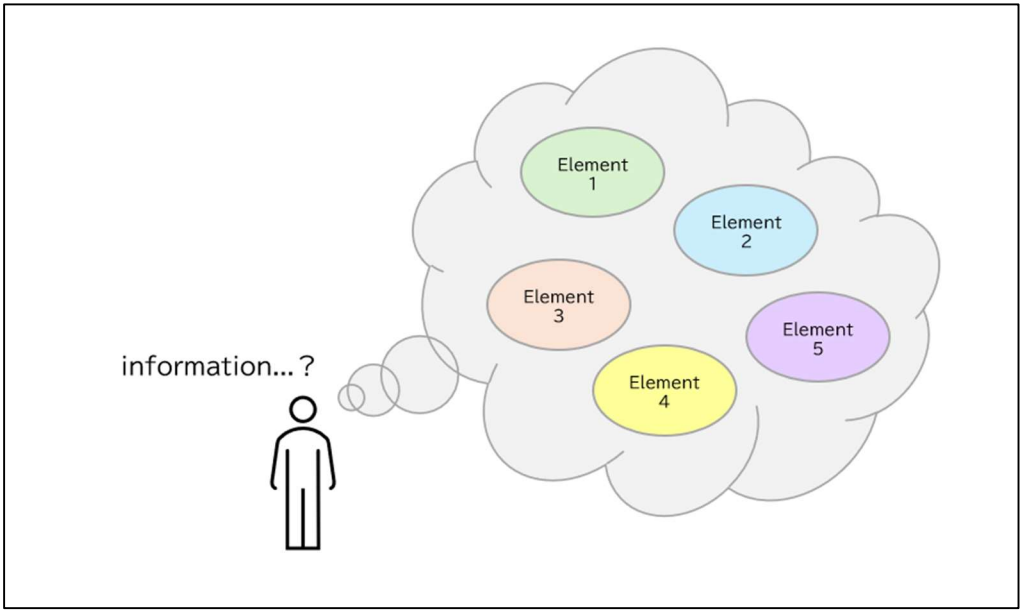


Figure 1. Polysemous information concepts.

Regarding what kind of relationship to assume between these various elements, Floridi states that there are three possible positions: reductionist, non-reductionist, and anti-reductionist (Floridi 2004; Floridi ed. 2016, Introduction).

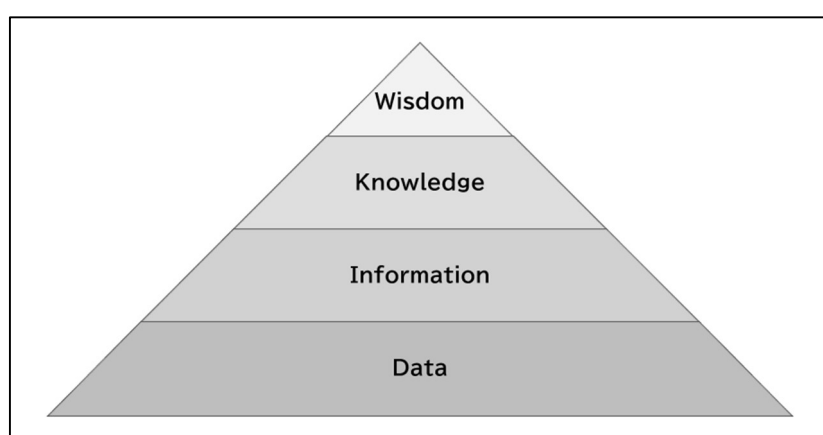
reductionism	:	The position that any element can be reduced to one specific underlying element, with a linear, or hierarchical structure in which the various elements are arranged in a row. In some cases, there are branches within the hierarchical structure.
non-reductionism	:	All positions except reductionism and anti-reductionism. Each element is distributed and involves an interconnected network-like structure.
anti-reductionism	:	The position that each element refers to something different and that there is no interconnection between the elements.

Reductionism and anti-reductionism are, so to speak, two polar positions. According to one pole, reductionism, there is one fundamental and privileged element of the information concept, and all other elements can be included in and accounted for by that fundamental element. According to the other pole, anti-reductionism, each element of an information concept is simply labeled “information” and has no interconnectedness, and one element cannot explain another. Then, the remaining non-reductionism would point to an intermediate position that does not belong to the two extremes. In other words, all positions in which there is some connection between each element, but not a foundational and privileged element, and in which each element is woven into a dispersed network, are here called non-reductionist.

The above classification method or classification name by Floridi may be somewhat misleading because it differs in some respects from the common understanding<sup>3</sup>. For example, if the various elements are in a hierarchical structure, it is generally considered reductionist, but if no foundational and privileged “*original concept*” (Ur-concept) is assumed, it is not reductionist according to Floridi. This point will be reiterated in Section 2.3. However, since comprehensiveness is achieved by setting up mutually exclusive positions, it may well stand up to use as a springboard for analysis.

## 2.2. Various Information Concepts

The DIKW pyramid is probably the most well-known method of characterizing information concepts in relation to other concepts (Figure 2). DIKW” stands for Data, Information, Knowledge, and Wisdom, and is characterized by its representation as a pyramid-like hierarchical structure. According to Ridi, the formation process of the DIKW pyramid is not clear, but he believes that the pyramid-like hierarchical structure may be influenced by two subjective assumptions that people have (Ridi 2020).



**Figure 2.** Common DIKW pyramids.

<sup>3</sup> Some of the commentary and criticisms by Akagi (2006) appear to be based on misunderstandings. For example, there is no such fact, although it is stated as follows (Akagi 2006, pp. 65-77).

The second anti-reductionist theory, while attempting to offer a counterproposal to the right reductionist theory, tries to narrow down the source of the multiplicity of information to a single concept. [...] Despite the name “anti-reductionism,” it merely opposes the first reductionism on the right, but has no substance at all.

The current mainstream philosophy of information, represented by Floridi, excludes reductionism and anti-reductionism from the philosophy of information and implicitly states that their success or failure should be handled by the philosophy of science.

Within the framework of the information philosophy, misinformation is excluded as not being information. Further derivative misunderstandings have also spread, originating from the misunderstanding-based criticism by Akagi (cf. Sugino 2016, p. 3). It is obvious that the following quote is far removed from Floridi’s view, which is organized in this paper ([10] in the quote is from Akagi (2006)).

Regarding the possibility of unifying the concept of information in an interdisciplinary way, Floridi sets out that information can be defined from three standpoints: reductionism, anti-reductionism, and non-reductionism, and then says that in effect there are only two types left: reductionism and non-reductionism [10]. [...] The broad scope of the concept of information probably means that it is difficult for philosophy to be fully responsible for its application to each of these fields.



- Quantitative Assumptions : The image of the world is that there is more knowledge than wisdom, more information than knowledge, and more data than information. When we filter out the noise (in the everyday sense) from the many data in the world, information, knowledge, and wisdom are taken out in order.
- Normative Assumptions : The image is of normatively superior wisdom positioned at the apex, and as it becomes less valuable, it is positioned at the bottom of the pyramid.

Ridi and Rowley and Hartley survey a diverse field and show that the DIKW pyramid has already gained public acceptance as common (Ridi 2020; Rowley and Hartley 2008).

On the other hand, however, the DIKW pyramid at best shows that information is sandwiched between lower level data and upper level knowledge, and does not refer to each element of the information concept. It is precisely this point that we wish to address in this paper. In other words, several elements are supposed to be assumed inside the information concept, which is supposed to start from data and lead to knowledge, but what are the connections between each element and how is it supposed to lead from data to knowledge?

In the following, we will use the three categories introduced earlier to organize the cases of “anti-reductionism” and “reductionism” in turn, excluding the non-reductionism adopted by Floridi.

### 2.2.1. Examples of Anti-Reductionism

A common understanding of the information concept is that it can be divided into two categories: objective things and subjective things (cf. Capurro 2020). For example, Wiener, who proposed cybernetics, describes the information concept as follows (Wiener 1989, pp. 93-94).

It seems to me that some sort of distinction needs to be made between information that is treated ruthlessly (brutally) and bluntly (bluntly) and information that is the basis for us humans to act efficiently - or, with the necessary modifications, for a machine to act efficiently. --It seems to me that some sort of distinction needs to be made between the information and the information that serves as the basis for our efficient human behavior - or, with the necessary modifications, for the efficient behavior of machines. In my view, the central distinction and difficulty here arises from the following facts. That is, the fact that what matters for action is not the amount of information that is transmitted, but rather the amount of information that can permeate the communication and storage devices just enough to serve as a trigger for action.

According to Iliadis, Wiener distinguished between information as objective “things” as entities that can be sent and received, and information as subjective “things” that contribute to action, such as fluidly varying in significance for each receiving subject (Iliadis 2013). The term “subjective” here refers to a way of being that changes depending on the receiving subject (even if the subject is a machine of sorts). Considering that cybernetics was proposed at almost the same time as Shannon’s information theory, the idea that information concepts should be distinguished into objective and subjective information can be seen as originating from cybernetics. These ideas were inherited by Osgood, who also belonged to the school of cybernetics (Osgood 1952).

The origin of such polysemy is explained as follows by Capurro and Hjørland, who have done much work in the history of information concepts (Capurro 2020; Capurro and Hjørland 2003). According to them, the Latin *informatio* was formed from Aristotle’s *forma*, an analogy from the act of giving form (*forma*) to the other person (prefix *in*), which until the Middle Ages meant “to educate” or “to give knowledge. Since the act of giving a *forma* as a thing to another person is assumed, it is classified as objective information. However, since the early modern period, the concept of

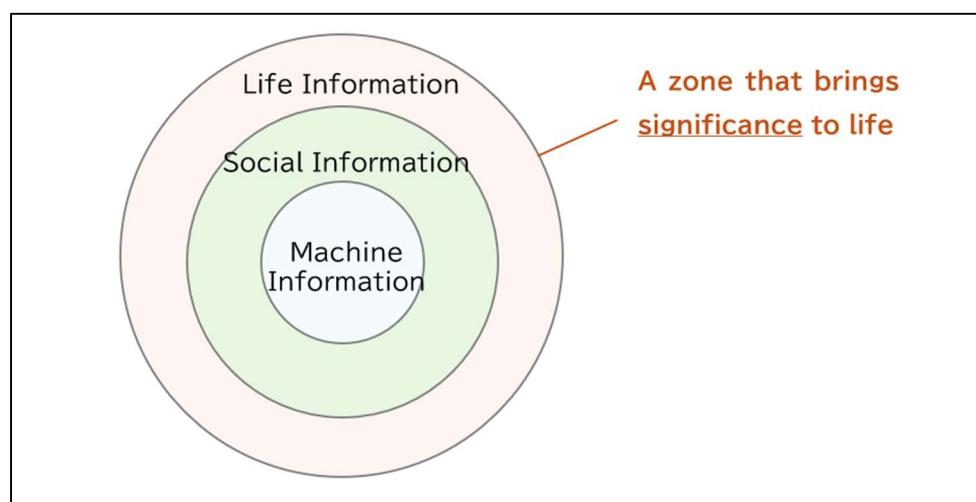
information has come to focus on the aspect of “being conveyed” due to the influence of Descartes and others, and is now used exclusively in the sense of subjective information from the viewpoint of the receiver. This shift from objective information to subjective information occurred here, but since the 20th century, thanks to the work of Hartley, Shannon, and other researchers at Bell Labs, information as objects, or objective information, has been restored. As a result, we can say that today we have a mixture of two elements: objective information (for the second time) and subjective information (since early modern times).

Such an explanatory approach is characterized by an emphasis on the polysemous nature of the information concept, while at the same time adopting a negative (or at best neutral) attitude toward the interrelationships among the various elements. The important point is to emphasize the situation in which each element points to something different, even though they are the same labeling, and not to try to explain one particular element in terms of its relationship to another.

### 2.2.2. Examples of Reductionism

Reductionism is, so to speak, the foundationalism of the information concept. In other words, it considers only certain elements as essential and tries to explain other elements in relation to them.

For example, one field that has become increasingly influential in recent years with regard to the characterization of information concepts is Fundamental informatics (cf. Nishigaki 2021; Hagiya 2014). Fundamental informatics is in the lineage of cybernetics in that it places the idea of autopoiesis at the core of its theory. In fact, Nishigaki, the proponent of Fundamental informatics, emphasizes its relevance to neo-cybernetics, the successor theory to cybernetics (Nishigaki 2021). However, as Nishigaki himself states, his stance on the concept of information, as described below, is the exact opposite of that of cybernetics, which takes an anti-reductionist stance, and is characterized by (1) denying the existence of objective information and (2) explaining the three elements of subjective information, “life information,” “social information,” and “machine information,” as hierarchical (Figure 3).



**Figure 3.** Characterization of information concepts in Fundamental informatics.

First, regarding (1), Fundamental informatics denies the existence of objective information and considers only subjective information as essential “information. The following quote is a good example of a position that does not allow for the existence of objective information:<sup>4</sup> .

<sup>4</sup> According to Nishigaki, “information” emerges along with the semantic action involved in some life activity. Therefore, we cannot speak of information as if it were an external thing, ignoring the historical aspects that accompany life activity (Nishigaki 1998, p. 28; 2004, p. 23).

Information is not something that “comes in” to a living system from the outside. It is a mistake to regard information as something that exists outside. (Nishigaki 2004, p.23)

Regarding (2), in Fundamental informatics, “life information” is regarded as a fundamental element, and the other elements, “social information” and “machine information,” are explained in a way that they are encompassed by it.

They satisfy the following inclusions and are not equal. life information  $\supseteq$  social information  $\supseteq$  machine information (Nishigaki 2021, p. 85)

All information is “life information” and this is nothing more than the fundamental information concept in basic informatics. (ibid.)

Here, by assuming a linear hierarchy, we believe that they are trying to explain objective information (what we assume to be objective information) in a unified way as a subset of biological information.

Others argue that the “symbols” of objects treated in information theory, or the “differences” and “patterns” that McKay, Bateson, and others refer to as definitions of information, are merely labeled as “information” as a metaphor, not as information in the true sense, and that true information exists as something else (cf. There is also a position that “information” is not really information, but rather a separate thing (cf. Akagi 2006). This is the assertion that what appears to be several elements in an information concept is actually a trick, and that information in the true sense consists of only one specific element.<sup>5</sup>

Reductionism is superior in simplicity in that it shows the relationship between each element, which was not explained by anti-reductionism, and gives a unified view of information. On the other hand, however, it is undeniable that it disregards, or at least devalues, the historical background and complexity of the concept of “information,” as pointed out by Capullo and Hjørland, because of the theory’s explanatory capacity and modern linguistic sense.

### 2.3. Information Concept Map As Non-Reductionism

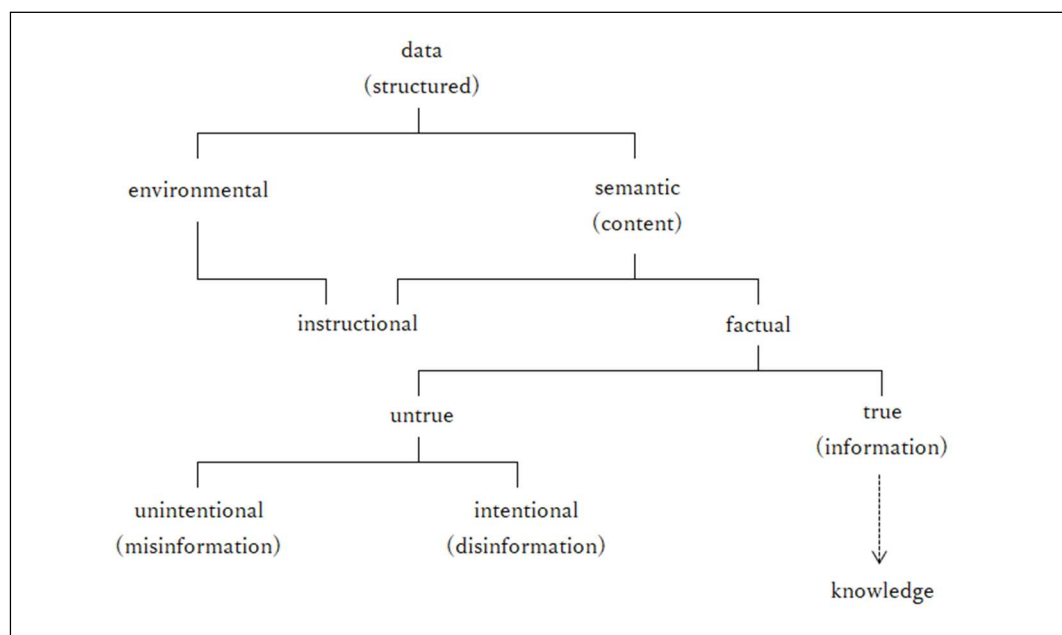
So far, we have looked at the polar positions of anti-reductionism and reductionism. Floridi is critical of these positions, believing that the object lumped together as “information” is an interdependent network of elements in an irreducible relationship, and cannot be reduced to any one basic element in particular (Floridi 2011, p. 33).<sup>6</sup>

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<sup>5</sup> It should be noted that, coincidentally in this case, both sides view what could be called subjective information as fundamental.

<sup>6</sup> Burgin's General Theory of Information (GTI) is similar to cybernetics in that it views information as “the ability to cause change” and in that it can be interpreted as an analysis of systems in an autopoietic way (Burgin 2010; Mikkilineni 2023). However, while cybernetics is a form of anti-reductionism, the author considers GTI to be a form of non-reductionism in that it seeks to explain the interrelatedness of different information elements in several dimensions. In that sense, even though GTI differs from Floridi's view of information (Floridi sees information as static, while GTI sees it as dynamic), it is still part of the non-reductionist camp, just like Floridi. Note, however, that this paper focuses on Floridi's map, so it mainly discusses Floridi as a representative example of non-reductionism.





**Figure 4.** Original map of information concept (Floridi 2010).

Therefore, Floridi presented the way each element is connected as an “information concept map” (Figure 4) (Floridi 2010). Note that not only some of the elements in the figure are real “information,” but all the elements shown in the figure are “information concepts. Although Floridi assumes “data,” which is placed at the top in the figure, as a foundational property (see Section 3.2), according to him, “data” does not qualify as an “original concept” (Ur-concept) that has privileged status as the *reductio ad absurdum* of other elements, and he never admits privileged status for other elements either. It does not (Floridi ed., 2016, pp. 2-3)<sup>7</sup>. In addition, the various distributed elements are tied to each other in a network-like fashion, allowing one element to be explained by another. All of this leads us to classify Floridi’s way of organizing as “non-reductionist” out of the three.

A brief look at Figure 4 reveals a shape reminiscent of the DIKW pyramid, with data at the very top and information and knowledge at the bottom right. In fact, when the book containing the original information concept map was translated into Japanese, Kawashima stated the following as an explanation (Kawashima 2021, p.189)

This can be easily understood by recalling the diagram of a pyramid in which information is combined to become knowledge and eventually to wisdom (Figure 1). It is a diagram that is often seen.

“Figure 1” in the quotation is almost identical to Figure 3 “Common DIKW Pyramid” in this paper. So, should we understand the information concept map as a variant of the DIKW pyramid?

It is the author’s position that this is not the case. Rather, emphasizing the similarity to the DIKW pyramid may hinder understanding of the information concept map. This is because there are several aspects of the information concept map that are not well understood. First, if it was created with the common DIKW pyramid in mind, it is upside down. This is by no means a trivial problem. As already mentioned, while the exact reason why the DIKW pyramid is pyramidal has not yet been clarified, we cannot ignore the fact that it is upside down, even against the intuitive reasoning of several commentators (cf. Ridi 2020; Rowley 2007; Frické 2019). Second, it is not at all clear from the diagram whether the term given to each node represents a property name or a pure element name. And third, it remains unclear how each element is connected. Floridi himself does not tell us how to read the

<sup>7</sup> At first glance, this seems strange. The reason I said in 2-1 that this classification scheme is “misleading” is because it runs counter to my intuition on this point. It should be noted that when Floridi speaks of “reductionism” in this context, the particular element of the reduction destination must have the privileged status of explaining other elements, such as “life information” in Fundamental informatics.

map, for example, whether one element can add to the properties of another element, or whether the elements do not share properties (but are still connected in some way). In light of these points, applying the common DIKW pyramidal understanding to the information concept map does not seem to make much sense.

In this paper, therefore, we would like to focus on the following few statements by Floridi to give an explanation focusing on the way information concept maps are created.

Information is notorious for taking many forms and having many meanings. It can be associated with multiple explanations, depending on the perspective adopted and the requirements or desirability envisioned by each person. (Floridi 2010, p.1)

[...] data are transformed into factual information by being processed semantically at some given level of abstraction (Floridi 2011, p. 77)

In other words, the information concept map is a product of the method of Level of Abstraction. In Section 3, we will actually apply the method of Level of Abstraction to create an information concept map and clarify its structure.

### 3. Actually Create a Map of Floridi's Information Concepts

In Section 2, we pointed out that in the enterprise of classifying information concepts, Floridi's organization, or "information concept map," is positioned as an attempt at non-reductionism. However, as already mentioned, its detailed structure was not clarified by Floridi himself, and it remained unclear why it should be organized in such a way.

In Section 3, we will show how each element on the map is derived and why it must be structured the way it is by deciphering the way information concept maps are created. To this end, we will first briefly reiterate the "the method of Level of Abstraction" that Floridi employs as his methodology. Then, by using the central idea of this method, "show/hide information," each element on the map is actually derived and its structure is clarified.

#### 3.1. Overview of the Method of Level of Abstraction

the method of Level of Abstraction (LoA) is a methodology on abstraction published by Floridi and Sanders in 2004 (Floridi and Sanders 2004). Floridi cites the LoA methodology as the methodology he employs, and the fact that it has been introduced in several textbook-like books makes it safe to say that it has a strong influence on the entire philosophy of information (cf. Illari 2013; Floridi ed. 2016). We will limit our overview here to the extent that it is necessary for the discussion in this chapter (cf. Floridi 2011; Floridi 2019; Enomoto 2023).

First, the purpose of the LoA methodology is to provide a method for "how to set the playing field, or LoA (level of abstraction), for viewing things. Figure 5 shows the scheme of the theory involving LoA. According to this, a system, the object to be analyzed, can be analyzed only at a specific LoA. This is because, for example, living organisms do not perceive things as they are, but with some purpose in mind, focusing on one aspect or the other - in other words, discarding one aspect or the other.

Next, the definition of LoA, the ring for viewing things, is given as a set of observables, meaning "interpreted type variables". That is, a particular LoA is the set of

$$LoA_i = \{ observable_1, observable_2, \dots, observable_n \}$$

(where n is an integer greater than or equal to 1). This means that even when we view the same thing, the way we see it changes depending on the observable selected as a component.

Here, Enomoto, in order to alleviate the difficulty of understanding the LoA method due to its high generality, presents the idea of understanding observers bubbles as display items in a view (Enomoto 2023), based on an analogy between the LoA method and the relational database

mechanism. In this view, abstraction - that is, the act of selecting an observable—— is equivalent to the operation of selecting which item to display in a view (Figure 6).<sup>8</sup>

In other words, looking at things at a particular level is an “information showing/hiding” operation. This is only one of the attempts to understand the LoA method in a more concrete and comprehensible manner, but by using this “show/hide information” concept, it is easier to create an information concept map than by applying the LoA method as it is.

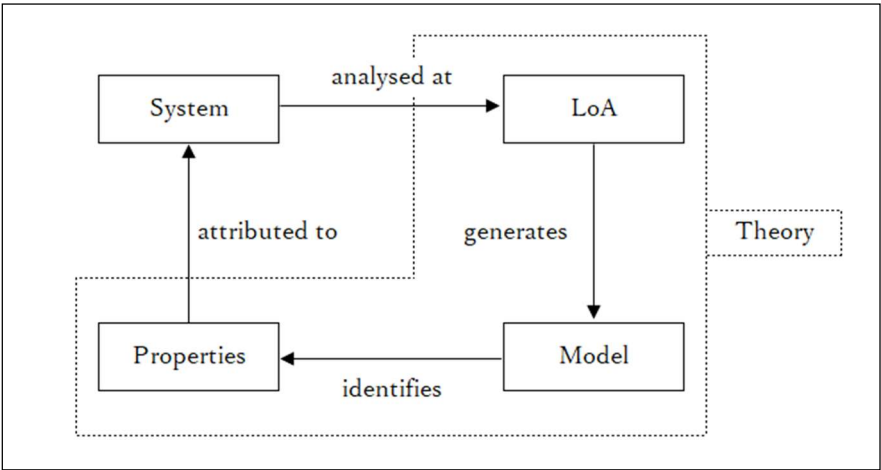


Figure 5. Scheme of the theory (Floridi 2013, p. 35).

Field :	<i>observable<sub>1</sub></i>	<i>observable<sub>2</sub></i>	<i>observable<sub>3</sub></i>	<i>observable<sub>4</sub></i>	...
Table :	○○	○○	○○	○○	...
Display :	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Conditions :		1		0	

Figure 6. Image of Observable as a display item in the database.

3.2. Application to Information Concepts

Based on the above, the LoA methodology is applied to information concepts. In order to select items for display, candidate properties must be listed in advance. Looking back at Figure 5 again, we notice that there is a mixture of terms that were often used to name elements in the history of information concepts and terms that were often used to describe elements. For example, terms such as “data,” “semantic content,” and “misinformation” have become established as element names in their own right, whereas terms such as “instructional,” “intentional,” and “intentional” have become established as element names. Terms such as “instructional,” “intentional,” and “true” are used to emphasize the nature of each element in particular.<sup>9</sup>

<sup>8</sup> Note that “table” in the figure originally means a two-dimensional table consisting of rows and columns, but here, for convenience, it is considered to mean the system to be analyzed. In addition, “extraction conditions” in the figure is a place to enter appropriate conditions when you wish to search for items that satisfy specific conditions.

<sup>9</sup> A few more examples. The expression “semantic content” is common, but “directive semantic content” is

In addition, as background knowledge, Floridi asserts Ontological Neutrality, which states that all information concepts have the property of being “data” (Floridi 2011, p.90). Furthermore, it is widely known that “data” plus “meaning” is called “semantic content,” and among “semantic content” those that are true (true, veridical)<sup>10</sup> are called “semantic information” (cf. It is widely known that “semantic content” and “true, veridical” semantic information are called “semantic information” (cf. Floridi 2010; Floridi 2011).

Considering the historical nature of each of the above elements and the descriptions by Floridi, the candidates for observers for the information concept map can be narrowed down as described below (see also Figure 7). The first observable is “data. This is an observer bubble that appears in all elements, so it does not need to be there, but it is provided to explicitly display it as an observer bubble. The feeling is that it emphasizes the fact that we are focusing on the data aspect of “information. Since this is a fundamental property that appears in all elements, the key point is naturally to always select “Display” and to display everything without writing anything in the extraction conditions.

Field :	data	meaning	value()	intention()	
Table :	information	information	information	information	
Display :	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Conditions :					

Figure 7. Image of an observable for creating an information concept map.

The second observable is “meaning,” which reflects Floridi’s idea that semantic content is the addition of meaning to data. When we focus only on the data aspect of “information,” the “meaning” observer bubble is hidden and discarded, but when we want to consider information as semantic content, that is, when we also focus on the meaning aspect of “information,” the “meaning” is displayed. If it has meaning, it does not matter what the specific value (content) is, so this too will display everything without writing anything in the extraction conditions.

The third observable is “value()”. This does not mean the value of a thing, but the truth value. When we focus only on the data and meaning aspects of “information,” we can hide and discard the “value()” observable, but when we want to consider the truth or falsehood of information, that is, when we also focus on the truth-value aspect of “information,” we should display the “value()” observable.<sup>11</sup> Unlike the previous two observables, the truth value is divided into multiple

not. While "semantic content" is already an established word, "directive" (and its counterpart "factual") are used to describe what the semantic content looks like.

<sup>10</sup> The Japanese translation of *Information: A Very Short Introduction* (Floridi 2010), which contains a map of information concepts, translates "true" as "truthful" and "veridical" as "consistent with fact. However, Floridi states in several references that "true" and "veridical" (and "truthful") are synonymous and mean "true" in terms of truth value" (cf. Floridi 2005a, pp. 16-17).

<sup>11</sup> Although "factual" appears before truth-value-related properties such as "true" and "untrue" in the original information concept map, Floridi points out that the property "factual" means having a truth value (Floridi 2011, Chapter 4). Therefore, in this chapter, by displaying the observable "value()", the property "factual" can be satisfied at the same time. On the other hand, some may point out, "Isn't it also important to bifurcate between factual and directive? The answer to this question is that the original information concept map is used to determine whether or not an element is placed at the destination of the branch, and whether or not it is adopted as an observable is determined by calculating backward from there. In this sense, it may be said that the candidates for observables are quite arbitrary.

elements depending on its value (content), so when you want to consider something “true” (true), you should write 1 in the extraction condition, and when you want to consider something “untrue” (false), you should write 0. The “()” in the name of the observable is added for convenience to emphasize that a value input is required. Note that, based on the implicit premise that an observer bubble must have at least one meaning in order to have a truth value, the observer bubble “meaning” must also be displayed when you want to display this observer bubble.

The fourth observable is “intention()”. When we focus only on the data, meaning, and truth aspects of “information,” the “intention()” observable should be hidden and discarded, but when we want to consider the intention of the sender of information, that is, when we also focus on the intentionality aspect of “information” the “intention()” observable is also displayed. Like the “value()” observable, this too is divided into multiple elements depending on its value (content), so 1 is written as the extraction condition when you want to consider “intentional” information, and 0 when you want to consider “unintentional” information. Note that, in the same way, the observer bubble “meaning” must also be displayed when you want to display this observer bubble, based on the implicit assumption that the observer bubble must at least have a meaning in order to have intentionality.

The preparations are now complete. Figure 8 is the information concept map reworked by the author. For clarity, each element is surrounded by a gray-filled double line and bolded. On the other hand, the so-called properties other than the elements are surrounded by dotted lines to emphasize that they are different types of nodes from the elements. In addition, the underlined areas refer to the observables that make up the element.

The procedure is described in detail below. First, as Level 1, focus only on the data aspect of the information concept and display only the observable “data”. The LoA “data” is the result of this operation. Of all the elements of the information concept, this is the one that discards the most aspects, and therefore has the highest level of abstraction.

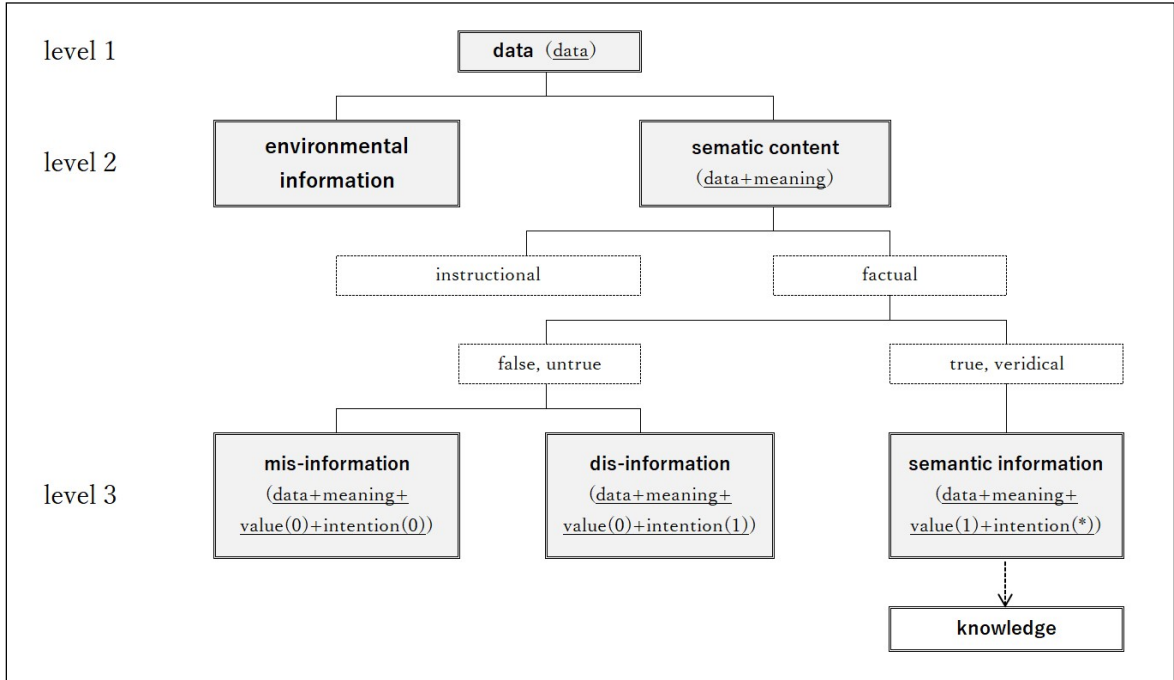


Figure 8. Rebuilt map of information concept.

Next, as Level 2, we focus on the data and meaning (meaning) aspects of the information concept and display it in the form of adding the observable “meaning”. The result of this operation is LoA “semantic content (data + meaning)”. Compared to the level 1 data, the level of abstraction has been lowered because the number of aspects to be discarded has been reduced by one, making it more



concrete. Therefore, it is indicated lower than Level 1 to visually express the reduced level of abstraction.

Next, as Level 3, we focus on the four aspects of the information concept: data, meaning, truth value, and intentionality, and display them with the addition of the “value()” and “intention()” observers. If the extraction condition for the “value()” observable expressing the truth value is set to 0, it will branch to the “false, untrue” property, and if the extraction condition for the “intention()” observable expressing intentionality is determined, the element name will be determined accordingly. This operation results in LoA “false information (data+meaning+value(0)+intention(0))” and LoA “false information (data+meaning+value(0)+intention(1))”. In contrast, if the extraction condition of the observable “value()” is set to 1, it branches toward the property “true (true, veridical)”, but if we follow Floridi’s characterization, the element is determined regardless of the value of intentionality, so the extraction condition of the observable “intention()” is wildcard “\*” and any of the values such as “null”, “0”, or “1” may be included.<sup>12</sup> This operation results in LoA “semantic information (data+meaning+value(1)+intention(\*))”. Compared to the level 2 semantic content, the level of abstraction has been lowered because the number of aspects to be discarded has been reduced by two, making it more concrete. For this reason, it is placed lower than Level 2 for the purpose of visually expressing the reduced level of abstraction.

The difference between the reworked map in this paper and the original map by Floridi is that “semantic information,” “misinformation,” and “false information” are juxtaposed at the same height in Level 3. In the original map, the heights were slightly different, but these three elements only differ in the extraction conditions, and in the redesigned version, the observers to be selected are equal. In other words, they belong to the same level of abstraction. Of course, if “intention()” is omitted from the “semantic information” observable (hidden) and placed between level 2 and level 3, as in the original version, it would still be virtually the same. The important point here is that the level of abstraction depends on the observable one chooses, not that a particular element necessarily occupies that position.

As a related story to the previous paragraph, “environmental information,” which is positioned around level 2, should be considered independently of the level of exception. The treatment of environmental information is also often changed by Floridi, with different works positioning it differently, including whether or not a line is drawn from environmental information to another node (cf. Floridi 2005b). For example, if one adopts a naturalistic position, semantic content is based on environmental information, so the nature of semantic content becomes environmental, and furthermore, environmental information can have semantic properties (cf. Dretske 1981; Millikan 2004). 1981; Millikan 2004). Also, as Floridi points out, environmental information does not necessarily require semantics; it can be semantic or not (Floridi 2010, p. 33). Given these considerations, there may be a problem with the way the bifurcation in the original map was done. The proper place of environmental information in the map should be explored in the future, but depending on one’s point of view, this exceptionality may also be a good representation of the nature of the map, which “changes depending on the observers who choose it”.

## Conclusions

We review the discussion in this paper. First, in Section 2, as a review of previous research, we organized the definitions of information concepts that have been made based on three different classification methods (“reductionist,” “non-reductionist,” and “anti-reductionist”). Here, Floridi’s map of information concepts was classified as non-reductionist, and it was confirmed that each distributed element is woven into a network. In Section 3, the methodology of LoA was briefly explained, and the information concept map was reconstructed by applying it to the actual information concepts. As a result, it was found that the information concept map differs from the

<sup>12</sup> The resulting LoA is a “moderated LoA” in that the observables “value()” and “intention()” have restrictions on the values that can be entered.

DIKW pyramid in that it is structured in such a way that each element is arranged by adding observers in the order of increasing abstraction. This work has shown the relationship between the information concept map and the LoA methodology, which has not been explicitly discussed in the past, and its applicability, allowing us to properly reevaluate Floridi's results.

On the other hand, the following issues remain for discussion in this paper. Although observers were selected using the "information display/hide" concept, it is questionable whether the observers to be adopted as candidates can really remain in their current state. Since the information concept map also has a descriptive aspect of organizing the multifaceted information concepts that are currently in use, it is necessary to further examine whether the current observers' bubbles are successfully modeling information concepts in the real world.

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