1.1. Material and immaterial information

> 'Even the most perfect reproduction of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be.'
>
> Walter Benjamin

Synopsis: *Information is either material or immaterial (1–4); The materialisation and dematerialisation of information (5–6); The materialisation of immaterial information (7); The dematerialisation of materialised (immaterial) information (8–9); The invention of intellectual property (10–11); The (re-)materialisation of information into digits (the digitisation of information) (12–15); Digital information is infinite (16); Digital-born and digital world-only information (17); Digital humans? (18).*

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1. *

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Information is either material, meaning processable by Beings in the analogue or the digital world (i.e. processable by more than one Being[38]), or immaterial, meaning unprocessable by Beings (plural) in the analogue or the digital world (i.e. it is processable by only one Being—it is a thought, a feeling or a wish, but also, significantly, the spoken word[39] too).

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38   For biological Beings it is processable through their senses, while for non-biological Beings it is processable through their nature, meaning the design given to them by humans.

39   *Verba volant*: basically, the spoken word, a verbal discussion, is unprocessable by more than one Being because it has not materialised (for example, on paper) meaning that what was said has not been retained, it has departed and it cannot be proved that it ever existed. However, once speech materialises, e.g. on paper, or if it causes another, material, action (including repetition *verbatim*), then it becomes processable, in this new form, by more than one Being. The same is true of a gust of air: unless it is scientifically registered (e.g. in terms of strength or direction), it is not material information, i.e. it cannot be processed by more than one Being.

2.

Immaterial information is infinite (thoughts, feelings and wishes know no end), but while in the analogue world material information is finite (because the analogue world is finite), in the digital world it is infinite.[40]

3.

All immaterial information is created (thought, felt) by humans and animals, that is, by biological Beings.[41]

Non-biological Beings (organisations and artificial Beings) are (for the moment assumed[42] to be) unable to create new immaterial information (thoughts or feelings).

Material information can either be created by Beings (all Beings can create Things or other Beings) or simply exists in the analogue world (it has been created by Nature).

4.

Humans, as Beings,[43] can and will process information. Once they have become individuals through their unique identification in space and time by their states,[44] they can and will constantly increase their information processing, to serve their need to augment it.[45]

5. The materialisation and dematerialisation of information*

Material information has been processed by humans and animals in terms of property[46] since the beginning of time.

Immaterial information can become material, meaning processable by other Beings as well (or even by the same single Being in some future

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40 See Chap. 1, par. 15.
41 Human creativity, as we know it, is the result of a purely human need to augment information processing, see Chap. 5.1 par. 6, and note 5.1/3/1.
42 Specifically, artificial Beings.
43 See Chap. 2.
44 See Chaps. 7 and 8.
45 See Chap. 5.1.
46 See Chap. 24, par. 3.

time), if it is materialised by its creator (i.e. the Being that thought of
it or felt it). Materialisation is the making of immaterial information by
a Being processable by others through the conversion into a material,
tangible (meaning, processable directly by humans without tools[47]) format.
Humans will speak,[48] write, draw and so on in the analogue world, or
program in the digital world; all animals, including humans, will build in
the analogue world. The materialisation of immaterial information[49] is, in
fact, a processing, meaning a material action observable in the analogue or
the digital world.[50]

In the vast majority of cases (and this is true for the analysis in the re-
mainder of this chapter), a Thing will be created in this manner.[51] However,
it can also be the case that another Being (an organisation or an artificial
Being) can be created in this way too[52]—these, nevertheless, cannot be
dematerialised in the way described below.[53]

6.

Once materialised by their creator in this manner, Things can be demateri-
alised, meaning they lose their material, tangible (i.e. processable directly
by humans) format, but remain reproducible, and thus are able to be
processed by more than one Being in the analogue or the digital world.

Practically, a book sits in the head of its author (as immaterial informa-
tion) until it is put on paper (it materialises, becomes material informa-
tion); after it has been written down on paper, it can be printed as many
times as necessary (printing essentially that same, now fixed, dematerialised
information). Similarly, music sits in the head of its composer (as immateri-
al information) until it is put into a musical score (becomes materialised),
after which any musician can reproduce it (essentially by replaying that
same dematerialised, musical score).

Likewise, a chair has been created in the analogue world following the
design of its creator; after the first model has been created, it can be

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47 As is the case with digital information, see par. 12
48 See par. 1, particularly footnote 39.
49 Possible only for biological Beings, see par. 3.
50 See Chap. 4, par. 2.
51 See Chap. 3, par. 4.
52 See Chap. 2, par. 6; on the state, see Chap. 9, par. 1.
53 In par. 6. On the issue of control over the processing operations possible on newly
    materialised information, see Chap. 6, par. 4.

reproduced infinitely, in both the analogue and (if digitised[54]) the digital worlds.

In this way, since the beginning of time, immaterial information has been processed (and therefore controlled[55]) by humans like material information, in four large cycles of materialisation and dematerialisation:

(a) at first, at the beginning of recorded human history, certain immaterial information (thoughts, feelings and wishes) was materialised, meaning that it became perceptible by human senses in the analogue world, through paintings on cave walls and writing;[56]

(b) then, part of the materialised information was dematerialised (it became immaterial again, but this time in a fixed manner perceptible in the same way by more than one individual), when the first book was copied;[57]

(c) in the seventeenth century, the new concept of intellectual property designated only part of the dematerialised information as property;[58] and

(d) finally and most importantly, the digitisation of information, which has occurred recently and is ongoing,[59] is, for the first time since the beginning of time (as outlined in point (a)), re-materialising this information in a different, entirely new format (the digital format) and for an entirely new world (the digital world). This includes all information: all material information as well as all dematerialised information is suitable for processing in the new digital world.

This is why this current period is the most important in humanity's history since the invention of writing (i.e. it is the third milestone moment in humanity's development[60]). It is not a matter of the Information Age succeeding the Industrial Age, which succeeded the Enlightenment, which succeeded the Renaissance and so on. This is an entirely new era; if anybody wanted to find its equivalent in human history, he or she would have to look thousands, not hundreds, of years back in time.

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54 See par. 12.
55 See Chaps 6, par. 4, and 24, par. 3.
56 See par. 7.
57 See par. 8.
58 See par. 10.
59 See par. 12.
60 See Prologue, par. 6.

7. The materialisation of (immaterial) information

Immaterial information has been materialised in the analogue world since the beginning of humanity, or at least since the point at which humans started drawing on cave walls and speaking to each other.

When writing was invented, immaterial information processed by humans (their thoughts, feelings and wishes) was materialised in the analogue world, first in the form of tax or military records[61] or regulations (e.g. the Hammurabi code), and shortly thereafter in the form of books, in which epics and mythologies were written down.

8. The dematerialisation of materialised (immaterial) information

Part of the materialised immaterial information discussed in paragraph 7 was dematerialised again, when the first book was copied.

This was a moment of great importance for humanity. Somebody at that time saw some value in certain among all the written records created up to that time and selected them[62] for copying—that they were copied *verbatim* is the key point here. (This was not the case for musical pieces or paintings, because copies of such works, however artful, cannot be exact, and are therefore new materialised immaterial information.)

Such dematerialised information became an intangible Thing, a dataset[63] separate from the (tangible) original book it[64] came from (which of course remained a tangible, material Thing in its own right).

9.

During the long period from the moment that the first book was copied in ancient times until the introduction of the concept of intellectual property in the seventeenth century, humanity was happily, and freely, copying (and selling, not sharing) the dematerialised information described in paragraph 8, because there was no way for the creator of new information[65] to control

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61 Which was why writing was invented anyway; see Chap. 9 on the materialisation of the state.
62 A choice that haunted us until very recently, see par. 15.
63 See Chap. 1, par. 2.
64 Necessarily, see par. 17.
65 See Chap. 6, par. 4.

the relevant processing operations—therefore control was exercised only over the materialised information (the books themselves).

In other words, although there was book commerce at least as early as in Peisistratid Athens, with scribes copying books and selling them (a practice certainly generalised throughout the Hellenistic and Roman worlds), property-like control was exercised on the end-product, the book, and not on the work of the intellect contained therein. Neither Plato nor his philosopher students nor Aeschylus or his dramatist followers were paid for each copy, written by hand on papyrus or other material, of the books they wrote. (Their money was made through teaching or reciting instead.) Indeed, nor was the state of Imperial Rome paid either, each time its laws were copied to take from Rome to any part of its vast empire or elsewhere.

The same is true of painting (or music or architecture or industry): the materialisation of information had occurred since the beginning of time, but control was exercised only over the material end-product, not the dematerialised information.[66]

The dematerialised information described in paragraph 8 could be exploited only in its material form, as a tangible thing (a book, a music score, a specially designed jewel, a motto etc.), in spite of everybody acknowledging that it was a(n) (immaterial) Thing. Those who profited were the copiers and manufacturers, not the creators.

10. The invention of intellectual property

The dematerialised information described in paragraph 8, enjoying the freedom (as in lack of control over the processing of it) as described in paragraph 9, became property (intellectual property), and thus under the control of humans, in the seventeenth century. In short, mechanical mass copying (through the invention of Gutenberg's press) made it obvious to humanity for the first time that value lies in the (intellectual) creation of the dematerialised, intangible dataset and not in the (mundane, however tiring to produce, tangible) reproduction—a distinction that, like the one described in paragraph 8, has haunted us until very recently.

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66 Notwithstanding that they could not have been exact copies of the original, certainly in terms of paintings or architecture, albeit less so in music after annotation was discovered.

A different kind of property, intellectual property, was thus invented by humans.[67]

11.

As is obvious, the concept of intellectual property applied to dematerialised information.[68] However, after this concept was introduced by legislators, developments took two different paths.

The part of dematerialised information that was considered valuable (that which is unique, original, technically useful, distinctive etc.) was protected as a new type of property, intellectual property (IP), to distinguish it from the traditional type of property.

The remaining part of dematerialised information, if any (it is not certain that anybody cared to copy tax or military records or other large repositories of mundane information, although it can be imagined that, e.g. transmissions of state data between state agencies qualified as such), remained unregulated and unclaimed (uncontrolled).

12. The (re-)materialisation of information into digits (the digitisation of information)

The digital world is made up of digital information.[69] For the past few decades humanity has been busy digitising its information (and working with it in this form).

Digitisation is not, however, dematerialisation. It is just another form of materialisation (of already dematerialised information), this time in an entirely new format, one that is machine-readable. It is the transformation of information into digits. (Accordingly, the dematerialisation of information should not be confused with the digitisation of information.)

Humans created specific tools for this purpose. Digitised information is not tangible, it can only be processed by humans with the assistance of information processing tools (i.e., computers, in essence artificial Beings[70]).

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67 See Chap. 24.1.
68 All materialised information (i.e. artefacts) already being covered by the concept of property, see Chap. 24, par. 3.
69 See Chap. 1, par. 11.
70 See also Chap. 2, par. 12.

13.

The digitisation of information, a process that is still under way, includes:

- the digitisation of material, analogue-world information;[71]
- the digitisation of dematerialised information (both that covered by IP rights and that which is not[72]); and
- the (slow but steady) digital creation of new information.[73]

Digital information comprises all of the above categories of information.

Practically speaking, therefore, the digitisation of information leaves only immaterial information (thoughts, feelings and wishes) outside the realm of digitisation.

14. The digitisation of material, analogue-world information⋆

In a process that started in the 1980s but gained speed (culminating in the early 2000s), humanity is digitising all material information found in the analogue world.[74] This includes both information that has been created by humans over the course of their history (i.e. artefacts) and information created by Nature (trees, lakes, rivers, animals etc.).

In essence the digitisation of material, analogue-world information pre-supposes that it first be dematerialised before it is re-materialised in a digital format.

However, crucially, this re-materialisation of material information into digits is not unique, in the sense that the dematerialisation that preceded it, and upon which the digitisation is based, takes one form among the many that are possible. In other words, the result of the digitisation of an artefact (e.g. a table) is neither unique nor exclusive, because it is based on a dematerialisation (most likely, in the form of a photo of the object) that is one among the many possible[75]—meaning that it can be digitised many times over. Similarly, the digitisation of, for example, the remains of an ancient temple is not unique—another attempt at its digitisation by another

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71 See par. 14.
72 See par. 15.
73 See par. 17.
74 An act of processing collections of information, see Chap. 2, pars. 5 and 6.
75 On (the vastly smaller category of) IP-protected Things (for instance, when the IP-protected design of a chair would be the basis for its digitisation), see pars. 15 and 16.

group of archaeologists would produce a second result, existing in parallel to the first one.

In other words, while the digitisation of material, analogue-world information leads to a digital reproduction of the original, it is only one digital reproduction among many possible others—it is not the original itself. A single dataset in the analogue world can lead (through its digitisation) to a potentially infinite number of datasets in the digital world.

15. The digitisation of (already) dematerialised information

The digitisation of already dematerialised information is, in effect, its re-materialisation in a different format. In other words, until recently, dematerialised information was only materialised in the analogue world in a tangible format (e.g. books, films, magnetic means for the reproduction of music, products or buildings following a particular design, insignia (trademarks) affixed on objects), meaning in a format directly processable by humans. Now, through digitisation, already dematerialised information is re-materialised but, importantly, in an intangible format (that is, one not directly processable by humans): the digital copies of books, music and so on cannot be processed as such (as a series of 0s and 1s) by humans, but are reproducible through the intermediary of computers and computer programs.[76] which enable them to be processed by humans.

In essence, humanity is now in the process of making (all of its) knowledge processable (accessible, usable) by computer programs, so that it can communicate with them. Once this has been accomplished, the next step will be for computer programs to start communicating with each other.[77]

Importantly, the digitisation of already dematerialised information has not, however, stopped at IP-protected immaterial information,[78] although, of course, it started with it. Although this is an expensive procedure, for efficiency purposes dematerialised information which is not IP-protected (e.g. state records, large repositories of mundane information, such as scientific or military records) is also being digitised.[79] In fact, for the first time in

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76 See Chap. 2, par. 18.
77 See also note 0/1/14.
78 See pars. 9 and 10 above.
79 Of course, if viewed as information that was only materialised (i.e. never copied), then this would fall under the category described in par. 9 on the digitisation of material information; in any event, this information is digitised anyway.

the history of humanity, state records have become dematerialised, that is, intangible, in their entirety. State records had been material information ever since the invention of writing[80] (piecemeal exchanges among e.g. state agencies excluded)[81]—only the material on which they were recorded had changed, with paper succeeding clay tablets, engravings on stone or wooden tablets.

The digitisation of dematerialised information that is not IP-protected abolished a choice made by humans in ancient times that had been maintained by us until recently: namely, on the worthiness (or not) of protecting dematerialised information through (property) law. From the moment the first book was copied until just a few decades ago, only IP-protected dematerialised information was considered valuable—its protection based on criteria such as originality, distinctiveness, effort of the human intellect and so on. Other dematerialised information did not merit any protection (at best it was protected as materialised property) or special treatment by regulation (for example, access rights to state records). Now, once digitised, new regulations protect (or, regulate control over) it for the first time.

16. Digital information is infinite*

Paragraphs 13, 14 and 15 have explained why information in the digital world is infinite.[82] When it comes to the digitisation of material information (par. 14), although the volume of material information is finite (because it exists in the analogue world), the digital reproductions of it may be infinite in number. If one so desired, the same monument or the same table could be re-digitised as many times as one wished, and each time this would create a new digital copy.[83]

On the other hand, when it comes to the digitisation of already dematerialised information (par. 15), although there is a finite number of, for example, books or music scores, they relatively quickly lose their special regulatory (IP) protection and can be reproduced or (partially) processed freely. Information that does not enjoy any legal protection (e.g. state records) is processable in any case.

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80 See par. 1.
81 See also Chap. 17, par. 9.
82 See Chap. 1, par. 16.
83 Notwithstanding legal restrictions, e.g. in terms of limiting access to monuments to limit such reproductions.

Most importantly, however, all digital-world-created information (meaning the information described in par. 17) is infinite: (making use of the above information) anyone can create as many digital works, organisations, computer programs and so on as he or she wishes.

17. Digital-born and digital world-only information*

Information, regardless of whether material or immaterial, has invariably been materialised in tangible media in order to be processed by other humans. Although an idea or a thought can of course be transmitted orally, only a relatively small circle of people will receive it—each of them may well transmit it further, but it is not certain that it will be the same thought or idea (or rather the opposite is certain![84]). In other words, information has to be made tangible by one human (preferably in writing) in order for it to be processed by other humans.

In practice, therefore information is materialised by its creators. Authors put their ideas on paper, composers do the same, film directors use film; similarly, shopping lists are put on paper, as are laws and tax records. As has been seen,[85] if any of this information is considered worthy of copying, then it is dematerialised (and eventually protected by regulation); otherwise it remains materialised in its original medium (most likely to be lost at some point, after this medium inevitably perishes).

Today, however, new information is increasingly digital-born. This is as true for this book as for most other intellectual works today. State records are created on computers with the assistance of computer programs. Huge repositories of information are created and kept exclusively in digital form.

This is digital-born information. Importantly, however, it can become tangible, that is, it can also exist in the analogue world: the book can be printed, as can state records or other repositories of information, no matter how large. Therefore, digital-born information is material, intangible information that was created digitally but can become tangible, that is, it can be directly processable by humans, if needed.

A subcategory of digital-born information is digital world–only information. This is information that is digital-born (a thought or idea that was materialised directly into digits) that nevertheless can exist only in the digital world. In other words, it cannot become tangible to humans other

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84 See also par. 1.
85 In par. 10.

than through the medium of a computer (unlike a book or state records, which can be printed, or music that can be recorded onto a magnetic medium). This is the case, for example, for a domain name, a website or an object in an online virtual digital world (e.g. the metaverse).

In both of the above cases, information (in essence, datasets) can be Things and Beings. The main distinction continues: Things, even if digital-born and digital-only, cannot process information. In the above example, a domain name, a website or an object in an online virtual digital world cannot process information. Only Beings, including artificial Beings (specifically, computer programs), can and will process information.

18. Digital humans? *

In the digital world, humans have become users[86] of information. The use they make of such information falls under the scope of a moral philosophy.[87]

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86 See Chap. 17, par. 11.
87 See Chap. 1, par. 13.