

Normative-informational positions: a modal-logical approach

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Abstract This paper is a preliminary investigation into the application of the formal-logical theory of normative positions to the characterisation of *normative-informational positions*, pertaining to rules that are meant to regulate the supply of information. First, we present the proposed framework. Next, we identify the kinds of nuances and distinctions that can be articulated in such a logical framework. Finally, we show how such nuances can arise in specific regulations. Reference is made to Data Protection Law and Contract Law, among others. The proposed approach is articulated around two essential steps. The first involves identifying the set of possible interpretations that can be given to a particular norm. This is done by using formal methods. The second involves picking out one of these interpretations as the most likely one. This second step can be resolved only by using further information (e.g., the context or other parts of the regulation).

Keywords Modal and deontic logic · Normative systems · Theory of normative positions · Regulation of information flow · Norms for information agents

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1 Introduction

The theory of normative positions has provided a means of generating an exhaustive characterisation of the different types of normative status (*permitted*, *obligatory*, *forbidden*, and so on) that may be assigned to a given state of affairs. In the tradition of Kanger, (Kanger and Kanger 1966; Kanger 1972; Lindahl 1977; Jones and Sergot 1992) the focus has usually been on the normative status of states of affairs of type ‘agent j brings it about that A ’; for instance, the class of *normative one-agent act positions* generated by the method described in (Jones and Sergot 1992) consists of the following seven positions:

$$OE_jA \quad (E1)$$

$$OE_j\neg A \quad (E2)$$

$$O(\neg E_jA \wedge \neg E_j\neg A) \quad (E3)$$

$$PE_jA \wedge PE_j\neg A \wedge P(\neg E_jA \wedge \neg E_j\neg A) \quad (E4)$$

$$PE_jA \wedge PE_j\neg A \wedge O(E_jA \vee E_j\neg A) \quad (E5)$$

$$PE_jA \wedge \neg PE_j\neg A \wedge P(\neg E_jA \wedge \neg E_j\neg A) \quad (E6)$$

$$\neg PE_jA \wedge PE_j\neg A \wedge P(\neg E_jA \wedge \neg E_j\neg A) \quad (E7)$$

There, Standard Deontic Logic (SDL)—a modal system of type KD in the classification proposed by (Chellas 1980)—is adopted for the logic of the obligation operator ‘ O ’, and the permission operator ‘ P ’ is the dual of ‘ O ’; and a modal system of type ET¹ is used for the relativised action modality ‘ E_j ’. Given these choices for the deontic and action modalities, the method yields the result that there are precisely these seven mutually exclusive normative positions for one agent vis-à-vis the state of affairs described by ‘ A ’. So either (E1), the agent is obliged to see to it that A , or (E2) he is obliged to see to it that $\neg A$, or (E3) he is obliged to remain passive with respect to A , or ... and so on.

The present article starts from the assumption that it might also be of interest to investigate the normative status of another sort of state of affairs—of a type quite different from those represented by act descriptions—pertaining to the *informational* state of a given agent.² By this is meant the state of affairs that an agent j is (or is not) *informed* that A , or is (or is not) *informed* that $\neg A$. Consider, for instance, the situation of an individual j in relation to some government agency k that has responsibility for controlling the flow of information concerning A . What is the class of possible normative positions for k (concerning the information j is permitted, forbidden, required, etc. to have about A)? Or consider the situation of individual k in relation to some authority j (say, a court of Law), where k has certain obligations to supply information to j , or is permitted to withhold information from k . In both of these contexts, among others, it would be useful to have at our disposal an

¹ This means, essentially, that the action modality is closed under logical equivalence, and satisfies the T. schema, the ‘success condition’: $E_jA \rightarrow A$.

² In sect. 6.2, below, we indicate that there are nevertheless some contexts in which it would be appropriate to reintroduce the notion of agency.

exhaustive characterisation of the class of possible *normative-informational positions*, as they will here be called.

Furthermore, since the original aim of the theory of normative positions, as proposed by Kanger and others, was to provide a formal-logical framework for the articulation of Hohfeldian rights-relations, it seems natural to suppose that the development of an account of normative-informational positions, along the lines indicated above, might also provide a platform for the systematic investigation of such rights as *the right to silence*, *the right to know* and *the right to conceal information*. However, the potential application domain for a theory of this kind would seem not to be confined to legal analysis, but might also contribute to the formal specification of the normative status of electronic information agents, whose tasks may include the acquisition of information, and the monitoring of information flow, among others.

Rules use ordinary language. They are often ambiguous, and convey many shades of meaning. It is here our contention that the theory of normative-informational positions can be used as a guide in attempting to determine the appropriate logical form to be assigned to a particular norm. The proposed approach is articulated around two essential steps. The first involves identifying the set of possible interpretations that can be given to a particular norm. This is done by using formal methods. The second involves picking out one of these interpretations as the most likely one. This second step can be resolved only by using further information (e.g., the context or other parts of the regulation).

This paper is organised as follows. In sects. 2–4, we present the proposed framework. In sect. 5 we show how it can be applied to the analysis of specific regulations. Reference is made to Data Protection Law and Contract Law, among others. Section 6 identifies some further refinements to the formal language that we plan to incorporate to increase expressive power. We choose here to proceed step by step. Simple structures convey very basic distinctions and insights, but might be gross oversimplifications. Complex structures may come closer to the contours of discourse, but can be extremely cumbersome to handle, with insights disappearing in a mass of details. It would not seem advisable to try to cover all complicating factors at once, but rather to get an initial appreciation of them a few at a time, only subsequently putting them together and investigating their interactions. Therefore, our policy in this preliminary study is to start with the simplest possible syntactic apparatus, reserving more complex machinery until the exact limits of the more Spartan one are clear—and only in so far as it is confirmed that its essential ideas are indeed ‘on the right track’.

2 A modality for ‘informational state’

In (Jones and Parent 2004; Jones and Parent 2007) modal-logical characterisations are given of the (forms of) conventions that constitute various key types of signalling acts: *asserting*, *commanding*, *requesting*, *promising*, ... among others. These characterisations employ several modalities, among them an ideality/

optimality modality, ' I_s^* ',³ used to represent those states of affairs that would obtain if a conventional signalling system were in an optimal state, relative to its function of facilitating the transmission of reliable information. For instance, if—according to the conventions constituting signalling system s —the hoisting on board a ship of a particular sequence of coloured flags counts as an assertion that the ship is carrying explosives, then—when on a particular occasion those flags *are* hoisted—the signalling system s would be in an optimal/ideal state, relative to its function of facilitating the transmission of reliable information, only if it were then indeed the case that the ship was carrying explosives. An observer, or audience, j , who is familiar with the conventions governing s and who witnesses the hoisting of this sequence of flags, will understand the meaning of the signal in the sense that he is aware of what would now be the case, were the signaller to be telling the truth. So j 's informational state, following his observation of the flag-raising, is represented—on this approach—by a belief whose content takes the form ' I_s^*A ', where ' A ' describes the state of affairs that the ship is carrying explosives. j 's understanding the meaning of the signal amounts to his being aware that, were the signalling system s in an optimal state relative to its function of facilitating the transmission of reliable information, ' A ' would now be true. (Of course, if j also believes that the signaller is reliable, j will move on from the belief whose content is ' I_s^*A ' to the belief that A .) The modality ' I_s^* ' was assigned the logic of the smallest normal modal system K. Closure under logical consequence would seem to be a natural assumption for this operator, given the intended interpretation. (For if signalling system s would be in an optimal state only if ' A ' were true, then it could be in an optimal state only if the logical consequences of ' A ' were also true.) Obviously, the T. schema

$$I_s^*A \rightarrow A \quad (T.I_s^*)$$

does not accord with the intended interpretation. What of the D. schema

$$I_s^*A \rightarrow \neg I_s^*\neg A \quad (D.I_s^*)$$

which is of course equivalent to

$$\neg(I_s^*A \wedge I_s^*\neg A) \quad ?$$

Well, the validity of $(D.I_s^*)$ would not be acceptable, for the simple reason that it would rule out the possibility of making inconsistent assertions. (It *would* be perfectly possible, for instance, in many circumstances, for one or more signallers to raise the flag sequence that means (according to s) that the ship is carrying explosives, *and* to raise the flag sequence that means (according to s) that the ship is not carrying explosives.)

³ The ' \star ' in the notation had no particular significance. It was introduced in the multi-modal language described in (Jones and Parent 2007) merely to distinguish this particular notion of ideality from an evaluative normative modality, ' T ', that also figured in the same language.

For the purposes of the present investigation into normative-informational positions, an operator similar in interpretation to ‘ I_s^\star ’ will be adopted, and will be denoted by ‘ I_j ’, where j is any agent. Expressions of the form ‘ $I_j A$ ’ will be understood to mean ‘were the information supplied to j to be true, then ‘ A ’ would be the case’, or ‘according to the information supplied to j , ‘ A ’ is the case’. The simpler, and perhaps less accurate, readings ‘ j is told that A ’ and ‘ j is informed that A ’ may also be used, for ease of expression. For reasons parallel to those mentioned for the ‘ I_s^\star ’ operator, ‘ I_j ’ will also be assigned the logic of a (relativised) normal modal operator of type K. In what follows, relativised versions of the obligation and permission modalities of Standard Deontic Logic (SDL), which is a normal modal system of type KD, will be employed to represent the normative component of the positions to be investigated. Expressions of the forms ‘ $O_k A$ ’ and ‘ $P_k A$ ’ will be read ‘it is obligatory for k that A ’ and ‘it is permitted for k that A ’, respectively. Thus the agent k is understood to be the bearer of the obligation/permission.⁴ The problems associated with SDL are well documented in the literature. However, its adoption for the purposes of the present enquiry is defensible on grounds described in (Jones 2004). (But see below, sect. 6.3, for an indication of how our methods might be extended to accommodate *conditional* normative expressions.)

3 Generating normative-informational positions

Given that the modality ‘ I_j ’ is assigned the logic of a (relativised) normal modality of type K, there are precisely 4 *informational positions* for j vis-à-vis the state of affairs described by ‘ A ’. These are:

$$I_j A \wedge \neg I_j \neg A \tag{I1}$$

$$I_j \neg A \wedge \neg I_j A \tag{I2}$$

$$\neg I_j A \wedge \neg I_j \neg A \tag{I3}$$

$$I_j A \wedge I_j \neg A \tag{I4}$$

It will be useful to introduce some phrases to refer to these positions:

- In (I1), j is told *straight truth/straight lie*, depending on whether ‘ A ’ is/is not the case.
- In (I2), j is told *straight truth/straight lie*, depending on whether ‘ $\neg A$ ’ is/is not the case.
- In (I3), j is told neither ‘ A ’ nor ‘ $\neg A$ ’, and in this sense (I3) represents the *silence* position
- In (I4), j is told both ‘ A ’ and ‘ $\neg A$ ’, and in this sense (I4) represents the *conflicting information* position.

⁴ An expression of the form ‘ $O_k A$ ’ is implied by, but does not imply, one of the form ‘ $OE_k A$ ’. See also sect. 6.2, below.

In order to apply to (I1)–(I4) the method for generating normative positions described in (Jones and Sergot 1992), enclose each of (I1)–(I4) in parentheses, then prefix each with ‘ O_k ’ and ‘ $O_k\neg$ ’, respectively, to form 8 obligation expressions. Then prefix each of those 8 expressions with the negation sign, and display the resulting 16 expressions as a list of 8 tautologies:

$$O_k(I_jA \wedge \neg I_j\neg A) \vee \neg O_k(I_jA \wedge \neg I_j\neg A) \quad (1)$$

$$O_k(I_j\neg A \wedge \neg I_jA) \vee \neg O_k(I_j\neg A \wedge \neg I_jA) \quad (2)$$

$$O_k(\neg I_jA \wedge \neg I_j\neg A) \vee \neg O_k(\neg I_jA \wedge \neg I_j\neg A) \quad (3)$$

$$O_k(I_jA \wedge I_j\neg A) \vee \neg O_k(I_jA \wedge I_j\neg A) \quad (4)$$

$$O_k\neg(I_jA \wedge \neg I_j\neg A) \vee \neg O_k\neg(I_jA \wedge \neg I_j\neg A) \quad (5)$$

$$O_k\neg(I_j\neg A \wedge \neg I_jA) \vee \neg O_k\neg(I_j\neg A \wedge \neg I_jA) \quad (6)$$

$$O_k\neg(\neg I_jA \wedge \neg I_j\neg A) \vee \neg O_k\neg(\neg I_jA \wedge \neg I_j\neg A) \quad (7)$$

$$O_k\neg(I_jA \wedge I_j\neg A) \vee \neg O_k\neg(I_jA \wedge I_j\neg A) \quad (8)$$

There are $2^8 = 256$ ways of selecting just one of the disjuncts from each of the disjunctions (1)–(8). That is, 256 distinct conjunctions, each of 8 conjuncts, may be generated from (1)–(8). It turns out that, of these 256 conjunctions, just 15 are logically consistent, given the logics selected for the component modalities. Each of these 15 may be simplified, to remove redundant conjuncts (i.e., conjuncts that are themselves logically implied by some other conjunct in the same conjunction). The result may be exhibited as (N1)–(N15), below:

$$O_k(I_jA \wedge \neg I_j\neg A) \quad (N1)$$

$$O_k(I_j\neg A \wedge \neg I_jA) \quad (N2)$$

$$O_k(\neg I_jA \wedge \neg I_j\neg A) \quad (N3)$$

$$O_k(\neg I_jA \vee \neg I_j\neg A) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \wedge P_k(\neg I_jA \wedge I_j\neg A) \wedge P_k(I_jA \wedge \neg I_j\neg A) \quad (N4)$$

$$O_k(I_jA \leftrightarrow \neg I_j\neg A) \wedge P_k(I_jA \wedge \neg I_j\neg A) \wedge P_k(I_j\neg A \wedge \neg I_jA) \quad (N5)$$

$$\neg P_k I_j\neg A \wedge P_k(\neg I_j\neg A \wedge I_jA) \wedge P_k(\neg I_j\neg A \wedge \neg I_jA) \quad (N6)$$

$$\neg P_k I_jA \wedge P_k(\neg I_jA \wedge I_j\neg A) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \quad (N7)$$

$$O_k(I_jA \wedge I_j\neg A) \quad (N8)$$

$$O_k I_jA \wedge P_k(I_jA \wedge I_j\neg A) \wedge P_k(I_jA \wedge \neg I_j\neg A) \quad (N9)$$

$$O_k I_j\neg A \wedge P_k(I_jA \wedge I_j\neg A) \wedge P_k(I_j\neg A \wedge \neg I_jA) \quad (N10)$$

$$\neg P_k(I_jA \wedge \neg I_j\neg A) \wedge P_k(I_j\neg A \wedge \neg I_jA) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \wedge P_k(I_jA \wedge I_j\neg A) \quad (N11)$$

$$\neg P_k(I_j\neg A \wedge \neg I_jA) \wedge P_k(I_jA \wedge \neg I_j\neg A) \wedge P_k(I_jA \wedge I_j\neg A) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \quad (N12)$$

$$\neg P_k(\neg I_jA \wedge \neg I_j\neg A) \wedge P_k(I_jA \wedge I_j\neg A) \wedge P_k(I_jA \wedge \neg I_j\neg A) \wedge P_k(I_j\neg A \wedge \neg I_jA) \quad (N13)$$

$$O_k(I_jA \leftrightarrow I_j\neg A) \wedge P_k(I_jA \wedge I_j\neg A) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \quad (N14)$$

$$P_k(I_jA \wedge I_j\neg A) \wedge P_k(I_jA \wedge \neg I_j\neg A) \wedge P_k(I_j\neg A \wedge \neg I_jA) \wedge P_k(\neg I_jA \wedge \neg I_j\neg A) \quad (N15)$$

4 Describing the positions

For the purpose of discussing (N1)–(N15), it is convenient first to split the group into two sub-groups, consisting of (N1)–(N7) and (N8)–(N15), respectively. Each of (N1)–(N7) implies that the *conflicting information* position (vis-à-vis j) is not permitted for k . That is, each of (N1)–(N7) is incompatible with the truth of ‘ $P_k(I_jA \wedge I_j\neg A)$ ’. By contrast, each of (N8)–(N15) implies that the *conflicting information* position (vis-à-vis j) is permitted for k .

Note the correspondence between (N1)–(N7) and (E1)–(E7), ((N1)–(E1), (N2)–(E2),..., and so on). The formal differences between each pair arise from the fact that the logic of the ‘ E_j ’ modality contains the T. schema, which in turn implies the D. schema:

$$E_jA \rightarrow \neg E_j\neg A$$

In other words, if the logic of the ‘ I_j ’ modality had contained the D. schema, then each of (N1)–(N7) would have been reducible to forms that correspond exactly to those of (E1)–(E7), with (of course) ‘ I_j ’ replacing ‘ E_j ’ throughout, and ‘ O_k ’/‘ P_k ’ replacing ‘ O ’/‘ P ’ throughout, and some re-arrangement of the order of the conjuncts.

Suppose now that ‘ A ’ is true. Then the positions (N1)–(N7) may be described as follows:

- (N1) It is obligatory for k that j is told the *straight truth*.
- (N2) It is obligatory for k that j is told a *straight lie*.
- (N3) It is obligatory for k that the *silence position* obtains.
- (N4) The *conflicting information position* is forbidden for k , but the *silence position*, the *straight lie position* and the *straight truth position* are each permitted for k .
- (N5) The *conflicting information position* and the *silence position* are both forbidden for k , but the *straight truth* and *straight lie positions* are both permitted for k .
- (N6) It is not permitted for k that j is told a lie, but the *straight truth* and *silence positions* are both permitted for k .
- (N7) It is not permitted for k that j is told the truth, but the *straight lie* and *silence positions* are both permitted for k .

If, on the other hand, it is ‘ $\neg A$ ’ rather than ‘ A ’ that is true, then (N1) and (N2) swap descriptions, (N6) and (N7) swap descriptions, and the descriptions of each of (N3), (N4) and (N5) remain unchanged.

It is the presence of (I4) in the list of *informational positions* that gives rise to the *normative-informational positions* (N8)–(N15). (Clearly, there is no counterpart to (N8)–(N15) in the class of *normative one-agent act positions* just because the action counterpart to (I4) is a logical contradiction.)

Supposing, first, again, that ‘ A ’ is true, then the following descriptions may be proposed for (N8)–(N15):

- (N8) It is obligatory for k that the *conflicting information position* obtains.

- (N9) It is obligatory for k that j is told the truth; the *straight truth position* is permitted for k , but so is the *conflicting information position*.
- (N10) It is obligatory for k that j is told a lie; the *straight lie position* is permitted for k , but so is the *conflicting information position*.
- (N11) The *straight truth position* is forbidden (= not permitted) for k , but the *straight lie position*, the *silence position* and the *conflicting information position* are each permitted for k .
- (N12) The *straight lie position* is forbidden for k , but the *straight truth position*, the *silence position* and the *conflicting information position* are each permitted for k .
- (N13) The *silence position* is forbidden for k , but the *conflicting information position*, the *straight truth position*, the *straight lie position* are each permitted for k .
- (N14) The *straight truth* and *straight lie* positions are both forbidden for k , but the *conflicting information position* and the *silence position* are both permitted for k .
- (N15) The *conflicting information position*, the *straight truth position*, the *straight lie position* and the *silence position* are each permitted for k .

If, on the other hand, it is ‘ $\neg A$ ’ rather than ‘ A ’ that is true, then (N9) and (N10) swap descriptions, and (N11) and (N12) swap descriptions, but the descriptions of each of (N8), (N13), (N14) and (N15) remain unchanged.

5 Application of the theory

Given the choice of logics for the modalities, the generation method shows that—for any agents k (norm-bearer) and j (informee), and for any state of affairs ‘ A ’—precisely one of the set of 15 normative-informational positions holds. So the set may be used as a tool in the analysis of normative-informational concepts, such as the *permission to be silent*, and the *permission to be correctly informed*.

As indicated in the introductory section (§ 1) above, we take a two-step approach to those kinds of conceptual analyses. We illustrate this procedure with various examples. In subsection 5.1, we try out the method in two simple cases. Our main aim is to identify the kinds of nuances and distinctions that can be articulated in a logical framework such as the aforementioned one. In subsections 5.2 and 5.3, we then show how such nuances can arise in specific regulations. Reference will be made to Data Protection Law and Contract Law.

5.1 Permission/interdiction to be silent

Consider the example *permission to be silent* in relation to the set of 15 positions. In fact 8 of these 15 contain or imply k ’s permission to be silent, vis-à-vis j , with respect to A , and these are (N3), (N4), (N6), (N7), (N11), (N12), (N14) and (N15). To define the context further, suppose that the concern is with the permission ordinarily granted to a person, under English Law, at the time of that person’s arrest

for an alleged criminal offence.⁵ Which of the 8 cases would be the appropriate choice?

Well, it is reasonable to eliminate (N3) immediately, since *k*, the person arrested, is not under an *obligation* (as far as *j*, the arresting authority is concerned) to remain silent. There would seem to be good grounds for eliminating (N7), too, since it forbids *k* to tell the truth, which again would not ordinarily be understood to be part of the arresting authority's intention. Similar considerations would eliminate (N11) and (N14). Then there remain the 4 positions: (N4), (N6), (N12) and (N15). Is the agent *k* *forbidden*, i.e., *not permitted*, to give conflicting information (as far as *j* is concerned), at the time of arrest (when he/she is *not*, one supposes, *under oath*)? If not, then (N4) gets eliminated, along with (N6). The final choice, between (N12) and (N15), depends on whether or not the *straight lie position* is permitted for *k*.

As a second illustration, consider the situation of a future British government, led by P.M. Bliar, which is not permitted to be silent on the burning issue of the use, by the government, of weapons of mass deception. What might here be the normative-informational position of the government (*k*), vis-à-vis the citizen (*j*), as P.M. Bliar sees it? Clearly, the 8 positions considered above in discussion of the previous example, each of which contains or implies that the *silence position* is permitted, are ruled out. The positions (N1), (N2), (N5), (N8), (N9), (N10) and (N13) remain. Given Bliar's aversion to *straight truth*, and the lack of subtlety of the *straight lie*, (N1) and (N2) are eliminated. The transmission of *conflicting information*, being a valuable strategy for the spin doctors, is hardly going to be forbidden by Bliar and his magic circle, so (N5) goes out; but then perhaps they don't want to *tie* themselves to the use of conflicting information, so (N8) is eliminated. Furthermore, supposing that they don't want to be *required* to let the truth out, or *required* to lie, (N9) and (N10) go too. So (N13) remains as the *Bliar position*: 'say what you like about 'A', so long as you say something'!⁶

5.2 Data Protection Law

In Europe, data protection is subject to a rather strict legislation both on the European and national level. In this respect, reference can be made to the EC Directive on Data Protection (hereinafter EC Directive⁷). We choose article 7 of the EC Directive as a running example, because the implementation of this article plays a central role in data protection laws in Europe. This article says:

⁵ The person arrested is ordinarily told that he/she has the *right* to remain silent, but that anything he/she says may be taken down and used in evidence against him/her. The *right* to remain silent implies (but is not implied by) the *permission* to remain silent, but the *relational* aspect, characteristic of the Hohfeldian interpretation of rights (rather than mere permissions), will be ignored for present purposes. It will most definitely figure in future work, however. As we indicated in the Introduction, the theory developed here is, we believe, capable of providing a platform for the development of a formal account of information rights.

⁶ This example, despite being facetious, does nevertheless serve to illustrate the way in which a map of the class of possible positions might play a role in choosing (for good or ill) an 'appropriate' strategy or policy. *Prolegomena to the theory of spin*?

⁷ Directive 95/46/EC, Official Journal L281, 23/11/1995 pp. 31-50.

“Member states shall provide that personal data may be processed only if:

- the data subject⁸ has unambiguously given his consent; or
- processing is necessary for the performance of a contract to which the subject is party or in order to take step at the request of the data subject prior to entering into a contract; or
- processing is necessary for compliance with a legal obligation to which the controller⁹ is subject; or
- processing is necessary in order to protect the vital interests of the data subject; or
- processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller or in a third party to whom the data are disclosed, except where such interests are overridden by the interests for fundamental rights and freedoms of the data subject which require protection under Article 1 (1).”

We start by simplifying the example in two ways. First, we substitute “disclosed” for “processed”. The processing of personal data is an umbrella category, which includes (but is not limited to) the disclosure of personal data. Second, we put aside the phrase “Member states shall provide that”. This is a trivial alteration, since these words only mean that the Directive has to be implemented into national law by the member states.

The question is: how should the rest of Article 7 be analysed? The answer is complex; we will give it in layers.

First of all, it is worth mentioning that, from a legal perspective, the obligation not to disclose any personal data is in fact the general case. The argument is as follows. The right to freedom of expression, which is firmly embedded in, e.g., the European Convention on Human Rights and Fundamental Freedoms of 1950, seems *prima facie* to imply the right to disclose any personal data. But the right to privacy, which is also recognized as fundamental in the 1950 Convention, takes precedence over the right to freedom of expression. In that respect the interdiction to disclose any personal data holds as a general rule. The role of Article 7 is to list a number of exceptions to this rule: the data subject has given his consent, etc. In this respect, the fact that Article 7 takes the form of a conditional statement is important. Formalizing the truth-functional (or propositional) structure of its consequent is a straightforward matter; we omit the details here. We just stress that the locution ‘only if’ must be represented as a default-conditional \Rightarrow as usually defined in non-monotonic logic. Indeed, Article 7 in turn allows for exceptions. The analysis of the atomic propositions appearing in the consequent (“the subject has given his consent”, “the processing is necessary for the performance of a contract to which the subject is party”, etc.) goes beyond the resources of the present framework. For

⁸ In data protection law, the data subject is the natural person (individual) to whom the personal data refers.

⁹ In the EC Directive, the data controller is defined as anybody who determines the purposes and means of the processing of personal data. Data controllers are responsible for the lawful processing and may be held liable. The data processor acts on behalf of the data controller.

the purpose of the present discussion, these atomic propositions will be denoted by schematic letters p, q, r , etc, as is usually done in elementary logic.

It might be instructive to focus first on the obligation not to disclose any personal data. For clarity's sake, consider the situation where the data are collected and stored on a computer. Let f be a one-place predicate; $f(l)$ is read "the file or the record of agent l is such-and-such". For immediate purposes, let A abbreviate $f(l)$. At first sight, the obligation for k not to disclose l 's record to agent j can be formalized as follows:

$$O_k(\neg I_j A \wedge \neg I_j \neg A) \quad (1)$$

where $(\neg I_j A \wedge \neg I_j \neg A)$ is an instance of what has been termed the *silence position*. In fact, (1) corresponds to (N3).¹⁰ The permission for k to inform j (reliably) that A can, then, be rendered as:

$$P_k(I_j A \wedge \neg I_j \neg A) \quad (2)$$

(2) is obtained by replacing, in (1), ' O_k ' with ' P_k ' and the *silence position* with the *straight truth position*.

Now, we go one step further and investigate if, and to which extent, some other parts of the EC Directive should affect our initial understanding of (the antecedent in) Article 7. As just observed, there are circumstances in which the data controller is allowed to disclose personal data. Then we may ask whether there are any rules about the quality of the data that can be disclosed. According to EC Directive, Article 6 (1) lit. d, personal data must be accurate. The term accuracy is not defined in the Directive, but "inaccurate" is defined in some national legislations as "incorrect or misleading as to any matter of fact". The question may arise how this rule can be formalized. When we speak about the accuracy of data, it is important whether or not the content of the communicated information is true. Suppose it is A rather than $\neg A$ that, according to the evidence available to the data controller, is true. The obligation to use accurate data when disclosing personal data can be rendered as follows:

$$O_k(I_j A \wedge \neg I_j \neg A)$$

This clarified, we can return to the consequent in Article 7. We have identified (2) as the appropriate normative-informational position if the disclosure of personal information is allowed according to Article 7 of the EC Directive. But a central conjecture in the theory we are trying out here is that this might not be the only, not perhaps even an adequate, representation of what Art. 7 in combination with Art. 6 mean. (2) covers many cases. By this, we mean that, among the 15 distinct situations that are logically possible, 8 of them imply the truth of (2). These are: (N1), (N4), (N5), (N6), (N9), (N12), (N13) and (N15). So, we may ask, which of these 8 properly represents "it is permitted for k to inform j about A "? In most cases, *conflicting information* would not fulfil the requirement of accuracy alluded to

¹⁰ As explained below, there are cases where such a rendering is too strong. This need not concern us here.

above.¹¹ Therefore, we suggest eliminating the last four conjunctions, (N9), (N12), (N13) and (N15), which each implies that the *conflicting information position* (vis-à-vis *j*) is permitted for *k*. For the same reason, we suggest eliminating (N4) and (N5), each of which implies that the *straight lie position* is permitted for *k*. Then there remain the two positions (N1) and (N6). The peculiar thing about (N1) is that it places agent *k* under an obligation to inform *j* about *A*. Such an obligation makes sense if agent *j* is the data subject, and has requested to be informed about *A*.¹² However, with respect to the communication of personal data to other persons, there is no such obligation. Therefore, (N6) is the appropriate choice in most cases.

5.3 Good faith and fair dealing in contract

The context of contract formation provides another good illustration. In civil law systems, there is a general rule requiring the parties to negotiate in good faith. And, as a result, one finds duties of information or disclosure imposed on the negotiating parties. Which of (N1)–(N15) captures the appropriate logical form? The answer is clearly (N1). The only other conjunct containing the obligation for party *k* to tell the truth is (N9). This conjunct is ruled out, since it also contains the permission to give conflicting information. Such a permission is bizarre in the present context.

As has been emphasized by (Weitzenbock 2004), in common law the situation appears to be different. The main rule is *caveat emptor* ('let the buyer beware') and, as a result, there is no such duty of disclosure at the precontractual stage. It is worth quoting from (Weitzenbock 2004, sect. 2.3.1.2, page 95):

“While parties to a contract should not mislead each other as to the subject matter of the contract, whether innocently or fraudulently, they should not in general have to act so as to protect the other’s interests, but may act in their own interest.”

Therefore,

“while a party who positively misleads the other party (even if innocently) will in principle be faced with rescission of the contract, a person who says nothing will be secured.”

Which of (N1)–(N15) is, then, the appropriate choice? Party *k* is surely permitted to remain silent. But, as mentioned, 8 positions contain or imply *k*’s permission to be silent, vis-à-vis party *j*, with respect to *A*. These are (N3), (N4), (N6), (N7), (N11), (N12), (N14) and (N15). Is the agent *k* permitted to give conflicting information? If not—as seems to be the case—then (N11), (N12) and (N15) get eliminated. Then there remain the five positions: (N3), (N4), (N6), (N7) and (N14). Well, it is reasonable to eliminate (N3), since *k* is certainly not under an *obligation* to remain silent. It is also reasonable to eliminate (N7) and (N14), which both forbid *k* to tell

¹¹ However, it is possible to think of situations where conflicting information might be the most accurate information available: If the data controller has collected information from different parties who do not agree about factual information and the data controller has no possibility of verifying the information, then it may be appropriate to communicate the conflicting information.

¹² Agent *j* might, for instance, wish to verify that the data concerning him are up-to-date.

the truth. The final choice between (N4) and (N6) depends on whether or not the *straight lie position* is permitted for k . Given that parties to a contract should not mislead each other, (N4) goes too. So (N6) remains as the *common law position*: ‘if you say something, tell the truth, or shut up!’

6 Further refinements

We now indicate how to increase the expressiveness of the framework so as to capture further aspects of relevance for the present analysis. We present below some structures that are relatively more complicated, and show how to analyse them within the existing framework, or extensions thereof.

6.1 Informational positions of second-degree

One interesting feature of the logic is that it allows us to iterate information acquisition operators. The logical machinery allows such an embedding, at least as a formal possibility, and the EC directive on data protection law alluded to above provides examples of such iterations. In particular, Article 11 requires anyone processing personal information to notify the data subject that they are doing so. So, consider the obligation for k to notify l that his personal data have been disclosed to a third-party j . The informational position within the scope of the deontic operator has the following more complex form:

$$I_l(I_jA \wedge \neg I_j\neg A) \wedge \neg I_l\neg(I_jA \wedge \neg I_j\neg A) \quad (\text{II}')$$

This sentence is similar in pattern to the *straight truth position* (II) with which we have been working so far. The former can be obtained by replacing, in the latter, j with l and A with $I_jA \wedge \neg I_j\neg A$. Using a self-explanatory terminology, this more complex form of informational position can be said to be an informational position of second-degree. The methodological procedures outlined above are meant for the first-degree (or flat) case, but it should be possible to carry them over to the second-degree case. Then one would be able to compare the pattern exhibited by the informational positions of the second-degree with those exhibited by the informational positions of the flat type. This is a topic for further investigation.

6.2 Agency

Perhaps the best way to illustrate the need for the introduction of an agency operator is by turning again to Article 7 of the EC Directive. As we have seen, this article tells us when the (general) interdiction to disclose personal data is no longer in force. The question arose how the latter prohibition should be formalized. The following rendering was proposed:

$$O_k(\neg I_jA \wedge \neg I_j\neg A) \quad (3)$$

Such a rendering is adequate in many contexts. But there are cases where the proposed translation is too strong. In fact, the meaning of the legal rule is: k is

obliged not to communicate the information himself (or through others), but he is not obliged to prevent j from obtaining the information elsewhere. The sentence (3) suggests the opposite, and gives us to understand that k must secure the result that the *silence position* is maintained, no matter what j 's source of information is. This nuance can be made explicit in the symbolism, by introducing some agency operator E_k to be read as 'agent k brings it about that'. Thus, the following formalization is too strong:

$$O_k E_k (\neg I_j A \wedge \neg I_j \neg A) \quad (4)$$

Intuitively, formula (4) captures formally the fact that k must secure the result that the silence position is maintained, regardless of j 's source of information. As we have just seen, this does not match the meaning of the legal rule. It just says that k is obliged not to communicate the information himself. Therefore, (4) is "too strong", in the following sense: It implies that k does not fulfil his obligation, even if j gets the information elsewhere (e.g. from another agent m). From a legal point of view, this is obviously wrong.

One alternative, weaker rendering is:¹³

$$O_k \neg E_k \neg (\neg I_j A \wedge \neg I_j \neg A) \quad (5)$$

The significance of (5) is best viewed in a "possible worlds" semantics. The sentence within the scope of the obligation operator, then, says that k 's own actions are always compatible with the truth of $\neg I_j A \wedge \neg I_j \neg A$. Note that the following sentences are each equivalent to (5):

$$\begin{aligned} O_k \neg E_k (I_j A \vee I_j \neg A) \\ \neg P_k E_k (I_j A \vee I_j \neg A) \\ \neg P_k E_k \neg (\neg I_j A \wedge \neg I_j \neg A) \end{aligned}$$

6.3 Conditionals

Norms are conditional by their very nature. Deontic conditionals raise complex philosophical and technical issues, which any theory of norms (of any kind) must address. As initially conceived, the theory of normative-informational positions puts aside such issues, since as such they are not essential to the analysis of the procedures used for determining the logical space of normative positions. Formally adequate treatments of conditionals are nevertheless available in the literature. They all treat $A \Rightarrow B$ to mean, more or less, something like $\Box_A B$, where \Box_A is a necessity operator dependant on A and $\Box_A B$ means that B is (A -)necessarily true. The authors may differ on what properties to give to \Box_A but basically they agree (though this is only implicit in their work) on the form $A \Rightarrow B = \Box_A B$. There is therefore good reason to believe that the method presented in this paper can be used to construct the

¹³ Another rendering would be $O_k E_k \neg E_k \neg (\neg I_j A \wedge \neg I_j \neg A)$.

logical space of *conditional normative-informational positions* for, e.g., a given antecedent.

6.4 Capabilities and rights

It might also be argued that our stock of action-logical tools needs to be expanded to give place to a notion of ‘practical possibility’. This point can be illustrated by turning back to Article 11 of the EC Directive on Data Protection. The analysis of the obligation to notify, which we have just outlined, might well need further refinement. In particular, it is natural to ask if such a duty implies the following norm: it is obligatory for the data controller that (by putting in place some appropriate mechanisms) he makes it possible for the data subject to have access to the information given in the notification. Indeed, permitting the data subject to have access to the information in question seems to be one thing, making it possible for him to realize this permission seems to be another thing. This point has been emphasized by Kanger, when discussing what he calls the ‘realization’ of rights,¹⁴ and by Sen who suggests thinking of rights in terms of capabilities.¹⁵ Does such a nuance effectively arise in the EC Directive? For present purposes, suffice it to observe that the above distinction can be made explicit in the symbolism, if we allow ourselves the use of an operator ‘Can’ (for ‘it is practically possible that’).¹⁶ The following rendering suggests itself:

$$O_k \text{ Can } (I_l(I_j A \wedge \neg I_j \neg A) \wedge \neg I_l \neg (I_j A \wedge \neg I_j \neg A))$$

This would be the simplest way to express the idea that k should make it possible for l to have access to the information given in the notification.

7 Conclusion

Two points, in conclusion: First, Marek Sergot has pointed out (personal communication) that there is also another point of departure for the generation of normative-informational positions, taking not the 4 positions (I1)–(I4) as the base, but rather the 8 positions obtained by conjoining each of those positions with ‘A’ or ‘¬A’. This is clearly an option worthy of further investigation, although the inclusion of ‘A’/‘¬A’ within the scope of the deontic operator, in generating the normative-informational positions from this base, will perhaps not always produce interesting results, since the question of whether or not ‘A’/‘¬A’ is itself obligatory may be quite irrelevant. By contrast, the approach taken above first generated the normative-informational positions, and afterwards considered the truth/falsity of ‘A’.

¹⁴ Cf. (Kanger 1985).

¹⁵ Cf. (Sen 1982).

¹⁶ The logic of the ‘can’ operator is discussed in, e.g., (Elgesem 1997).

Secondly, thus far we have confined ourselves to applying the formal framework to the legal domain. It goes without saying that discussions of the application of this formal framework would greatly benefit by taking a range of concrete examples from other domains, where the point of the rules is to define a policy to govern the transmission of information. The merits and shortcomings of the present formal framework could then be given a more thorough assessment, by measuring the extent to which it exposes, or not, the details and nuances exhibited by those rules. In particular, it would be interesting to investigate if, and to which extent, the formal framework outlined in this paper provides new insights into such area as Knowledge Management, where a central concern is to facilitate *information flow* within an organisation. For instance, (Brena et al. 2006) argue that so-called logics for defeasible argumentation (for an overview, see (Prakken and Vreeswijk 2002)) can fruitfully be applied to the analysis of multi-agent systems for knowledge management. It is claimed that decisions about disseminating relevant pieces of information in distributed organisations should emerge through a process of argumentation. Information distribution policies can sometimes conflict with each other. Therefore, these are best expressed as defeasible conditionals. On this account, determining whether or not a given piece of information should be delivered to a specific user amounts to determining whether or not the latter obligation is supported by a warranted (i.e., ultimately undefeated) argument. A preliminary step is, of course, to identify the exact normative content of our information distribution policies. This is where the theory of normative-informational positions comes into the picture.

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