Fundamental Legal Concepts

for Autonomous Agents

Giovanni Sartor

European University Institute
giovanni.sartor@eui.eu

22nd July 2008

Index

- agents and norms
- action
- obligation and permission
- obligative positions (rights)
- normative conditionals
- potestative positions (rights)
- sources of the law
- and so on

Norms for agents

Norm-governed agent-societies:

- Agents complying with norms (or violating norms)
- Agents creating norms (through contracts, decisions, etc.)
- Agents monitoring norm-compliance
- Agents implementing sanctions for norm-violations

For simulating human societies or for other purposes (e.g. agents buying and selling in a market-place)

Normative agents

A normative agent (an agent who rationally chooses to comply rather than to violate a norm):

- Self-interested agent, who takes into account the cost of violation (likelihood of sanction)
- Loyal agent following communal norms even against the agent's self-interest (an agent experiencing normativity)
- ...

How shall we enrich an agent's psychology to make norm-compliance possible?

Regimentation vs Normativity

How to organise an agent's society

- Regiment the behaviour of agents (build the agents or their environment in such a way that unwanted behaviour becomes impossible)
- Regulate the behaviour of agents (state rules which the agent's should adopt as standards of their behaviour. heterogeneousness and flexibility)
- ...

How shall we enrich an agent's psychology to make norm-compliance possible? How shall we build electronic or digital institutions?

Normative language

A language which is rich enough to express complex normative components. A compositional approach

- Start with simple elements
- Combine them into a more complex normative vocabulary (ontology), through logical structures
- ...

Two characterisations of action

With regard to action we distinguish two characterisations:

- A *behavioural* characterisation.
- A *productive* characterisation

Behavioural characterisation:

$Does_{Tom}$[smoke]

(*Tom* is smoking)

Productive characterisation:

$Brings_{Alex}$[the air is polluted]

(*Alex* brings it about that the air is polluted)

The basic deontic modalities

- obligation;
- permission.

Obligation

$\boldsymbol{Obl}\ A$

(it is obligatory that A)

where A is any (positive or negative) action description, and $\boldsymbol{Obl}$ is the deontic operator for obligation, to be read as “it is obligatory that.

Obligations

Behavioural obligation:

Obl *Does*$_j$[lecture]

(it is obligatory that *j* lectures)

Productive obligation:

Obl *Brings*$_j$[*k*'s personal data are cancelled]

(it is obligatory that *j* bring it about that *k*'s personal data are cancelled)

Issues on Obligations

Are there obligations of states of affairs (sein-sollen), rather than actions?

$\boldsymbol{Obl}\ A$

(where A is not an action)

Can such obligations have addresses?

$\boldsymbol{Obl}^{j}\ A$

Can one have the obligation that another does an action?

$\boldsymbol{Obl}^{j}\ Brings_{k} A$

My answer tends to be negative: obligations of states of affairs can be seen goal or values or group obligations; the obligation that another does an action A is the obligation of performing the action of making the other to the A. However further reflection is required

Obligation and sanction

What is a sanction? A negative consequence upon an agent linked to an action of the agent with the purpose of preventing that action ($\Uparrow$ preceeds the purpose)

(IF $Does_j$A THEN j is liable to B) $\Uparrow$NON $Does_j A$

Example

(FORANY (x) (IF $Does_x$[download copyrighted work] THEN x is liable to a fine of 1000 Euros)
$\Uparrow$NON $Does_j$[download copyrighted work]

(it j downloads copyrighted work, j is liable to a fine of 1000 Euros, for the purpose of preventing j from doing that)

Can obligation be reduced to sanction? I do not think the the following holds in general:

Obl $Does_j$A $\equiv$
FORSOME (B) IF $Does_j$A THEN j is liable to B)$\Uparrow$NON $Does_j A$

Behavioural and productive permission

Behavioural permission:

Perm $Does_{Tony}$[run MySoft]

(it is permitted that *Tony* runs MySoft)

Productive permission:

Perm $Brings_{Tony}$[MySoft is installed on three computers]

(it is permitted that Tony brings it about that MySoft is installed in three computers)

Obligations, prohibitions, permissions

- Being prohibited to perform an action means being obliged not to do it: $\boldsymbol{Forb}\ A \equiv \boldsymbol{Obl}\ \text{NON}\ A$.
- Being permitted to perform an action means not being forbidden to do it: $\boldsymbol{Perm}\ A \equiv \text{NON}\ \boldsymbol{Forb}\ A$.
- Being obliged to perform an action entails being permitted to perform it: $\text{IF}\ \boldsymbol{Obl}\ A\ \text{THEN}\ \boldsymbol{Perm}\ A$.
- Being both obliged to perform action A and obliged to perform action B entails being obliged to perform both actions: $\text{IF}\ (\boldsymbol{Obl}\ A\ \text{AND}\ \boldsymbol{Obl}\ B)\ \text{THEN}\ \boldsymbol{Obl}\ (A\ \text{AND}\ B)$.

Many deontic logic exist which include this inferences (and other ones)

Deontic possibilities

country	wearing the veil (V)	not wearing the veil (NON V)
France	***Forb*** V	***Obl*** NON V
Iran	***Obl*** V	***Forb*** NON V
UK	***Perm*** V	***Perm*** NON V

Facultativeness or mere freedom

$\boldsymbol{MereFreedom}\ A \equiv$
$(\boldsymbol{Perm}\ A\ \text{AND}\ \boldsymbol{Perm}\ \text{NON}\ A)$

($\lceil$it is facultative that $A\rceil$ is equivalent to $\lceil$it is permitted that A AND it is permitted that NON $A\rceil$)

For example, saying that $\lceil$in the UK, for a girl going to school, it is facultative to wear the veil$\rceil$ amounts to saying that $\lceil$she is permitted both to wear the veil and to not wear it$\rceil$.

Mere freedom

$\boldsymbol{MereFreedom}\ Does_{Mary}$[smoke in her house]

at least the cruder forms of interference, such as those involving physical assault or trespass, will be criminal or civil offences or both, and the duties or obligations not to engage in such modes of interference constitute a protective perimeter behind which liberties exist and may be exercised. (H.L.A. Hart)

Concepts of freedom

Mere freedom = faculty:

$\boldsymbol{MereFreedom}\ Does_j A \equiv \boldsymbol{Perm}\ Does_j A$ AND $\boldsymbol{Perm}$ NON $Does_j A$

Negatively protected freedom (toward k):

$\boldsymbol{NegFreedom}\ Does_j A \equiv$
$\boldsymbol{MereFreedom}\ Does_j A$ AND
$\boldsymbol{Forb}\ Brings_k Does_j A$ AND $\boldsymbol{Forb}\ Brings_k$ NON $Does_j A$

Positively protected freedom (toward k):

$\boldsymbol{PosFreedom}\ Does_j A \equiv$
$\boldsymbol{NegFreedom}\ Does_j A$ AND
$\boldsymbol{Obl}\ Brings_k$[possible ($Does_j A$) AND possible(NON $Does_j A$)]

Concepts of freedom. Examples

Mere freedom

$\boldsymbol{MereFreedom}\ Does_{Mary}$[smoke in her house]

Negatively protected freedom

$\boldsymbol{NegFreedom}\ Does_{Mary}$[express her views]

Positively protected freedom

$\boldsymbol{PosFreedom}\ Does_{Mary}$[obtain an elementary education]

Teleology

Norms and normative positions serve certain goals or purposes:

$Prop\Uparrow^{G}$

indicates that *Prop* advances the goal (or the set of goals) *G*. The goal may be

- a collective one (collective health): public law
- and individual one (the health of any individual): private law

Other-directed obligation

It is *obligatory, toward k*, that j does A ($\boldsymbol{Obl}^k Does_j A$) iff it is obligatory, that j does A, in order to advance the interest of k ($\boldsymbol{Obl}\ Does_j A)\Uparrow^k$):

$\boldsymbol{Obl}^k Does_j A \equiv (\boldsymbol{Obl}\ Does_j A)\Uparrow^k$

Interest-based notion of a right: Bentham, Jhering (vs. Power-based notion of a right: Kelsen, Hart)

Examples

$\boldsymbol{Obl}^{Mary}\, Does_{Tom}$[pay ¤ 1,000 to *Mary*]

(it is obligatory, toward Mary, that Tom pays ¤ 1,000 to *Mary*)

$\boldsymbol{Obl}^{Tom}$NON $Does_{Mary}$
[communicate to others *Tom*'s trade secrets]

(it is obligatory, toward Tom, that *Mary* does not communicate to others *Tom*'s trade secrets)

Other-directed permission

$\boldsymbol{Perm}^{Tom}\,Does_{Mary}$[raise a building up to 15 meters high] $\equiv$

(it is permitted, toward *Tom*, that *Mary* raises a building up to 15 meters high)

NON $\boldsymbol{Obl}^{Tom}$NON $Does_{Mary}$[raise a building up to 15 meters high]

Obligative right

$\boldsymbol{OblRight}_{Tom}Does_{Mary}$[pay ¤ 1,000 to *John*]

(*Tom* has the obligative right that *Mary* pays ¤ 1,000 to *John*)

means that:

$\boldsymbol{Obl}^{Tom}(Does_{Mary}$[pay ¤ 1,000 to John]

(it is obligatory, toward *Tom*, that *Mary* pays ¤ 1,000 to *John*)

Other interest-based rights

- permissive rights
- absolute rights

Permissive right

A person j has, toward a person k, the *permissive right* to do A ($\boldsymbol{PermRight}^k\, Does_j A$) iff it is permitted toward k, in the interest of j, that j does A:

$$\boldsymbol{PermRight}^k\, Does_j A \equiv (\boldsymbol{Perm}^k\, Does_j A)\Uparrow^j$$

$\boldsymbol{PermRight}^{Tom}\, Does_{Mary}$[erect a building up to 15 meters high]

(Mary has the permissive right, toward tom, to erect a building up to 15 meters high)

$\equiv$

$\boldsymbol{Perm}^{Tom}\, Does_{Mary}$[erect a building up to 15 meters high]

(it is permitted, toward Tom, that Mary erects a building up to 15 meters high)

Erga-omnes right

$\boldsymbol{ErgaOmnesOblRight}_k \, Done \; A \equiv$
$\text{FORANY}\,(x)\; \boldsymbol{OblRight}_k \, Does_x \, A$

$\boldsymbol{ErgaOmnesOblRight}_{Tom}\text{NON}\; Done$ [copy Tom's novel] $\equiv$
$\text{FORANY}\,(x)\; \boldsymbol{OblRight}_{Tom}\text{NON}\; Does_x$[copy Tom's novel]

$\boldsymbol{ErgaOmnesPermRight}_k \, Done \; A \equiv$
$\text{FORANY}\,(x)\; \boldsymbol{PermRight}^x \, Does_k \, A$

$\boldsymbol{ErgaOmnesPermRight}_k \, Done$ [express k's opinion] $\equiv$
$\text{FORANY}\,(x)\; \boldsymbol{PermRight}^x \, Does_k$[express k's opinion]

Hohfeld's obligative set

if X has a right against Y that he shall stay off the former's land, the correlative (and equivalent) is that Y is under a duty toward X to stay off the place [...] whereas X [...] has the privilege of entering on the land; or, in equivalent words,X does not have a duty to stay off. (W.N. Hohfeld, 1913)

Hohfeldian obligative set

Right	—	**correlative**	—	Duty
opposite				**opposite**
Noright	—	**correlative**	—	Privilege

Hohfeldian obligative set

$\boldsymbol{OblRight}_k Does_j A$ —— **equivalent** —— $\boldsymbol{Obl}^k Does_j A$

incompatible **incompatible**

$\boldsymbol{NoRight}_k Does_j A$ —— **equivalent** —— $\boldsymbol{Privilege}^k Does_j A$

where $\boldsymbol{NoRight}_k Does_j A$ means NON $\boldsymbol{Obl}^k Does_j A$, i.e., $\boldsymbol{Perm}^k Does_j$NON A

Hohfeldian concepts

$\boldsymbol{OblRight}_{Tom}$NON $Does_{Mary}$[copy TomSoft]

(*Tom* has the obligative right that *Mary* does not copy TomSoft)

$\boldsymbol{Obl}^{Tom}$NON $Does_{Mary}$[copy TomSoft]

(*Mary* has the obligation toward *Tom* not to copy TomSoft)

Negation:

$\boldsymbol{NoRight}_{Tom}$NON $Does_{Mary}$[copy TomSoft]

(*Tom* has a noright that *Mary* does not copy TomSoft)

$\boldsymbol{Privilege}^{Tom}$NON $Does_{Mary}$[copy TomSoft]

(*Mary* has a privilege toward *Tom* not to copy TomSoft, i.e. *Mary* is permitted toward *Tom* to copy TomSoft)

Normative conditionals

IF A THEN B

meaning that the conditional's antecedent causes or at least enables the verification of the consequent.

FORANY (x)
IF [x is below 18 years of age]
THEN $\boldsymbol{Forb}\ Does_x$[buy alcoholic drinks]

(for any x, if x is below 18 years of age, then it is forbidden that x buys alcoholic drinks)

Examples of normative conditionals

1. IF [Tom does not deliver the merchandise on time]
   THEN Tom becomes obliged to pay a penalty of ¤ 1,000 (deontic initiation)]
2. IF [Mary renounces the payment of the penalty]
   THEN [Tom ceases to be obliged to pay i (deontic termination)]
3. IF [Tom is inside a mosque]
   THEN [Tom is forbidden to wear shoes (deontic emergence)]
4. IF [Tom was born in Italy]
   THEN [Tom becomes an Italian citizen (constitutive initiation)]
5. IF [Tom acquires another citizenship]
   THEN [Tom ceases to be an Italian citizen (constitutive termination)]
6. IF [Tom and Lisa agree to create company LegalSoft]
   THEN [the company LegalSoft comes into existence] (existential initiation)
7. IF [Tom and Lisa agree to terminate company LegalSoft] THEN [company LegalSoft ceases to exist] (existential termination)
8. IF [an object is permanently attached to the soil]
   THEN [the object is an immovable good (constitutive state-emergence)]
9. IF [Tom drives while intoxicated]
   THEN [Tom commits a criminal offence (constitutive event-emergence)]

Examples

Deontic initiation:

FORANY (x, y, w)
IF *it happens that*
[x causes against y an illegal damage worth w]
THEN *it starts that*
Obl [x pays compensation w to y]
(for any persons x and y, and amount w, if x causes against y an illegal damage worth w, then the obligation that x pays compensation w to y starts)

Non-deontic state-emergency:

FORANY (x)
IF *it holds that*
[x is a piece of land, water source, a tree, a building, or is anyway permanently attached to the land]
THEN *it holds that* [x is an immovable good]

Constitutive (counts-as) rules

For state emergence:

state A COUNTS-AS *state B* $\equiv$
IF *it holds that A* THEN *it holds that B*

($\lceil$state *A* counts as state *B*$\rceil$ is equivalent to $\lceil$the holding of state *A* determines the holding of state *B*$\rceil$)

For event-emergence:

event A COUNTS-AS *event B* $\equiv$
IF *it happens that A* THEN *it happens that B*

($\lceil$event *A* counts as event *B*$\rceil$ is equivalent to $\lceil$the happening of event *A* determines the happening of event *B*$\rceil$)

Examples of counts-as

FORANY (x)
$Does_x$ [use this Web site] COUNTS-AS
$Does_x$ [accept our Agreement and Privacy Policy]
FORANY (x)
$Does_x$ [break the seal of this disk envelope] COUNTS-AS
$Does_x$ [accept all the terms of the following licence]

Potestative concepts

Legal permission and legal ability (licere, posse), though linguistically indistinct, are different from each other. . . . [L]egal ability, or legal power (juristische Können), on the other hand, occurs only in Rechtsgeschäfte, in the widest sense of the word, only in such acts which are imposed or adopted by the law for achieving its invisible legal effects (Alois Brinz, 1873).

Power $\neq$ permission $\neq$ physical or social possibility

Kinds of power

Powers are dependent on conditionality:

- A generic power consists in mere fact that a certain event determines a legal effect to happen (so that by causing the event one can determine its legal effect)
- An action-power consists in a generic power to produce a legal effect through an action determining it.
- An enabling-power is an action-power intended to enable the normative result of the action.
- A potestative-right is an enabling power intended to further the interests of the power holder.
- A declarative-power is an action-power consisting in the fact that one's declaration of a certain legal result determines that result.

Example of an action-power

FORANY (x, y)
IF [animal y does not belong to anybody]
THEN IF $Does_x$ [capture y]
THEN *it starts that* [x is the owner of y]
is equivalent to
FORANY (x, y)
IF [animal y does not belong to anybody]
THEN
$\boldsymbol{ActionPower_x}$
to start [x is the owner of y]
VIA [capturing y]

(for any person x and any animal y, if y does not belong to anybody, then x has the action-power to start x's ownership of the animal, by capturing y)

Hohfeldian potestative-set

X, the owner of ordinary personal property “in tangible object” has the power to extinguish his own legal interest (rights, powers, immunities, etc.) though the totality of operative facts known as abandonment; and—simultaneously and correlatively—to create in other persons privileges and powers relating to the abandoned object—e.g., the power to acquire title to the latter by appropriating it. Similarly, X has the power to transfer his interest to Y—that is, to extinguish his own interest and concomitantly create in Y a new and corresponding interest. So also X has the power to create contractual obligations of various kinds. (W.N. Hohfeld, 1913)

Hohfeldian potestative-set: schema

Power	**correlative**	Subjection
opposite		**opposite**
Disability	**correlative**	Immunity

Hohfeldian potestative square

$$
\begin{tikzcd}
\mathit{ActionPower}_j\mathit{Pos}_k \arrow[r, dash, "\textbf{equivalent}"] \arrow[d, dash, "\textbf{incompatible}"] & \mathit{Subjection}^j_k\mathit{Pos} \arrow[d, dash, "\textbf{incompatible}"] \\
\mathit{Disability}^k_j\mathit{Pos} \arrow[r, dash, "\textbf{equivalent}"] & \mathit{Immunity}^j_k\mathit{Pos}
\end{tikzcd}
$$

Hohfeldian potestative concepts

$\boldsymbol{ActionPower}_{Tom}$[terminate rent contract]$_{Mary}$ $\equiv$
$\boldsymbol{Subjection}^{Mary}_{Tom}$[terminate rent contract]

Negation:

$\boldsymbol{Disability}$Tom [terminate rent contract]$_{Mary}$ $\equiv$
$\boldsymbol{Immunity}\,Mary^{Tom}$[terminate rent contract]

Connection between obligative and potestative rights

Usully a person has the power (potestative right) to act when his or her rights are violated.

IF $\boldsymbol{Obl}^j A$ THEN $\boldsymbol{PotestativeRight}_j$[activate sanction for NON A]

(if j has an obligative right to an action A then j has the potestative right to activate a sanction for the non-performance of A)

Result-declaration

We say that *j declares A*, and we write $Does_j$[declare A], abbreviated as $Decl_j A$ to mean the following:

1. j states a normative determination A, and
2. this statement has the function to realise A through the very action of stating A.

Rules on the effectiveness of declarations

Examples:

- "whatever normative proposition is stated by the Parliament has the force of law'
- *quod principi placuit legis habet vigorem* (what the emperor likes has the force of law)
- whatever is stated by the parties of a contract is binding for them

FORANY (φ) IF $\mathit{Decl}_{\{\mathit{Parliament}\}}\varphi$ THEN *it is valid that* φ

(for any φ, if Parliament declares φ, then *it is valid that* φ)

IF *it is valid that* φ THEN φ

Declarative power

We say that j has the *declarative power* to realize A to mean that if j declares A, then it is legally valid that A.

$\boldsymbol{DeclPow}_j A \equiv$ IF $Decl_j A$ THEN *it is valid that* A

Example

FORANY (φ)
$\boldsymbol{DeclPow}_{Parliament}\ \varphi$
FORANY (x, y, φ)
$\boldsymbol{DeclPow}_x$ (*it finishes that* $\boldsymbol{Obl}^x Does_y \varphi$)

(for any persons x and y, and any action φ, x has the declarative power to terminate y's obligation toward x to do φ)

Source of the law/Normative source

By a *source of law* we mean any fact that embeds normative propositions and makes them legal (legally valid) by virtue of such an embedment.

FORANY (φ)
IF [φ is practised as a local custom]
THEN *it is valid that* φ
FORANY (φ)
IF [φ is practised as an international custom]
THEN *it is valid that* φ
FORANY (φ)
IF *it happens that* [a high court has decided a case according to *ratio* φ]
THEN *it is valid that* φ
FORANY (φ)
IF [φ represents the unanimous opinion of all jurisconsults]
THEN *it is valid that* φ

Conclusion

We need to be able to model norm-governed (and norm-productive) agent-behaviours. This requires:

- Modelling normative contents (in a sufficiently rich language)
- Modelling compliance and violation
- Modelling conditional norms and the exercise of powers