**Organizations**

A significant category of ensembles are those in which the actions of the ensemble membership are coordinated towards the achievement of one or more ends. Such an ensemble is termed an ‘organization,’ as can be seen from the usual definitions used by those who have a need for the concept. For example, Robbins et al. (2012, *Management: The Essentials*, Australia:Pearson, p. 4) describe an organisation as “a deliberate arrangement of people brought together to accomplish some specific purpose” and note three ‘characteristics’ of the ensemble of interest: i. “a distinct purpose;” ii. “the achievement of goals through people, who make decisions and engage in work activities to make the goal a reality;” and iii. “develop[s] a deliberate and systematic structure that defines and limits the behaviour of its members.”

Such coordination requires a system of norms that determine a system of dominance relations (or coordination cannot be achieved.) The dominance relations so created have effects on the individual agents in the ensemble but they are defined in terms of subsets of the ensemble. In so far as the coordination of the actions in the ensemble is directed to some end, these sub-ensembles may be considered as roles in an organization. Note that as the dominance relations in an organization are normative dominance relations they are thus relations of legitimate (rational-legal) authority in Weber’s terms.

***Organizations***

The norm formation that is constitutive of the ensemble describes its goals and the means by which they are to be achieved. Moreover, the rationality of any such norm formation will be judged by the consistency of its propositions with the supposed end point to be achieved. However, the fact that there is a supposed ‘goal’ for an organization is *not* essential to its sociological characterization. That essential character is rather the system of dominations and roles that are created by the norm formation that characterizes the ensemble. In what follows we shall not concern ourselves with an attempt to formalise a notion of something like intentionality for an ensemble of agents. Instead, an organization (and precursor concepts) will be defined in terms of their sociologically relevant characteristics in the first place, and may then be tested for satisfactoriness in the theories in which organizational entities have a place.

Let *X* be a set of agents, *R* = {*r1*, …, *rn*}  2*X* a partition of *X*, *N* a norm formation.

*Ô* = (*X*, *R*, *N*) is a Quasi-Organization if

* + 1. *N*  *NO*(*X*)

» *Every member of X accepts N (i.e. X*  *K(N))*

* + 1. (*ri*  *R*) (*rj*  *R*) [(*rj* >*N* *ri*) ( *ri* >*N* *rj*)]

» *Every part of R normatively dominates or is normatively dominated by some other part*

* + 1. (*ri*, *rj*  *R*) (*m**n*)(*rkl**l=1,...,m*

[(*rk1*=*ri*) & (*rkm*=*rj*) & (*l* [1,*m*-1]) [(*rkl* >*N* *r kl+1*) (*rkl+1* >*N* *r kl*)]]

» *Between every pair of* *elements of R there is a sequence of elements of R related by normative dominance*

* *R*(*Ô*) = *R* is the Roleset of *Ô*. The elements of *R*(*Ô*) are the Roles of *Ô*
* |*Ô*| = *X* is the membership of *Ô*
* *N*(*Ô*) = *N* is the Ruleset of *Ô*. The elements of *N*(*Ô*) are the Rules of *Ô*
* *OADD*(*Ô*) = {<*x*, *y*>: *x*, *y*  *|Ô*|, *x* >*N* *y*}, the Organizational Agent Dominance Diagram
* *ORDD*(*Ô*) = {<*ri*, *rj*>: *ri*, *rj*  *R*(*Ô*), *ri* >*N* *rj*}, the Organizational Role Dominance Diagram.
* Condition ii implies that any organization is at the same time an institution
* Condition iii simply requires that the elements of *R* all be part of a single network of dominance relations: there are no isolates or islands.

It is also typical of these coordinated ensembles that some roles are specified as being extraordinary in the sense that though they dominate others they are not themselves necessarily dominated by any other roles in the group. These are the leadership roles in an organization. Define the Leadership Roles as *L*(*R*):

*L*(*R*) = {*ri*  *R*: ~(*rj*  *R*) [*rj* >*N ri*]}

A quasi-organization with leadership roles is an Organization

A Line-Crossing (Quasi-)Organization is a (quasi-)organization for which:

(*p*, *q*, *r*  *R*) [*p* >*N r* & *q* >*N r*]

* Note that matrix structured organizations (see example below) are line-crossing

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| **Example:**  In Organizational Theory, there is a common typology of organizational structures that are described as *simple*, *functional*, *divisional*, and *matrix*. These can be described relatively easily using the tools provided.  *Simple*  *Ô* = (*X*, *R*, *N*) has a simple structure if   1. *R* = {*r1*, *r2*} and 2. *r1* >*N* *r2*.   But any particular structure is much better described using the graphical tools developed above; thus:  *N*: *r1* | *r2*  *Functional*/*Divisional* (*Tree*)  *Ô* = (*X*, *R*, *N*) has a tree structure if   1. *R* = {*r1*, *r2*, …, *rn*}, 2. #(*L*(*R*)) = *1*, and 3. (*i*)[*j*)[*ri* >*N* *rj*] !*j*)[*rj* >*N* *ri*]]   For which an exemplary representation might be:  *N*  *r1*  *r2 r3 r4*  *r5 r6 r7*  *Matrix*  *Ô* = (*X*, *R*, *N*) has a matrix structure if   1. *R* = {*r1*, *r2*, …, *rn*}, 2. *R1*,*R2*,*R3*,*R4**R*)[(*i*,*j*[*1*,*4*])[*i**j*  *Ri**Rj*=] & *R* = *i=1,…,4Ri*] 3. *#*(*R1*) = *1* 4. *R1* >*N R2* & *R1* >*N R3* & (*i,j*)[*ri**R1*&*rj**R4* ~(*ri* >*N rj*)] 5. (*ri**R4*)[(!*rj**R2*)[ *rj* >*N ri*] & (!*rj**R3*)[ *rj* >*N ri*]]   For which an exemplary representation might be    *N r1*  *r2 r3 r4*  *r5 r9 r10 r11*  *r6 r12 r13 r14*  *r7 r15 r16 r17*  *r8 r18 r19 r20*  Note that here *R1* = {*r1*}, *R2* = {*r2*, *r3*, *r4*}, *R3* = {*r5*, *r6*, *r7*, *r8*}, and *R4* = {*r9*, *…*, *r20*} |

*Hierarchies and Recursions*

Let *Ô* = (*X*, *R*, *N*) be an organization. We extend the concept of a domination sequence introduced earlier to say that there is an Organizational Domination Sequence (or a Chain of Command) in *R* subordinating role *p* to role *q* iff (*ri*: *i*=1, …,*n*>)  *Rn*) [*r1*>*N p* & *r2*>*N r1* & … & *q*>*N rn*], and we write *q*>>*N* *p* and read that as *q* Organizationally Superdominates *p*

* If *ri* >*N rj* then *ri* Proximately Organizationally Dominates *rj*
* If *ri* >>*N rj* but ~( *ri* >*N rj*) then *ri* Distantly Organizationally Dominates *rj*.
* For *r*  *R* define the Range of Organizational Superdomination of *r*:

*ROS*(*r*) = {*ri*  *R*: *r* >>*N* *ri*}

* Also known as *Span of Control* in the literature

We can define several versions of organizational governance with respect to structures of superdominance. An Organization may be said to be:

* Heterarchic if it has several leadership roles with overlapping ranges

(*p*, *q*  *L*(*R*)) [*p*  *q*] & (*p*, *q*  *L*(*R*)) [*ROS*(*p*)  *ROS*(*q*)  ]

* Polyarchic if it has several leadership roles with *non-*overlapping dominances

(*p*, *q*  *L*(*R*)) [*p*  *q*] & (*p*, *q*  *L*(*R*)) [*ROS*(*p*)  *ROS*(*q*) = ]

* Henarchic if it has a single leadership role

#(*L*(*R*)) = 1, and we say *L*(*R*) = *rL*

* + Note that *ROS*(*rL*) = *R – rL*

Suppose *q* organizationally superdominates *p* (*q*** *p*) then we can define the non-empty set *CC*(*q*, *p*) = {*ri*: *i*=1, …,*n*>)  *Rn*): *r1*>*N p* & *r2*>*N r1* & … & *q*>*N rn*} to be the set of chains of command from *q* to *p.*

We define *l*(*p*), the Organizational Level of *p*, as the length of the shortest chain of command between *p* and some leadership role. So:

*l*(*p*) = *min*({#(*cc*): *cc*  *q**L*(*R*)*CC*(*q*, *p*)})

* We may conventionally describe the leadership roles as being level 0 roles.
* If there are several level 0 roles then we might wish to say instead that the organizational level of *p* may be different wrt each level 0 role. We won’t go into this any further.

An Organizational Recursion (or Command Loop) on *p* is a sequence *ri*: *i*=1, …,*n*>)  *Rn* where *r1*>*N p* & *r2*>*N r1* & … & *p*>*N rn*.

* Where a command loop on *p* exists, *p* >>*N* *p*
* Suppose *p* >>*N* *p*, then we can define the non-empty set *CL*(*p*) = {*ri*: *i*=1, …,*n*>)  *Rn*): *r1*>*N p* & *r2*>*N r1* & … & *p*>*N rn*} to be the set of organizational recursions or command loops on *p*.
* If (*p*  *R*(*Ô*)) [*CL*(*p*)  ] then *Ô* is Fully Recursive; and is thus no more than a quasi-organization, since no leadership role can participate in a recursion.
* All organizations are *at most* Partially Recursive

A command loop *cl* = *ri*: *i*=1, …,*n*>)  *Rn* *CL*(*p*) on *p* is a Level *l* Organizational Recursion if *min*{*l*(*ri*): *i*=1, …,*n* } = *l*.

* A recursive organization (an organization with command loops) is Recursive at Level *l* if (*p*  *R*) [*CL*(*p*)  *l*(*p*)  *l*] & (*p*  *R*) [*CL*(*p*)   & *l*(*p*) = *l*]

A command loop *cl* = *ri*: *i*=1, …,*n*>)  *Rn* *CL*(*p*) on *p* is an Organizational Recursion of Depth *d* if *max*{*l*(*ri*): *i*=1, …,*n* }- *min*{*l*(*ri*): *i*=1, …,*n* }+1 = *d­*.

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| **Example:**  Recursion is relatively common in political structures – at least in their ideal forms. The best known of these is the structure envisaged by the US Constitution (which is a high level element of the norm formation that defines the US government as a quasi-organization.) Note that the forms of domination that are effective in each direction may differ, which one would expect to be the case since they derive from different elements of the constitutive norm formation. The following diagram summarizes the case for the USA.  *ÔGovUSA* = (*X*, *R*, *N*)  *N* = *Constitution+* – the constitution and the legislative additions and interpretations  *X* = the subset of the population of the USA actually involved in the activity of government as defined by the constitution  *R* = {*re*, *rl*, *rj*} – the executive, legislative, and judicial sectors of government defined by the constitution  *N*  *re*  *Nej Nel*  *Nje Nle*  *rj* *Njl* *rl*  *Nlj*  Where the norm sub-formations marked allow the following actions of domination:  *Nej*: Appoints members, May grant pardons  *Nje*: Judges constitutionality  *Nel*: Proposes and vetoes laws, Calls special sessions of congress, Makes treaties  *Nle*: Overrides veto, Confirms appointments, Ratifies treaties, Creates budget, May impeach  *Njl*: Confirms appointments, Proposes amendments, Creates lower courts, May impeach  *Nlj*: Judges constitutionality |