Chapter 7
A Methodology to Measure the Hierarchical Degree of Formal Organizations

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ABSTRACT

Hierarchy is a fundamental phenomenon in management and organization science, a phenomenon which has marked the evolution of human societies over centuries. Among the many studies on this issue, the ones that adopt a formal approach of investigation are mainly based on social network analysis. Following this line, in this work we focus on organization distribution of formal direct authority in stylized, pure hierarchical archetypes. Past research, analyzing the share of asymmetric links in out-tree topologies, was not able to distinguish among different types of out-trees. Indeed since the out-trees can differ under substantial structural features, in order to measure the degree of hierarchy it is necessary to employ indicators of power concentration and distribution. Results show that the purest archetype of hierarchy is the star form, and not the typical org chart. Further, ceteris paribus, an organization with more hierarchical levels is less and not more hierarchical than an organization with fewer levels. Moreover, power tend to concentrate in lower levels, and especially into the penultimate one.

INTRODUCTION

The objective of this work is to develop a methodology and draw the main results of measuring the hierarchical degree of formal organizations, limitedly to direct relationships. More generally, authority (or power or status, according to the many sociological approaches) can be seen as an asymmetric decision. And a decision is a peculiar injunctive type of communication, which orients or strictly determines a receiver's behavior. In this perspective, formal organizations are essentially decision networks, and indeed this was exactly Simon's view of organizations (Simon, 1947; Simon & March, 1957). Now, after

so long time from his approach, we know well that organizations are much more and else than that (for a broad view, see Clegg *et al.*, 2006). However, to a large extent, depicting organizations as decisions (and not only "simple" communications) networks still grasps a relevant aspect of what organizations do[1].

In its simplest and purest sense, a hierarchical relationship is an asymmetric relationship, characterized by the fact that one can be obeyed by another (or many other) one(s). As sociological literature suggests since the classic works of Weber and Simmel, the reasons for such obedience can be various: rituals, charisma, money, physical dominance, etc. Such issues, albeit very interesting, do not concern our analysis, for which it is enough to express the point in terms of asymmetric decision, regardless of the specific nature and source of power. In this sense, a digraph whose links are not-all-reciprocal decisions (which guide the actions of subordinates) is a hierarchy.

For in a formal hierarchy, someone decides what another (or many others) should do, the resulting structure can be viewed as a command (or asymmetric decisions) network, in particular an *out-tree* graph (see Krackhardt 1994; Krackhardt & Hanson, 1993). In fact, if we look at a stylized org chart, which Simon (1962) considers the archetype of hierarchy, and if we orient its connections from the vertex to the subordinates through intermediate managers, and if there are no collaborations (or joint/reciprocal decisions) between managers or subordinates, an org chart becomes a pure out-tree. Krackhardt (1994) refers to the hierarchical properties of out-tree graphs by means of four graph indicators - connectedness, hierarchy, efficiency and least upper boundedness - that measure an organization degree of hierarchy in terms of its 'degree of out-treenness'. Because a pure out-tree would score 100% according to these four indicators, they are not able alone to grasp some salient features of hierarchies: they do not, strictly, discriminate between organizations with more or less power concentration. In fact organizations that exhibit the same degree of out-treenness could be saliently different in their configuration of *span of control* (SoC) and *number of ranks* (NoR), that is in two fundamental structural aspects. The former is an evident sign of the power of single individuals, because it indicates how many subordinates are managed. The latter indicates hierarchical levels, and it is an intuitively-grasped and popularly-used signal of an organization hierarchical degree. Hence, it appears difficult to accept a measure of organizational hierarchical degree (OHD) that overlooks both issues. Further, the degree of out-treenness does not catch how hierarchical power is distributed between hierarchical levels.

Therefore, a set of crucial questions, which cannot be answered with the degree of out-treenness, arise: how can we measure OHD besides the degree of out-treenness? That is, is there some other measure of power concentration else than the degree of out-treenness? In fact, this latter question is particularly interesting, because another way of looking at OHD is in terms of the extent to which decisions are concentrated in few hands or distributed evenly among most individuals, instead of looking at the share of asymmetric relationships, as the degree of out-treenness points out. As we will see below, these two perspectives on OHD differ remarkably. A further question concerns how can we compare the OHD of two or more organizations that are pure out-trees and have the same size, but differ in terms of SoC and/ or NoR. And finally, how OHD is distributed between people and ranks? In this chapter we provide an answer to these questions.

As we will see in the next sections, if OHD is meant as power concentration (PC) and it is measured by out-degree centralization indices, then such questions can be answered. Moving from the consideration that an organizational formal structure can be described by SoC and NoR, we are going to investigate on how a pure out-tree centralization, and thus, its PC depends on different configurations of these three variables. Furthermore, by calculating rank centrality, we will measure power distribution (PD) among them.

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