Civilizations as Networks: Trade, War, Diplomacy, Command-Control

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Abstract

Civilizational studies have been advanced by using network concepts for defining and bounding units of analysis, and for examining and comparing command-control networks. Several future applications of network concepts can be identified. Highly contextualized, "natural-historical" approaches will likely be most fruitful.

Introduction

Complex physical systems exist simultaneously as an interacting combination of atomisms and as a coherent field, itself an atomism on another level of interaction (Wilkinson and Iberall, 1986:37-38). "Complex systems have embedded interiors with many interacting parts, networks, and fields. From a mechanical point of view, emergent field processes often lead to 'surprising' results that are not reducible to a mechanical or deterministic account" (White and Johansen, 8/8/2002, xxiii). Indeed, "complexity" is informational: complex systems surprise and educate their observers by their unpredicted, and therefore informative, behavior.

Complex systems are complex in spatial structure: they are wholes whose identity is more than the collection of their parts. They are also complex in temporal structure: the timescales of the whole are not those of the parts. "[A]ll complex physical systems display 'long' cycles...." (Wilkinson and Iberall, 1986:38).

Complex systems are objects of study for many disciplines, and similar principles and research strategies seem to apply across many scales, and across "social," "biological," and "physical" sciences. Of particular importance is the determination of their process timescales, their "spectroscopy" (Wilkinson and Iberall, 1986; Iberall and Wilkinson, 1987, 1991; Iberall et al., 2000).

Being genuine wholes made up of genuine, interconnected parts, complex systems may often be usefully conceived and examined as networks. Harary and Batell (1981) define a system as sets of relations among elements at different levels where each level is a graph in which each node may contain another graph structure, i.e. embedded networks. This paper recounts the background of two applications of network concepts to problems of human macrosocial systems, "civilizations" or "world systems," reports some initial gains, and contemplates next steps.

Civilizations are complex social systems with evident network characteristics. However, network approaches remain subdominant in civilizational and macrosystem studies. The civilizationist Arnold Toynbee (e.g. 1961:272, 282, 289), like most of his successors down to Matthew Melko (1969:8, 20; 2001:32-33) and Samuel Huntington (1996:40-43) tended to treat civilizations as cultures, or as human collectivities each possessing a culture shared by its members, with bounded locations in space and time (Melko and Scott, eds., 1987). The "culturalist" definition however proves impossible to implement consistently, as has been shown by critics from Sorokin to the present (Allen, 1963; Sorokin, 1950, 1956, 1963; Wilkinson, 1996, 2001b).

An alternative concept propounded by Toynbee, though never systematically implemented, proposed to treat civilizations as networks of relations. In this concept, "[s]ociety is the total network of relations between human beings"; societies are "particular networks" which are not "components of any more comprehensive network"; a civilization is a species of society, a network of relations of a distinct nature and pattern; and the network of external relations linking coexistent civilizations with each other is significantly more tenuous than the network of internal relations between the participants in any one of them (1961:81, 280, 286).

It will readily be seen that civilizations so conceived are rich, multiple, multilevel embedded networks. Cities may be seen as nodes varying in size and centrality, tied by trade routes varying in content, length and thickness, with the city/tradenet wholes varying in cohesion and centralization. States may be graphed as nodes linked by influence, alliance and war relations into a states-system network varying on similar dimensions.

Discussion

The great advantage of the network concept of civilization is that, unlike the cultural concept, it permits consistent empirical implementation. A decision does have to be made as to whether the networks' spatiotemporal boundaries are to be defined on economic criteria (trade networks whose flows are goods) or politico-military criteria (war-and-diplomacy networks whose flows are messages and armies), since, prior to the 19th century globalization of trade (opening of Japan) and the 20th century globalization of war (World War I), their dimensions were not the same, trade networks being more extensive, so that goods flowed between peoples and states who exchanged neither messages nor invasions.

A politico-military criterion for specifying network boundaries has been elected by several researchers (e.g. Chase-Dunn and Hall, 2000; Cioffi-Revilla and Lai, 1999; Wilkinson, 1987a, 1987b), with varying preferred nomenclatures for the entities thus defined (civilizations, world-systems, politico-military networks, macrosocial systems). For this paper, the civilizational nomenclature will mainly be employed.

The first effect of a network concept on civilizational studies is to reconstruct the roster of civilizations. Many traditionally listed "civilizations" (Egyptian, Mesopotamian, Indic, Chinese, Japanese), most or all of which under strict culturalist criteria would have to be dissolved because clearly polycultural, survive under network criteria, sometimes under regional labels (e.g. Far Eastern, Southwest Asian), although several highly valued traditional entities (Classical, Byzantine, Islamic, Russian, Western) do not survive as wholes under network criteria, but only as parts of a larger and very long-lived "Central" Civilization (Wilkinson, 1987a).

How can the elements and transactions of a civilizational network be reduced for analysis while still retaining sufficient complexity to reflect reality? The number of cases is small (c. 20); system "biographies" or "natural histories" and focused comparative studies are, at least initially, the preferred approaches.

Network-based comparative studies of civilizations have proceeded fairly systematically, with the usual dialectic of theory and evidence. Cases are located and enumerated, cities and polities allocated to civilizations, boundaries are proposed, mapped, disputed, refined (Cioffi-Revilla, 2001; Cioffi-Revilla and Landman, 1999; Wilkinson, 1987a, 1987b, 1992, 1993a, 1993b, 1994). The war experiences of civilizations are enumerated and compared (Brecke 2001, 2002; Cioffi-Revilla and Lai, 1999; Hui, 2000 and forthcoming; Richardson, 1960; Wright, 1965). Populations, especially city populations, are estimated (Chandler, 1987; Gilb, forthcoming), and systemwide and regional growth charted (Chase-Dunn and Willard, 1993; Wilkinson, 1995), testing theories of growth and decline phasing (Gills and Frank, 1992). Growth rates of centralized political-command networks (empires) are measured, compared (Chase-Dunn, Manning and Hall 2000) and related to population growth rates of key demographic-network nodes (Chase-Dunn, Alvarez, Pasciuti and Hall 2002).

The varieties of world system structures are conventionally defined in the terminology of power, e.g.: nonpolarity=many small powers, no great powers; multipolarity=several great powers; tripolarity=three great powers; bipolarity=two great powers; unipolarity=one great power, non-dominant; hegemony=one dominant great power; empire=a world system unified in one state: Wilkinson, 1996a. But evidently such terms denote command-control networks whose network architectures vary in centralization, shape, and complexity of connections. Comparative-civilizational researches use network-based definitions to find command-control boundaries, and then assess systemwide command-control network architectures at intervals over long periods (Wilkinson 1986, 1996a, 1999, 2001a, 2002, in press).

Collected civilizational network data raise new questions. Some network command-control architectures have been robust, or at least durable, others fleeting. Some are rare, others frequent. Some have been stable, in the sense that if overthrown they have recurred, others not. Different world systems display distinctive polarity "signatures," singular network-architecture patterns. The Indic system seems to "prefer" unipolar or bipolar architectures to others; the early Central system "favors" both multipolarity and unipolarity; the Far Eastern system shifts from robustly favoring one structufor a few centuries re to equally robustly sustaining another for a similar period, then shifting to yet a third (Wilkinson 1986, 1996a, 1999, 2001a, 2002, in press). Why?

The distinctive behavior of various civilizational networks over time naturally raises the question of whether such networks are correspondingly dissimilarly structured in ways that could account for the behavioral differences. Approaching that question, however, likely requires measuring of many structural properties of each civilizational network. If, as Bearman et al argue, historical order "appears at the aggregate level" as "a product of microlevel fluidity," if "macrolevel cohesive processes" are generated from "a host of independent microprocesses," if indeed "[t]angible social structures build on and depend on local fluidity and disruption for stability," with dense local networks underlying sparse global networks, (1999:510) then the strange orderings (e.g. of polarity sequences) require thick local narratives to comprehend the thinner systemwide stories.

In such narratives, perhaps more attention should be given to the comparative analysis of "network culture," i.e. the development of control protocols (rules designed to manage processes, relationships, and rule development smoothly, see Csete and Doyle 2002). Systemic behavioral norms have already been shown to be radically differentiated across systems (Hui, 2000, 2001, 2002, forthcoming).

Perhaps more attention should also be given to the study of "network geopolitics." Conceivably the persisting and evolving patterns in city networks, trade networks, state networks and war networks (see e.g. Cioffi-Revilla, 2000) all constrain and are constrained by the larger, and certainly distinctive, structural shapes of "network geopolitics."

Investigations of the relation of the architecture of civilizational command-control networks to that of city networks (Chase-Dunn, Alvarez, Pasciuti and Hall, 2002) and to warfare (Brecke, 2002) has not proven theoretically highly fruitful; but in the latter case some progress has been made, and more can be hoped for, by recalling A.S. Iberall's fundamental concept of complexity (Soodak and Iberall, 1978) as involving the relations between levels, with phenomena emergent at one level (e.g. the network) comprehended at another (e.g. the node or edge). Civilizational warfare produces transitory networks whose fairly durable nodes are actors (including states) and whose edges are more fragile links of enmity. War networks vary in complexity: the simplest, one against one (two nodes and one edge), is the most frequent. Most such wars barely disturb the higher-ordered system. The very largest wars are also very much more complex: World War II had c. 100 nodes and 140 edges; and it reconstructed the higher-ordered system (Richardson, 1960, chs. III, X).

The generation of complex, system-disturbing "general wars" has provoked civilizationist comparative study; however, none of the existing system-level theories of general-war production has been confirmed (Melko, 2001). But a more limited examination of the structure of wars in the global system 1820-1949 as social networks mapped onto matrices (with belligerents as rows and columns) produced a theory successfully explaining the distribution of war complexity at the world-system level by an agent-based theory. The main explanatory elements of that theory were chaos (a very small propensity for any pair of actors to fight), contiguity (a higher propensity for neighboring actors to fight), contagion (higher propensity for actors near a fight to join), and power (a higher propensity for great-power actors to fight, or rather to behave as if they were contiguous to everyone else in the system) (Richardson, 1960, ch. X; Wilkinson, 1980, ch. 6).

Richardson's "Theory XII" (as he called it, eleven predecessors having been tested to failure) could usefully be restated in network terms. One could visualize, or conceive, any civilization at any moment as constituting a relational network in which each actor is a node varying in size, each pair of actors is linked by an edge varying in length, and a one-on-one war "activates" one edge linking two actors. By "Theory XII," edges are activated and deactivated "spontaneously" and randomly (from the perspective of the system), except that short edges activate more frequently, as do the edges of large nodes and those of nodes with one or more edges already activated. Occasionally, in consequence, general systemwide wars may be expected to self-assemble out of agent-level behavioral characteristics, with their frequency, extent and structure dependent on network size, connectivity and centralization.

Is the war-behavior of the 19th and early 20th century global civilization generalizable to other periods and other systems, or are the war-net "signatures" of various civilizations as different as their command-control architectures? We cannot yet say. Wright (1965:572) thought so; but his study depended upon an "unreconstructed" roster not using network criteria for boundary-drawing.

Studies of civilizational networks remain rather data-poor, which constrains theorizing somewhat. Historical narratives and analyses seem preferentially to focus on change more than stability, and disaster more than triumph. If so, fragility analysis of command-control network failures, and especially the collapses of power structures of long duration, may prove most viable for comparative analysis based upon data already published in narrative form. This does not obviate a very basic need in civilizational studies for the further collection and refinement of quantitative world-system data.

Conclusion

Network-based civilizational studies have proven interesting and fruitful in the conceptual and empirical stages, where such studies mostly remain, with plentiful empirical and theoretical work still to be done, using fairly elementary conceptualization and high-context "natural history" and comparative approaches. The growth of network studies as a widely applicable cross-disciplinary technique will likely supply both theories and models with civilizational applications.

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