If Parsons had Pajek: The Relevance of Midcentury Structural-Functionalism to Dynamic Network Analysis*

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Abstract

Social network analysis has been one of the most influential scientific revolutions of the past century. Its success has been due, in part, to its methodological sophistication and the emphasis it places on identifying and clearly depicting features of social structure. As such, social network analysis is often viewed in stark contrast to the structuralist paradigm that dominated the social sciences prior to its rise – structural-functionalism – in the mid-20th century. In this paper, we highlight important connections that exist between the key assumptions of social network analysis and the key tenets of some of the most influential structural-functional theories – especially those of Robert K. Merton and Talcott Parsons and their collaborators and followers. We reveal a substantial affinity between some of their most influential ideas and contemporary analysis of social network *dynamics*, in particular, and several ways in which their work could inform promising advances in this line of research. Our ultimate goal is to highlight the prospect of using these theories to guide future analyses of the dynamics of large social systems and the sequences of real-time action that compose them.

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Structural-functionalism and social network analysis are two of the predominant paradigms of the social sciences within the past 75 years. However, following an almost complete paradigm shift in structural sociology, they are generally seen as unconnected. Especially, as expressed in the writings of its most famous architects, Robert K. Merton and Talcott Parsons, structural-functionalism is highly abstract and overly generalized. Discrete data on individuals and events were rarely used in structural-functional work, and statements about social structure and processes were almost entirely conjectural. Social network analysis, on the other hand, is concrete and empirical. It hinges on the identification and systematic examination of actual actors and the relationships that exist between them. The two approaches to understanding society were developed by different sets of scholars, were developed in different eras, and established entirely different vocabularies to describe the way society works.

In these respects, the two paradigms seem, and are generally regarded, to be wholly incompatible. Structural-functionalism was widely criticized and had fallen out of favor by the 1970s. It was around this time that social network analysis began to emerge as a unified structural paradigm. This approach grew partly out of social-anthropological and social-psychological efforts to trace the micro-connections that exist between individual actors in small groups – a practice that was known as sociometry (e.g., Mitchell 1969; Moreno 1934). These methods were soon expanded to include analyses of relationships in larger groups, which involved the organization of data in matrices that could be interrogated mathematically (with the aid of computers) to uncover patterns of relationships. This included formal techniques for studying small groups, such as blockmodeling, as well as graph-theoretic analyses of larger populations (Freeman 2004). Social network analysts, thus, came to underscore the differences between their approach and that of midcentury structural-functionalists (see Granovetter 1990, as discussed below). The explosion of empirical network analysis that followed – with its new vocabulary of precise mathematical terms and its immensely useful visual aids – has, in retrospect, made the tenets of structural-functionalism look ungrounded and lifeless.

The main argument of this paper is that, despite apparent differences between structural-functionalism and social network analysis, there are also numerous and *instructive* affinities between these two paradigms, especially when considering Merton's middle-range theories and Parsons' systems-level structural accounts. The first, preliminary, goal of this paper is to highlight some of these affinities (as outlined in the following section). Both of these paradigms emphasize the omnipresence of a social structure that conditions individual agency. Further, both approaches assume that social structure has consequences for actors. While midcentury structural-functionalist scholarship tends to take this structure for granted, social network analysis actively attempts to detect and describe it systematically (Wellman 1983). Both paradigms share similar concerns, and, therefore, ask similar questions about the nature of social structure and agency, with a particular focus on describing those regular connections that are capable of supporting system-level processes, such as diffusion. In addition, both paradigms share an emphasis on the inherently relational nature of society (see the brief discussion of Parsons in Emirbayer 1997). In general, both spend considerable time addressing: 1) connections that exist among social actors and the larger structures or systems that emerge from these connections;[1] 2) the importance of social roles

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[1] Parsons speaks of the "level of analysis" problem, where there is an emergent structure at an inclusive level that cannot be readily deduced by microlevel processes. More familiarly, Coleman (1990) referred to this as the macro-micro problem.

in shaping the nature of transactions that occur between actors; 3) the dynamics of social structure and the importance of time in understanding social action; and 4) regularity or patterns of social action that occur within social structures. Both paradigms are concerned with actors' linkages to each other in the context of a larger system consisting of dynamic social relationships.

The second, and main, goal of this paper is to utilize some of the more valuable insights from these aspects of structural-functionalism to develop theoretical resources for contemporary social network research. One reason to document and revisit the affinities that exist between social network analysis and Merton's and Parsons' brands of structural-functionalism is that there is an opportunity to use them to advance social network analysis itself. We argue that this is most evident in the study of social network *dynamics*. There has long been a fascination with social network change, though the empirical analysis of this has developed somewhat slowly. That society is inherently dynamic – and that the key to understanding how systems work is to observe them in action, over time – is the most critical point on which both paradigms agree. Only by acknowledging this can scholars understand how different actors manage their interactions in real time in a complex world. We, therefore, close this paper by discussing the potential value of Parsons's and Merton's mid-century work on dynamic social systems for informing analyses of social network dynamics. Ultimately, our goal is to close the "theory-gap" in social network analysis (Granovetter 1979), especially as practitioners address more complex, dynamic topics.

We begin by reviewing some of the themes in Merton's and Parsons's work that are particularly relevant to social network analysis. We will focus on elements of their work that provide insight into dominant issues facing social network researchers in the 21st century. We do not conduct an empirical analysis in this paper, and we do not aim to develop or test specific hypotheses. We appropriate "Pajek" in the title of this paper primarily as a metaphor for the larger body of contemporary network-analytic techniques and tools that were not available to midcentury scholars. We do not refer to the relevance of midcentury scholars to specific commands or other functions of that software, specifically. Rather, by means of theoretical exposition and extensive literature review, we identify several strands of research in the broad area of social network analysis to which midcentury structural-functionalism will provide meaningful theoretical guidance in contemporary applications of social network analysis. Because of its rapidly growing relevance to the field, we focus in particular on the issue of the analysis of *social network dynamics* or change. Our ultimate goal is to show that some aspects of midcentury structural-functionalist theories provide valuable theoretical foundations for questions and hypotheses that are emerging within the field of social network dynamics.

Social Networks and Midcentury Structural-Functionalism

Structural-functionalism began as a way of seeing society as an integrated set of interlocking dynamic parts. It stemmed from earlier sociological theories of scholars like Auguste Comte, Herbert Spencer, and Émile Durkheim, who drew heavily on an organismic analogy to explain society – the idea that society is essentially a body that is composed of organs that are symbiotically interconnected. The conceptualization of society as a set of coordinated parts – the "structure" of society – was expanded by anthropologists such as Bronislaw Malinowkski and A. R. Radcliffe-Brown. They deemphasized the organismic analogy and focused instead on how societies meet

certain needs or requisites, especially integration between their component parts. In this respect, "functions" are the social processes that accomplish this (e.g., religious practices, the establishment of codified laws and a judiciary system). Social processes are the recurrent time-ordered or dynamic expression of social structure conceived as a crystallized static social order (c.f., Parsons 1960) – that is, they are obverse aspects of the same coin.

There are many scholars who contributed to the structural-functionalist paradigm. Those who had the greatest impact on the early development of the paradigm were Robert K. Merton and Talcott Parsons. In this paper, we restrict our focus to their contributions to the study of the structural components of dynamic social processes. In the interest of providing a relatively abbreviated account, we do not cover the work of many other structural-functionalists, whose ideas are likely relevant to the theorizing of social network dynamics, and we regard what follows as a springboard for future work.

Mertonian Network Analysis

Merton contributed to many different areas of sociology (and the term "structural-functionalism" in some ways oversimplifies and denigrates what he accomplished), but we focus here on structural-functionalist themes in his work that concerned dynamic social processes. Early on in his career, he developed an interest in, and critique of, structural-functionalist theories, which had a lasting influence on his work. He rejected the macrosocial image of society as a single integrated whole, and focused on how society operates in everyday life. He favored theories of the "middle range," which do not involve sweeping statements about large systems. Nonetheless, he believed that structural-functionalist ideas – for example, the notion that societies require internal integration – provide fertile ground for testable hypotheses.

For instance, Merton argued that social integration should be assessed in different ways for different groups and in different social contexts (e.g., contracts between firms, friendships between neighbors), and cannot be assessed using some universal concept (Merton 1968a). This comes out in his discussion of the structural-functionalist postulate of universal functional unity, for example: "Social usages or sentiments may be functional for some groups and dysfunctional for others in the same society" (p. 81). In short, what constitutes the foundation of a functional relationship depends on the social context. From a networks standpoint, this insight presages the development of a vast array of different views of what constitutes the basis of a "tie" between social actors (e.g., see Wasserman and Faust 1994) or alternative models of social structures characterizing a particular action system (c.f., Laumann and Pappi 1976).

Several of Merton's other insights regarding middle-range social processes are prescient in their anticipation of key social network ideas and models. Paramount among these is reference group theory (Merton 1968a). The central claim of this theory is that individuals form perceptions and judgments on the basis of a reference group composed of other individuals. The key point is that individuals come to evaluate their social situations, attitudes, beliefs, and other ideas relative to this "basis of comparison" (see especially pp. 279-304). From a structural-functionalist perspective, a group emerges as a reference point based on the social roles one plays and the positions they occupy in larger social structure. This insight provides one explanation for the operation of "peer effects," social influence, and diffusion processes in various network applications – including work on delinquency, risky behavior, and health (see Friedkin 2006;

Marsden and Friedkin 1993; Rogers 1962). Social network research (which also emphasizes other important mechanisms of influence) has been successful, in part, because it has shown strong evidence that individuals' beliefs, behaviors, experiences, and other outcomes are shaped heavily by those of the people to whom they are connected.

The concept of the reference group gains additional meaning in Merton's work on the now widely analyzed concept of "homophily." First, the notion that individuals maintain large "status sets" (e.g., as defined by their race, occupation, gender, age, etc.) is one of Merton's basic insights. This has implications not only for the range of social roles one plays and the obligations one must fulfill on a daily basis, but also for the array of social attribute-based connections one maintains with others in a vast web of group affiliations (Simmel [1922] 1955). The particular combination of statuses one maintains affects the profile of one's social network. In their empirical work, Lazarsfeld and Merton (1954) observed high levels of homophily between friends with respect to their social statuses, which inspired their clever use of the phrase, "Birds of a feather flock together" (see also McPherson, Smith-Lovin, and Cook 2001). This has implications for social influence theory as well, as Merton argued that reference groups were particularly influential for one when they consist of like-others.

A related network idea from Merton's work is that of "opportunity structure" (Merton 1996). The concept of opportunity structure applies "to every kind of socially patterned choice. It should find empirical expression in aggregative social patterns of choices and outcomes while allowing for individuality by being coupled with *the concept of a distribution of choices among individuals similarly situated in the social structure.*" (p. 157; emphasis his.) The idea is that individual experiences and options are constrained by socio-environmental factors that are closely tied to one's social positions and statuses. In sociology, this has numerous applications. It is often referenced in studies of the structure of individual social network ties. For example, the composition of personal social networks is seen as a function of the sets of individuals who are physically proximate, or who come into contact on a regular basis by virtue of their embeddedness in the same or adjacent social contexts (see Feld 1981; Fuhse 2009; Laumann 1966, 1973; Laumann, Galaskiewicz, and Marsden 1978; Laumann and Senter 1976; McPherson and Smith-Lovin 1987).

However, probably the most important network-related insights from Mertonian structural-functionalism, for the purposes of this paper, concern social roles. For Merton, individual actors' behaviors are best understood not in terms of psychological processes, individual traits, or rationality, but rather in terms of their involvement in a system of interlocking roles. A key concept that comes into play here is that of the "role-set" (Merton 1968a), which refers to the array of obligations, expectations, and performances that may come with a single social status (e.g., being a professor). People act as they do because of bundles of expectations and obligations that are encoded in the (sets of) social roles that are associated with their numerous social statuses. "[S]ocial structures confront [persons] with the task of articulating the components of countless role-sets—that is, the functional task of managing somehow to organize these so that an appreciable degree of social regularity obtains, sufficient to enable most people most of the time to go about their business without becoming paralyzed by extreme conflicts in their role-sets" (p. 42). This problem multiplies as one considers the numerous social statuses a given person has. In order to understand one's everyday social action, one needs to know the combinations of social

statuses and roles one plays and map out how those roles are actuated at different times in specific circumstances. This perspective informed early efforts to systematize the link between social roles and social connectedness within groups, especially with respect to blockmodels, which explicitly sought to map role-sets as network positions (see Boorman and White 1976, p. 1387; also see White, Boorman, and Breiger [1976] and Wasserman and Faust [1994]). However, due, perhaps, to his aversion to larger systems-level thinking, Merton did not advance the notion that these bundles of roles give rise to a larger coordinated *system, or network*, of action. This was, to our thinking, the primary contribution of Talcott Parsons.

Parsonsian Network Analysis

Like Merton, Parsons accomplished much in his career – especially the later period – that is not easily characterized as structural-functionalism. However, we focus on his many structural - functionalist themes that have clear relevance to network dynamics. Though Merton and Parsons diverged, there is a great deal of overlap between their structural-functionalist ideas, especially with respect to network-relevant theories. Before we delve into this, it is important to note that, to a large extent, our treatment omits the straightjacket imposed by the most problematic aspect of Parsons' work – the overly formalistic architectonics of the infinitely regressible AGIL scheme.[2] We do not attempt to fashion a network theory out of the functions he emphasized there. Instead, we focus on Parsons' view of society as a dynamic system of interdependent parts and the specific types of structurally differentiated action that compose this system.

It is important to focus more on the structural than on the functionalist aspects of Parsonsian theory. However, we do find useful his emphasis on system-level analysis, which argues that structural components are interdependent and are brought into relative balance or equilibrium over time. *The Social System* (Parsons 1951) provides the most fully formed expression of Parsons' conceptualization of society as a complex structure that is composed of interlocking connections. His theory of structural-functionalism, as expressed therein, holds that society is a large social system in which all actors (e.g., persons, organizations) interface as complementary parts, more or less in unison. This unison is achieved, in part, due to the combination of a vast array of institutional rules, social norms, clearly defined status-role bundles (see pp 25-26), rationalized scheduling efforts (e.g., via clocks and calendars), and encoded agreements that exist among the actors in the system.

Despite its repeated emphasis on relational processes, Parsons' work is rarely discussed today in structural sociology. Emirbayer (1997) points out that while Parsons addressed voluntaristic, norm-based action, his work was highly relational and transactional (see especially pp 290-291). Indeed, it is far more relational and temporally oriented than our brief account conveys. Works such as *The Social System* are rich sources of relational insights, ranging from the idea that social

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[2] Parsons argued that all systems must satisfy four key functions in order to maintain themselves in a particular equilibrium- or pattern-maintaining state. These include (A) adaptation (obtaining and distributing resources from the environment), (G) goal attainment (identifying goals and mobilizing resources to meet them), (I) integration (maintaining coordination among differentiated structural units in the system, be it by mechanisms of competition or intentionally orchestrated constraints), and (L) latent pattern maintenance (maintaining patterns of behavior and reducing internal tensions among component parts).

actors are continually oriented to, and motivated by, their social roles and obligations to the idea that society is a vast system of interlocking social entities and interpenetrating social contexts.

Parsons explicitly stated this relational orientation: "Since a social system is a system of processes of interaction between actors, it is the structure of the *relations* between the actors as involved in the interactive process which is essentially the structure of the social system. The system is a network of such relationships" (Parsons 1951:25, emphasis his). The notion that particular ties (and actors) are important largely due to the positions they occupy and the roles they play in a larger system is hardwired into social network analysis, and is foundational to key network concepts like transitivity, brokerage, density, centrality, bridging, and structural equivalence. Oddly, while Merton's role theory is often referenced in foundational social network analysis texts, Parsons' more elaborate system-level view of interlocking roles is virtually ignored (see, for example, Wasserman and Faust 1994).

The temporal nature of social action is also central to the contemporary relational framework. Few theories are as explicitly concerned with relational dynamics as are those that were developed by Parsons and his colleagues (especially work he did in conjunction with Robert Freed Bales) at the height of the structural-functionalist era. For example, *Working Papers* (Parsons, Bales, and Shils 1953) reveals through empirical studies the structure of real-time interaction processes that occur within small groups as they attempt to solve problems (see also Hare, Borgatta, and Bales 1955). *Family, Socialization and Interaction Process* (Parsons and Bales 1955) carries this framework into small groups and the homes of families and examines specific interaction patterns that emerge among different members and how those patterns relate to their internal role structures.

The temporal ordering of contacts within a network is central to Parsons's theories. For him, assessing the "social interaction system" that constitutes a group involves paying careful attention to the specific acts that individuals who play certain roles in the context undertake, and the responses that follow from others who play different roles: "At a minimum the acts are two, the persons performing them are two, and the number of time units involved are two" (Parsons and Bales 1955:265). Conclusions from these studies, which focused on interactions over a period of time (e.g., one week), included that social roles emerge rapidly (even in previously undifferentiated groups), that role-based acts within groups occur in sequences, and that these sequences are critical to the realization of group goals. Perhaps the most interesting theme in Parsons' work along these lines is the insight that these seemingly trivial and unplanned everyday social interactions are highly patterned and predictable, as they involve sequences of interaction that get repeated daily and weekly. This is to be expected given the operation of an integrated and regulated system. However, this insight suggests one of the most promising directions for expanding on the rapidly growing fields of research on microsocial contact dynamics.

The concept of social roles plays as important a part in Parsons' relational thinking as it does in Merton's. Expanding on Linton (1936), Parsons developed the concept of "status-roles," which implies that an actor's statuses or positions tend to reflect the roles that they play. At least since Bott's (1957) work on the link between traditional spousal role performances and the interlocking structure of spouses' larger networks (which cited Parsons numerous times but did not draw heavily on his work), network analysts have recognized this close interplay between roles and positions (see also Burt 1992; Boorman and White 1976; White, Boorman, and Breiger 1976).

However, the key feature of Parsons' theory regarding social roles is that they gain expression and meaning only through the larger social system, not just at the level of individual dyadic interactions. As he states in *The Social System*: "The social system is, as we have seen, essentially a network of interactive relationships" (Parsons 1951:51). Actors interact with each other on the basis of their role relationships, giving rise to highly predictable, repetitive social encounters.

Also like Merton, Parsons recognized that social ties between actors are not merely dyadic. The nature of interaction between two actors is determined by their positions within a much larger system. Just as the impact of an individual's preferences and resources depends on the social context, specific relationships are shaped by the larger context. Actors take into account, for example, competing obligations, other opportunities, institutional constraints, and other factors that extend beyond the dyad. "[A] social system consists in a plurality of individual actors interacting with each other in a situation which has at least a physical or environmental aspect, actors who are motivated in terms of a tendency to the 'optimization of gratification' and whose relation to their situations, including each other, is defined and mediated in terms of a system of culturally structured and shared symbols" (Parsons 1951: 5-6). In short, to understand the dynamics of individual ties, one must understand the larger complex of ties that operate within that context at that same time.

Another significant feature in Parsons' theory – especially with respect to the analysis of network interactions in real time – is the importance he places on individual acts as units of analysis. As we already discussed, he saw society as a large system of interlocking social roles. The most microscopic evidence of this interconnectedness can be gleaned from the individual *act* (e.g., answering another person's question, giving money to another person). It is at such instances that we can begin to see the social system in action. Those individual acts, or "unit acts," as he called them in *The Structure of Social Action* (1937), reflect that larger system and also combine to compose it, in real time (Parsons 1951).

He argued that unit acts must be understood not in isolation, but rather as elements in a larger sequence of acts. "[A]cts do not occur singly and discretely, they are organized in systems" (Parsons 1951:7). Elsewhere, he states: "[A]ctions do not take place separately each with a separate, discrete end in relation to its situation, but in long, complicated 'chains' so arranged that what is from one point of view an end to which means are applied is from another a means to some further end and vice versa; and so on through a great many links in both directions" (Parsons 1937:229). This reflects one of the seldom-explored aspects of Parsons' theoretical scheme, which is its focus on networks of real-time acts. The social system is sustained through sequences of linked individual-level behaviors. For example: "When roles are differentiated, overt acts of certain qualities are expected of certain persons at certain times, while overt acts of other qualities are expected of other persons at other times. Furthermore, there is some permanence in the expectations which apply over extended time periods." (Parsons and Bales 1955:259.) Accordingly, Parsons and his colleagues (especially Bales) emphasized the need to study not individual social acts themselves, but rather how those acts are connected to each other in sequence. Here we see a different conception of networks – not just of series of acts or sets of actors, but of the two combined. This is an idea that we will expand on below, as it has been employed fruitfully in several studies of over-time network action.

Parsons was also deeply interested in how social systems, and the relationships that compose them, fluctuate and change. Even though he argued that society tends to be a somewhat stable system, dynamics are an absolutely essential part of Parsons' theorizing. Indeed, he argued that systems cannot maintain regular patterns of action without the operation of complex internal dynamics. For example, expanding on his earlier work on action systems, he argued that social systems tend to adapt to changes in the surrounding environment. "The definition of a system as boundary-maintaining is a way of saying that, *relative to its environment*, that is to fluctuations in the factors of the environment, it maintains certain constancies of pattern, whether this constancy be static or moving" (Parsons 1951:482; emphasis his). This is an over-time process that is governed in part by a continual series of social exchanges between actors within the system and inputs from the outside.

This continual maintenance of patterns results in a system that operates in predictable ways. A central concept here is dynamic *homeostasis* or *equilibrium*. For Parsons, this involves a co-existence between the system and the outside environment. "The 'equilibrium' conception is that . . . relatively small changes tend to be 'counteracted' by the effects of their repercussions on other parts of the system, in such a way that the original state tends to be restored" (Parsons and Smelser 1956:247). As it relates to social networks, a key implication is that the structural features of a given network – including levels of density and bridging tendencies, frequencies of interaction, and the content of exchanges – tend to remain relatively stable over time.

To this point, we have outlined several ways in which the mid-century structural-functional theories of Merton and Parsons developed themes that are relevant to analyses of social network dynamics. In the next section, we take the opposite approach to demonstrating the affinity between these two paradigms by focusing on how contemporary analyses of social network dynamics reflect older structural-functionalist tenets. Through a review of several areas of research on social network dynamics, we identify strands of midcentury structural-functionalist thinking.

From Structural-Functionalism to Dynamic Network Analysis

The structural-functionalism that was developed by Merton, Parsons, and their contemporaries is now seen as almost completely irrelevant to contemporary social network analysis. The development of social network analysis itself facilitated this alienation.[3] For one, a major

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[3] Mark Granovetter's keynote address in 1990 to the annual Sunbelt conference for social network researchers contains some insightful passages in this respect. At that time, social network research was not quite yet integrated into the mainstream of social-scientific research, despite its having established many watershed empirical contributions, especially in sociology. In puzzling through this problem, Granovetter observed:

> I believe that part of the answer is that for thirty years, American sociology . . . was dominated by the followers of Talcott Parsons . . .. [In saying] that society is integrated by common value orientations held by all its members . . . Parsons believed that he was upholding the classic sociological tradition, and moving away from a conception of atomized actors. But in his argument, there was hardly any room at all for particular people or relations; they were relegated to a minor and subordinate role in the conceptual scheme . . .. The founders of network analysis, to some extent, were rebelling against this excessively abstract and over-socialized view of social life. (1990:15.)

characteristic of Parsons' work was that it was highly abstract and theoretical. Parsons sought to explain society using "analytical realism," which involves abstracting from empirical reality so as to avoid the entanglements of heterogeneity and messiness that typically characterizes real-world social phenomena (Parsons 1937).

The desire to counterbalance years of abstract-theoretical work with concrete-empirical work was a driving force in the early days of social network analysis (Freeman 2004). For example, structural-functional analyses of kinship systems had been highly idealized, describing abstract descent rules (e.g., patrilineal systems vs. matrilineal systems) and marriage rules. Rarely was there an explicit enumeration of how particular sets of individuals would trace their lineage and kinship relations. J. Clyde Mitchell and his colleagues (see Mitchell 1969) pointed out that these abstract categories of kinship were not helpful in describing emergent relations among people from different tribes, such as those coming together for the first time in urban settings. This is why they proposed an enumeration of ties among actual people, which was an important step in describing how relationships orchestrate collective action in real time. Thus, social network analysis was welcomed as a meso-methodological tool that would allow scholars to test the linkage between abstract rules of kinship and real-world interactions.

Network analysis is much valued throughout the sciences today partly due to its empirical utility and its ability to make abstract social concepts more concrete and visible (e.g., through visual aids). In the beginning, this involved deep analysis of small systems of action, such as a dorm (Newcomb 1961), a monastery (Sampson 1968), and the bank wiring room (Homans 1950), as recounted in White, Boorman, and Breiger (1976). The algebraic techniques were more easily applied here than they would have been in the larger systems that Parsons had in mind. Second, Granovetter (1990) traces the rejection of Parsons to his adoption of the notion of "over-socialized" social actors who share common values (see Wrong 1961). Social network analysis distanced itself from this aspect of Parsons' thinking by serving as a bridge between that model and more under-socialized models of social agency that are dominant in other disciplines. This led to vocal rejections of Parsons by social network researchers: "In the Parsons-dominated atmosphere of the 1950's and 1960's when network analysis had its formative period, network analysis had to be rebellious and iconoclastic . . ." (Granovetter 1990:15). Such is the nature of paradigm shifts (Kuhn 1962).

Our contention is that this blanket rejection of Parsons' conceptual scheme – which indeed may have been necessary for establishing the paradigm shift that fueled the organization of social network analysis as a field – is no longer in the best interests of social network analysis, especially as the field focuses increasingly on complex network dynamics. To be sure, some early network researchers acknowledged the influence of structural-functionalist insights on attempts to understand relational patterns in large-scale social systems (e.g., Heinz et al. 1993; Higley and Gunther 1992; Higley and Burton 2006; Laumann 1966, 1973; Laumann et al. 1994; Laumann and Knoke 1987; Laumann and Pappi 1976; Laumann and Youm 1999). And a few scholars suggested early on that network analysis was essentially a structural-functionalist undertaking. McCord (1980), in particular, argued that structural-functionalism should be seen as a social network

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Granovetter thus articulated the basis for many early network researchers' rejection of Parsons. This does not mean that Granovetter eschews network-relevant theorizing or rejects the relevance of midcentury structural-functionalists. On the contrary, he argued long ago that social network analysis is too atheoretical (see Granovetter 1979), and sees particular relevance of Merton's ideas to social network research (personal communication).

theory, owing in part to the mutual focus of both approaches on large-scale wholes or systems. Their interest may have been partly in preserving some degree of continuity during what they saw as the divergence of two otherwise fundamentally consistent scientific paradigms. Our interest is similar, in that we seek to mine the theoretical insights of midcentury structural-functionalism for the theoretical justifications that are needed to ground some of the new and most exciting directions in social network analysis. The need to do this is increasingly urgent, we argue, given the widespread interest in, and the rapidly growing capacity to study, larger, whole social network structures, and, in particular, the dynamics of interaction that occur within these networks. Merton's and Parsons' theories of network dynamics deserve some reconsideration as a basis for undertaking these kinds of investigations.

Structural-Functionalist Aspects of Dynamic Network Analysis

As we have discussed, a paradigm shift began in the 1960s and 1970s within structural sociology. The move away from structural-functionalism and toward network analysis opened up the possibility for social scientists to analyze structure using graph theory and other formal methods. A relatively recent development is the reconceptualization of networks away from one in which features of structure can be understood using a single "snapshot" toward one in which interaction cycles, rhythms, turnover, growth, and decay are tracked over time (e.g., Suitor, Wellman, and Morgan 1997). This has resulted in the rapid development of methods for measuring, modeling, and visualizing the "pulse" and "tempo" of the dynamic processes that constitute social network dynamics (Moody, McFarland, and Bender-deMoll 2005; see also Doreian et al. 1996; Snijders, van de Bunt, and Steglich 2010; Suitor, Wellman, and Morgan 1997). Much of this newer work has strong structural-functionalist strands.

There are several types of dynamic network analysis. The goal of this section is to identify structural-functionalist themes across these various types. To structure our discussion, we consider two cross-cutting dimensions of dynamic network analysis – one borrowed from the structural-functionalist paradigm, the other borrowed from the social network paradigm. (Both dimensions are in the structural-functionalist paradigm, but are thought of somewhat differently.) First, Parsons distinguished between processes that occur, and are associated with change within a system, and those that involve changes to that entire system (the level of analysis problem): "Let us first emphasize a crucial distinction between two meanings of the term 'process' (often qualified by the adjective 'dynamic'): first, process *within* a given structure of the system in question, and second, process which results in major *changes in* that structure" (Parsons and Smelser 1956:247; emphasis theirs)." As we will show, contemporary research on network dynamics bears out the value of this distinction in that it has developed work on both internal network dynamics and dynamics that involve the external boundaries of networks (i.e., boundary maintenance). The second dimension draws on the well-known distinction between egocentric and sociocentric (or whole) networks. One involves analyses of changes in actor-oriented network structures, whereas the latter concerns changes in larger systems. The combination of these two dimensions – internal vs. external boundary and egocentric vs. sociocentric – provides a means of classifying types of network change. The resulting classification scheme is presented in Figure 1, which summarizes the types of network dynamics that are discussed below in the following four subsections.

Figure 1. Classification of Forms of Social Network Dynamic Analysis According to the Type of Network Unit (Egocentric vs. Sociocentric) and the Area of the System (External Boundary vs. Internal Structure) Being Analyzed

	Egocentric *(Actor-Oriented)*	Sociocentric *(System-Oriented)*
External *(Network Boundary Maintenance)*	• Personal network turnover and "churn" • Network recruitment • Separable temporal exponential random graph models (STERGMs) **1**	. • Network emergence, growth • Network collapse, shrinkage • Response to vulnerability • Network turnover (actor entry into/exit out of network) **2**
Internal *(Network Structures and Functions)*	**4** • Interaction sequencing • Role/context switching • Network scheduling • Relational event models • Contact routinization • Homeostasis	**3** • Tie formation, stochastic actor-oriented models (SAOMs) • Dynamic group balance • Dynamic blockmodels • Diffusion and network flows Homeostasis

Egocentric Network Boundary Maintenance. Social network analysts have long been interested in the issue of network boundaries (see Laumann, Marsden, and Prensky 1983). Along these lines, a classic, but rapidly growing area of research in social network analysis concerns individuals' cultivation or loss of social network members (i.e., changes in the boundaries of their networks) – as reflected in cell 1 in Figure 1. Some of this work refers to social network change in terms of network turnover, or "churn." A key issue is the extent to which individuals' networks involve turnover. A typical finding is that individuals' networks – including those that are composed of relatively strong ties – evince considerable turnover (e.g., Small, Pamphile, and McMahan 2015; Wellman et al. 1997). Cornwell et al. (2014) report that over a five-year period, over 90% of older adults experience some change in membership in their confidant networks. An empirical challenge for researchers has been to develop methods for predicting the loss or development of new egocentric connections for individuals who are embedded in a given context. This has led to the expansion of exponential random graph models (ERGMs) to the case of egocentric networks, which has in turn led to studies of tie formation and duration using "separable temporal exponential random graph models," or STERGMs (Carnegie et al. 2015; Krivitsky, Handcock, and Morris 2011). Unfortunately, this area of research, and the models associated with it, are not yet well developed – an issue to which we return below.

Sociocentric Network Boundary Maintenance. The issue of boundary maintenance is also paramount in the study of changes that occur in membership in larger social systems, or sociocentric networks (cell 2 in Figure 1). This is perhaps one of the least-explored issues in social network dynamics – the movement of actors into and out of network systems. A major concern for

this cell regards the conditions under which whole networks expand or shrink. One example of a study along these lines is Papachristos's (2009) analysis of gang murders in Chicago. That study documents a literal war among separate exclusive networks, and shows that the reshaping of each network's boundaries (i.e., the assassination of particular network members) reflected a dynamic struggle between the gangs. The way a given network changed was a direct result of its interactions with other networks in the local environment. Unfortunately, little other work has been done on this topic.

Several lines of work deal with the intersection of cells 2 and 3, as they link the dynamic experience of actors entering into and exiting from networks to the internal dynamics of those networks. One relevant line of work in this respect draws on the work that Parsons and Bales did on the interaction process. Their idea there was that systems are realized through sequences of acts. (This came out most clearly in Bales' IPA framework.) More recent research along these lines developed out of efforts to link expectation-states theory to dynamic networks. Work on "E-state structuralism", in particular, suggests that the particular sequencing of unit acts that take place within a set of people (who may not have known each other previously) gives rise to an emergent network that has particular properties, such as a stable status order (see Skvoretz and Fararo. 1996).

One famous structural-functionalist idea that informs how networks expand as new actors are introduced is Merton's (1968b) concept of the "Matthew effect." The main idea is that actors who start out with more resources (social or otherwise) gain a disproportionate share of resources in the future. Several researchers who have studied the growth of large-scale networks, such as the World Wide Web, have argued that the Matthew effect can help account for the fact that some actors emerge as hubs in networks. Through processes such as "preferential attachment" (see Barabási and Albert 1999), nodes that enter a system earlier become disproportionately central to that system as it grows.

Much less has been written about the processes through which actors exit networks. Some work has considered how preexisting network-structural features can lead to the splitting of networks and thus the creation of new network boundaries through the loss of bridges and cutpoints. This comes out in work on scale-free and other complex networks, such as the North American power grid (e.g., Albert, Albert, and Nakarado 2004). One implication is that hub-centered structures are more vulnerable to outside attacks, which can lead to the splintering of networks, and, thus, the creation of new network boundaries. This insight harks back to early work in the structural-functionalist tradition that was concerned with how various factors can affect system-level vulnerability, survival, and evolution. Unfortunately, little work has been done on the dynamics of actors' movement into and out of networks.

Internal Sociocentric Network Dynamics. The majority of dynamic social network research has focused on over-time changes in the structures and *processes* that characterize networks, not changes in network boundaries or membership (see Doreian and Stokman 1997). Much of the work in this vein has been developed in the study of sociocentric networks, or larger network systems (cell 3 in Figure 1). Some of this work explores how relationships develop within networks, and how the formation of these relationships depends on the characteristics of the larger system. That social structure is linked to whether relationships develop within a network is a major assumption of exponential random graph models, or ERGMs (see Lusher, Koskinen, and Robins 2013). These

models explicitly assume that social network ties are structurally determined – that the likelihood that a tie exists between a given pair of actors depends not only on the attributes of those actors, or their dyadic features, but also on the local network ties that surround them. Stochastic actor-based models (SAOMs) examine the development of new ties over time (e.g., Snijders, van de Bunt, and Steglich 2010). These models are used to test hypotheses about the larger social processes that guide global, sometimes gradual, changes in networks.

Some work along these lines considers how the structural properties of networks emerge over time as the result of series of shifts in the relationships among the networks' individual members. This includes studies of such phenomena as shifts in blockmodel structure (i.e., actors' shifting membership across positions) of networks (e.g., Xing, Fu, and Song 2010), the increasing or decreasing centralization of networks (e.g., Kim and Shin 2002), and emergent clustering or fragmentation of networks over time (e.g., Box-Steffensmeier and Christenson 2014). Some of this work defines roles as emergent and time dependent. This has been done by researchers who have highlighted the fact that certain actors' roles are only relevant at certain times (e.g., see Cornwell, Curry, and Schwirian 2003; Heinz et al. 1993). It has also been done in work that applies blockmodeling to dynamic data – such as Bales-type data on within-group interaction dynamics and two-mode event sequence data – which can be used to identify actors that are structurally equivalent not just because of their similar patterns of ties, but because of their similar patterns of time-dependent links to other events (Doreian, Batagelj, and Ferligoj 2004). The resulting temporally contextualized concept of roles was central to Parsonsian thinking, and he undoubtedly would have seen immense value in applying dynamic blockmodeling to larger social systems

Building on early balance theory, another strand of dynamic network analysis examines how the appearance and disappearance of ties within smaller units (i.e., triads) in a network emerges from a sequential process (see Doreian 2002), whereby actors attempt to arrange the most "balanced" environment amongst themselves (e.g., to minimize conflict among alters). Scholars, such as Doreian et al. (1996) and Moody, McFarland, and Bender-DeMoll (2005), show that, as a result of these group-level dynamics, general balance is an emergent property of many social networks. This idea has informed dynamic group balance theory. A larger, evolutionary implication of this work is that networks that do not change in these ways are more vulnerable to conflict and longer periods of instability.[4]

Research on the diffusion of innovations and ideas reflect structural-functional insights regarding the structure of dynamic flows within systems. The importance to systems of having different types of actors and ties that play different roles for diffusion purposes has received considerable attention over the years (e.g., Burt 1992; Granovetter 1973). The relevance of functionalist processes to network flows can also be seen in small-world network research (Watts 1999). In Milgram's experiment (see Travers and Milgram 1969), a key question was: What information do people use when trying to select intermediaries, so as to minimize the number of steps needed to reach the

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[4] This model is partly based on a social-psychological model of intra-psychic balancing among competing positive and negative valences (attitudes) toward other actors in the interaction set (see Heider 1958). This provided the undergirding of a dynamic approach to blockmodeling following the work of White and colleague (see Doreian, Batagelj, and Ferligoj 2004). Structural-functionalists provide a less psychologically grounded model of dynamics in which third-party actors who are themselves not even participants in an exchange between dyads channel and constrain those dyadic transactions.

target? The main thing people took into account when choosing to whom they would forward the package was geographic proximity. But an important (and overlooked) finding is that professional and network-structural roles played an important part in linking participants to targets.[5] The idea that some actors constitute more effective diffusers in a larger social system, not merely because of social attributes, but because of their social statuses and positions, is a functionalist idea.

Internal Egocentric Network Dynamics. Much of the research that has been done on internal network dynamics has focused on egocentric networks (cell 4 in Figure 1). For example, the research on network turnover discussed above is often concerned with how these dynamics relate to stability or change in characteristics of egocentric networks over time. Echoing Parsons' arguments about system homeostasis and equilibrium, this research finds that even if the rate of turnover with respect to who is (reported to be) a network member is high, structural features of the network being examined (e.g., its size, density) tend to remain stable over time. This is evident in studies of personal networks, organizations, and across large systems like interlocking directorates (e.g., see Cornwell et al. 2014; Heinze 2004; Sasovova et al. 2010; Small, Pamphile and McMahan 2015; Suitor, Wellman, and Morgan 1997). Some underlying assumptions in this work include that this stability is due to: 1) the fact that individual members are of secondary importance to the functional roles they are playing within these systems, which are maintained; 2) that the local opportunity structure includes potential future network members who are similar in various ways to past network members; or 3) that social systems include cybernetic control mechanisms (Wiener 1948), which are regulative information-sensing mechanisms (e.g., a thermostat) that alert actors to potential changes in the social environment, and, thus, prompt some preventive, adaptive, or compensatory action. There is a wide range of work that has come to develop very detailed accounts of the regulation of interpersonal relations via cybernetic mechanisms (see McClelland and Fararo 2006).

Another line of research in this fourth class focuses on the dynamics of interaction that occur between specific actors and the events, actions, or interactions they experience. This work has come to identify numerous roles, constraints, and patterns that govern relationships within contexts. For example, one of the more complex and interesting issues in studies of real-time interaction has to do with the problem of "network scheduling" (Gibson 2005), which recognizes that even between close friends and family, social interactions must fit within a larger fixed temporal framework in which all actors' obligations are mutually coordinated. This gives rise to predictable sequences of role enactment, which can be witnessed in the predictable daily and weekly interaction patterns that unfold within households (see Bakeman and Gottman 1997). Likewise, following Parsons' insights regarding the sequential chains of action that emerge during a given period of time from actors' role sets, network researchers have begun to examine how actors move, or "switch" between different role-specific contexts and different contexts through the course of the day (Cornwell 2013; Mische and White 1998; White 1995, 2008). As Parsons

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[5] Of the packages that reached the target, 48% reached the target through one of only three final intermediaries. Two of these, accounting for 23% of the completed chains, were business associates of the target, and one quarter (25%) reached the target through the same final well-connected intermediary. In short, many of these chains included hubs. A similar finding was reported in Burt's (2005) work on the development of innovative ideas, which showed that individuals' formal roles within an organization (e.g., the type of management position they occupied) affected their likelihood of serving as bridges in the network (e.g., due to their contact with other companies).

emphasized, this constant motion and temporal segregation is critical to the maintenance of complex role systems.

In the foregoing sections, we have shown both that: 1) structural-functionalist work was oriented directly toward what are now recognized as key concepts in the field of social network analysis, including those relating to network dynamics; and 2) that contemporary research on social network dynamics responds to core structural-functional concerns. In the next section, we turn our attention to how insights from this midcentury structural-functionalist work are relevant to some of the newer lines of inquiry in social network analysis. What follows is a theory-driven discussion, not an attempt to develop or test specific hypotheses.

Old Structural-Functionalism, New Network Directions

We have shown both that midcentury structural-functionalist thinking was highly relational and foretold the advent of network analysis in important ways, and that findings from social network research reveal findings that are consistent with lessons from structural-functionalism. The above sections thus expose the affinity that exists between the two paradigms. In this section, we argue that Parsons and Merton's early structural-functionalist ideas can be used to move network analysis forward – that is, that midcentury structural-functionalism is a source of new ideas, and that it can be used to provide the necessary theoretical grounding for contemporary empirical work.

Social Network Equilibria

A key contribution of the structural-functionalist paradigm is that it contributes several theories regarding how networks evolve over time, both endogenously and in response to exogenous shocks. Social networks are critical systems in many respects (e.g., as primary sources of social support for individuals), and changes to their boundaries and/or internal processes can have lasting consequences. Therefore, it is important to understand factors that may affect whether and how they change and how they adapt to events – such as the removal or death of a network member or the introduction of popular new communication devices. It is reasonable to expect that social network structures will change when faced with such developments. A common misreading of Parsons would suggest that he would have expected social networks to maintain or regenerate their preexisting structural characteristics in the wake of unexpected developments. The concepts of homeostasis and equilibrium play a major role in this respect. Indeed, we see some evidence of this tendency toward maintenance of a preexisting structure in studies of individuals' reconstitution of features of their networks (e.g., density) following major personal losses like the death of a friend. For example, a national longitudinal study found that any new confidant ties that older adults develop over a five-year period tend to look very much like any confidant ties that they lost during that same period – for example, in terms of average frequency of contact and levels of interconnectedness with one's other network members (see Cornwell et al. 2014).

But Parsons did not conceptualize equilibrium as the maintenance of a *static* state. Rather, it involves the maintenance of order in the relationships among the network's elements. "The most general and fundamental property of a system is the interdependence of parts or variables. . . . [I]nterdependence is *order* in the relationships among components . . . [Equilibrium] need not,

however, be a static self-maintenance or a stable equilibrium. It may be an ordered process of change – a process following a determinate pattern, rather than random variability relative to the starting point." (Parsons and Shils [1951] 2008:107; emphasis theirs.) In other words, equilibrium can involve change, as long as it is gradual and conforms to some trajectory that helps to preserve the overall system. For example, a gradually expanding network may be seen as being in equilibrium. They referred to this as "moving equilibrium." Regardless of whether it is static or moving, for Parsons the maintenance of equilibrium in any system requires continual dynamic internal processes.

An important direction for future work in network dynamics is to attempt to understand the mechanisms that govern equilibrium with respect to the structural properties of social networks (despite the considerable internal turnover and turmoil that occurs within them over time). Structural-functionalists developed some useful ideas along these lines. Parsons, for one, argued that equilibrium is due in part to the presence of cybernetic control mechanisms – sources of information about changes in the social environment. We argue that the identification of these informational mechanisms is crucial in efforts to understand whether, and how, actors within a given social network recognize and respond to changes that could alter the structure of the larger social network in which they are embedded.[6] For example, following the death of a network member, what are the mechanisms through which one learns the extent to which this loss affects important aspects of one's network (e.g., implications for one's network centrality, or triadic closure)? Additional questions include what prompts actors to seek out and then act upon this information and, furthermore, how the success of their efforts in this respect depends on their structural positions within their social networks. It is important to answer these questions, because informational mechanisms link changes in the boundary of a network (cells 1 and 2) to changes in its internal structure and functioning (cells 3 and 4).

Equilibrium is likely also a function of the interface between the network and the structure of the external environment. We draw this from Merton's (1996) concept of *opportunity structure*, which refers to the patterned access to certain kinds of social resources that results from the social and spatial constraints of one's local environment. The equilibrium of network structures partly reflects the fact that, even if exogenous shocks occur or people's preferences change, the pool of others from which individuals can choose their new contacts is inevitably constrained to geographically and socially reachable stock. For example, in their 1940s housing study, Merton, West, and Jahoda (1951) found that various architectural features, spatial configurations, and other social factors in the project had unintended consequences for residents' ties with certain social contacts by constraining their exposure to, and, therefore, opportunities to form relationships with them. The extent to which levels of network change within individuals' personal social networks are related to the local opportunity structure have not been explored at length in contemporary network analysis. However, there are some useful forays into this topic, including work on the link between

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[6] Another key empirical question regards the capacity of different social networks to detect and respond to external causes of change. Parsons would have pointed out that not all threats to the integrity of a system are detected, especially when cybernetic control mechanisms are not in place. For example, during the Great Depression, it took time to devise a system of sampling the labor force and measuring various features of the levels of employment (through the Bureau of Labor Statistics) to devise routine, reliable and valid labor force indicators. Even with this information, it was not always clear what should be done to achieve a target level of labor force participation. Social systems are complex in their interdependencies and there will be strong disagreements among interested role players over appropriate courses of action to stabilize a system state.

network structure and features of network composition and heterogeneity (e.g., Burt 2005; Laumann 1973).

We should emphasize that a structural-functionalist approach to network change need not assume that network dynamics reflect efforts at adaptation, per se. Some network change is endogenous to the system, as suggested in Merton's (1984) concept of *socially expected durations*. The idea is that the dynamics of social structure are governed by expectations that actors form about when relationships will end. "Social expected durations . . . are socially prescribed or collectively patterned expectations about temporal durations imbedded in social structure of various kinds: for example . . . the assumed probable durations of diverse kinds of social relationships (such as friendship or a professional-client relation); and the patterned and therefore anticipated longevity of individual occupants of statuses, of groups, and of organizations" (pp 265-266). (This is to be distinguished from actual relationship durations, which may or may not be as long as originally expected.) Expectations often operate informally within casual social relationships. An excellent example is provided in Desmond's (2012) recent study of the survival utility of "disposable" network ties formed among strangers in the wake of eviction and poverty. However, organizations can determine the lengths of relationships, and entire role-sets, by dictating and enforcing terms. Indeed, much of the "expectable" aspect of the duration of network relationships is, according to Merton, determined by institutional factors. For example, terms of contract are often established by industry standards or are set according to bureaucratic rules. Likewise, the duration of neighbor relations is often dictated by terms of local rental agreements (e.g., Kleinhans, Priemus, and Engbersen 2007). The idea of socially expected durations has implications for the dynamics of social network ties in that it helps to explain aspects of relationship duration, rates of tie decay, and network member recruitment that has little to do with external environmental shifts.

Network Action Sequencing

As we discussed earlier, structural-functionalist theories were centrally concerned with the dynamics of real-time social interaction. Much network research has justly focused on the task of developing ways of measuring and depicting aspects of structure, while problems of everyday network *process* have been largely neglected. The application of network-analytic techniques for understanding the temporal organization, or order, of social phenomena in sequences is a relatively recent interest among social network analysts. This can be seen in recent work on networks of real-time action sequences (Cornwell 2015), the analysis of series or streams of relational events (Butts 2008; Stadtfeld and Geyer-Schulz 2011), the reframing of brokerage potential as a function of when one interacts with different parties relative to when those parties interact with each other (Spiro, Acton, and Butts 2013), and the complex problem of network scheduling (Gibson 2005). These represent some of the most interesting but least-developed areas of work concerning the internal network functions in both egocentric and sociocentric network analysis (cells 3 and 4 in Figure 1).

Fortunately, midcentury structural-functionalist theories provide guidance on this topic. The main lesson is that the real-time social action that occurs within the context of networks is ordered in a highly patterned manner, temporally speaking. This all goes back to the structural-functionalist idea of interlocking role sets. Parsons (1951) wrote about the "institutionalization" of social action, which involves the regularization of role expectations and obligations on the part of individuals in

the system, which, in a given context, consists of "a plurality of interdependent role-patterns or components of them" (p. 39; but see entire section). The notion of "patterned" action plays a major role throughout Parsons' theories. Because role expectations are institutionalized and because interaction contexts are repeated, everyday behavior inevitably involves the repetition of acts from one time period to the next (e.g., day after day, week after week). This institutionalization has its roots in a variety of structural forces, including the fact that people are driven by norms, the omnipresence of obligations and shared values that are dictated and reinforced by larger society and culture, as well as institutional practices (see pp 36-45). One's behavior is oriented toward the goal of meeting obligations that are associated with the various social roles one plays – obligations that are linked to numerous other individuals and organizations within the surrounding environment who are in turn interconnected in a larger web of interlocking expectations (Merton 1968a; White, Boorman, and Breiger 1976). As a result, everyday social situations are marked by relatively stable, mutually reinforcing patterns of behavior that get repeated in predictable ways. Because roles and obligations – and the networks that link them – are relatively stable, one day looks very much like the next.

Parsons' notion of this dynamic, real-time social system was informed by his early work on the interplay between actors' interests and resources, on the one hand, and structural context, on the other. In his view, sequences of events that unfold over a period of time (e.g., community issues) involve different actors at different time points. Less limited than frameworks in which events are seen as being linked together directly (e.g., in a Markovian stochastic fashion), the structural-functionalist view is that events are also linked to each other indirectly through the interests and resources of those who initiate and participate in them. Different actors participate in different events at different times. In network terms, this is more consistent with a two-mode (actor-by-event or interest-by-event) model of action sequences than a one-mode (event-by-event) model.

Figure 2. Parsons' Knot
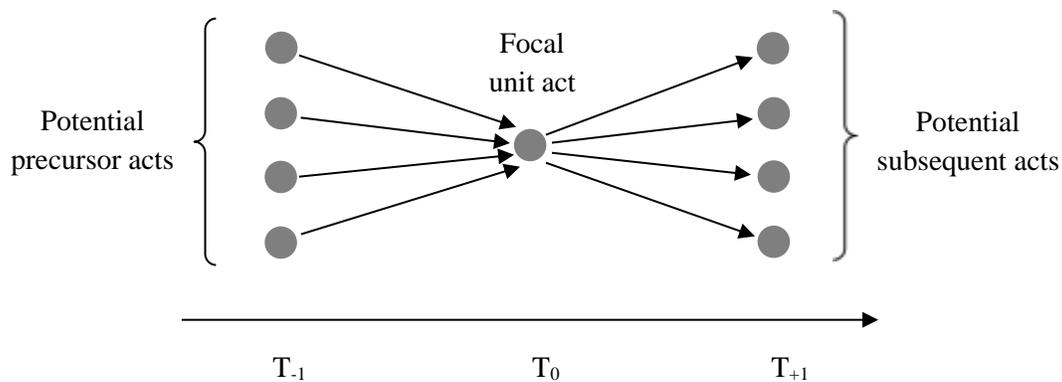
Note: This figure is adapted from Parsons (1937). The edges appear as in the original. We have added nodes to help visualize the various possible unit acts that occur at a particular time point in the action sequences, and we have also added notation for the time units.

Parsons explicitly articulated a networked view of chains of unit acts. In elaborating on his conception of a given actor's unit acts as being linked together through time, he discussed how

these acts are in turn linked up to other acts in a larger system: "[T]he total complex of means-end relationships is not to be thought of as similar to a large number of parallel threads, but as a complicated web (if not tangle). In talking of a single chain, what is done is to unravel from the web a single thread that passes through a large number of points where it is knotted with other threads. The knots are concrete acts." (Parsons 1937:229-230.) Uncharacteristically, Parsons devised a figure to map this view of intersecting microsequences, as shown in Figure 2. With this, Parsons conceptualized each act at a given time point as a juncture in a larger directed network of potential or likely action *pathways*, where actors might arrive at and depart from that point in several different possible directions on different occasions.

The notion that different paths in this action sequence are followed by different actors who intersect at a given point in time and space through these unit act knots was finally fully articulated in *The Social System*. This conception of action has been demonstrated in several studies, including work on the structure of issues in policy domains (e.g., energy and health) at the national level (e.g., Heinz et al. 1993; Laumann and Knoke 1987) and the unfolding of community level issues (e.g., Cornwell, Curry, and Schwirian 2003). Unfortunately, little contemporary research has attempted to understand how event sequences are structured by actors' underlying interests, resources, and strategies.[7]

The issue of sequences of action figures prominently in other structural-functionalist theories as well. The notion that social structure rests on series of sequential micro acts is precisely what Parsons argued in *The Structure of Social Action* (1937) and *The Social System* (1951). This was elaborated most fully in Bales's (1951) interaction process analysis (IPA), which recorded sequences of behaviors (e.g., utterances, gestures, and other acts) that occur within group settings and examined how these sets of acts relate to group outcomes like problem solving (e.g., Bales and Strodtbeck 1951). It is also worth noting that the regularity of interaction that is suggested by sequence-oriented frameworks highlights the relevance of Merton's concept of socially expected durations at the micro-interaction level. From Merton's perspective, real-time sequences of interaction are likely both due to, and shaped by, these expectations.

It is difficult to overlook the potential value of applying newer and more sophisticated social network techniques for the purpose of understanding how different acts are connected to each other. From a network perspective, individual acts are connected to each other via their temporal adjacency, and the actors who execute these acts are connected to each other through their interaction. From a Parsonsian perspective, the larger network that emerges from these series of acts constitutes the social system itself. The most important analytic challenge, from this perspective, is to then understand how fixed patterns of interaction emerge from the combination of the norms and values (i.e., culture) of the social context, on the one hand, and the motives, goals, and role performance skills of the individuals who are involved in it (e.g., personality), on the other. Fortunately, with recent advances in both network and sequence analysis software (e.g., see Marcum and Butts 2015) and computer power, the identification of fixed patterns of real-time interaction, and the ability to model them as relational events, is now highly feasible.

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[7] The idea that the operation of complex role systems leads to order and regularity plays a big role in structuration theory and in related work on sequences of social interaction. Numerous scholars emphasize the fact that actors tend to interface with each other in sequenced patterns that are repeated in routines (Collins 2004; Gershuny 2000; Giddens 1984; Zerubavel 1981).

Exchange-Network Dynamics

A final issue we wish to address concerns the relevance of Parsons' theorizing for the contemporary study of social exchange dynamics. This issue also largely concerns internal functions in both egocentric and sociocentric research (cells 3 and 4 in Figure 1). One of Parsons' later and least-appreciated arguments is that actors engage in a multiplicity of economic or social transactions for multiple and unrelated purposes subject to the institutional rules that govern a particular medium of exchange. He pulled together a long tradition in sociology and economics that discussed the emergence of money as a medium of exchange (c.f., Parsons 1963a, 1963b, 1970; Parsons and Smelser 1956; also see Turner 1968). Like Simmel's ([1907] 1978) view of money, Parsons characterized media of exchange as important for their symbolic rather than their material properties. "In the field of social interaction, many mechanisms have properties so similar to those of language that it is not too much to say that they *are* specialized languages" (Parsons 1963b:38-39; emphasis his). That is, the medium of exchange in a given situation (e.g., money) is a language that possesses two interdependent features: 1) the code or grammar or normative framework – i.e., the rules of the language that regulate how the medium constructs messages, utterances, or communications; and 2) the messages that are appropriately encoded from the specialized language or code.

More specifically, Parsons discussed four media – money, power, influence, and commitment – that exist empirically in highly varying stages of development in particular societies. He used the long-available discussion of money (e.g., Simmel [1907] 1978) as the model scaffolding for the other three media. Some societies, for example, have an elementary monetary system that involves the presence of a monetary unit (e.g., precious seashells, or blankets) that can be traded for various goods and services, because they hold intrinsic value for both parties to the transaction, and, thus, actors are willing to accept them as surrogates in exchange for real goods or services. Modern developed societies have evolved a highly elaborated credit system based on a whole series of social inventions (e.g., double entry book keeping) that allow inherently valueless paper (e.g., a check, which is a promissory note and an instruction to pay someone in a credit entry on a ledger in exchange for a real good or service to be sent to another) as a binding commitment for the exchange of valued resources. The relative precision and efficacy of the messages exchanged are dependent on the code in force in a particular society and its trustworthiness over time in guaranteeing the integrity of the exchange of promissory notes. The media of exchange, in short, are specialized languages to facilitate the exchange of information.

The real-time nature of these transactions is central to exchange-network research, which primarily uses information about exchange media to assess highly precise power dynamics and monetary exchange outcomes (e.g., Cook and Whitmeyer 1992; Willer 1999). Some attention has been given to the important idea that actors can change positions within exchange networks, and its implications (e.g., see Willer and Willer 2000). Unfortunately, few network researchers have considered how the use of different media of exchange unfolds over time and serves to regulate and constrain the dynamics of exchange among multiple parties pursuing different ends in larger action systems, especially in different social contexts (e.g., countries). When a crisis in confidence about the monetary unit arises (e.g., the rampant inflation of the Mark in the German economy during the Weimar period in the 1920s), the prevailing system of exchange collapsed, as fewer

actors were willing to accept money as legal tender and the exchange system reverted to a much more restrictive barter economy with a highly circumscribed range of transactions at a distance (that is, barter systems lack fluidity and extensivity in time and space). Exploring these types of questions is only possible with a reconceptualization of exchange relationships as multidimensional and occurring sequentially over a period of time within different social contexts.

From this perspective, the stability of media that are used within series of exchanges within a given context provides a marker of the extent to which the overall exchange system is stable and predictable. Another structural-functionalist extension of social exchange research, then, involves understanding the cybernetic control mechanisms (Wiener 1948) that are used by actors within a system to modulate their treatment of certain exchange media. These mechanisms play a role in modulating real-time change in exchange markets, and they are often closely linked to the network connections of actors within these systems. One example of research that identifies network mechanisms that play a role in modulating exchange dynamics is a paper by Zuckerman (1999), who points out that the stock price of a given firm is lower when the firm is not centrally located within the published judgments of analysts who specialize in that firm's industry. Other studies have tied dynamic features of firms' network positions to exchange outcomes. Stark and Vedres (2006), for example, show that the different sequences of action through which firms formed (or lost) network connections to other firms (via owners) directly affected their foreign investment. They find, for example, that firms that experienced more "durably cohesive" ownership network structures attracted more foreign investment. More studies along these lines would complement existing research on the structure of power and commitment within exchange networks to how these different media of exchange are modulated and vary according to dynamics of other network-structural features.

Parsons' conceptualization of media of exchange constitutes one of the most dynamic aspects of his theories. He argued that these media (e.g., money) are symbolic and can be circulated through networks of exchanges. Few, if any, attempts have been made to trace these flows. Furthermore, we know little about how these dynamics relate to the structure or functioning of other aspects of social networks, as discussed above. Cook and Whitmeyer (1992) convincingly argue that network analysis and exchange research work toward different conceptions of social structure. As Parsons argued that exchange is central to the integration of different aspects of social systems, an obvious question that lingers is how the dynamics of exchange in a given context relate to the stability or integration of different types of network connections in that same system. Indeed, the question remains whether what are treated as normal network ties are in reality exchange relationships masquerading as ordinary social relationships.

Conclusion

Midcentury structural-functionalism pales in comparison to contemporary social network analysis with respect to empirical rigor and technical sophistication. But the two paradigms have an undeniable substantive connection in their concern over the dynamics of social systems. Moreover, the mid-century work of the most influential structural-functionalist scholars – especially Robert K. Merton and Talcott Parsons – provide valuable theoretical resources for analyzing and understanding important aspects of social network dynamics, including aspects of network change and real-time action sequences. This paper has outlined some of these connections, with an eye

toward advancing social network analysis in new directions. In retrospect, the highly dynamic nature of the interaction processes and larger social systems that Merton and Parsons described in their structural-functionalist work is striking. These are prescient insights that provide theoretical justification for new directions in analyses of dynamic social network change and real-time network processes.

It is interesting to speculate how mid-20th century structural-functionalists like Merton and Parsons might have used social network analysis techniques to test and illustrate their points. Of course, Parsons saw himself as an "incurable theorist," (Parsons 1951) and relied on analytic realism in part because he believed that real-world data – with all of their individual-level messiness – tend to obscure larger truths. And Merton was more interested in developing middle-range theories. However, to some extent, the theoretical nature of their work reflected the profound constraints of then-extant technology, and both Merton and Parsons no doubt would have seen value in the usefulness of cutting-edge network-analytic tools, such as ERGMs, optimal matching, and network analysis and visualization software for testing and illustrating the social-structural embeddedness of everyday action. It is likely that, from Parsons' perspective, the most valuable features of contemporary social network analysis include its capacity to map out large, whole social network structures. Some examples include analyses of the structure of the World Wide Web and large-scale scientific collaboration networks (for examples, see Newman, Barabási, and Watts 2006), as well as the structure of Facebook "friend" ties (Lewis et al. 2008). In these, Parsons would have seen evidence of the kinds of large-scale systems and regularized processes that figure so heavily in his theories. Unfortunately, it is often these more recent and influential network analyses – which are increasingly conducted by scholars who are not trained in sociology – that have the least-developed foundation in social-structural theory.

Merton and Parsons also would have applauded the emergence and recent surge of interest in research on social network change. Work that documents patterns of change in networks provides valuable tests of the general structural-functionalist expectation that social systems tend to be characterized by high levels of regularity and predictability – despite high rates of movement and fluctuation in real-time interaction. This is perhaps most clearly demonstrated in the thus-far limited work that has sought to portray network dynamics visually – for example, using Pajek's over-time plug-in (e.g., Moody, McFarland, and Bender-deMoll 2005). Important empirical questions remain regarding the extent to which the presence of large-scale network structures and the dynamics that occur within them – on both short time scales and over longer periods of time – reflect the operation of structural-functionalist concepts like interlocking actor sets and roles, evolutionary universals, and socially expected durations.

The relevance of midcentury structural-functionalist thinking to recent developments in social network analysis is difficult to ignore. The theories that characterize this prominent past era in social science provide a much-needed foundation for some of our most exciting future studies.

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