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Social Network Analysis in the Study of Terrorism and Political Violence

Arie Perliger

SUNY Stony Brook, aperliger@gmail.com

Ami Pedahzur

University of Texas at Austin, pedahzur@austin.utexas.edu

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Arie Perliger, SUNY at Stony Brook

Ami Pedahzur, University of Texas at Austin

Introduction

The academic community studying terrorism has changed dramatically in the past decade. From a research area which was investigated by a small number of political scientists and sociologists, employing mainly descriptive and qualitative studies that resulted in limited theoretical progress as noted by Schmid and Jongman (1988) as well as Crenshaw (2000), it has in a short time become one of the more vibrant and rapidly developing academic realms as scholars from different branches of the social sciences have engaged in an effort to unravel this phenomenon, introducing new theoretical outlooks, conceptualizations and methods.

The descriptive and explanatory potentials of Social Network Analysis (SNA) in the study of violent political groups attracted some of the new students of terrorism shortly after the September 11th attacks (Van Meter 2001, Carly et al. 2002, Krebs 2002). Yet, even though their studies showed strong potential as they provided significant insights about the structures and internal processes of terrorists groups, the use of SNA in the study of political violence has remained quite limited, and still amounts to only a small fraction of the research in the field. Our experience in presenting SNA of violent groups in various platforms and events has led us to conclude that this is a result of two factors, which sustain each other. The majority of political violence students have very limited acquaintance with the rationale, and the main concepts and methodological tools of SNA; hence, many of them are still reluctant to exercise SNA in their studies and consequently tend to express doubt regarding its efficiency and relevance for the study of complex social phenomena.

This essay is not methodological *per se* in the sense that our goal is not to provide a methodological introduction to SNA. We do strive however to provide a clear presentation of the advantages of this realm for the study of terrorism and related fields, as well as the main relevant methodological tools and concepts, by utilizing pertinent and intelligible examples. These illustrate how network analysis complements conventional approaches to the study of political violence and

how it can provide important information about the characteristics of the group structure (and how it influences members motives, behaviors and the outcome of their actions), recruitment processes, evolution, and of the division of political and social power among its members. We hope this will encourage more scholars to incorporate SNA into their studies, and consequently will further our understanding of the processes, causes and implications of political violence.

Utilizing Social Network Analysis in the Study of Political Violence and Terrorism – Why and When?

The use of SNA in the study of political violence in recent years should be attributed to several conceptual and methodological developments. The first is the growing acknowledgment within the academic community of the important association between the group's dynamic and (social) structure, and its members' motivations and behaviors (Sageman 2004, 2008). Sociological and organizational texts started to incorporate network perspectives in the early 1970s, emphasizing its importance for understanding collective action (Granovetter 1973, Snow, Zurcher and Ekland-Olson 1980, Perrow, 1986). Until recently the study of political violence tended to neglect this dimension of violent groups as it focused on two major elements: the individual and the organization. Scholars using the first approach investigated psychological and sociological tendencies in order to decipher the profile of terrorist group members and to understand their motives (for a complete review see Victoroff (2005)). Scholars applying the second approach used organizational theories to explain the strategic and tactical decisions of terrorist organization elites (Crenshaw 1981, Moghadam 2003, Pape 2003, Bloom 2004, Sandler and Enders 2005). Yet, three decades of research yielded inconclusive answers regarding terrorists' profiles and a mounting number of empirical observations revealed that a growing proportion of violent attacks (by political groups) in recent years were not perpetrated by hierarchal paramilitary organizations but by small, informal and non-

hierarchical social frameworks which are adaptive and dynamic (Raufer 2003, McAllister 2004, Sageman 2004, 2008).

The growing prominence of these empirical observations led an increasing number of scholars to shift their attention from the individual or organizational levels of analysis, to the social dynamic within the groups and especially impelled them to investigate how the type/intensity of ties between the group's members and their multifunctional nature are associated with the group's radicalization, the emergence of common identity and ideological commitment, and engagement in violent activities (Rodriguez, 2005; Koschade, 2006; Pedahzur and Perliger, 2006). As further exemplified in this paper, SNA is well suited for such investigations.

A related development was the growing popularity of revisionist views regarding the timetable that characterizes the process leading to acts of political violence. Until recently, conventional wisdom in the field assumed a timetable in which the cause of the violence preceded the formation of the violent group, which was established in response to an external trigger and aimed at obtaining identifiable political goals (Crenshaw 1992, Pape 2003, Victoroff 2005). Nevertheless, in the face of new evidence garnered in recent years, especially in studies focusing on religious violent groups in Western countries (Hoffman 1999, Juergensmeyer 2003, Stern 2004), it appears that it is not uncommon to find cases in which the formation of the social framework responsible for the violence precedes the cause of the violence (Sageman 2004, 2008, Rodriguez 2005, Pedahzur and Perliger 2009).

In other words, many of the social networks engaging in terrorism existed long before they became involved in terrorist activities. Hence, understanding the motives and the processes that led the group to engage in political violence requires a look beyond the *apparent* causal relations between the causes of the violence and the violent activities. The consolidation of a *cause* is just one stage in

the group's long slide to violence. This again reflects that social processes within social networks are highly relevant in understanding political violence.

From a methodological perspective, contemporary students of political violence enjoy superior access to information and data about violent groups. Since September 11th, growing numbers of media outlets have increased their coverage of terrorist incidents and groups. This, combined with the striking increase in the efforts and resources invested in data collection about these groups by academic and governmental agencies in recent years (for example, START at the university of Maryland and TIGER at the University of Texas at Austin), have simplified the adaptation of research methods which demands high resolution information about the terrorists and their groups, among them SNA. Lastly, the growing popularity of terrorism as a research area, which has attracted social networks experts to engage in its study, has also contributed to the growing use of SNA in the study of political violence (Krebs 2002).

The above-mentioned factors responsible for the growing use of SNA also hint at the characteristic manifestations of political violence that are particularly suited for investigation with SNA. The first is almost trivial: Violence or political action is a result of collective action, i.e., an output of a process, which is an action of a group of actors who interact with each other on some level. Lone wolves like Theodore Kaczynski or groups like the one behind the Oklahoma City Bombing, which consist of very few members (2-4), are naturally less suitable for SNA. On the other hand, groups that consist of more than dozens of members, such as Hamas or Aum Shinrikyo, are also somewhat problematic to study from this perspective since it is difficult to accurately map the relations among all the actors (of the clandestine group) as well as recruitment paths and changes in types of relations. In the next section we will elaborate on the methodological facets of mapping and defining the boundaries of the terrorist network.

Another important characteristic refers to the group level of institutionalization. While hierarchal paramilitary organizations, such as The IRA, The Red Brigades, Hezbollah or the LTTE, usually include social networks, the social processes within them are less relevant for explaining group activities, target selection and motives. In these cases, the relevant processes are at play within the higher echelon of group leaders and are more understandable using theories that focus on organizational processes, leadership behavior, and rational decision-making. By contrast, when the interactions are less formal, like in the cases of the RAF, the SLA and the Hamburg cell, when the division between the different echelons of the group is less strict, and in general, when there are more interactions and transmission of information among group members and echelons, SNA becomes more efficient in uncovering the group dynamic, structure, activities and motives.

How to Study Violent Social Networks

When practicing SNA, we evaluate the investigated social phenomena as a product of a (social) framework, which includes actors (in the case of terrorist groups, these are group members, who are represented by nodes in a graphical representation of the social network) and ties (relations or interactions between actors). Hence, in contrast to other quantitative methods which tend to focus on the description and aggregate analysis of the attributes of those actors who make up the research population, SNA assumes that in order to comprehend the social phenomenon, it is more conducive to map out and analyze the system of ties among the various actors and the ways in which these relational patterns shape actors' activity, decision making and group dynamics and eventually, the outcome of the group's collective action (Wasserman and Faust 1994, Scott 2000). In the following paragraphs, we will epitomize how this can be applied to the study of violent political groups.

Mapping the Group

The process of mapping the networks involves two critical methodological decisions. The first refers to the question of which actors to include; the second is how the ties between them should be

measured or categorized. Two basic approaches are common in SNA studies for solving the first dilemma (Wasserman and Faust 1994). The first is based on the actors' self-definition of the boundaries of the group. Those that are considered by the members, as belonging to the group, will be included. While this approach can be efficient in cases in which the researcher has access to the group members, it can be problematic when dealing with clandestine networks. The *nominalist* approach, which is more practical for the study of violent groups, is based on the theoretical focus of the researcher, who shapes the boundaries of the group based on his/her interests. Naturally, in the case of terrorist groups, researchers strive to include all the actors who take part in the group's activities and the social processes leading to the violent activities. However, this raises the question of what constitutes significant participation in these processes.

The cases of the social networks responsible for the November 2003 attacks in Istanbul and the July 2005 attacks in London, illustrate the dilemma. In the first case, some group members were in contact with the top leaders of Al-Qaeda during the initial planning stages of the operation. In the second case, spiritual leaders were in contact with the group members although they had a limited (if any) part in the operational execution of the attacks. What methodological criteria can we use in order to determine if the Al-Qaeda leaders in the first case and the clerics in the second case should be considered part of the terrorist network?

Several approaches could be suggested. The first includes all actors who were necessary to perpetrate the attack. A more inclusive perspective would involve all those who assisted in the execution of the attacks. This includes actors who were part of the group for short time, individuals who were not present in the formation stages of the group yet did not participate in the decision making processes, or spiritual leaders who just provided moral support for the actual perpetrators. By contrast, an exclusive outlook would include only actors who are longtime members of the group, participating consistently in its activities and in the decision-making processes, and who have

continuous relations with other members. While these different approaches for drawing the boundaries of terrorist networks are all valid, depending on the researcher's agenda, we think that considering the dynamic nature of a member's status within such groups, when peripheral members sometimes become important actors in a short period of time, the methodological edge lends itself to the inclusive approach. Another option is creating progressive representations of the networks, which refer to different time frames; in this case, the inclusive approach better fits mapping the network in its initial stages. The number of members at this stage is relatively small, most are significant members and any actor has the potential to become a prominent figure within the network. A more exclusive approach will provide more valid representation of the network in the operational stages of its activities. In these stages, the chances are high that the group includes many passive supporters and passersby whose inclusion could disrupt the *real* social network, which is at play and is primarily responsible for the execution of the violence.

After deciding which actors *belong* to the network, a decision must be made regarding the categorizations of tie types. While ties may have different characteristics—they can be binary or not, symmetrical or asymmetrical (even strength in both directions or stronger in one direction), negative or positive—it seems that measuring tie strength is most relevant for understanding the social dynamic within violent networks. Whereas Granovetter's (1973) classic and groundbreaking study essentially differentiated between *weak ties* (relationships with acquaintances) and *strong ties* (family and close friends), others tried to develop more sensitive categorizations. Krebs (2002), one of the first to analyze the September 11th network, based his categorization on the amount of time spent together by the pair of members (lived together, traveled together, short meetings) to generate three levels of the tie strength. Similarly, Pedahzur and Perliger (2006) also used three categories to distinguish between family relations, long-term friendships and acquaintances. Brams et al. (2006) offer a more sophisticated approach using directional ties in order to detect the flow of information

within the network and eventually the level of influence of each actor on other actors. While different researchers have adopted different approaches, mainly based on combination of the magnitude and frequency of interactions between actors, according to their theoretical tendencies and the level of resolution of the data they were able to obtain, there is little doubt about the importance of tie strength in explaining different processes within the network. Rodriguez (2005), for example, illustrated the important strategic advantages of weak ties between cells of terrorist groups, as this structure provides them more flexibility, enhances their survivability when one of the cells is exposed and makes them less visible. Alternatively, he and others illustrated the importance of strong ties within the subgroups of the network, which facilitate solidarity, commitment, cooperation, and reduce disagreements (Sageman, 2004). Finally, studies have implied an association between type and number of ties a member has and his/her role within the group (Rodriguez 2005, Pedahzur and Perliger 2006).

Division of Power Within the Group

One of the main advantages which SNA provides for students of terrorists groups is the capability to uncover the informal division of influence and social capital within the group, which, in turn, influences the group's internal political and social processes and the outcome of its activities.

Figure 1 around here

Whereas in highly institutionalized and hierarchal organizations, the political/social power is concentrated in the top echelon of identifiable and established leaders, in cases of less formal and hierarchal groups, the situation depicted is substantially different. Instead of a formal *leader* we will try to detect those actors who possess unique characteristics which make them significant to the continuous operation of the group. First is the classic *hub*, or an actor that has a significantly higher number of ties than other members (high level of centrality). Such a member is, in many cases, responsible for coordinating the group's activities, for recruitment of members, and has the ability to

manipulate the flow of information within the group more easily (Koschade, 2006). To illustrate, in the case of the Israeli *Jewish Underground* terrorist group (see Figure 1), the hubs intentionally did not reveal the long-term highly extreme goals of the group to some members in order not to alienate them from participating in short-term less extreme operations. The hubs were able to do that not just because of their high level of centrality, but since entire sections of the network were dependent on them for connection with other parts of the network (high level of betweenness). Since a relatively high number of members were tied to the network via a specific hub, this also implies that the hubs were responsible for recruitment processes, . Finally, the importance of detecting the hubs stems not just from the fact that this allows us to uncover the power division within the network and who possesses more social capital (Bourdieu 1986) but also to better understand the motives beyond the group's actions. As demonstrated by (Pedahzur and Perliger, 2006), by looking at the characteristics and history of the hubs, the researchers were able to detect the motivations behind the attacks of the studied networks of Palestinian suicide bombers, epitomizing that the “hubs” will, in many cases, use the networks to promote personal or local political interests.

The case of the Jewish Underground also exemplifies that a high number of ties is not the only criteria for detecting informal leaders. While some groups pose a dense structure, others are constructed as bundle of connected subgroups. In this case, the actors who are in strategic locations and serve as connectors between the different subgroups possess significant power and are crucial for the survival of the network. While they do not have to be connected to high numbers of members, they can veto almost any operation that needs the cooperation of the different subgroups. Finally, there are those who do not have a particularly large number of ties, nor are they connectors between different parts of the network, but they are situated in a strategic location in terms of their proximity to hubs or to large numbers of members within the network; hence, they have high level of access to information and resources.

How can these kinds of actors be detected? How can we compare the influence of different actors in the same or in different networks? The most common techniques for evaluating the actor's role/power within the network are *measures of status* (sometimes referred to as *centrality measures*). Some of the prominent relevant measures, which can be effective in the study of violent groups are degree of centrality, closeness and betweenness. A similar measure was introduced by Brams et al. (2006) developed the concept of *influence* as a function of the actor *importance* within the network (which is, in turn, determined by the amount of his/her ties and their direction relatively to other actors).

Understanding the division of power within the network can help us to test theories dealing with the decision making processes within terrorist groups, assess the validity of top-down or bottom-up theories, as well as understanding how the internal socialization operates or is activated. Finally, one should not forget the importance of such analysis for developing counterterrorism models (as shown by Carly et al. 2002) as they enable understanding of how such networks could be destabilized or dismantled. For example, the case of the Jewish Underground illustrates that operational hubs, who retain the operational knowledge concerning weapons, explosives and tactical planning, are more crucial to the survival of the network than ideological ones. In this case, the retirement of the operational hub led to the collapse of the network (the ideological leaders wanted to keep the network active). The network attacks resumed only when the operational hub returned to cooperate with one of the subgroups.

Structure and Sub-Groups

Structural characteristics of the network are associated with the group outcomes, internal social processes as well as members' behavior, such as, the decision of whether or not to participate in its activities as illustrated recently by Seigel (2009). The SNA literature presents a variety of tools, which

enable us to uncover these characteristics. First are measure that provides information on the level of cohesion and degree hierarchy within the network such as *Group Degree centrality*, *Density* and *Inclusiveness* (See, for example, Koschade (2006) which analyzed the Bali 2004 network). These measures are important for understanding the internal dynamic within the network, patterns of socialization, and the nature of decision-making process within the group. They are also important in testing some basic hypotheses regarding the characteristics of clandestine networks. Most networks need to balance between efficiency (low number of redundant links, high level of group centrality) and robustness/survivability (high density, high number of redundant ties). Somewhat paradoxically, however, in the case of clandestine network it seems that high numbers of redundant ties lessens the chances of network survival. Clandestine networks are interested in secrecy, hence high levels of density and group centrality increase the chances that the group is exposed. Then again, high density facilitates effective indoctrination, a crucial element in the radicalization process of the network. As showed by Krebs (2002), one of the ways to bypass these contradicting needs of the clandestine network is by deactivating strong ties while the network operates in hostile environments. In this case the density of the network is being lowered when the network becomes active and prepares to act.

Another important set of tools refers to the uncovering of internal cohesive subgroups within the whole network. The theoretical importance of such subgroups stems from the causality found in various political and sociological studies between cohesiveness and the tendency for group uniformity, intensive socialization and radicalization (Klandermans and Oegema 1987, McAdam and Paoulsen 1993). The concept most often used in this context is *clique* — when each actor in the subgroup is tied to all other actors and there are no actors who are tied to all the clique members. However, sometimes there are less cohesive subgroups in the network; hence, they do not fit the definition of a clique, i.e., in order to identify these other types of subgroups, other methodological

concepts are often used, such as n-cliques (n geodesic distance between members) or k-core groups (every actor has ties to at least K actors within the subgroup). Identifying the subgroups allows us to detect different functions of the network (founders, collaborators, passersby), network recruitments paths, operational characteristics (for example, in some networks there is a clear distinction between a suicide bombers subgroup and other subgroups while in others, the suicide bombers are isolated actors in the periphery of the network) and patterns of flow of information. Moreover, by looking at the attributes of the subgroups, we can evaluate ideological homogeneity and level of solidarity within the network and how this influences the activities and development of the terrorist network. In the case of the Jewish Underground, for example, the combination of the limited connections between the subgroups and the strong cohesiveness within them, helps to explain the rapid disintegration of the network after its first attack; why so many actors found it easy to detach from the whole group while continuing to play small roles in its activities as passersby (an obligation to assist their friends in the subgroup); and how it was able to avoid exposure for so long (over five years).

We would like to end this section by pointing out the potential contribution of some other theoretical concepts common in SNA to the investigation of violent political groups. Since we can assume that actors' behaviors are a product of their structural opportunities and constraints, we can expect actors with similar location characteristics to react in similar ways (structural equivalence). To illustrate, studies on Muslim and Palestinian networks found that peripheral actors in most cases are those who have the highest chances of becoming perpetrators of attacks (Pedahzur and Perliger, 2006; Rodriguez, 2005). In essence, the network limits the tie opportunities of these members, since they have the highest chances of being caught. Moreover, in cases in which the perpetrators were not peripheral, we see a very limited and primitive organizational structure; in other words, these are *one attack* groups. Basically, the structure and the location of the perpetrators could be associated

both to the overall operational capabilities of the group as well to its life span. Lastly, SNA could be of high value for understanding the relations between different terrorist groups worldwide (see, for example, Basu, 2004), especially by using theories of structural balance (which assume that actors will forge ties in cases of sheered interests such as positive ties to other third actor), homophily and heterophily.

Concluding Remarks

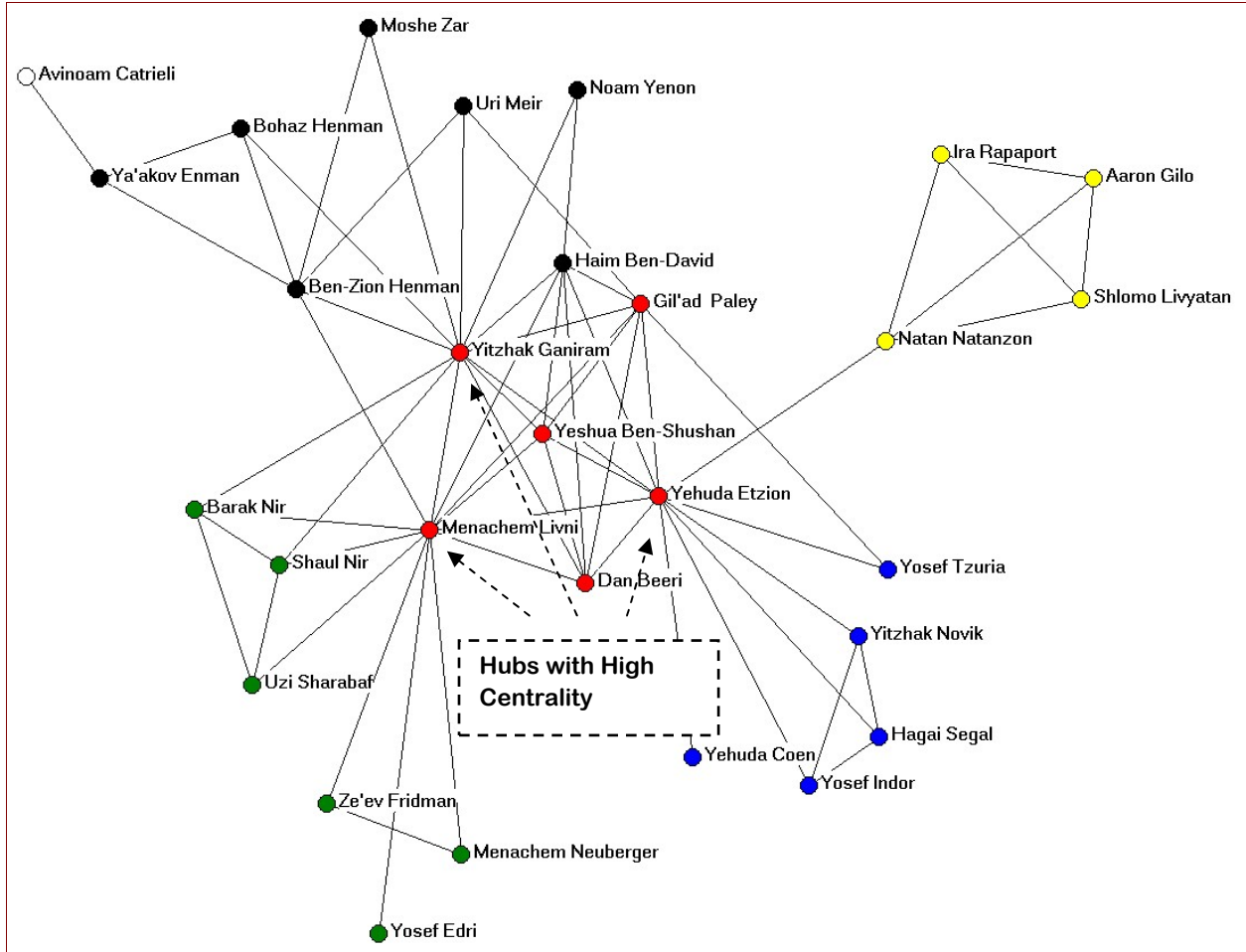
The article has illustrated the potential of SNA in the study of political violence and terrorism. This method could be highly useful for further developing and testing some of the current prominent theoretical frameworks in the field. Theories focusing on profiling terrorists – identifying individuals who are more likely to be engaged in terrorist activities – could make use of SNA in order to add a social dimension to the basic socio-demographic profile by looking at their patterns of social interactions as well as by distinguishing between different roles within the network, which in turn are reflected in different profiles. Psychological theories focusing on social learning process could also benefit from the use of social network analysis focusing on ego-networks. Naturally, the growing literature emphasizing the role of social processes within small informal groups and involvement in violent activities is well suited to the use of SNA. Finally, counterterrorism theories based on SNA could exemplify which group structures are more vulnerable, how the networks could be destabilized, which actors are crucial for the continuing existence of the groups, how the radicalization process could be thwarted and how the security forces could locate recruitment paths.

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Figure 1 – The “Jewish Underground” Terrorist Group



Source: NSSC dataset on Jewish terrorism