Terrorist Networks' Productivity and Durability: A Comparative Multi-level Analysis

by Arie Perliger

Abstract

Terrorist networks, similar to the more traditional terrorist organizations, employ violence in order to promote political and social changes. By utilizing a unique dataset of 18 terrorist networks the current study contributes to the growing body of literature on terrorist networks by examining the factors that determine network productivity and durability. The findings illustrate how effective networks generally operate within supportive and homogeneous communities, tolerant of the violent struggle. The findings also suggest that while funding and operational knowledge/training are not strong predictors of operational success, they seem to be potential preconditions for the formation of the networks, and for a network to shift from the ideological radicalization stage into the operational/behavioral stage. Finally, when looking at the structural characteristics that differentiate successful from less successful networks, it seems that the most important elements are the ability of the successful networks to effectively balance between cohesiveness and flexibility while preserving their dynamic nature.

Keywords: *Terrorist networks, organizational behavior*

Introduction

The term 'new terrorism' entered academic discourse during the 1990s as researchers reported an unprecedented rise in the number of victims, the use of new and highly destructive tactics, and a preponderance of fanatical supra-national religious groups carrying out the terrorism.[1] Furthermore, the structure of the "new" groups, it was assumed by many, was fundamentally different from that of more traditional terrorizing groups (e.g., IRA, ETA, Fatah). While the latter—termed "terrorist organizations"—were characterized by clear lines of authority, a formalized hierarchy and a set of organizational functions and decision-making bodies (such as central committees, headquarters, etc.), many of the "new" groups—termed "terrorist networks"—assumed a horizontal flat structure, based on non-formal social relations and a high level of interdependence among the different actors comprising the group.[2] As the academic community began to pay more attention to these networks, new methods were developed for deciphering the processes and social dynamics within them.[3] Less attention was given to the differences in the ways these groups end—or more accurately, to their different levels of operational success (in carrying out attacks) and durability. Why, for example, were Hamas networks (active in the West Bank during the early 2000s) able to produce long-term campaigns of violence, while others—e.g., many of the Jihadist networks active in Europe— could have been described as "one-hit wonders", or were dismantled before even being able to initiate their first significant attack?

The current article contributes to the growing body of literature on terrorist networks by looking at the factors determining network productivity and durability. The next two sections will conceptualize the 'terrorist network' and will detail a theoretical framework identifying the potential factors influencing network operational characteristics. This is followed by a methodological section and an empirical analysis seeking to test the proposed theoretical framework. The concluding section will assess the remaining theoretical gaps and the main implications of the findings.

Between 'Terrorist Organization' and 'Terrorist Network' – Defining the Research Population

Defining the research population of this study is not an easy task. While most scholars of terrorism acknowledge that a growing number of terrorist groups are better analyzed from a network-centric perspective rather than from a classic organizational outlook,[4] limited attempts have been made to draw a clear line between the two forms of terrorist groups. Most studies refer to small social networks that possess a dynamic structure and limited hierarchy, without attempting to provide a wider framework of analysis to distinguish them from the "old" traditional, formal and hierarchical terrorist organizations.[5] Outside the realm of political violence studies, it seems that both political scientists and sociologists tend to emphasize the absence of formal and clear lines of authority and/or distribution of functions within flat networks in comparison to the formal organizations which "…possess a role structure distinct from their actual membership, are clearly bounded, and internally differentiated both in a horizontal (functional) and vertical direction (differential distribution of rights and duties)."[6] These criteria have been utilized in typologies dealing with social coordination and governance,[7] and typologies dealing with different types of economic organizations.[8]

In order to clearly define the research population of this study, and to conceptualize the "terrorist network," a deductive analysis of network literature has been utilized, looking into the various characteristics ascribed by the literature to "new" terrorist networks in comparison to the traditional "older" organizations. The findings have assisted in constructing the classification presented in Table 1.

Table 1 – Terrorist Networks versus Terrorist Organizations

Type	Hierarchy	Size	Communication	Boundaries
Network	Inherently leaderless. While some members have more "social power" than others, there are no formal mechanisms which institutionalize the status gaps between members, nor are there formal routines and protocols that manifest the division of power within the network.	Size is limited by the non-hierarchal structure, few individuals to several dozen.	Informal, not regulated or influenced by the functional role of the actors, their formal power or other organizational features. Based on social relations that are a product of primordial and previous social ties.	Elusive borders. Entrances and exits are in general less costly and dynamic.
Organization	Hierarchal structure, identifiable leadership. Division of power is relatively stable.	The formal and hierarchal structure allows expansion of the group from few dozens to several hundred and more.	Communication tends to correspond with organizational lines of authority and regulated according to the organizational protocols.	Tend to establish clear identifiable boundaries via different mechanisms, including formal and standardized training and recruiting procedures.

Four main criteria (level of hierarchy, size, internal communication patterns and boundaries) have helped. to conceptualize the 'terrorist network' and to distinguish it from the more "conventional" and "traditional" terrorist organization. The first is the level of hierarchy. Networks tend to be inherently leaderless. While some members have more "social power" than others, especially those with a high level of centrality and/or closeness (access to a large number of the network's members, or those located in a central position within the group's social network), there are no formal mechanisms which institutionalize the status gaps between members, nor are there formal routines and protocols that manifest the division of power within the network. [9] Moreover, while division of power within organizations is relatively stable, in networks the situation is more dynamic, and central figures today could quickly become marginal actors tomorrow.[10]

The absence of a clear and stable hierarchy is associated with the size of the group. In general, the larger the group's size, the more difficult it is to distribute tasks consensually without a high level of hierarchy and formalization of authority (even in organizations where decisions are generated bottom-up).[11] Large groups usually display at least some hierarchical features, which foster formalization of group norms and practices, as well as institutionalization. Hence, the flat nature of terrorist networks eventually limits their ability to expand. Indeed, the size of most terrorist networks does not exceed several dozen members while the more traditional terrorist organizations usually have included between several hundred and several thousand members (e.g., the BR, PLO, IRA and others).[12]

The third criterion refers to patterns of internal communication. In networks, communication between members is informal, and not necessarily regulated or influenced by the functional role of the actors, their formal power or other organizational features. Social relations, which are a product of primordial and previous social ties, have more influence on the patterns of communication within the network. In contrast, within organizations the communication tends to correspond with organizational lines of authority (hence limiting communication between members not sharing the same status or functional role) and is regulated according to the organizational protocols or routines.[13]

Networks and organizations also differ in the way their boundaries are constructed and regulated. Organizations tend to establish clear identifiable boundaries via different mechanisms, including formal and standardized training and recruiting procedures.[14] Networks, in contrast, have more elusive borders, and entrances and exits are in general less costly and more dynamic. In many cases, even the network members themselves, including central ones, have limited knowledge about the exact size of the network, or the identity of all of its members.[15] Moreover, since there is no formal recruiting procedure, the members have a freer hand in engaging in ad-hoc recruitment for specific operational needs.[16] Having recognized the uniqueness of social networks involved in terrorism it is now possible to examine how these characteristics determine their operational capabilities and durability.

Operational Success: A Theoretical Framework

Terrorist networks employ violence and propaganda in order to promote political and social changes. However, the realization of these changes depends on various factors, many of them unrelated directly to the nature of the group's actual violent campaign.[17] These include government structure and characteristics; the country's specific history of violence; various social, demographic and cultural characteristics; the state's counterterrorism capabilities; and the strength and type of response of opposing ideological factions. Hence, even in cases where political changes are visible following the terrorist group's actions, in many cases it seems difficult to determine the extent to which the violence initiated by the group contributed to the decision of the government to modify its policies or to promote changes in the socio-political order. This problem is even

more predominant when analyzing the actions of violent networks, many of them active for relatively short periods of time, and lacking political and/or civilian wings which frame the political goals of their struggle.

An effective analogy is to a "firm" that could be highly successful in terms of producing excellent services or products, but generates limited income as a result of various non-related factors, many of them beyond its control. In order to bypass the "measuring success" methodological obstacle, this study will evaluate the group's operational success and resiliency in terms of its ability to survive and to generate a continuous and systematic campaign of violence; or more specifically, its durability and productivity. Both of these, rather than its ability to bring about desired political changes, appear more related to the group's characteristics (for more on the distinctions between "effectiveness" and "success," in the framework of terrorist groups, see Crenshaw, 1981).[18]

What are the factors that are associated with these two dimensions of operational success? The terrorism literature and network-oriented studies provide two sets of variables to consider. The first are the environmental features, involving the relations between the network and its surroundings. These include communal support, access to materials and to operational and human resources, as well as the government's attitude towards the violent campaign.[19] The second are structural characteristics. The networks' level of hierarchy, its density, the existence of subgroups and the way they are tied and structured, the number of hubs or the network free scale structure,[20] among other attributes, are expected to be associated with its operational output.[21] The following sections will elaborate on these two sets of factors and the rationale associating them with a network's durability and productivity

Environmental Factors

The terrorism literature traditionally tends to address the interactions of the terrorist group with its environment in three main contexts: first, in terms of recruitment and mobilizing support[22]; second, in the context of funding (and relations with sponsoring states)[23]; and finally, in the operational context of being able to utilize popular sympathy for the group's cause in order to facilitate the armed struggle.[24] The latter provides a more comfortable operational environment (access to safe houses, popular logistical assistance, enhancing members' morale and more). In the current study, these three dimensions have been expanded to portray a more nuanced and context-specific picture of the type and level of intensity of the relations between the network and its environment. As seen in Table 2, five variables are assumed to be associated with the type of environment within which the network operates: (a) the type of relations with the surrounding community; (b) the political authorities' attitude to the group's goals and actions; (c) access to funding; (d) access to recruitment resources; and (e) access to operational knowledge. The extent to which each of these environmental resources or characteristics was accessible to, or supportive of, the terrorists' activities, was evaluated and coded based on a three level scale – *optimal, challenging* and *hostile*.

An *optimal* environment includes cases in which: (O1) the majority of the surrounding community is supportive of the network's violent activities; (O2) the political authorities promote permissive policies—i.e., the government is tolerant or even empathetic to the group's goals and violence (and as a result does not employ any meaningful counterterrorism measures); (O3) there is stable and continuous access to multiple recruitment sources (social frameworks whose nature and population characteristics lend themselves to recruitment, such as educational, cultural or communal institutions that promote, or are tolerant of the network's militant views); (O4) access to significant and continuous funding resources (such as sponsoring states, international charity foundations or criminal initiatives that provide substantial revenues to the network or to some of its members); and (O5) access to operational and military knowledge via multiple

members in the network with military or operational experience.

When some of the above conditions are missing or less accessible, the terrorists will have to confront more challenging conditions, and will encounter more difficulties in terms of producing violence and survivability. A more *challenging* environment is thus defined by (C1) a clear division within the surrounding community regarding the network's activities—while it is not clear if the whole community opposes the violent struggle or terrorist activities, it is clear that these are not supported by large parts of the community and that there is significant opposition to violence (in other words, participating in the violent activities provides limited social capital within the community for the network's members); (C2) active CT efforts—while the government is not supportive of the network's activities/goals, limited CT measures are employed as a result of limited capacity or underestimation (or unawareness) of the significance of the threat; (C3) recruitment limitations—the network has access to just one recruitment resource, or random and non-continuous access to multiple recruitment resources; (C4) funding source limitations (e.g., funding is based on one time financial assistance from an external actor; and (C5) operational knowledge limitations—e.g., knowledge is based on the military experience or training of a single member, or based on short-term specific training of several members (mostly for specific scenarios or operations).

Finally, a *hostile* environment is characterized as one in cases in which (H1) the surrounding community is not supportive of the violent campaign of the network; (H2) the government perceives the network's actions or terrorism as a significant threat, and thus employs its full CT capabilities; (H3) the network is based exclusively on self-funding (and the members have no exceptional financial capacities); (H4) there is no significant access to sources of recruitment (thus, recruitment is based solely on the members' close social networks, including extended family and peers); and (H5) the network has no members with previous military or operational knowledge, nor access to training.

The empirical section of this study will examines the role of different types of environments, as well as each of these environmental components, in determining a network's productivity and durability.

Structural Factors

Thus far, attempts to understand the association between the structure of terrorist networks and their operational outputs has yielded limited theoretical insights. Two main methodological tendencies are deemed responsible, beginning with the lack of diversity in the research population of most studies in terms of the groups' structure, origin, ideology and level of success. The usage of relatively small samples (and sometimes just one case study) of networks, originating mostly from one geographical arena or ideological stream, has prevented the utilization of a classic "control" group that would allow effective comparative analysis.[25] The second is the tendency to exclude contextual information about the actors comprising the network from the network analysis itself or vice versa. Hence, many studies rely solely on qualitative analysis of the network's social dynamic and characteristics,[26] or on structural analysis,[27] rarely combining the two in order to obtain a more insightful understanding of the network's nature. The utilization of a relatively large dataset of networks, as well as an amalgam of social network and contextual analysis, will hopefully enable the current study to provide an improved understanding of the relation between networks' structure and their output.

To understand the ways in which the structure of a terrorist network impacts its productivity and durability, we must first determine what attributes we expect the structure to provide in order to facilitate operational success. To begin with, a network should aim to maximize secrecy, thus allowing minimum exposure of its members following an attack. At the same time, the structure should allow the network to maximize its human resources, enabling effective coordination and communication. Finally, we would expect the

structure to have a high level of resiliency to external attacks on the group. Hence, even elimination of some members should not lead to the overall collapse of the network or to significant diminishing of its operational capabilities.

The need to accomplish these objectives has led many to assume that clandestine, illegal networks must balance between "efficiency" (high level of group centrality,[28] i.e., a strong hierarchy and a low number of redundant ties) and robustness (high density,[29] i.e., a high number of redundant ties, low levels of "betweenness"[30] among most actors, and a flat structure).[31] The former minimizes the chances of the network's exposure because of the limited familiarity and ties between most of the group's members (i.e., the capture or elimination of one actor should have a limited effect on the overall network). This also enables the formulation of a more coherent operational vision, since the "hub" has effective control of most communication channels (and an extremely high level of betweenness). However, the robustness and high density ensures survival in cases when an actor with a high level of centrality is eliminated, since alternative ties allow the network to maintain operational capabilities and coordination. Moreover, it seems that high robustness facilitates effective indoctrination, a crucial element in the radicalization and socialization of network members.[32]

The association between networks' density, centrality and their outputs are examined in this study, as well as the association with the network's tendency to adopt what some have suggested is the way (successful) terrorist networks balance between centrality and density, i.e., adopting a structure that includes a clear division into subgroups that maintain a minimal number of ties between them while having high levels of density within (subgroups oriented structure), resulting in an organizational structure that minimizes chances of entire group exposure (in many cases, the hub's subgroup serves as a barrier between the different subgroups in order to prevent the creation of unnecessary redundant ties). The terrorist network's survivability is increased without harming its ability to engage in effective indoctrination and high quality attacks (which involved several subgroups). The fact that the subgroups in the terrorist networks are relatively "independent" also allows the network to overcome internal ideological conflicts more easily, since each subgroup has the prerogative to decide in which operations to participate or which targets to attack.[33]

But is the number of subgroups also important? And since, in some cases, this is a reflection of network size, does the size of the network correlate with its productivity and durability? Potentially, a network's size and the number of subgroups influence its ability to initiate parallel attacks or sophisticated ones, reflect recruitment potential, and in general, affect operational and logistical flexibility. A particularly high number of cliques (subgroups within the network where every member knows every other member) is associated with higher levels of cohesiveness as well as facilitating coordination and resiliency when the network suffers from elimination of actors (the higher the number of cliques, the higher the chances the surviving members will have enough close and meaningful ties in order to preserve some of the network capabilities). On the other hand, the bigger the network, the more points of contact it has with the environment and external elements, thus augmenting chances of exposure. The association between the number of actors and subgroups and a network's productivity and durability will be tested to ascertain whether an optimal size (which balances these) can be detected.

If compartmentalization is important for the group's survival, it seems logical to assume that its effectiveness depends on exactly who the actors are that are being divided. For example, effective separation between the operational actors and the leaders, planners, and coordinators seems to have strong benefits in terms of durability. It makes the latter less vulnerable, less guided by irrelevant considerations (peer pressure), and ensures continuity even if operational failures lead to losing some "operational" actors. On the other hand, concentration of all leaders in one subgroup can potentially harm the long-term survival of the network

since— if it is exposed and removed—the remaining members of the network are left with only attacks already in the "pipeline" and without long term planning capabilities.

Finally, network science—and especially the unique contributions of Laszlo-Barabasi and his associates[34]—have led some scholars[35] to assume that the number of "hubs" as well as free-scale structure may be associated with the network's survivability. Scale-free structure ensures the resiliency of the network in cases of a random attack, since the chances of elimination of highly connected actors is relatively low, and a high number of hubs ensures that even if eventually one of the hubs has been targeted, other hubs will be able to continue to coordinate the network's violent efforts.

To conclude, the universe of ideas regarding the ways that structure influences the operational output of networks seems populated with contradicting perceptions regarding the importance of most structural characteristics, as well as limited empirical evidence. The following empirical analysis will strive to provide a more coherent understanding of the association between organizational structure and operational outputs.

Dataset and Methodology

The research hypotheses for this article were tested using a dataset containing "social network mapping" and contextual data of 18 networks that were active during the years 1980-2006 in various political, cultural and geographical settings.

Table 2 – Networks' Characteristics

Types of Groups	Durability (Months)	No. of attacks (attacks/durability)	Region	Ideology
Jewish Underground	46	4 (11.5)	Israel/West Bank	Religious/Radical-right
Morocco (late 1990s-2000)	44	22 (2)	Morocco	Religious
Istanbul	25	4(6.25)	Turkey	Religious
Samaria	25	12(2.08)	PNA/West Bank	Religious/Nationalist
Jenin	24	15(1.6)	PNA/West Bank	Religious/Nationalist
Hebron	24	11(2.18)	PNA/West Bank	Religious/Nationalist
Yemen	18	1(18)	Yemen	Religious
Bat Ayin	16	11(1.45)	Israel/West Bank	Religious/Radical-right
9/11	15	3(5)	US	Religious
Jordan (2000)	14	1 (14)	Jordan	Religious
1993 NY network	13	0	US	Religious
Nablus	12	4(3)	PNA/West Bank	Religious/Nationalist
1993 Twin Towers network	12	1(12)	US	Religious
Hofstad	11	0(0)*	Netherland	Religious
Amir Network	9	1(9)	Israel/West Bank	Religious/Radical-right
London	9	1(9)	UK	Religious
Madrid	7	1(7)	Spain	Religious
Morocco (mid 2000s)	6	1(6)	Morocco	Religious

* The killing of Theo van Gogh, by one of the network's members, was more an individual act rather than part of the long-term plots of the group. Even if we consider this event as an attack by the group, the latter will be still ranked at the bottom in of the list in terms of productivity.

Table 2 provides basic information regarding the networks included in the dataset. As can be seen, seven of the networks were active in the West Bank and Israel. Four were Palestinian networks and the other three were Jewish ones. While active in the same region, they were not operating in fully similar environmental

conditions and were functioning during different time periods. Four other networks were active in European countries, three in Western Europe and one in Turkey. The other networks were active on American soil (three networks), other Middle Eastern countries (two networks) and Africa (two networks). The composition of the dataset was based on information extracted from three main sources. The information regarding the Jewish networks is based on two years of field research conducted between 2004-2005 in the West Bank. This led to the creation of a "Jewish terrorism dataset," which included mapping of the social relations within the Jewish terrorist groups. Several recently published works[36] deciphering the dynamic and social structures of these groups have already made use of this dataset. The Palestinian networks data is based on the NSSC's (National Security Studies Center at the University of Haifa) "Palestinian Terrorism Dataset".[37] Finally, the data on the other networks was gathered in the framework of a two-year project funded by the ISF (Israel Science Foundation), intended to analyze the operational and structural dimensions of suicide bombers' networks worldwide (ISF Grant 827/06). In all these three sources, both the contextual information and the mapping of the networks was based on information extracted from an amalgam of open sources including governmental reports, relevant news and academic articles, judicial proceedings, relevant books, interviews with members of some of the groups, policymakers and representatives of law enforcement forces.

Table 2 also includes measures of the networks' productivity and durability. Since productivity refers to the capacity of the network to produce violence consistently and frequently, it was measured by the networks' lifespan divided by the number of attacks it perpetrated. The question of durability however is more complex. While traditionally the tendency of most terrorism datasets is to use the groups' first attack as the starting point for measuring their life spans as terrorist groups,[38] this could be somewhat deceiving. Social networks are a byproduct of social settings; they are formed naturally in the workplace, between individuals sharing residential areas and in familial frameworks. Under some conditions, these networks become "motivated networks," when the members agree on identifiable shared goals. Thus, terrorist networks do not become ones during or after perpetrating their attacks, but when the members are beginning to move actively towards accomplishing their goal of producing violence. In other words, the social network's radicalization at some stage is reflected in the shift from ideas to practical activities leading to engagement in violence; at that point, it is no longer a social network per se, but a motivated group with the goal of perpetrating terrorist attacks. Based on this rationale, the durability of the networks was measured between the point in time its members began actively planning and/or preparing their violent attacks until most of its members were arrested or eliminated by the security authorities, or decided to end the network's violent campaign. As can be observed in Table 2, there is some compatibility between the two variables. Of the six networks which survived two or more years, four showed relatively high levels of productivity (one attack per 2-4 months), and the rest were capable of producing multiple attacks. Of the four networks surviving less than a year, none produced multiple attacks and all needed between half to a full year at least for producing their single attack. In the following sections, a comparative analysis will explore whether high or low productivity and durability are a result of specific environmental or structural characteristics.

Findings: Environmental Factors

Table 3 provides a summary of the environmental conditions under which the different networks operated, as well as their productivity and durability. To facilitate the analysis and the observation of trends in the data, the networks were organized in descending order based on their productivity. As illustrated here, the most important environmental factor influencing the networks' operational output seems to be communal support for the network's activities. Seven of the eight most durable networks and the top five networks in terms of

productivity were active within supportive communities.

Table 3 – Environmental Factors

Network	Durability	Productivity	Government's tolerance – CT Measures	Community	Access to funding	Access to operational knowledge	Access to potential recruitment sources
Bat Ayin	16	11(1.45)	O-C	O	C	O	O
Jenin	24	15(1.6)	H	O	O	O-C	O
Morocco (late 1990s-2000)	44	22(2)	C	O-C	O	O	O
Samaria	25	12(2.1)	C-H	O	O	O-C	O
Hebron	24	11(2.18)	H	O	O	O-C	O
Nablus	12	4(3)	C	C-H	O	C	C
9/11	15	4(3.75)	C-H	C-H	O-C	O-C	O-C
Morocco (mid 2000s)	6	1(6)	C	C-H	C	O	C
Istanbul	25	4(6.25)	H	C-H	C	O	O-C
Madrid	7	1(7)	C-H	C-H	O	C	C
Amir Network	9	1(9)	C	C-H	H	O-C	O-C
London	9	1(9)	H	H	C-H	C	C
Jewish Underground	46	4(11.5)	O	O	C	O	O
1993 Twin Towers network	12	1(12)	C- H	C- H	O-C	O-C	C
Jordan (2000)	14	1-3(4.6)	O-C	C-H	C	O	C
Yemen	18	1(18)	O-C	O-C	O	O	C
1993 NY network	13	0	C- H	C- H	C	C-O	O-C
Hofstad	11	0(0)	H	C- H	C-H	C-O	O-C

O – Optimal; C- Challenging; H-Hostile

Looking specifically at the differences between networks active within the same arena further supports this conclusion. The three Palestinian networks active during the years 2000-2004 in the West Bank (Jenin, Samaria, Hebron; for more in-depth information about the networks see also Pedahzur and Perliger, 2006)[39] operated during the Second Intifada, within a highly dense Palestinian population that greatly supported the suicide attacks' campaign initiated by these networks. While the data are not always consistent over time, public opinion polls show that 60-70% of the Palestinian population supported a violent struggle, believing that it was more efficient in ending the Israeli occupation than peaceful negotiations. Moreover, attacks against settlers and soldiers were supported by almost 90% of the Palestinians, and in general, around 80% rejected any punishments for activists in terrorist networks.[40] Similar findings were obtained when the polls inquired about the level of support for specific suicide attacks initiated by the Palestinian networks (for example, 75% supported the suicide attack at Maxim Restaurant initiated by the Jenin network).[41] In some cases the popularity of the suicide attacks transformed them into prominent mobilization mechanisms in the competition for popular support among the different networks.[42] In accordance with the theoretical logic presented earlier, the only Palestinian network which operated in a much less supportive environment (the "Nablus Network", which was active in the city of Nablus in 1996), was also significantly less durable and productive in comparison to the aforementioned three other Palestinian networks. In Nablus itself, the base of operations of the network, less than 30% of the population supported any kind of violent anti-Israeli operations.[43] Furthermore, we can find in 1996 a high level of support for the negotiations between Israel and the Palestinian National Authority (PNA) (75%), and for the peace processes in general (68%). Even after the victory of the Israeli right in the May 1996 Israeli general elections, and the appointment of Benjamin

Netanyahu as Prime Minister, the support for violent attacks did not exceed the 40% mark.[44]

The case of the Jewish networks further provides support for the importance of communal support. The two more durable (especially the "Jewish Underground") and productive (especially the "Bat Ayin" network) Jewish networks enjoyed significant support from within the settler community (both networks were based in West Bank settlements) as well as from their representatives in the political system. This was reflected not only by the supportive response of large parts of the settler community during and after the exposure of the networks—including mass demonstrations, rallies and petitions against any attempt to assume harsh punishments against the networks' members[45]—but also in surveys conducted during the periods of the networks' activity showing strong support in the settlers community for violent acts of "self-defense" by Jews and for the release of the networks' members (60% among the entire Jewish population and 75% among the settlers)[46]. This support and understanding for the networks' actions is illustrated effectively by the words of an Israeli settler after one of the "Jewish Underground" attacks (as he was quoted by an Israeli journalist): "Since the attack, you can feel the joy here [in the settlements]…it's about time that the Arabs were repaid for their deeds."[47]

In contrast, the Amir network, which was neither particularly productive nor durable, was mostly situated geographically in a more neutral area (the city of Herzliya, one of the more liberal and secular cities in Israel). [48] Moreover, the ideological core ideas of the network, which focused on the need to eliminate the Israeli Prime Minister, were much less consensual than the type of ideology and attacks initiated by the two previous networks.[49] Essentially, the Amir network was interested in assassinating an Israeli, who was practically a war hero, and although he was despised by many on the Israeli right, there are indications that very few supported the actual assassination.[50] This was reflected in the inability (or difficulty) of the network to obtain a spiritual approval for its plans from the settlers' religious leadership,[51] or to expand beyond its core founding clique, although some members had access to significant recruitment resources (such as the students union at Bar-Ilan University).[52] In contrast, the other two networks targeted Palestinians, direct adversaries of the settlers' population, and acted during times of violent clashes between the two communities (the early 1980s and the second Intifada).

Besides the networks operating in the West Bank/Israel, two other networks showed high levels of durability (the "Istanbul" network) and productivity (Morocco 1998-2002). Both were active in relatively challenging, but not completely hostile communal environments within moderate Muslim countries (Morocco and Turkey). The Moroccan network, lasting for almost four years, was based mainly in the orthodox "Hay El Oulfa" neighborhood of Casablanca, which is known for its poverty, lack of governmental presence and hostility towards authorities. Moreover, one of the network's leaders, Mohamed Damir, was a prominent figure in the neighborhood (basically a social leader).[53] Hence, while not an optimal environment like those mlieus enjoyed by the Palestinian or Jewish groups, it still provided a relatively safe haven for the network, which was not hesitant about eliminating governmental representatives who challenged its control of the neighborhood.[54] Furthermore, the relatively low-key nature of the network's operations—mainly assassinations against those who showed Western tendencies and non-Islamic behavior or crime-related activities—facilitated more supportive attitudes from the immediate surrounding environment of the network, and contributed to the limited and delayed governmental response. The Istanbul network was not highly productive, but it was durable. It seems that there are a few elements that can explain the ability of the network to overcome the relatively challenging communal environment. The first is the external logistic and financial support, which limited the need to resort to communal support, as well as the fact that for significant periods of time members of the group were not physically present in Istanbul.[55]

In contrast, governmental attitude seems to have limited influence on the operational capabilities of the

networks. Some of the more durable and productive networks have confronted a hostile regime (Hebron, Samaria, Jenin, Istanbul) while some of the networks active in more convenient environments in terms of governmental response or awareness (Nablus, Yemen, Amir Network, Jordan) were not really productive or particularly durable. Nonetheless, government response has some influence on the durability of networks; none of the networks enjoying permissive political environments was categorized in the lower third in terms of durability.

Lastly, findings regarding the association of operational success and access to funding, recruitment resources and operational knowledge are less consistent. Of the three, access to recruitment resources seems most associated with operational success. This is not surprising as it is somewhat correlated with the level of communal support. Eight of the ten most durable networks and seven of the ten most productive networks had "optimal," or close to optimal access to recruitment resources. However, two-thirds of the networks included multiple members with military training (although not always of the highest quality, and one was not engaged in operations which demanded military training), while the other third included at least one actor with such expertise. Hence, it seems that operational knowledge is more a pre-condition for the emergence of the network than a factor influencing its durability or productivity. Lastly, funding appears to be associated on some level with durability; six out of the ten most durable networks enjoyed "optimal" funding, and four of the five least durable suffered from limited funding. This tendency is somewhat less prominent when looking at productivity; while six of the seven more productive networks enjoyed "optimal" funding, a high level of funding could also be found in some of the less productive networks.

Findings: Structural Factors

Naturally, the size of the dataset prevented the use of advance statistical analyses. Nonetheless, some trends are detectable when looking at the association of structural characteristics with the operational success of the networks. In the theoretical framework, the need for clandestine networks to balance between centrality and density was emphasized. Escalating to extreme levels of either one can potentially decrease the network's survivability and productivity. Indeed, the analysis of the networks' social structure provides some support for this hypothesis (see Table 4).

Table 4 – Structural Characteristics

	Network's Centrality	Network's Density	Clustering Coefficient	Size	No. of Hubs	Free Scale (%)	No. of Cliques	Size/ No. of Cliques
Bat Ayin	30.667	1	0.622	16	0	40	12	1.333
Jenin	21.209	1.122	0.705	49	3	48.5	118	0.415
Morocco (late 1990s-2000)	13.737	1.296	0.713	24	2	56	5	4.8
Samaria	32.435	1.107	0.991	36	4	50.6	24	1.5
Hebron	33.088	1.64	1.06	36	2	31.6	75	0.48
Nablus	21.013	1.173	0.997	22	1	32.3	8	2.75
9/11	36.565	2.782	1.04	20	0	37.7	0	
Morocco (mid 2000s)	25.271	1.414	1.121	41	4	46.3	10	4.1
Istanbul	39.369	1	0.659	28	6	49.7	13	2.154
Madrid	8.031	1.903	1.23	69	15	52.3	18	3.833
Amir Network	52.381	0.767	1.385	8	1	42.1	2	4
London	19.407	1.274	0.739	16	1	38.3	6	2.667
Jewish Underground	36.097	2.763	2.038	29	4	45.8	14	2.071
1993 Twin Towers network	59.439	2.688	1.844	15	1	40.6	5	3
Jordan (2000)	20.333	1.708	1.343	11	0	35.4	3	3.667
Yemen	31.556	1	0.465	16	0	40.6	4	4
1993 NY network	66.272	2.625	1.901	14	1	36	6	2.333
Hofstad	12.628	1.464	1.017	29	6	48.7	15	1.933

All of the more productive networks except for one (eight of the nine networks that produced multiple attacks, as well as the mid-2000s Morocco network) have a group centrality level of 20-40%, some of them very close to the overall sample average level of centrality (31.08). When looking at the networks that were "one-hit wonders" the picture is significantly more varied. The less durable networks tend to slide into the extremes of very low network centrality (Madrid, Hofstad) or very high network centrality (1993 WTC network, Amir Network). More specifically, the first group of networks' average centrality is 28.1 with a standard deviation of 8.37 (29.7%) while in the second group the average centrality is 34 with SD of 21.11 (62%). This trend is visible also when looking at durability. The variance in group's centrality among the ten less durable networks (21.6) is significantly higher than the variance among the nine most durable networks (8.10). This supports the view that "successful" networks balance between the need to develop some level of centralization (mechanism which allows them to preserve a cohesive vision and consensus around the network's goals, as well as for coordination), and the need to prevent it from becoming an obstacle to organizational flexibility and a potential vulnerability (in cases of penetration and/or elimination of central actors or subgroup).

The findings are less consistent when examining networks' density. In general, however, density is lower among the more durable and productive networks. The nine more productive networks (those that produced multiple attacks and the mid-2000s Morocco network) had an average density level of 1.39 (.56SD) and only

one of them had a density level higher than 1.7. The findings are similar when examining the association between networks' density and durability. The density of seven out of the eight more durable networks was under 1.7, while five out of the other ten (less durable networks) had a density higher than 1.7. The former group of networks' average density was 1.3 (.60SD), in comparison to 1.7(.70SD) in the latter group. The findings might reflect that in the dilemma between inflating the number of redundant ties (in order to foster resilience) and, on the other hand, the need to create a more compartmentalized structure with limited redundant ties, the latter structure is more effective in enhancing operational success.

As indicated earlier, some students of terrorist networks perceive the subgroups oriented structural formation as a preferable solution for overcoming the contradictory needs of clandestine networks, and for balancing between robustness (density) and centrality. The findings do not provide support for this contention but actually seem to support the opposite view. In order to assess the closeness of the networks to subgroups oriented structure, the weighted overall clustering coefficient [56] of each network was measured. In general, the more durable and productive networks showed lower levels of clustering. Except for the Jewish underground network, all the eight "leading" networks in terms of durability possessed clustering coefficients of below 1 or close to it, while in the eight less durable networks all but one possessed clustering coefficients of above 1, and some close to 2. This tendency is more prominent when looking at the association between clustering coefficient and productivity; all of the networks perpetrating multiple attacks held clustering coefficients of between 0.62 and 1.22 (average of 1.1), while seven of the nine "one hit wonders" (and the Hofstad group) had a clustering coefficient level higher than one (average of 1.5).

However, while subgroups-based structure is not optimal in terms of durability and productivity, this does not mean that the existence or number of sub-groups are not an important factor in determining the network's operational success. The findings suggest that the relative (to the group's size) number of cliques within a network is highly associated with both durability and productivity. Among the nine more productive networks (as defined earlier) the average level of clique proportion (number of cliques divided by the network size) was 1.94 (the smaller the number, the higher the proportion of cliques in terms of network size) in comparison to 3.05 among the less productive networks. While the sample size is not optimal, ANOVA analysis confirmed the statistical significance of the gap between the two groups ($F=3.158^*$). The same finding, although somewhat weaker, could be seen when viewing the relationships between durability and number of cliques (2.09 level of cliques proportion among the durable networks—i.e., surviving more than a year—versus 2.89 among the less durable networks).

Finally, while no visible association was found between tendencies toward scale-free structure or number of hubs and operational success, it seems that size is important. The more productive and durable networks include more than 20 members (except for the Bat-Ayin network). Among the less productive networks (the "one-hit wonders") we can find a relatively high portion of networks with fewer than 20 members (Amir network, London network, Jordan network, Yemen, and both 1993 NY networks; the Hofstad and the Madrid networks are the exceptions).

Conclusion

Homegrown and relatively independent terrorist networks do not survive for long. Just two of the networks analyzed in this study survived in practice for more than two years, and none of them exceeded the five-year mark. Nonetheless, some of the networks were clearly more successful than others. Is it possible to portray the main characteristics of a successful terrorist network? The findings presented above provide at least a starting point for discussion. To begin with, the operationally effective networks generally operate within

supportive and homogeneous communities, tolerant of the violent struggle. Under these conditions, the social frameworks of the community become effective and accessible recruitment resources. Hence, while in most of the networks, the core subgroup is based on family ties or other primary social ties, the operational capabilities and longevity of the networks are determined by their success in expanding the core primordial social network and using the recruitment resources to expand the network, build potential new subgroups (in most cases these subgroups are social networks which were formed within the original recruitment resources, such as educational institutions, religious establishments, residential neighborhood and others) and recruit potential perpetrators (in the case of the more durable suicide attacks' networks, using mostly marginal actors for operational reasons; see more in Pedahzur and Perliger, 2006).

Less encouraging is that the findings suggest that the level (and types) of counter-terrorism measures employed by the state do not have a consistent impact on the productivity or durability of networks. Nonetheless, since the networks operated in different time periods and in different regions, it is difficult to draw conclusions from the findings regarding the current capabilities of Western democracies in countering homegrown networks. In addition, the findings of course do not consider the many networks which never materialized as a result of counter-terrorism policies or operations. The findings also suggest that perhaps the answer is in focusing counter-terrorism measures on prevention of proliferation of material and operational "capital." While funding and operational knowledge/training are not strong predictors of operational success, they appear to be potential preconditions for the formation of the networks and for network's shift from ideological radicalization stage to the operational/behavioral stage.

When looking at the structural characteristics that differentiate the successful from the less successful networks, it seems that the most important elements are the ability of the successful networks to balance effectively between cohesiveness and flexibility while preserving their dynamic nature. Successful networks obtain enough hierarchy (level of centrality) to ensure effective coordination and cohesive operational vision, and on the other hand, provide enough freedom and flexibility to its members and subgroups–a practice which ensures survival when some parts of the network become dysfunctional. Successful networks are also potentially highly dynamic. They have a relatively high portion of overlapping cliques, and each member is affiliated to several cliques. Thus, when the network is under strain, even if some complete subgroups have been eliminated or isolated, the remaining members have the potential to form alternative subgroups. This also explains the absence of "small world structure" among the successful networks, as this actually limits the number of potential subgroups or cliques the single member can be affiliated with. Moreover, the existence of a high portion of overlapping cliques reflects the capability of a successful network to effectively integrate the subgroups recruited from the different recruitment resources.

The current study represents an exploratory attempt to provide some insight into the factors influencing terrorist network's durability and productivity, by looking at the structure and characteristics of a relatively high number of networks originating and operating in different settings. While this study is one of the first to implement a comparative approach for the investigation of terrorist networks, some limitations should be kept in mind when evaluating the findings. First, some of the networks analyzed could be seen as "sleeper cells" rather than "authentic" independent or homegrown networks, mainly the 9/11 and the Yemen networks. Although these two networks included "local" members, it could be argued that their success or failures were related to their type and nature of ties to AQ central. Nonetheless, even the omission of these networks could not have significantly changed the main findings. Another problem is a great difficulty in assessing the exact level of support for the different networks within the surrounding community. This is especially true when dealing with networks that existed for short periods of time. Finally, mapping the social networks of the different terrorist networks is based on a static "snapshot" of the network's structure.

Although in some of the networks, there is evidence that limited changes occurred over time (e.g., the Amir Network, or Palestinian networks), it could be assumed that this was a limitation in some of the more dynamic networks structure-wise.

The current research points out several promising paths for future research. These include more deeply studying the interplay between environmental and internal factors contributing to the productivity and durability of terrorist networks and looking at indicators of dynamic structure as potential predictors of durability. Another important future path for research is extending the theoretical framework on productivity and durability to a new spectrum of violent groups to include cults and networks that are part of a larger social movement (e.g., ELF, Neo-Nazi groups etc.). Finally, and perhaps most important, there is a need to consider the role of ideology in the outputs of terrorist networks. To illustrate, can we identify specific relationships between operational patterns and ideological objectives, which eventually also impact on the durability and productivity of terrorist networks? Are some ideological goals actually more prone to short term campaigns and limited violence? The answers to these questions can clarify whether or not maximizing productivity and durability are constant across ideological lines or not.

About the Author: Arie Perliger *is the Class of 1977 Director of Terrorism Studies at the Combating Terrorism Center and Associate Professor at the U.S. Military Academy at West Point. He has published widely on issues related to terrorism and political violence, security, Middle Eastern politics, the far right in Israel, Europe and the U.S., and the applicability of social network analysis to the study of social phenomena.*

Notes

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[26] Vidino, 2007.

[27] Krebs, 2002.

[28] Degree centrality of an individual actor is the ratio of each actor's actual ties to his potential ties (Freeman, Roeder and Mulholland 1980), or simply put, the level of is connectedness to other actors. The concept of group centrality in this article reflect the tendency of the group to adopt a "star network" in which the

majority of the actors are connected to one member (hub) while have limited ties between themselves (Wasserman and Faust, 1994 chapter 5).

[29] Density is usually defined as the sum of the values of all ties divided by the number of possible ties. That is, with valued data, density is usually defined as the average strength of ties across all possible (not all actual) ties within the network (Freeman, Roeder and Mulholland 1980).

[30] "Betweenness" assists in identifying those actors who connect between subgroups or lone actors within the network (Borgatti 2005:59-60).

[31]] Helfstein and Wright, 2011.

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[38] See for example: Cronin, 2009.

[39] Pedahzur and Perliger, 2006.

[40] See for example: http://www.pcpsr.org/survey/polls/2001/p3b.html;http://www.pcpsr.org/survey/polls/2002/p5a.html; NSSC datasets. In some surveys two questions were presented – support in terrorism and support in armed attacks. Naturally, the latter enjoyed higher levels of support, reflecting that while refusing to call it terrorism, still the majority supported the armed struggle.

[41] See http://www.pcpsr.org/survey/polls/2003/p9a.html.

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[43] See http://www.pcpsr.org/survey/cprspolls/96/poll22c.html#suparmed.

[44] See http://www.pcpsr.org/survey/cprspolls/96/poll22b.html;http://www.pcpsr.org/survey/cprspolls/96/poll24b.html;http://www.pcpsr.org/survey/cprspolls/96/poll25a.html.

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