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NON-KINETIC TARGETING OF DARK NETWORKS: SOCIAL NETWORK ANALYSIS OF THE PKK TERRORIST ORGANIZATION

by

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December 2018

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Dark networks can be defined as illegal and covert social networks. Terrorist groups are an excellent example of a dark network. Decision makers have two basic options to disrupt dark networks. The first option is kinetic targeting, which entails finding the target and capturing or eliminating him or her. The second is non-kinetic targeting, which involves finding, tracking, and monitoring key actors, psychological operations, information operations, rehabilitation and reintegration, and institution building.

Because of the covert nature of dark networks, it is a challenge to understand the whole structure of the dark network and identify the right actor for non-kinetic targeting. At this point, social network analysis (SNA) can be used to solve this problem. SNA is a set of mathematical tools and theories developed to understand the structure of social networks by assuming the individual's behavior is driven by the structure of the social network in which he or she is embedded.

In this thesis, I analyze the Kurdistan Worker's Party (PKK) terrorist organization in Turkey using SNA and craft a non-kinetic targeting plan to disrupt this dark network.

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NON-KINETIC TARGETING OF DARK NETWORKS: SOCIAL NETWORK ANALYSIS OF THE PKK TERRORIST ORGANIZATION

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LIST OF ACRONYMS AND ABBREVIATIONS

IO	Information Operations
IRC	Information Related Capabilities
KCK	Kurdistan Community Union
PCDK	Kurdistan Democratic Solution Party
PJAK	Part for Free Life in Kurdistan
PKK	Kurdistan Worker`s Party
PYD	Democratic Union Party
SNA	Social Network Analysis

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For the strength of the pack is the wolf, and the strength of the wolf is the pack.

—*Edmund Clarence Stedman*

Thank you to all the pack for your support.

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I. INTRODUCTION

A. PROBLEM AND PURPOSE

Dark networks are defined as illegal and covert social networks (Cunningham, Everton, & Murphy, 2016). Their research illustrates that decision makers have two basic options to disrupt these networks. The first option is kinetic targeting, which entails finding the target and capturing or eliminating him or her. The second is non-kinetic targeting, which involves finding, tracking, and monitoring key actors, psychological operations, information operations, rehabilitation and reintegration, and institution building.

In a kinetic targeting process, it is not a complex problem for planners and decision makers. Because even selecting and prioritizing targets are still a challenge, matching available sources with the target is evident. It involves removing the target. The elimination of Saddam Hussein, Osama bin Laden, or Abdullah Ocalan are examples of kinetic targeting, and are referred to as manhunting (Everton, 2012). Cronin (2011) points out that even though kinetic targeting is the most applied option, it is often not enough to disrupt dark networks.

So non-kinetic targeting is an opportunity to disrupt dark networks. Yet, because of the covert nature of dark networks, it is a challenge to understand the whole structure of the dark network and identify the right target for the non-kinetic targeting process. At this point, social network analysis (SNA) can be used to solve this problem. As described in *Disrupting Dark Networks*, SNA is a set of mathematical tools and theories developed to understand the structure of social networks that assume the individual's behavior is driven by the structure of the social network in which he or she is embedded (Everton, 2012).

In this thesis, I analyze the Kurdistan Worker's Party (PKK) Istanbul Executive Committee, which provides financial and recruitment support and

serves as an ideological training center. My strategic choice for disrupting this terrorist organization will be the non-kinetic approach.

B. KEY TERMS

Dark network: covert and illegal networks.

Social network analysis: mathematic-based tools and theories that enlighten and visualize the structure of a network.

PKK terrorist organization: an ethno-nationalist separatist terrorist organization that has operated in Turkey since 1978.

C. STRUCTURE OF THESIS

Figure 1 shows the overall structure of the thesis. In Chapter II, I review the academic papers about information operations, non-kinetic targeting, and dark networks related to the PKK, highlighting the gap between strategies to disrupt dark networks and relations between actors. Chapter III explains the fundamentals of visual analytics and social network analysis as a methodology. Data analysis occurs in the fourth chapter, which ends with crafting a non-kinetic targeting plan to disrupt the PKK. In the final chapter, I discuss challenges in analyzing dark networks and further recommendations.

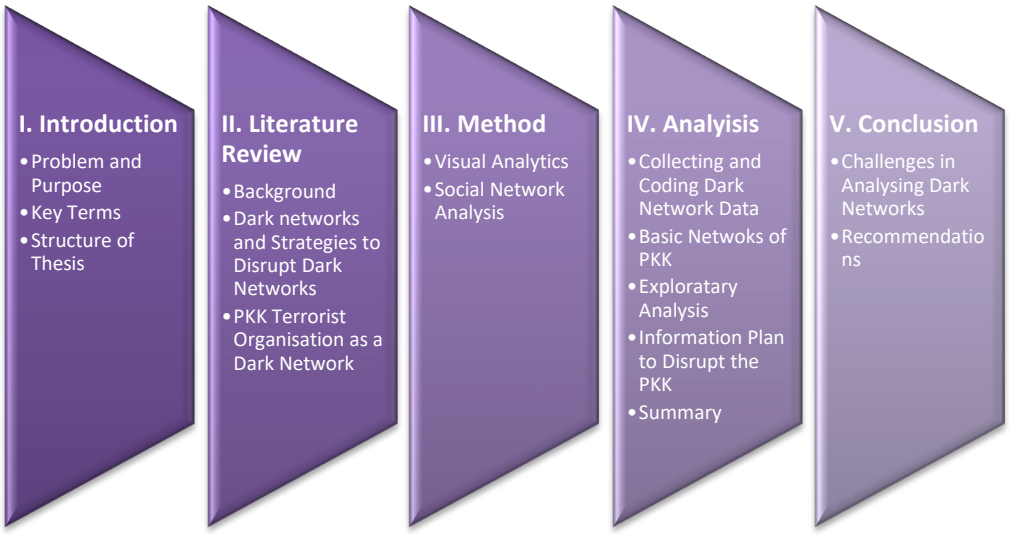

Figure 1. Structure of the Thesis

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II. LITERATURE REVIEW

A. BACKGROUND

War is defined as the armed actions of states or social classes to gain their own goals. The article “The Changing Face of War: Into the Fourth Generation” describes four war generations in modern history (Lind, Nightengale, Schmitt, Sutton, & Wilson, 1989). The article suggests that the first generation of warfare tactics were based on line and column tactics, the second generation was based on linear movement, and the third generation warfare tactics were based on fast maneuvers, such as blitzkrieg tactics in War World II. As they noted, these three generations were against known adversaries. In the article, the authors describe a new generation of warfare that terrorism and new technology combine. In this fourth warfare generation, the battlefield and the adversary are not clear (Lind, Nightengale, Schmitt, Sutton, & Wilson, 1989).

The 9/11 attack in 2001 was the top level of this kind of fourth generation warfare operation. A terrorist organization bypassed military power and struck directly at civilian and military targets in the homeland. After this attack, the main question was “Who is the enemy?” In *Mapping Networks of Terrorist Cells,* the author showed a different aspect of the question. He used a social network analysis (SNA) to examine the network involved in the 9/11 attack (Krebs, 2002). Planners and decision makers started to realize the importance of SNA because of this study.

For decision makers, it is essential to have multiple strategies to disrupt dark networks. Cunningham, Everton, and Murphy (2016) provide a roadmap to examine dark networks using SNA. In *Understanding Dark Networks: A Strategic Framework for the Use of Social Network Analysis* readers are first introduced to SNA’s basic concepts. The authors then present the strategic alternatives for decision makers to disrupt dark networks. The book continues with detailed SNA subtopics such as network topography, cohesive subgroups within a social

network, networks' central actors, bridges and brokers, and positional analysis. Its final section introduces techniques for examining dark networks such as the quadratic assignment procedure, conditional uniform graphs, the exponential random graph model, longitudinal approaches, and stochastic actor-oriented models. Therefore, this study is the essential resource for my thesis model. I use the necessary SNA software tools and apply the strategies explained in the book to analyze and disrupt the PKK terrorist organization (Cunningham, Everton, & Murphy, 2016).

The Department of Defense publication, Joint Publication 3–13 *Information Operations* (2013), is a joint doctrine for the planning loop for information operations. According to the publication, "information operations (IO) are the integrated employment, during military operations, of Information Related Capabilities (IRCs) in concert with other lines of operation to influence, disrupt, corrupt, or usurp the decision making of adversaries and potential adversaries while protecting our own" (Joint Chiefs of Staff, 2013), For the non-kinetic approach to disrupt dark networks, I will use the information operation planning process outlined in JP 3–13.

In his 2010 Naval Postgraduate School thesis *Disrupting Terrorist Networks: An Analysis of the PKK Terrorist Organization,* Anil Karaca analyzes the Kurdistan Worker's Party (PKK) terrorist organization in Turkey and lays out a plan to disrupt it. Karaca applies contemporary social movement theory and identifies the key components of the PKK (Karaca, 2010). These key components are tangible such as funding resources. The gap in the thesis is that the relationships (ties) between individuals is disregarded. In my thesis, I focus on individuals and how they react to each other in order to form a non-kinetic targeting plan using SNA.

B. DARK NETWORKS AND STRATEGIES TO DISRUPT DARK NETWORKS

Dark networks are social networks that try to be invisible and operate against the authority (Milward & Raab, 2006). Operations of dark networks might be illegal or legal. This situation changes according to the authority in power. Yet, as described in *Understanding Dark Networks*, usually dark networks definitions include illegal and covert operations (Cunningham, Everton, & Murphy, 2016). Since dark networks are against authority in governing, governments seek to find solutions to control and destroy dark networks.

Cunningham, Everton, and Murphy (2016) discuss two general options to disrupt dark networks. The first one is a kinetic approach, which is more practical and visible to the public. For the short term, politicians and decision makers usually prefer a kinetic approach. The non-kinetic approach requires patience since the public cannot see the result in the short term. Table 1 presents the kinetic and non-kinetic options to disrupt a dark network.

Table 1. Options to Disrupt Dark Networks. Adapted from Cunningham, Everton, and Murphy (2016).

Kinetic Approach	**Non-Kinetic Approach**				
Capture or eliminate	Track	Psychological Operation	Information Operation	Rehabilitation and Reintegration	Institution Building

Cronin (2011) explains and presents case studies about ending terrorism. Table 2 outlines the strategic options that are explained in the book.

Table 2. Options to Ending Terrorism. Adapted from Cronin (2011).

Kinetic Approach	Non-Kinetic Approach			
Catching the Leader	Transition toward a Political Process	Ending Terrorism by Success	Ending Terrorism by Failure	Transition to Another Form of Violence
Crushing Terrorism with Force				

Since the non-kinetic approach is my strategic option to disrupt PKK, I used a combination of non-kinetic options to form a non-kinetic targeting plan.

C. PKK TERRORIST ORGANIZATION AS A DARK NETWORK

The Kurdistan Worker's Party (PKK) is a nationalist, separatist terrorist group in Turkey that has been active since 1978. According to the periodic table of terrorist groups prepared by Navanti Group in January 2018, the PKK, shown with a red circle in Figure 2, is defined as a large group (meaning there are between 2,500 and 5,000 members), with very high activity committing over 1,000 attacks per year (Navanti, 2018).

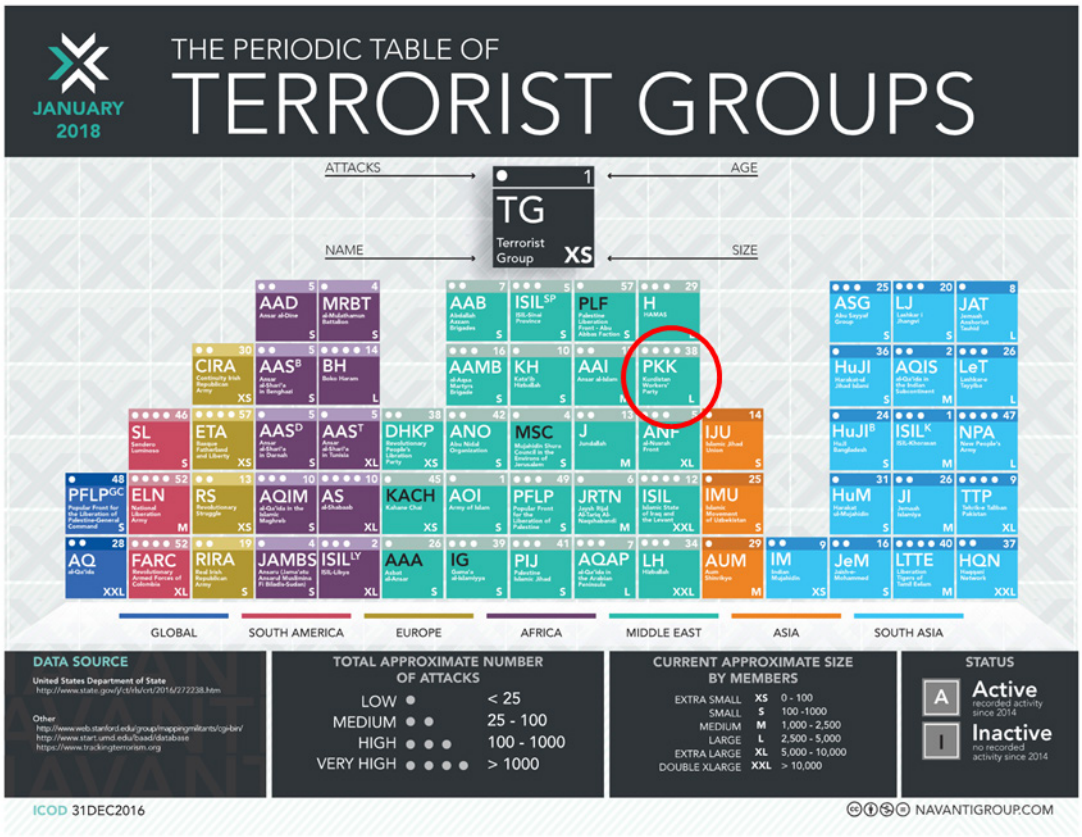

Figure 2. Periodic Table of Terrorist Groups.
Adapted from Navanti (2018).

The PKK is also a terrorist group according to the Congressional Research Service report (Cronin, Aden, Frost, & Jones, 2004). The group began a guerilla operation against Turkey in 1984 that cost around 40,000 lives (Bulut, 2014).

The PKK is not the only Kurdish separatist terrorist organization in the region. As seen in Figure 3, the Party for Free Life in Kurdistan (PJAK) is a terrorist organization located in **Iran**, the Kurdistan Democratic Solution Party (PCDK) is a terrorist organization located in **Iraq**, and the Democratic Union Party (PYD) is a terrorist organization located in **Syria**. The Kurdistan Community Union (KCK) serves as a coordinating organization of these four separatist terrorist organizations. The primary objective of these terrorist organizations is to

create a Kurdish territory and, ultimately, a federal Kurdish country reaching to the Mediterranean Sea (CIMEN, 2012).

Figure 3. Terrorist Groups in the Region

The PKK has survived for more than 40 years due to its dark network structure and ability to adapt to changing environments and conditions (Kanmaz, 2014). Kinetic targeting options, such as arresting the leader of the PKK, Abdullah Ocalan, did not solve the problem entirely. The changing phases of the conflict are shown in Table 3.

Table 3. The Phases of the PKK Conflict

Period	Milestones
1978–1984	• Organizational structure established • Goals and objectives determined • Members trained for guerrilla operations
1984–1993	• The PKK guerilla fight began in 1984 • Turkish Armed Forces initiated conventional military operations against the PKK • In 1993 the PKK reached the tipping point of violence (Unal, 2015)
1993–1999	• The PKK started to shift to indirect means of violence such as terrorist activity in the international arena • The PKK started to shift on political solutions • Turkish governments' first attempt to set up a dialogue observed • The PKK guerilla fight changed to a more asymmetrical approach • In 1999, the leader of the PKK arrested
1999–2005	• The PKK declared a ceasefire in 1999 and withdrew its armed militants from Turkey (Unal, 2015) • The PKK revised goals as seeking political and cultural rights for Kurds (Cronin, Aden, Frost, & Jones, 2004)
2005–2015	• Turkish government declared solving the conflict using social and political means instead of military operations • In 2007, the Union of Kurdistan Communities (KCK) founded as an umbrella organization to establish a de facto autonomy in parts of Turkey, Iran, Iraq, and Syria • In 2015 military operations resume against the PKK
2015–2018	• Turkish Armed Forces' military operations shifted from conventional means to a more sophisticated, target-oriented and technology-based operations beyond Turkey borders • Kurdish parties crossed 10 percent threshold in elections and sent members to parliament

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III. METHODOLOGY

Disrupting a dark network requires an in-depth analysis of the network. I used social network analysis (SNA) as the primary methodology for this thesis. For data coding, I used the Palantir program, which is a Visual Analytics software application.

A. VISUAL ANALYTICS AND PALANTIR

Visual analytics is a process of automatic data analysis based on visual interfaces (Thomas & Cook, 2005). It combines data analysis, visualization and human-computer interaction as illustrated in Figure 4 (Keim, Mansmann, Stoffel , & Ziegler, 2009). Analysts seek to derive meaningful information from big data, discover deep connections, and communicate the results easily with decision makers.

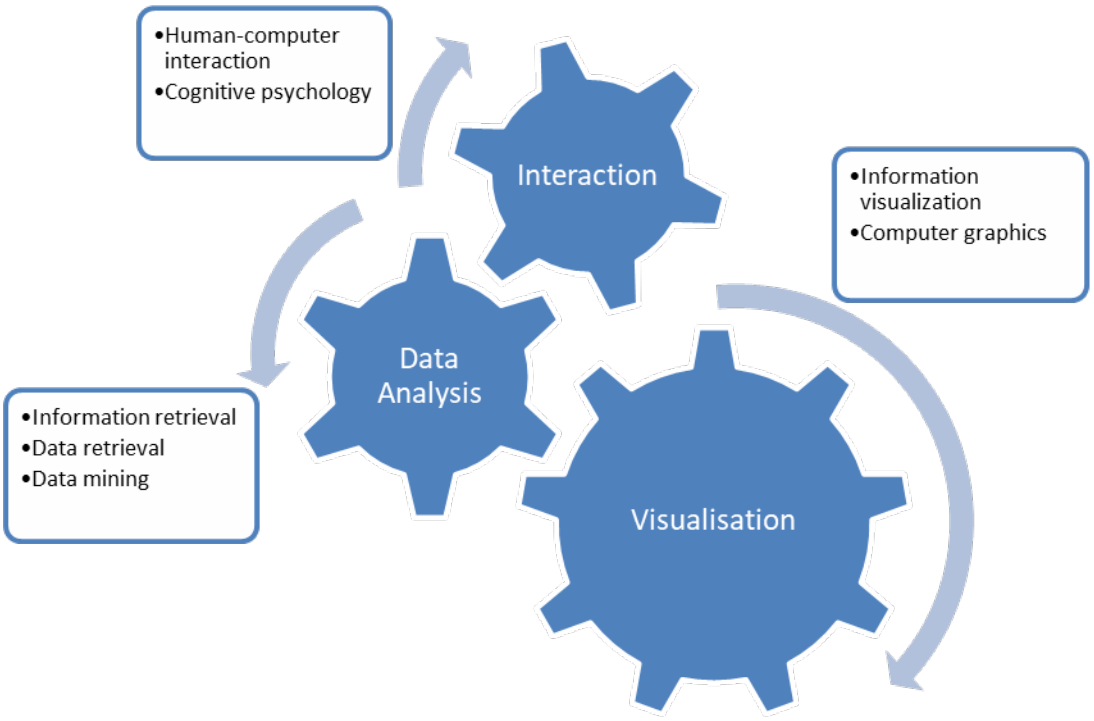

Figure 4. Visual Analytics

One of the visual analytics tools is Palantir. Palantir Technologies was founded in 2004 and offers a software application for integrating, analyzing, and visualizing big data. As noted on their website, intelligence, defense, and law enforcement communities such as the Los Angeles Police Department are using Palantir to solve real-world collecting, coding and analyzing problems (Palantir, 2018).

I used Palantir primarily for tagging, which is a process for structuring information from unstructured data sources, creating links, and adding attributes. An example of tagging is shown in Figure 5, a lab study of DA3610 Visual Analytics class in summer 2016 quarter.

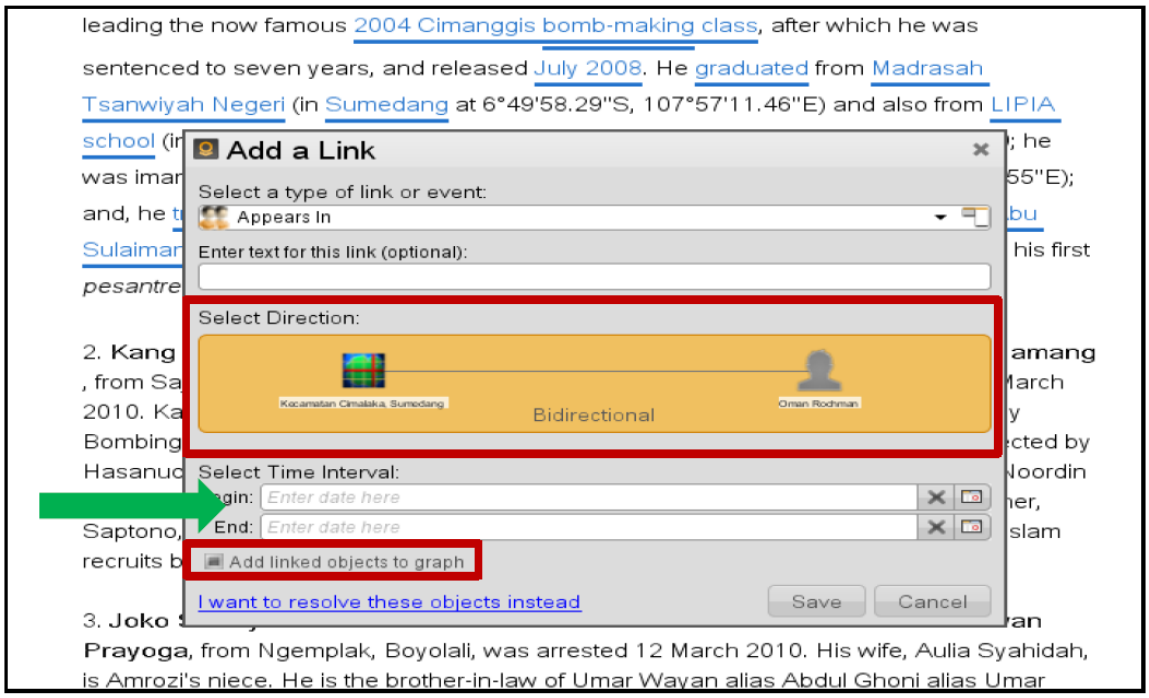

Figure 5. Tagging Unstructured Data

The data source for this thesis is the record from the Istanbul office of the prosecutor's indictment report in 2012 (CIMEN, 2012). It contains 2,401 pages and includes information about the terrorist organization member's affiliation and relational data. In all, 550 individuals are included in the data source. These data

are a matter of public record. For this thesis, no names were associated with these individuals; the data for this study contained unique identifiers to provide differentiation between actors. So I worked on this unstructured data in 32 class hours in the summer 2016 quarter. The output was structured data that is ready to use in SNA tools.

B. SOCIAL NETWORK ANALYSIS

Social network analysis (SNA) is a method that assumes an individual's behaviors are affected by the social network they are embedded in (Cunningham, Everton, & Murphy, 2016). It means that one's decision is not only his or her decision, but it is a combination of spouses', children's, and friends' ideas. So it is important how an actor interacts in the social network. Interaction patterns are generally seen as more important than actors' attributes for understanding social network behaviors.

Before giving basic terms and concepts of SNA, I will explain some misconceptions about SNA. First of all, SNA is not social networking such as Facebook or Twitter. SNA may be used to analyze relations in a Facebook group, but SNA is not about Facebook or Twitter. The second issue is within SNA; networks can be as small as two actors, and they can range from being highly decentralized to being highly centralized. Networks, in other words, should not be equated with decentralized organizations. In SNA, all groups, large or small, centralized or decentralized, are networks. The third misconception is that link analysis is the same as SNA. SNA focuses only on actors relations, but link analysis shows every link such as a building link to an actor. Link analysis shows all connections and an actor`s position is not necessarily meaningful. By contrast, within SNA, an actor`s position implies a role in social space. The final and most important misconception is that it is similar to other statistical approaches. Standard statistical approaches focus on attributes such as gender, education or age, not the social interaction in the network. Nevertheless, SNA focuses on

actors` interaction in the network that they are embedded in(Cunningham, Everton, & Murphy, 2016).

1. Basic Terms of SNA

For a better understanding of SNA, I begin by explaining its basic terms.

a. Actor

In a network, just about anything can be an actor (even non-human objects). Organizations, terrorists or terrorist groups, states, and so on might be an actor in SNA (Everton, 2012).

b. Tie

The tie is the most critical term of SNA since ties form the network. In a state network, there are financial and trade ties. In a family network, there are liking and friendship ties. In a terrorist network, financial and communication ties are examples of ties in SNA. Ties serve as channels between actors through which material and non-material resources flow.

c. One-Mode Network

One-mode networks have a single set of actors and the ties are formed between them. For example, Figure 6 shows a communication network that is a one-mode network. Red circles are actors, and red lines are communication ties between actors.

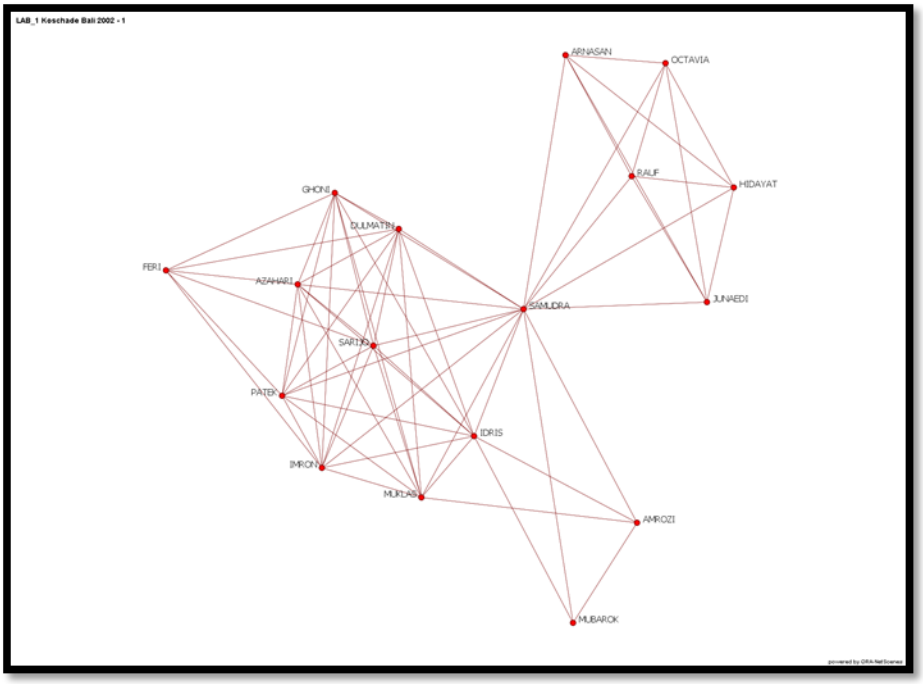

Figure 6. One Mode Network Sample.
Adapted from Koschade (2006).

d. Two-mode Networks

Two-mode networks may have one set of actors and one set of events or two sets of different actors (Cunningham, Everton, & Murphy, 2016). For example, Figure 7 is a two-mode network. Red circles are actors, blue squares are events, and black lines are the attending ties between events and actors.

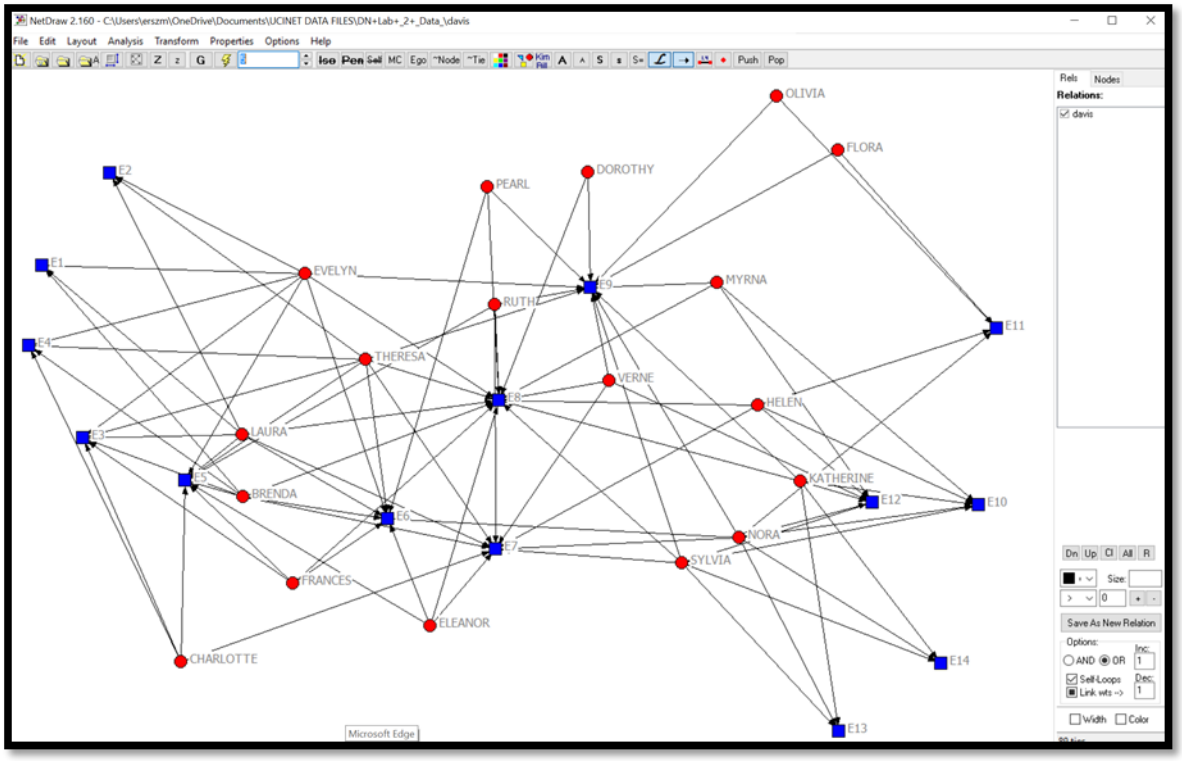

Figure 7. Two-Mode Network Sample. Adapted from Davis, Burleigh, and Gardner (1941).

e. Network Topography

Actors, ties, and the structure of ties form a network's topography. Performance of a network is based on its topography. In *Network Externalities and the Structure of Terror Networks* article, the authors explain that centralized networks are more efficient in the decision-making process and transfer of resources (Enders & Jindapon, 2010). Yet, for terrorist groups, centralized networks may easily be disrupted by legal agencies. Network topography is the result of a trade-off between security and effectiveness. Basic topography terms are shown in Table 4 (Cunningham, Everton, & Murphy, 2016).

Table 4. Network Topography Metrics

Measure	Explanation	Importance for Dark Networks
Size	Number of actors	
Average Distance	The average length of all the shortest paths between all actors	Dark networks with shorter average distance may diffuse information more quickly
Diameter	The longest of all the shortest paths	A relatively large diameter with same network size may indicate that the network is decentralized. Information diffusion and decision -making processes may take a longer time in networks with large diameters
Centralization	The ratio of the actual sum of differences in actor centrality over the theoretical maximum centrality	Centralized networks may more effectively mobilize people and resources. However, these networks may easily be disrupted by eliminating central actors
Density	The ratio of observed ties over total possible ties	Denser groups have more ties inside the network compared to same-size networks. That often means a preponderance of strong ties in the network, which may lead to the isolation of the dark network
E-I Index	The ratio of ties a group has to external members to internal members	Dark networks tend to have more internal ties. However, even a small number of external ties may give an opportunity to diffuse misinformation and reintegrate actors with weak ties inside the dark network to social life

2. Basic Software Programs for SNA

Since SNA is a set of mathematical tools and theories, the development of computer programs has played a significant role in widespread applications of

SNA to real-life problems. In this section, I will give the necessary information about three of these programs, which are UCINET, NetDraw, and Pajek.

a. UCINET

UCINET was initially developed at the University of California, and it is the most widely used SNA software (Freeman, Everett, & Borgatti, 2012). UCINET contains most of the SNA metrics, and you can convert your record into other analyzing software such as Pajek or Excel. UCINET stores its data in matrix format (Everton, 2008). It is regularly updated by its developers to keep abreast of developments and fix bugs. The downside of the software is its dual file system for storing data. One should be aware of this problem and should send both sets of the stored data to share with SNA data. UCINET's main screen is shown in Figure 8.

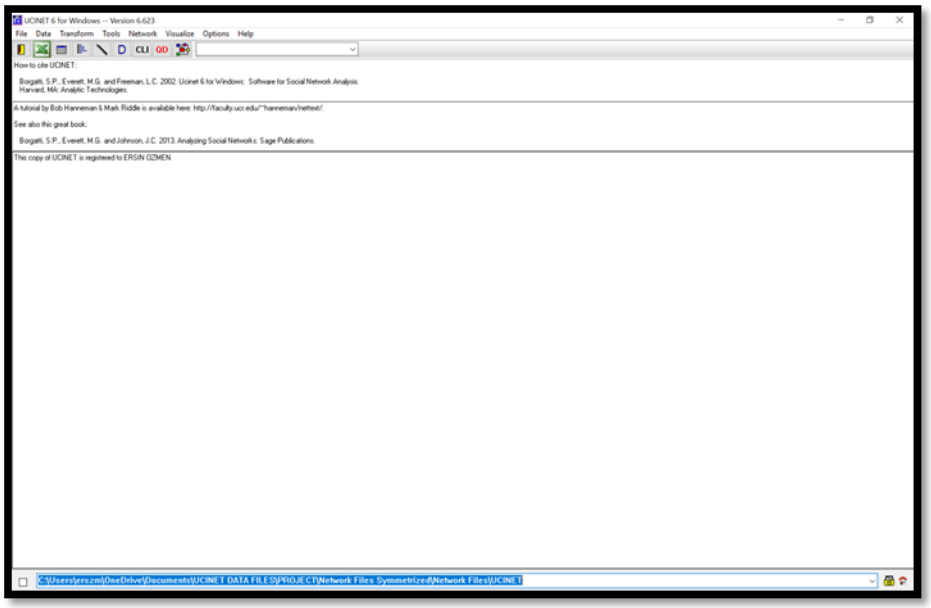

Figure 8. UCINET Main Screen

b. NetDraw

NetDraw is a program integrated into UCINET and developed by Steve Borgatti, one of UCINET`s developers (Borgatti, 2002). NetDraw`s primary

purpose is to visualize networks. Network maps can be rotated, resized, and stored in different formats, which is a handy tool for visual analytics (Everton, 2008). So, NetDraw is an extension of UCINET that can visualize UCINET SNA data. NetDraw's main screen is shown in Figure 9.

Figure 9. NetDraw Main Screen

c. Pajek

Pajek was developed by Vladimir Batagelj and Andrej Mrvar in 1996. It is designed for analyzing and visualizing large SNA data (Everton, 2008). Pajek does not store data as a matrix but as an edge list. This is why Pajek can handle extensive networks. The downside of Pajek is that it has fewer SNA metrics than UCINET. Pajek's main screen is shown in Figure 10.

Figure 10. Pajek Main Screen

IV. ANALYSIS: APPLYING SNA TO DISRUPT DARK NETWORKS

A. COLLECTING AND CODING DARK NETWORK DATA

The primary data source for this thesis is the written record from the Istanbul Office of the Prosecutor's indictment report of the Kurdistan Worker's Party (PKK) Istanbul Executive Committee in 2012. The PKK Istanbul Executive Committee serves as a financial, recruitment, and ideological training center. The written record is 2,401 pages and includes information about the terrorist organization member's affiliations and relational data (Cimen, 2012). Nonetheless, I only included individuals with a link to the terrorist organization as explicitly stated by the document. For example, the family members of actors are included in the records, but they have no ties with the organization, so they are outside the boundary of my network analysis. Moreover, the time limitation is between 2010 and 2012, and the location radius is just the Istanbul province. In all, 550 individuals are included in the networks analyzed. Eight types of ties involving these individuals were recorded: communication, collaboration, kinship, link, hierarchical, meeting, event, and training. The first five are one-mode networks; the last three are two-mode. Also, several attributes of the individuals were recorded. See the appendix for more detailed information (including definitions) on both the types of ties and the attributes recorded.

B. BASIC NETWORKS OF THE PKK

Figures 11 through 14 present the communication, meeting, event, and training networks, respectively. Individuals are represented by red nodes, while meetings are represented by green nodes, operations by blue, and training by light blue.

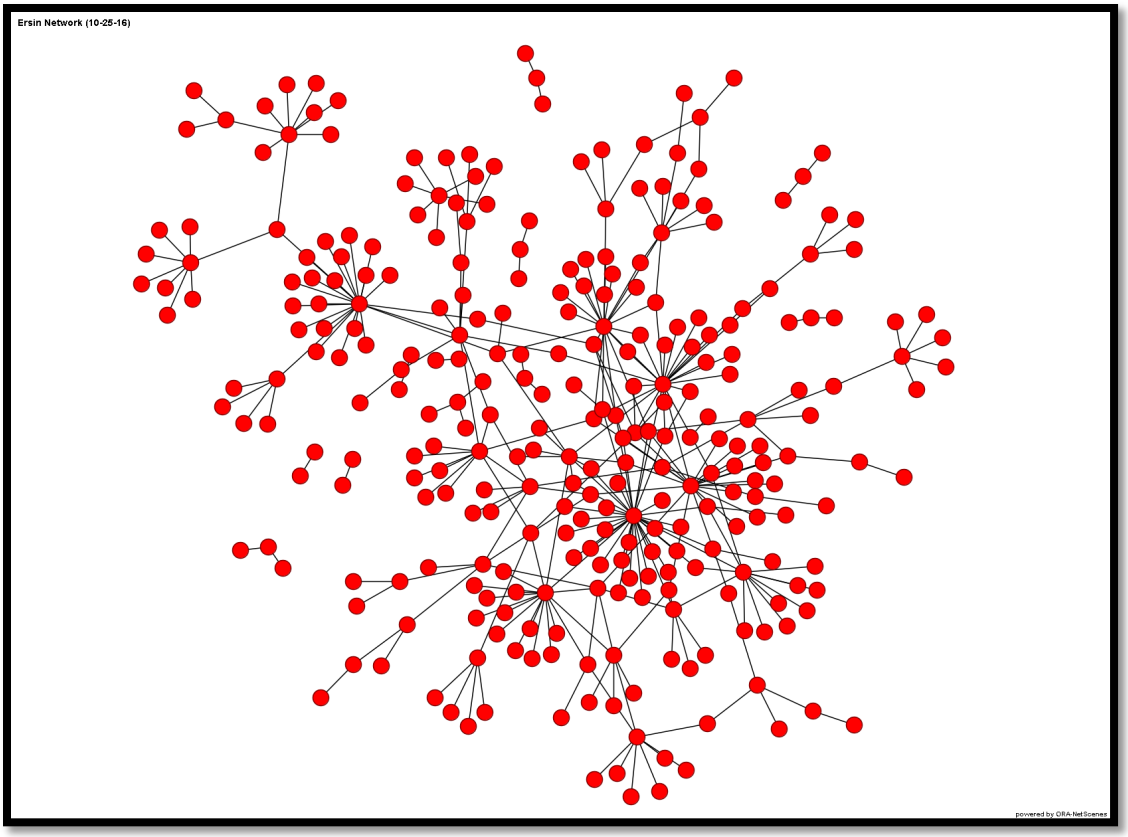

Figure 11. Communication Network Map. Adapted from data detailed in Chapter IV, Section A.

Black lines between actors (red circles) in Figure 11 represent direct communication through some medium, such as cell phones or writing.

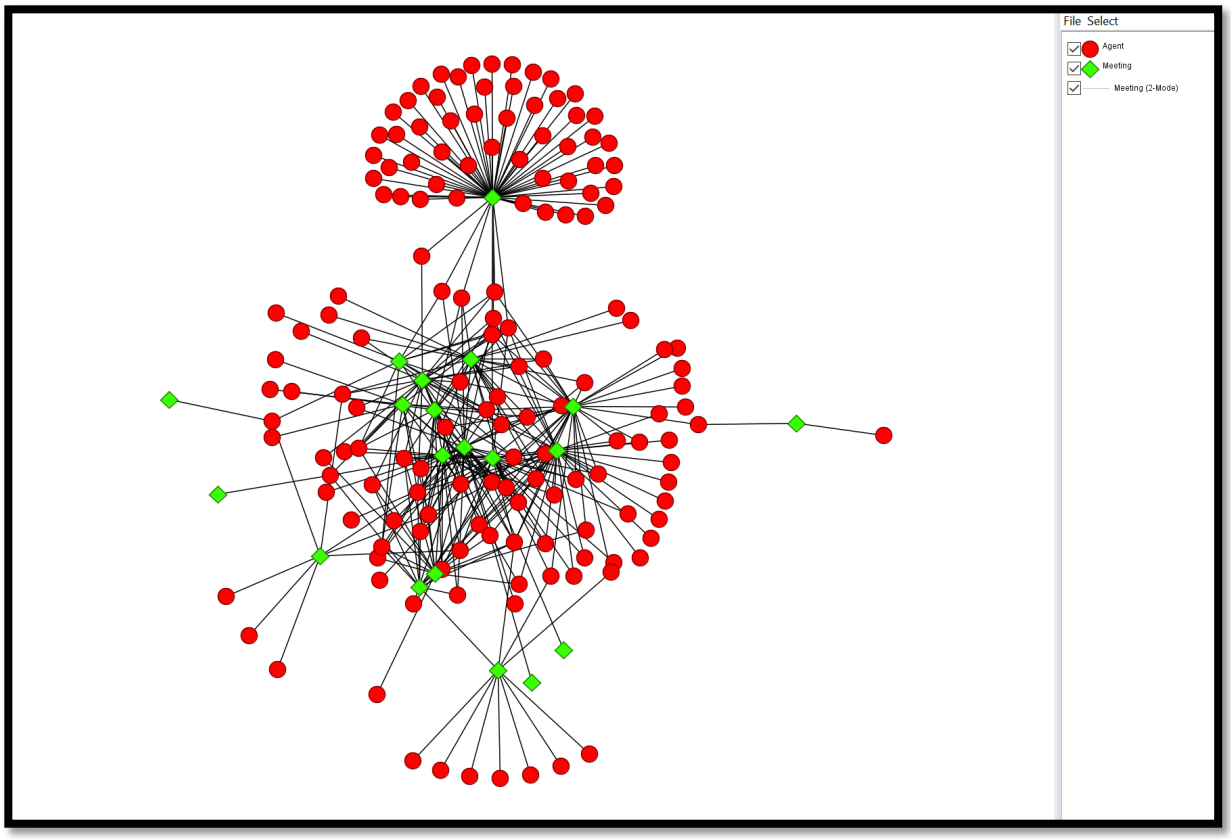

Figure 12. Meeting Network Map. Adapted from data detailed in Chapter IV, Section A.

Black lines between actors (red circles) and meetings (green diamonds) in Figure 12 show actors who attended specific meetings. The list of the meetings is included in the appendix.

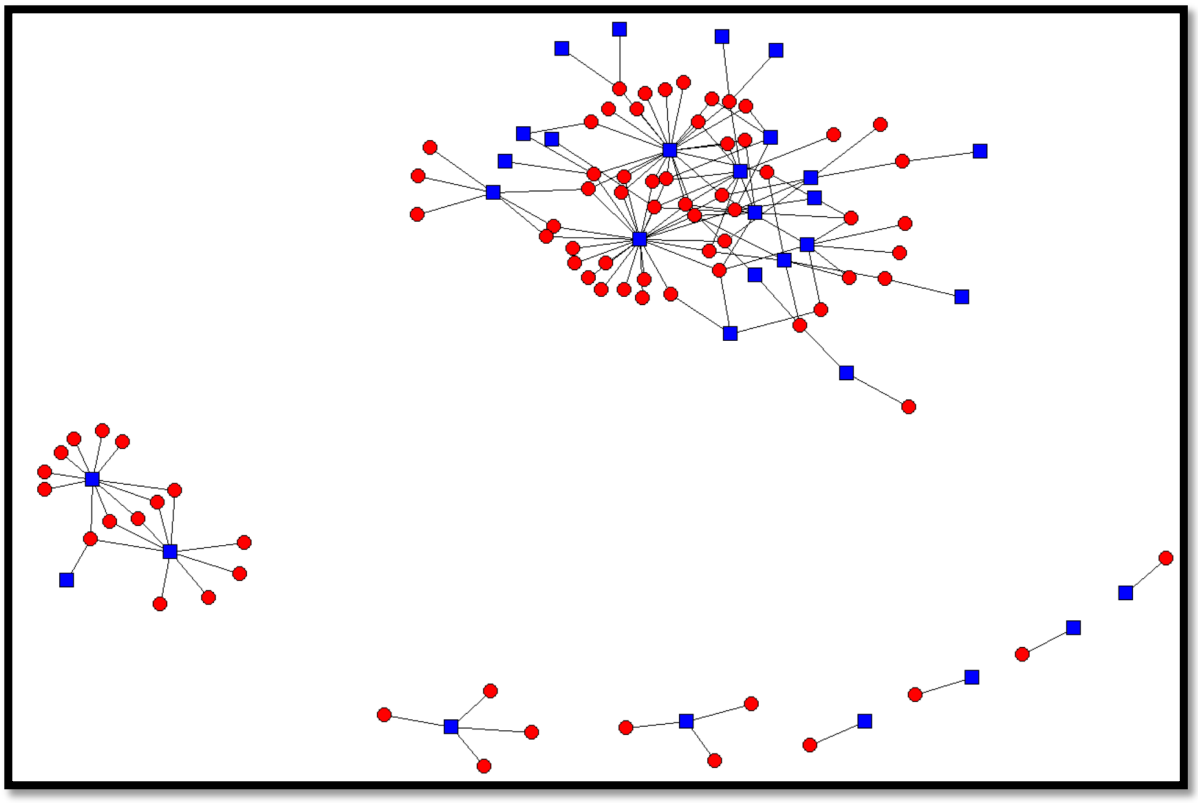

Figure 13. Event Network Map. Adapted from data detailed in Chapter IV, Section A.

Black lines between actors (red circles) and events (blue squares) in Figure 13 show actors who attended that specific event. Events only include tribal feuds and arson attacks, as detailed in the appendix.

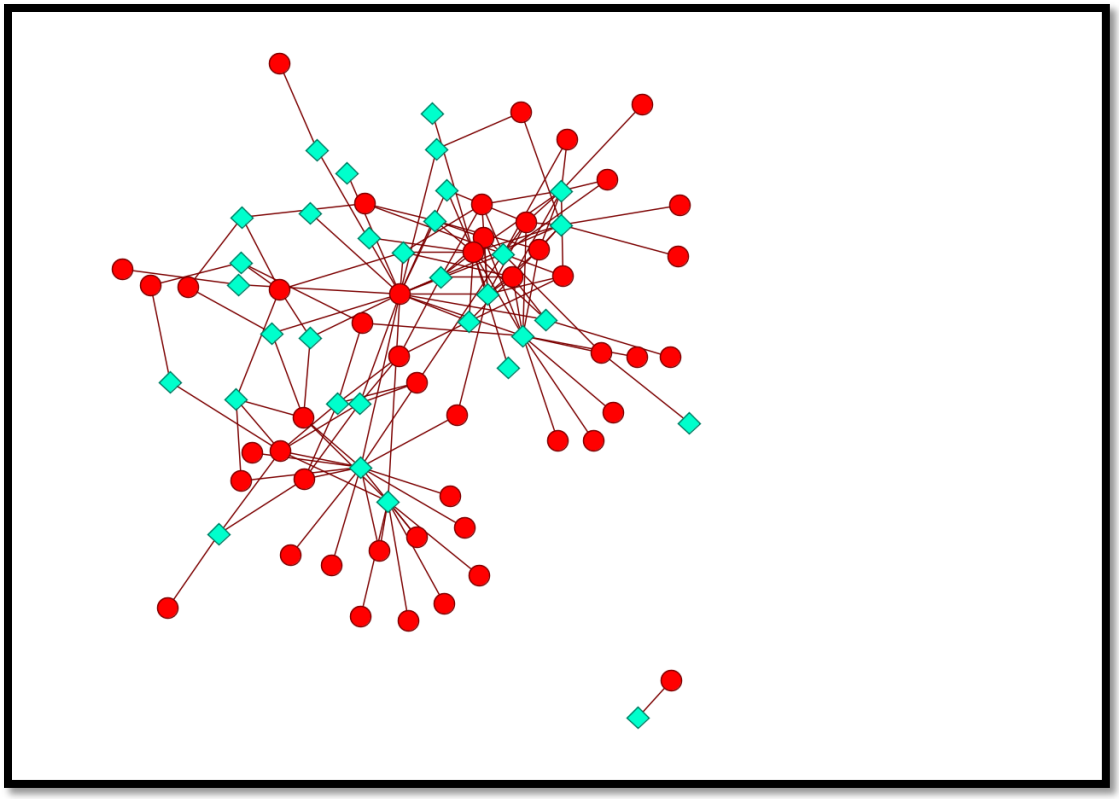

Figure 14. Training Network Map. Adapted from data detailed in Chapter IV, Section A.

Black lines between actors (red circles) and training (light blue diamonds) in Figure 14 show actors who attended that specific training. A list of trainings is included in the appendix.

C. EXPLORATORY ANALYSIS OF THE PKK

In this chapter, I explore the network topography of the PKK. Actors, ties, and the structure of ties form the network topography. This research illustrates that understanding network topography correctly is the first step for a detailed analysis (Cunningham, Everton, & Murphy, 2016).

1. Network Maps

As mentioned in Section A (Collecting and Coding Dark Network Data), there are eight types of ties: communication, collaboration, kinship, link,

hierarchical, meeting, event, and training. In Section B (Basic Network of the PKK), I mapped the basic networks of the PKK, which are the communication, meeting, event, and training networks. In this section, I study these basic networks and form new networks, which I call the information flow, planning, operation, and recruiting networks.

a. Information Flow Network

I aggregated the communication network with the collaboration and hierarchical networks to form what I call the information flow network, because the ties hold and share data through the network. It is presented in Figure 15. The black lines (ties) indicate there is two-way information flow between these actors (blue circles).

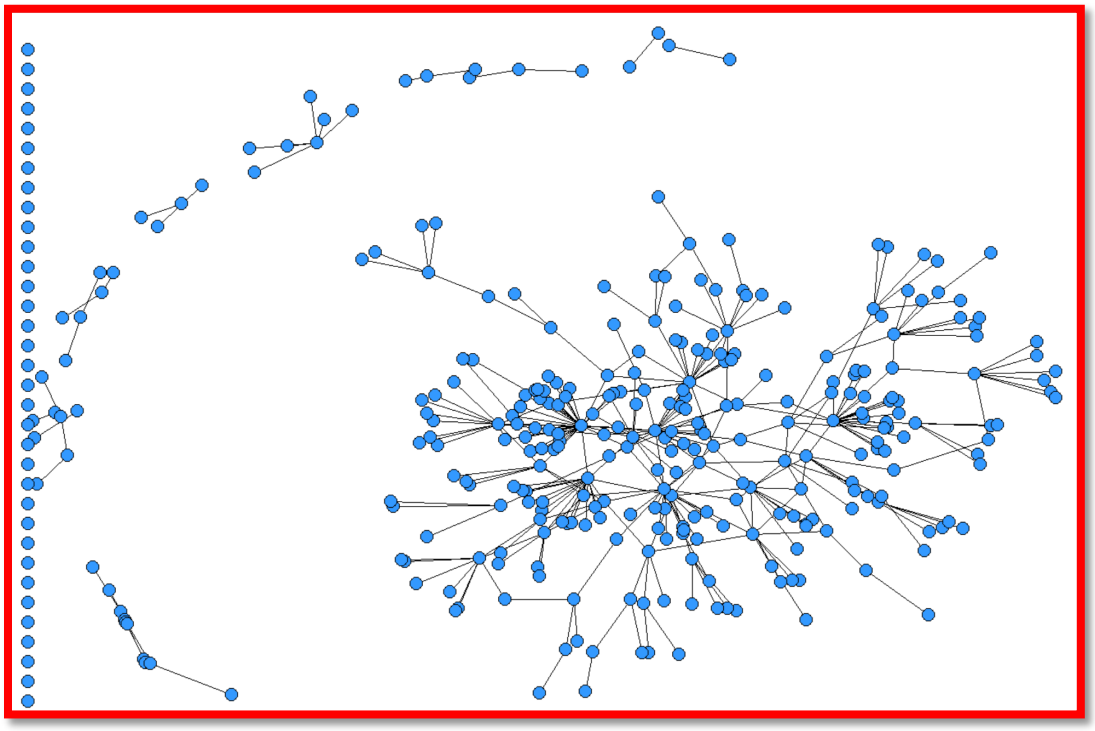

Figure 15. Information Flow Network. Adapted from data detailed in Chapter IV, Section A.

b. Planning Network

The planning process requires meetings and information flow, so to form the planning network, I aggregated the meeting and information flow networks. First, however, I had to convert the two-mode meeting network into a one-mode meeting network as seen in Figure 16.

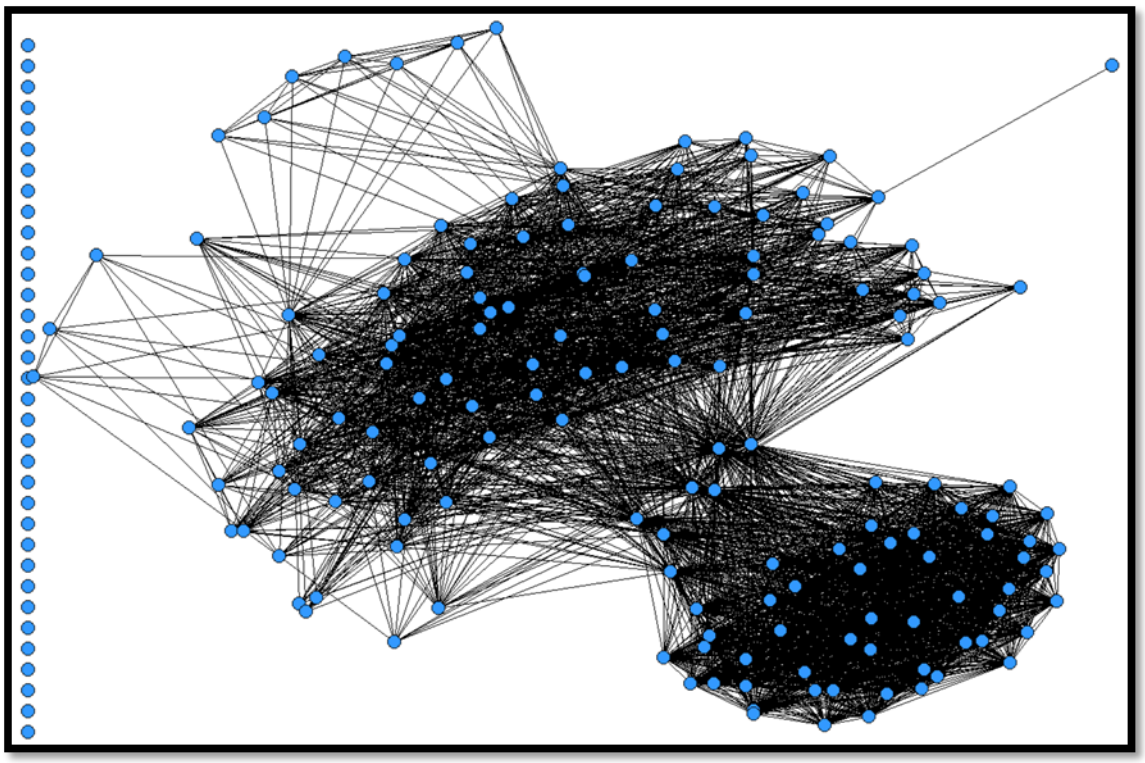

Figure 16. One-Mode Meeting Network. Adapted from data detailed in Chapter IV, Section A.

Then I aggregated the one-mode meeting network and information flow network, which produced the planning network as seen in Figure 17. Black lines represent a planning tie between these actors (blue circles).

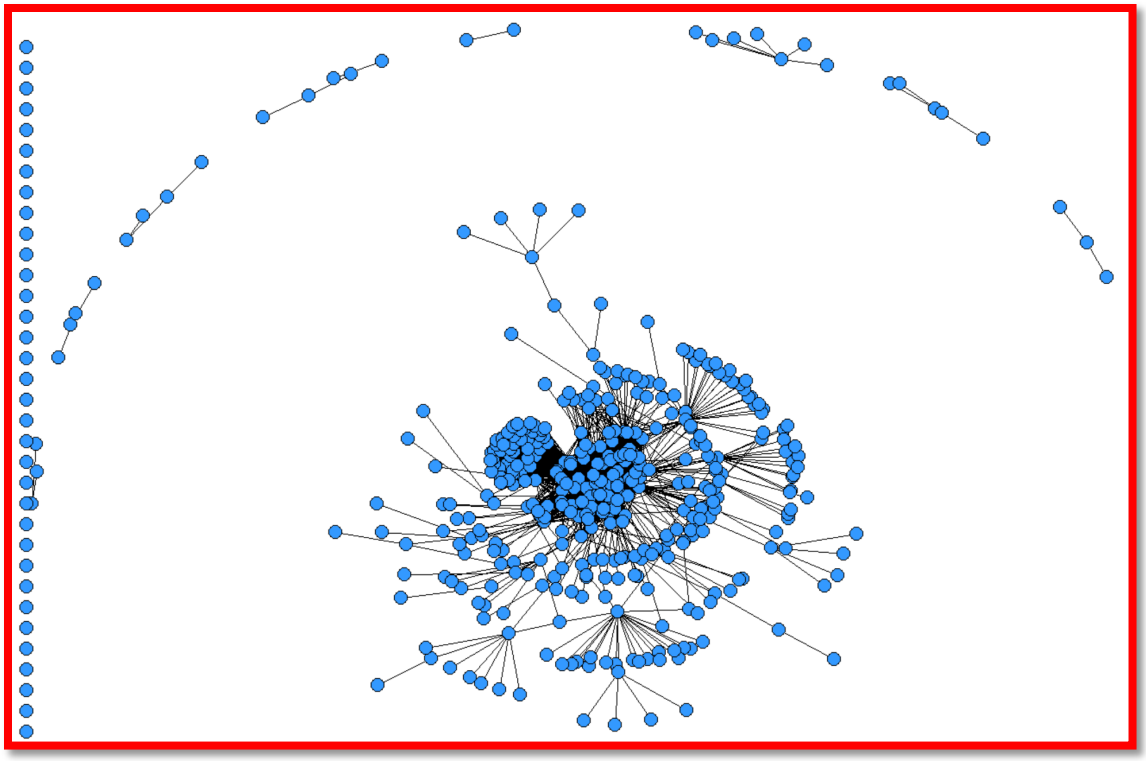

Figure 17. Planning Network. Adapted from data detailed in Chapter IV, Section A.

c. Operational Network

To construct the operational network as seen in Figure 19, I first converted the two-mode event network into a one-mode event network (Figure 18) and then aggregated it with the information flow network (Figure 15), since an operation network needs to consider the information flow before conducting a terrorist operation.

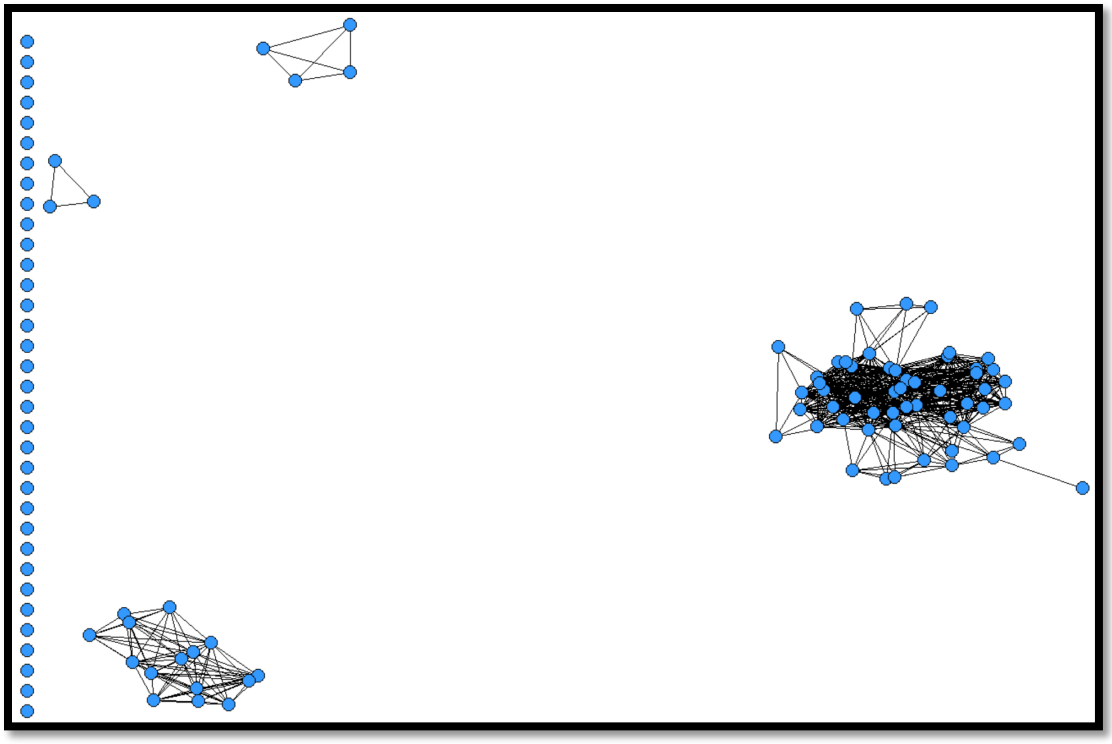

Figure 18. One-Mode Events Network. Adapted from data detailed in Chapter IV, Section A.

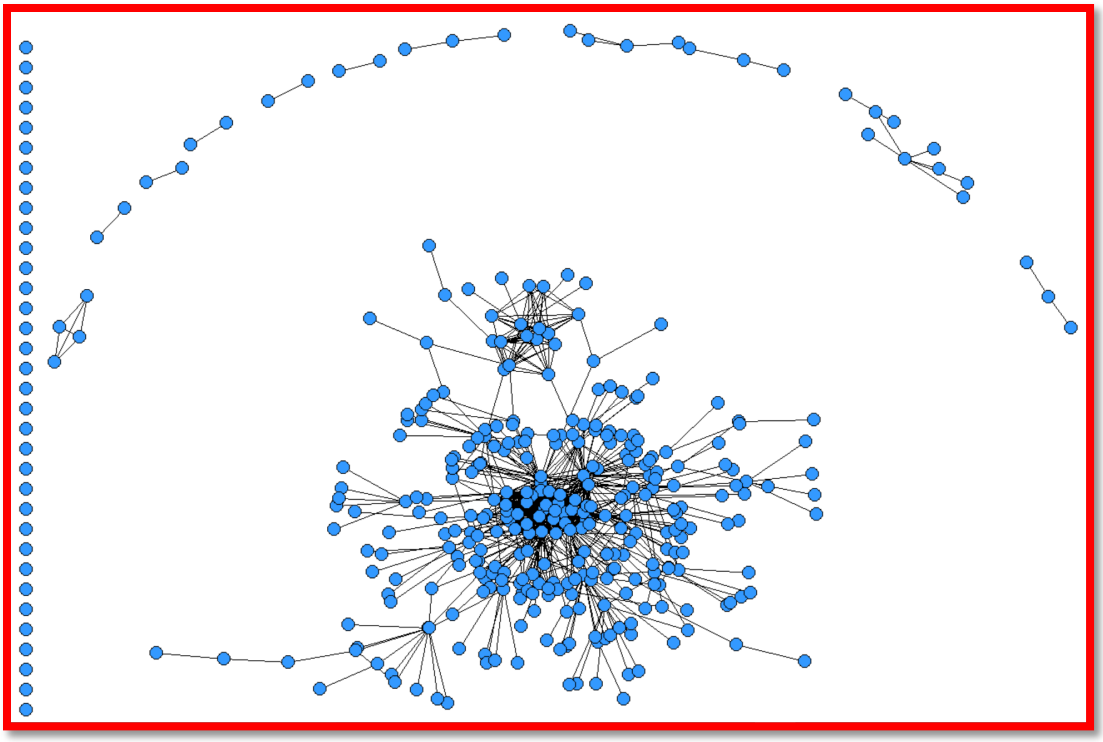

Figure 19. Operational Network. Adapted from data detailed in Chapter IV, Section A.

The black lines in Figure 19 represent the fact that these actors (blue circles) have a relationship, which enables them to commit a terrorist operation.

d. Recruiting Network

To construct the recruiting network as seen in Figure 21, I first converted the two-mode training network into a one-mode training network (Figure 20) and then aggregated it with the information flow network (Figure 15).

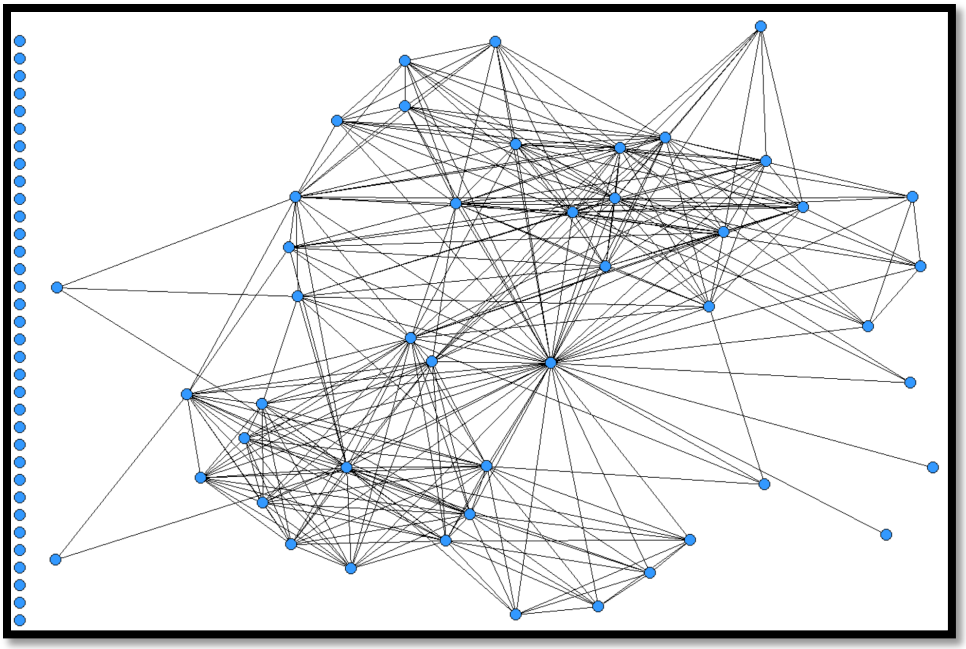

Figure 20. One-Mode Training Network. Adapted from data detailed in Chapter IV, Section A.

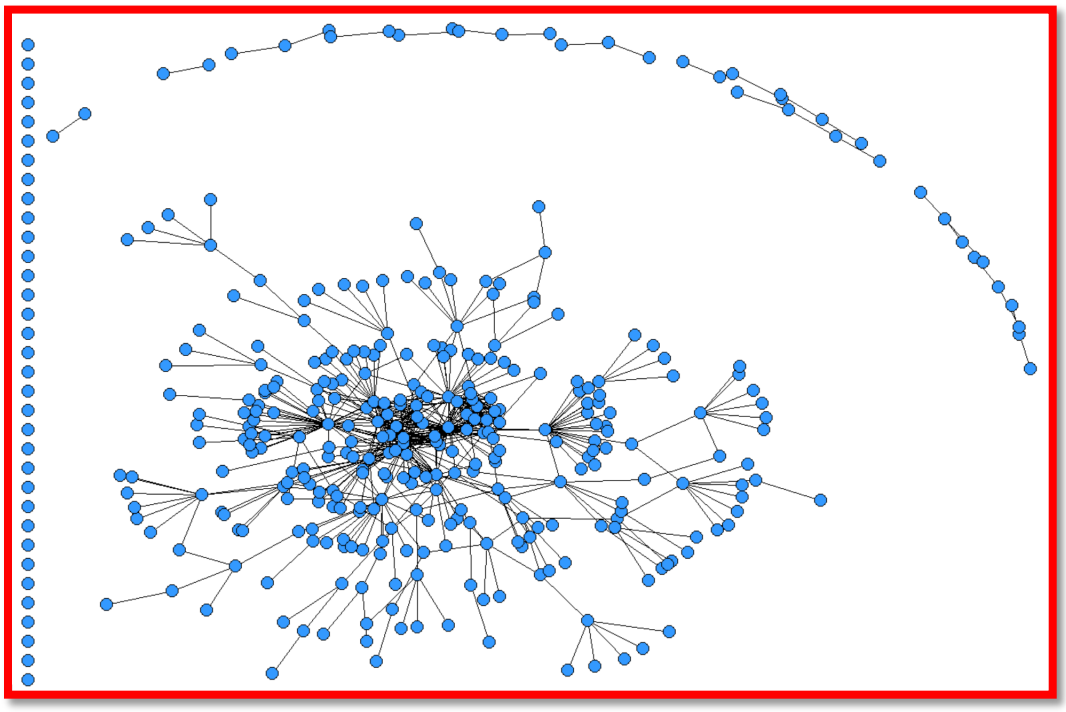

Figure 21. Recruiting Network. Adapted from data detailed in Chapter IV, Section A.

The black lines in Figure 21 represent that these actors (blue circles) have a relationship that enables to enlist new actors in the terrorist organization.

So for this chapter, I have four main networks. The first one is the information flow network as seen in Figure 15. The second one is the planning network as seen in Figure 17. The third one is the operational network as seen in Figure 19. Finally, the fourth one is the recruiting network as seen in Figure 21. All of these have red frame borders. In the next section, I analyze only three of these networks which are planning, operational, and recruiting networks. I excluded information flow network in the topography analysis since the information flow network is included in the other three networks.

2. Network Topography

Network topography is the starting point to craft a strategy to disrupt dark networks. As the first step in the descriptive analysis, I use the three main networks of the PKK: the planning, operational, and recruiting networks.[1] Table 5 shows the relevant topography scores for these three networks.

Table 5. Network Topography Scores. Adapted from data detailed in Chapter IV, Section A.

	Diameter	Avg. Distance	Density	E-I Index	Avg. Degree	Betweenness Centralization
Planning Network	10	3.3	2.69%	0.757	14.74	5.50%
Operational Network	12	3.6	0.67%	0.878	3.69	7.09%
Recruiting Network	11	4.4	0.43%	0.846	2.34	7.24%

[1] I do not analyze the information flow network in this section since it is included in the other three; however, I do take it into account when constructing my following strategies.

The “diameter” is the network`s longest geodesic (i.e., the longest, shortest path between all pairs of actors). The “average distance” is the average length of all of the geodesics. Networks with a shorter average distance may diffuse information quicker. Since all of the three capability networks are approximately the same size, we can use the density score to compare the networks. The density score shows the interconnection level of a network. Denser networks are often cut-off from outside of the network. The E-I index measures the ratio of internal and external ties. To calculate the E-I index, I used membership attribute data, which indicates if the actor is explicitly indicated as a member of the PKK or not. See the appendix for more information. The “average degree” is the sum of ties divided by the number of actors (Cunningham, Everton, & Murphy, 2016). To compare centralization, I used betweenness centralization because it gives a closer hierarchical picture of the network. Figure 22 visualizes the topography results.

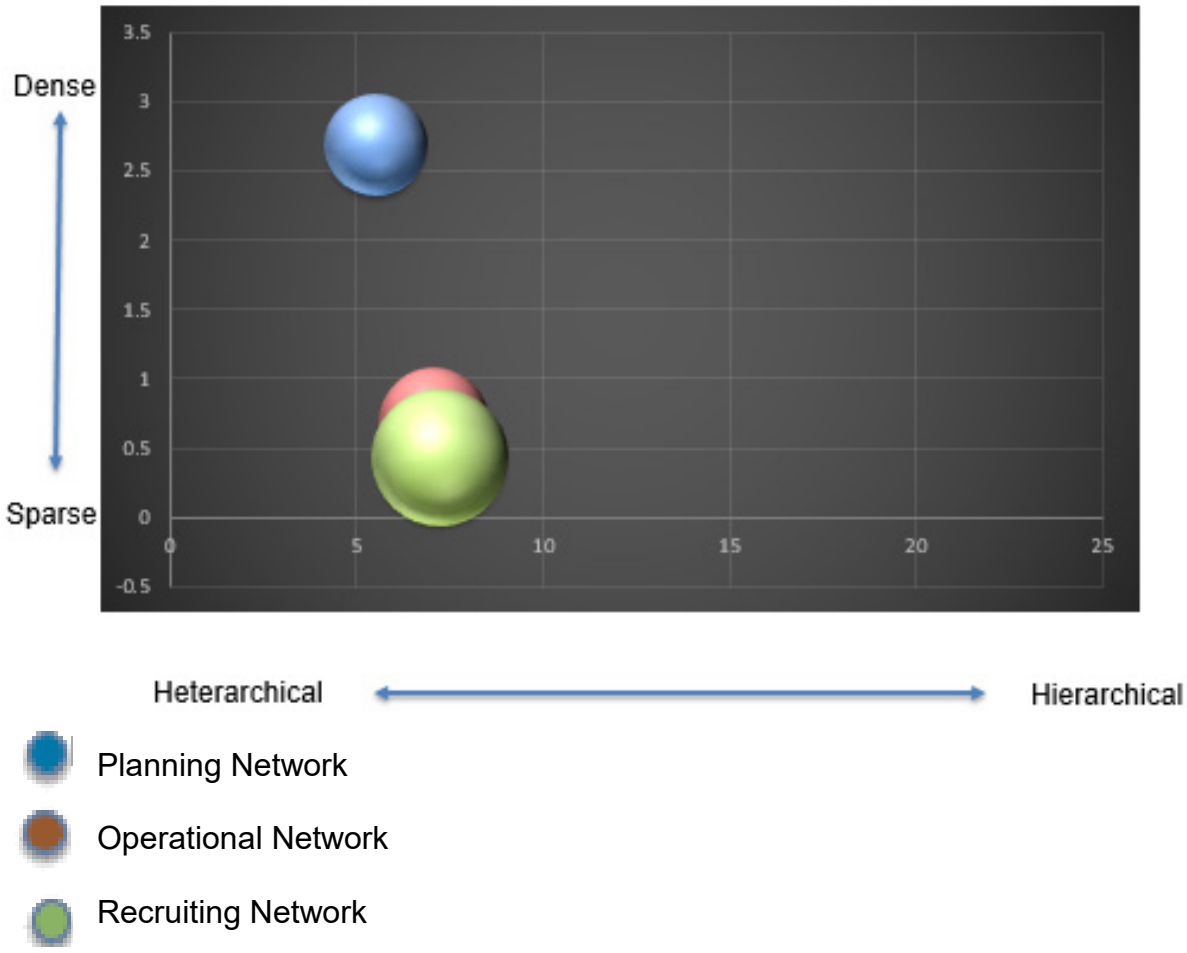

Figure 22. Network Topography. Adapted from data detailed in Chapter IV, Section A.

In Figure 22, the x-axis plots the networks in terms of centralization; the y-axis plots them in terms of density, and bubble size reflects average distance. One should be aware that there are no significant differences between the scores and all three networks are on the heterarchical side of the continuum, but the planning network is the densest and most heterarchical, as well as having the minimum average distance. Although all three networks have more external than internal ties, the planning network has less external ties than other networks.

My interpretation, in this case, is that planning capability has more strong ties inside the PKK terrorist organization, which makes sense because the decision-making cycle should be completed in the organization. However, the

decision-making cycle has a more heterarchical structure than the other networks. This reflects a trade-off between security and effectiveness, and naturally, the dark network chooses security over effectiveness. This means that a kinetic targeting strategy inside the planning capability network will not disrupt the PKK as expected. Misinformation diffusion might be a non-kinetic targeting option inside the planning capability network, since it has a minimum average distance score of 3.3, which indicates information flows quicker than other networks.

In Section A (Collecting and Coding Dark Network Data), I coded the data and highlighted eight types of ties, which are communication, collaboration, kinship, link, hierarchical, meeting, event, and training ties. The definitions and details of these ties are in the appendix. In Section B (Basic Networks of the PKK), I mapped four basic networks of the PKK, which are the communication, meeting, event, and training networks. In Section C (Exploratory Analysis of the PKK) I formed four new networks and did an exploratory analysis of the PKK terrorist organization using three of these networks. These three new networks are the planning, operation, and recruiting networks. Analyzing the network topography of these three networks helped me to understand the structure of the networks and how to craft an non-kinetic targeting plan.

In order to craft a non-kinetic targeting plan, it is essential to have as much information as possible. Thus, tracking the information flow network might be the starting point of a plan. The planning network is vital since the decision cycle of the terrorist organization starts and ends in the planning network. The planning network leads the operation network, which commits terrorist actions, and the recruiting network, which enlists new terrorists to adopt to a new environment. Thus, these four dark networks are the targets of the non-kinetic targeting plan. I will analyze them in order to identify vulnerabilities of these dark networks and craft a new non-kinetic targeting plan to disrupt the PKK in the following section.

D. NON-KINETIC TARGETING PLAN TO DISRUPT THE PKK

My strategic option to disrupt PKK is the non-kinetic approach. The desired end state is the operational environment at the end of the campaign. Defining the desired end state is the first step for a plan, since it will craft the operation lines and ways. Here, the desired end state is transitioning the PKK terrorist organization toward a political process. According to *How Terrorism Ends: Understanding the Decline and Demise of Terrorist Campaigns,* even if this approach does not completely end terrorism, it will help to manage violence and lead to a long-term decline in terrorism (Cronin, 2011).

Lines of operation connect actions to the desired end state. These lines show different aspects of the operation. There are four lines of the plan to disrupt this network: track the information flow network, degrade trust in the planning network, influence the operational network for peaceful demonstrations, and reintegrate actors in the recruiting network back into society.

Various strategies exist to accomplish the objectives. For tracking the information flow network, targeting “cut points” is the chosen strategy. For degrading trust in the planning network, targeting key players is the chosen strategy. For influencing the operational network for peaceful demonstrations, targeting social capital is the chosen strategy. For reintegrating actors in the recruiting network, targeting less effected actors is the chosen strategy. Figure 23 sumarizes these four strategies. The rationale for choosing these strategies is discussed in the following paragraphs.

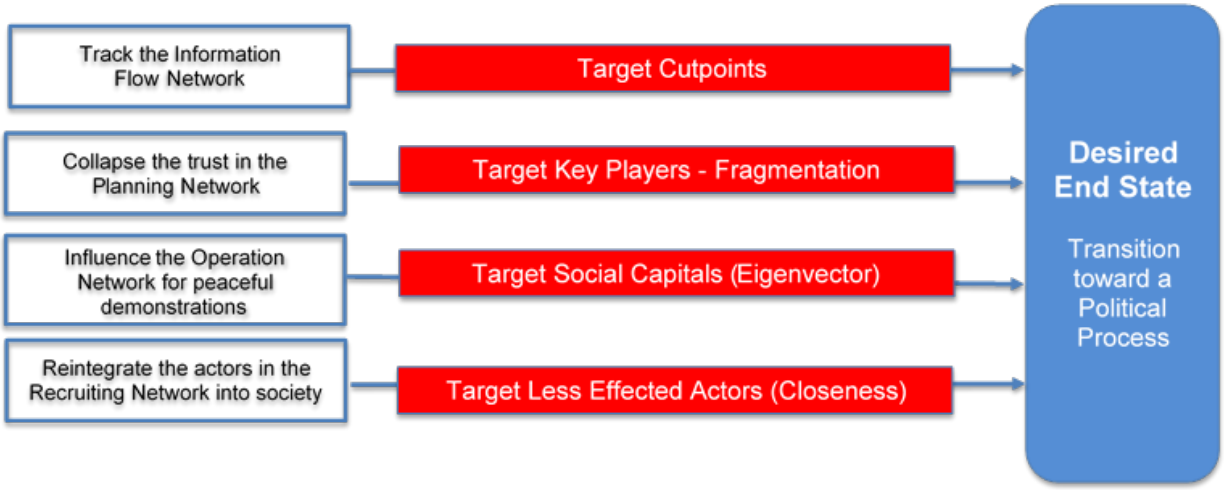

Figure 23. Non-Kinetic Targeting Plan

a. Track the Information Flow Network

There are several benefits to tracking a dark network. First, we will increase the level of information we have, since it is often incomplete (Cunningham, Everton, & Murphy, 2016). Thus, we may acquire a more detailed structure of the dark network. Second, we will get feedback on our comprehensive plan. So, we may adjust our plan.

To track the information flow network, I chose the cut points measure. In their book *Social Network Analysis: Methods and Applications* the authors identified cut points as actors whose removal disconnects the tie between two or more groups (Wasserman & Faust, 1994). For a kinetic approach, removing cut points cannot just disconnect the network, since the dynamic nature of the network will form new cut points. Nevertheless, for a non-kinetic approach, tracking cut points will maximize the benefits, since cut points are in a position to control the flow of information as seen in Figure 24 (Cunningham, Everton, & Murphy, 2016).

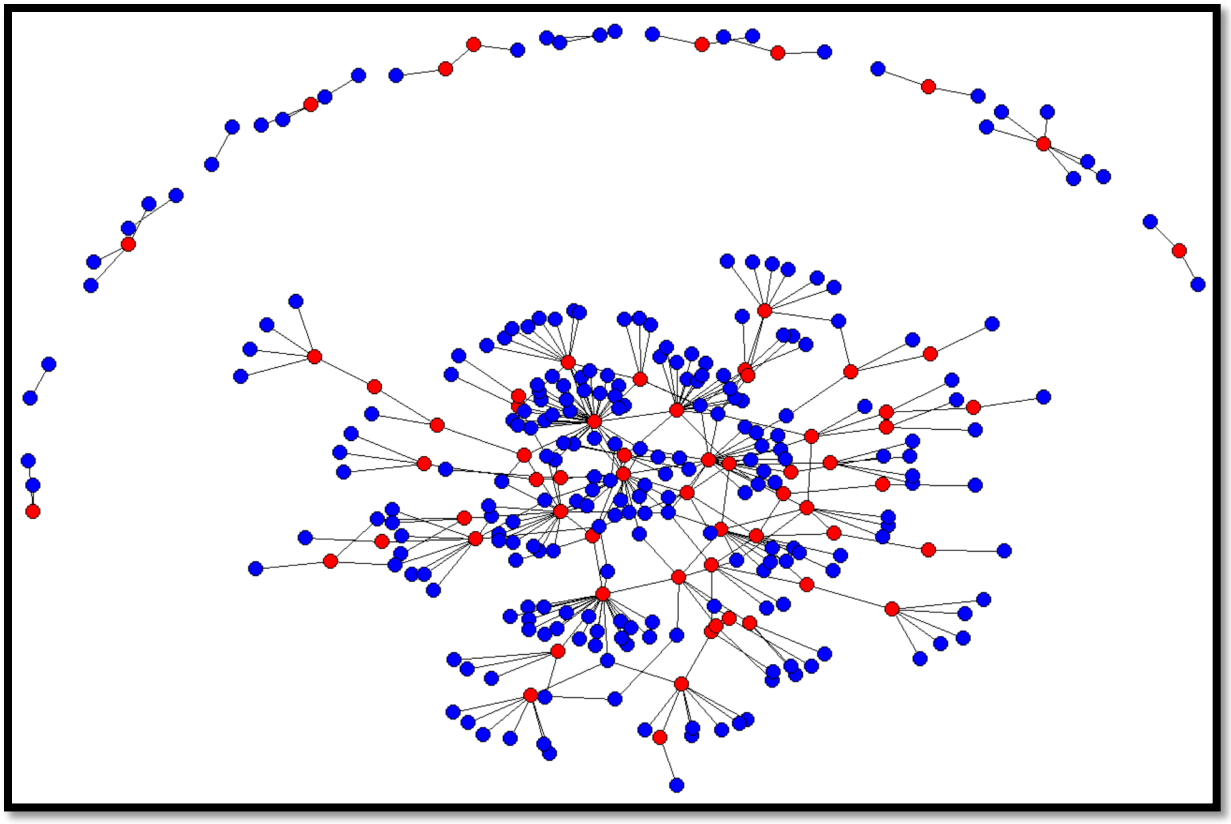

Figure 24. Cut points in the Information Flow Network. Adapted from data detailed in Chapter IV, Section A.

Figure 24 shows the cut points in the information flow network (cut points in red; isolates are hidden). Tracking the cut points is not for a limited time operation, but acts as a process that should continue until the desired end state is achieved.

b. Degrade Trust in the Planning Network

The planning network of the PKK leads the decisions for operations, so it is essential to disrupt the decision cycle. One option to disrupt the decision cycle is to collapse the trust between key players in the planning network so they cannot complete the decision cycle.

According to the authors, key players-fragmentation analysis helps identify sets of actors whose removal most effectively fragments the network

(Cunningham, Everton, & Murphy, 2016). The key player-fragmentation measure is used to get the maximum effect in the entire network to find the optimum number of targets. I calculated the fragmentation rate up to 20 actors. As seen in Figure 25, the fragmentation rate is below the trend line after 16 actors. So, I chose 16 actors as targets for the "degrading trust" operation. That should lead to an optimum level between sources and the desired effect.

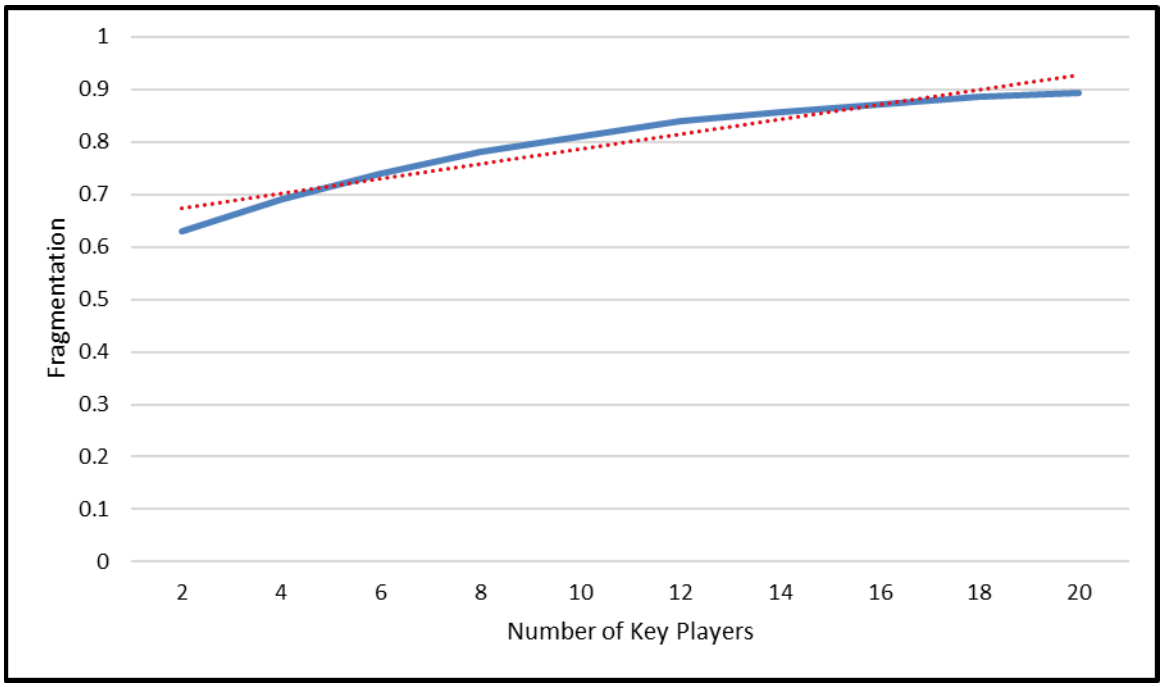

Figure 25. Key Player—Fragmentation Analysis. Adapted from data detailed in Chapter IV, Section A.

Figure 26 highlights the key players-fragmentation in the planning network (key players are colored red; isolates are hidden). These 16 key players' attributes are listed in Table 6. Although it is not a complete table because of the nature of dark networks, we may interpret that the financial aspect is crucial for the planning cycle.

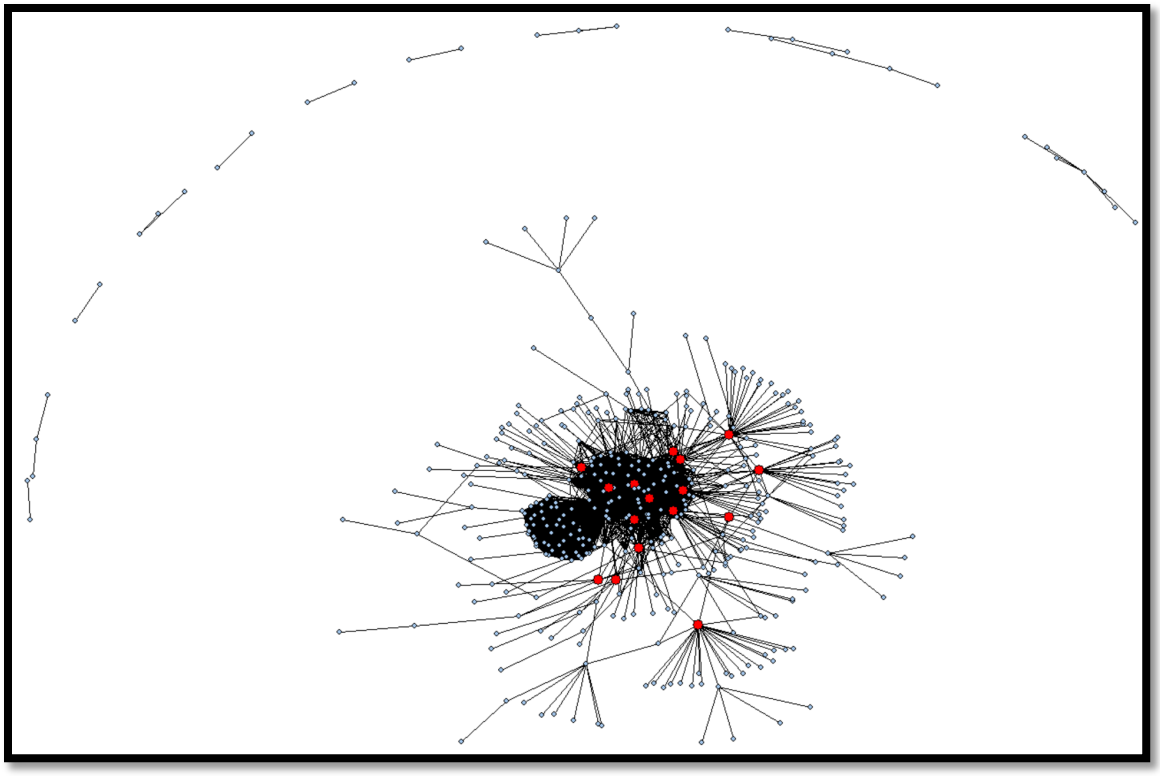

Figure 26. Key Players in the Planning Network. Adapted from data detailed in Chapter IV, Section A.

An information campaign on key players might start with breaking the financial ties between them. In the topography section, there are several key points that are essential for a non-kinetic targeting plan. These key points are:

(1) The average distance score of the planning network (3.3) is less than the other networks. That means misinformation flows quicker than other networks.

(2) The planning network also has more external ties than internal ties. That may help planners to use non-members of the terrorist organization for the misinformation process.

(3) The planning network has a more heterarchical structure than other networks, which means a kinetic targeting plan inside the planning network will not disrupt the dark network as expected. So non-kinetic targeting may be more efficient.

Table 6. Key Players—Fragmentation and Attributes

Actor ID	Cell Member Function	Organizational Field
256		
407		
4		
48	Financier	Justice Committee
397		Political Field
285		Executive Committee
409		Justice Committee
53	Financier, Recruiter, Supplier	
153	Financier	Political Field
284		
193		
78		
169	Financier	Executive Committee
396		
496		
336		

c. Influence Operational Network for Peaceful Demonstrations

Istanbul is the most populated province in Turkey with 15 million people, and has the seventh largest population in the world. I used Palantir for geospatial analysis. In the dataset, there are three different types of operations conducted by the PKK in Istanbul: arson attacks, bombings, and tribal feuds.

Figure 27 shows only tribal feuds on the map. Tribal feuds involve violence that results in damage to the property, but does not require any fire. We see a hotspot city at the center of the Istanbul where it is most populated.

Figure 27. Tribal Feuds. Adapted from data detailed in Chapter IV, Section A.

Figure 28 shows arson attacks on the map. We can see hotspot cities distributed around Istanbul. So, my interpretation is that the PKK tries to influence daily life by leaving its fingerprints on as many places as possible.

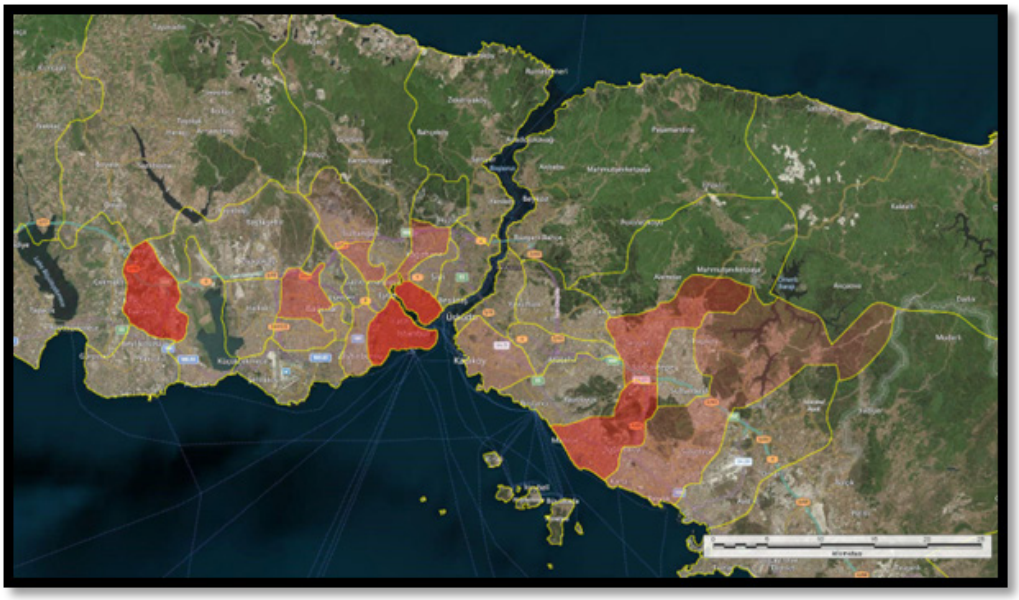

Figure 28. Arson Attacks. Adapted from data detailed in Chapter IV, Section A.

Figure 29 displays bombings. It indicates a shift to the borders of Istanbul, which suggests that more violent events occur in less populated areas. My interpretation is that the PKK tries to influence politicians and decision makers by violent events but tries to hide its footprints as much as possible by staying away from mass destruction bombings.

Figure 29. Bombings. Adapted from data detailed in Chapter IV, Section A.

From the geospatial analysis, we see that there is a pattern of operations. As the violence of the operations increases, the location of the event moves towards the borders of the city where it is less populated. So, it is not naive to say that the PKK is ready for the transition to the political field.

For the SNA data, only tribal feud and arson attack data are used because there was no relational information about the bombing events. These are violent demonstrations that require as many direct or indirect ties as possible to gather these people. Eigenvector centrality can capture influence power inside a network or potential social capital (Cunningham, Everton, & Murphy, 2016), so I use it to identify targets for an influence operation.

Figure 30 shows the operation network with a node size reflecting eigenvector centrality (isolates are hidden). Table 7 presents attribute data about the top 9 score actors. I included nine actors because there is a 20 percent decrease in the score between the 9th and 10th actor. From the table we can see that the political field is a crucial element in the operational network, which

suggests that these actors can be influenced by politically related information, which will be helpful for the desired end state.

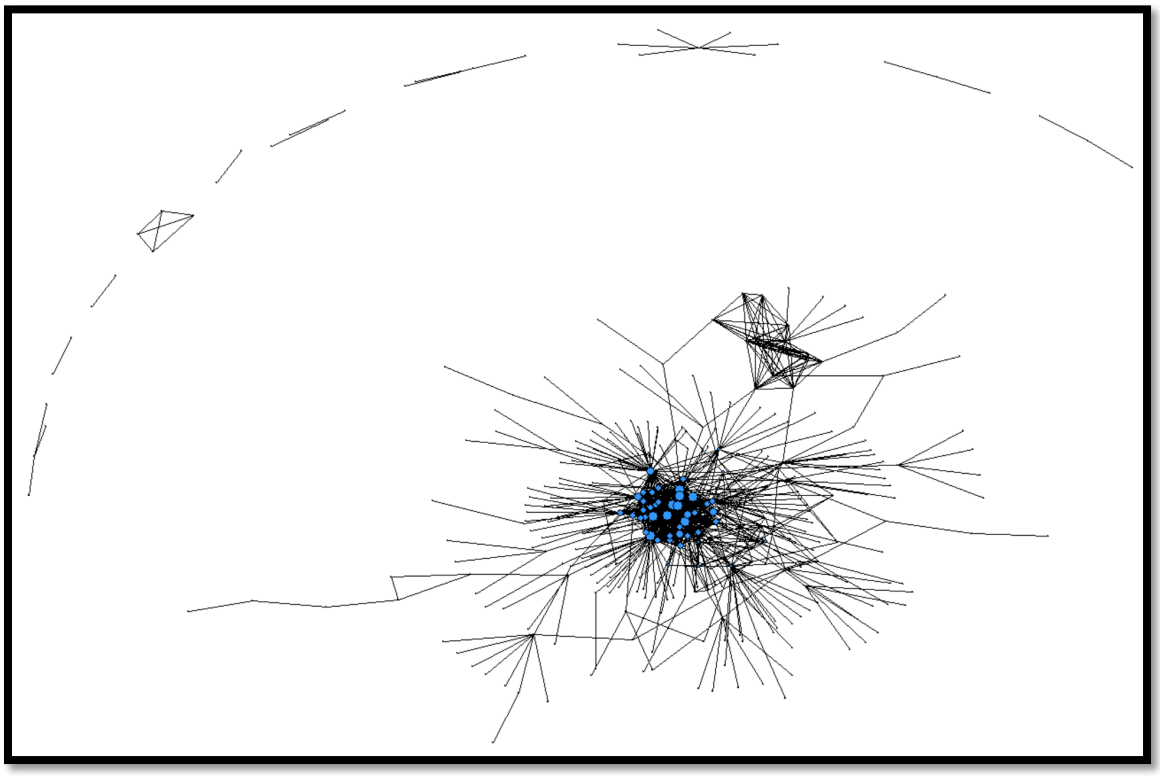

Figure 30. Operational Network. Adapted from data detailed in Chapter IV, Section A.

Table 7. Eigenvector Scores and Attributes

Actor ID	Eigenvector Score	Cell Member Function	Organisational Field
407	0.213		
53	0.212		
435	0.210		
397	0.209		Political Field, Women Field
227	0.204	Financier	
265	0.204		Political Field
147	0.202		
152	0.202		Political Field
109	0.202		Political Field

d. Reintegrate Actors in the Recruiting Network Back into Society

The recruiting network includes training sessions in which trainers teach the ideology for the separatist movement. Closeness centrality measures the average distance from each actor to every other actor in the network (Everton, 2012). It assumes that actors with a high closeness score can access the information more easily. So in the recruiting network, actors with high closeness centrality scores imposed more ideological information about the PKK, and are more likely linked with the terrorist movement. Actors with low closeness centrality scores are potential targets who can be influenced for reintegration into civil society.

Figure 31 shows the recruiting network. In the network, I deactivated all nodes except the main component to visualize it. Average reciprocal distance (ARD) is used for closeness, because it adjusts for the infinite distances that occur when calculating closeness centrality with disconnected networks. Nodes are sized based on closeness. Here, the reversed value is displayed, which means that larger nodes represent smaller scores. So, for a reintegration operation, larger sized nodes are potential targets. A reintegration operation, beginning with the peripherals and then moving toward the center of the network, should help disrupt the recruiting network.

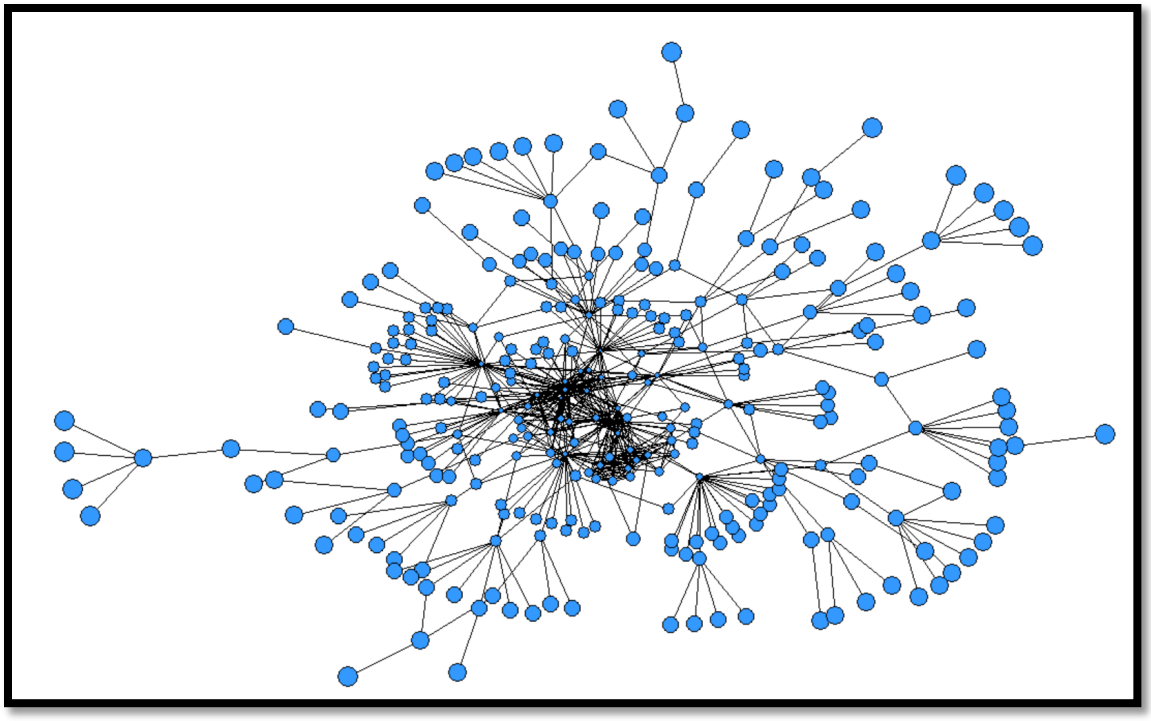

Figure 31. Recruiting Network based on ARD. Adapted from data detailed in Chapter IV, Section A.

A reintegration strategy requires a social movement through a legitimate or productive position in society (Cunningham, Everton, & Murphy, 2016). For a successful reintegration operation, the following options may be considered.

1. Rehabilitation programs
2. Institution building
3. Influence actors' families
4. Job opportunities
5. Education opportunities

E. SUMMARY

The PKK has been operating in Turkey and the surrounding region for nearly 40 years. Both kinetic and non-kinetic approaches have been used by politicians over the years to disrupt the PKK. However, the problem still exists.

In this project, I have tried to show the importance of the ties between actors and how social network analysis can be effectively used to craft a non-kinetic targeting plan to disrupt the PKK. Dark networks can form new ties in case of ties illuminated. Non-kinetic approaches' primary benefit is that we are not changing the ties, we are using the ties to disrupt the structure.

After analyzing the PKK Istanbul Executive Committee, four main networks showed itself: the information flow, planning, operational, and recruiting networks. As seen in Figure 32, a non-kinetic targeting plan on these networks may change the direction of the PKK terrorist organization through the political field.

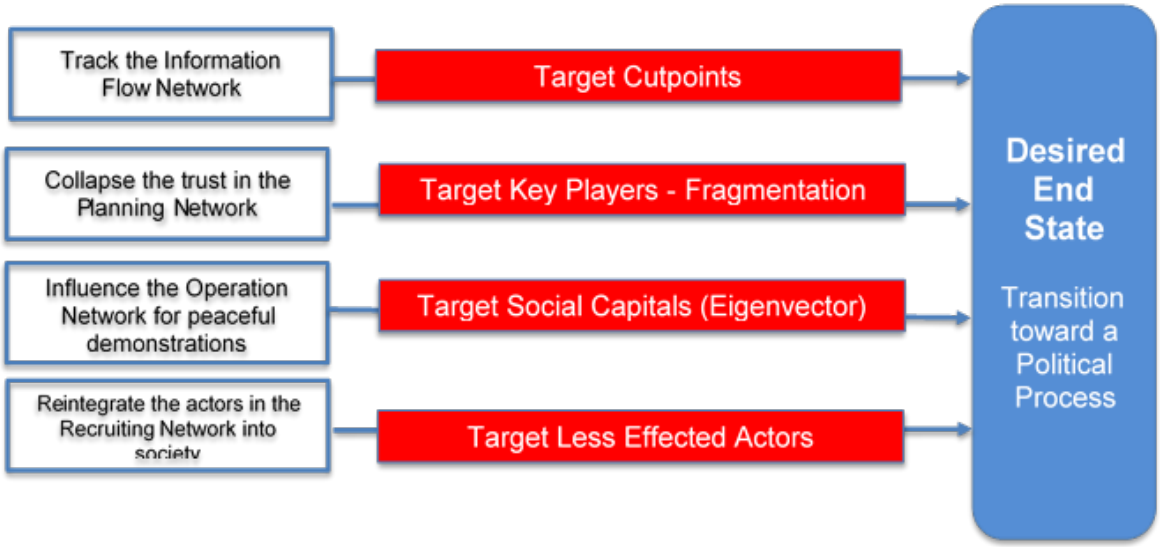

Figure 32. Non-kinetic Targeting Plan

V. CONCLUSION

A. CHALLENGES IN ANALYZING DARK NETWORKS

Analyzing dark networks is a challenge given their nature. The very first challenge is data collecting. As authors describe, questionnaires, interviews, direct observation, written records, experiments, diaries, and surveys are basic methods for data collecting of social network analysis (Cunningham, Everton, & Murphy, 2016). I used written records from the Istanbul Office of the Prosecutor's indictment report in 2012. Written records are efficient for data coding. However, they are a snapshot in time and are not able to analyze the dynamic nature of the network. The analyst may find the key players in the planning network, but these key players are only the key players in that very specific time. Dark networks are very adaptive to their environment, so the network topography is continuously changing. Decision makers should be aware of the changing nature of the dark networks to disrupt the network.

The second challenge regarding data is to identify the boundary of the network. In my thesis data, there were not only terrorist organization members' information, but also their families' and other actors' information, which are not linked to the terrorist organization. I only included actors who have ties with the terrorist organization. However, poor boundary work in social network analysis may lead to misinformation about the dark network.

The third challenge in analyzing dark networks is big data. As described in Chapter II, the PKK terrorist organization is defined as a large group with 2,500 to 5,000 members. It is not possible to find the data about all these members. So I used the data of the PKK Istanbul Executive Committee, which provides financial and recruitment support and serves as an ideological training center. It is not practical to analyze all PKK terrorist organizations. So my thesis is not a final plan to disrupt the PKK as a whole, but only a part of the PKK.

Another challenge is that every social network analysis is unique (Cunningham, Everton, & Murphy, 2016). There is not a magical formula to disrupt dark networks. Since social network analysis focus on relations between actors, the topography of the dark networks will be unique. So my non-kinetic targeting plan to disrupt dark networks might be a starting point, but decision makers are not able to apply the same plan for any dark network.

B. RECOMMENDATIONS

Crafting a plan to disrupt dark networks is a long-term study. The first step is to identify the data to analyze. If planners work with the wrong data, it will lead to unsuitable strategies for decision makers. So my first recommendation is finding the right data and identifying the suitable data boundary. A codebook is an essential tool for SNA (Cunningham, Everton, & Murphy, 2016). Codebooks serve as a guide for analysts during the coding process and also as a guide for decision makers to understand the structure of the social network, especially if you are working as a team. A codebook is the alignment line for team members. So, it is important to start with a detailed codebook to work on the data.

There are several features for exploratory analysis of the dark network such as size, average distance, diameter, centralization, variance, standard deviation, density, average degree, fragmentation, E-I index, and subgroups. Planners should not lose themselves in this large scale. First, determine a big picture for non-kinetic targeting plan and then analyze the essential features of your plan.

APPENDIX. CODEBOOK

DA 3610 summer 2014 visual analytics codebook is used as a basic reference for coding this study.

A. COMMUNICATION TIES

Definition: "Two actors with direct communication through some medium (cell phone, radio, writing)." (Cunningham, 2014, p. 9)

One mode matrix, 550x550

B. COLLABORATION TIES

Definition:

"Two or more actors are explicitly stated as collaborating in some unspecified nefarious activity (not including financial transactions)." (Cunningham, 2014, p. 8)

One mode matrix, 550x550

C. KINSHIP TIES

Definition: "Defined as any family connection such as a spouse, brother, nephew." (Cunningham, 2014, p. 9)

One mode matrix, 550x550

D. LINK TIES

Definition: "Miscellaneous relationships that do not fit any other relationship in this codebook." (Cunningham, 2014, p. 9)

One mode matrix, 550x550

E. HIERARCHICAL TIES

Definition: "Defined as the relationship between immediate superiors and subordinates. This tie should be explicitly stated in the text." (Cunningham, 2014, p. 9)

One mode matrix, 550x550

F. MEETING TIES

Definition: "A preplanned, coordinated event at least two actors with a specific date." (Cunningham, 2014, p. 11)

List of Meetings (by date)

12.09.2011_Meeting
13.03.2011_Meeting
15.03.2011_Meeting
15.05.2011_Meeting
09.07.2011_Meeting
07.09.2011_Meeting
09.06.2011_Meeting
20.09.2011_Meeting
26.09.2011_Meeting
28.08.2011_Meeting
08.08.2011_Meeting
23.09.2011_Meeting
29.06.2011_Meeting
09.03.2011_Meeting
09/03/2011_Meeting
26.06.2011_Meeting
08.05.2011_Meeting
20.01.2011_Meeting
07.08.2011_Meeting
15.09.2011_Meeting

Two mode matrix, 550x20

G. EVENT TIES

Definition: "Any event where the nature of the attack appears to be based on sectarian, communal, or ethnic divisions between groups." (Cunningham, 2014, p. 11)

List of Events

21.08.2011_Tribal Feud_Taksim
26.06.2011_Tribal Feud_Taksim
01.09.2011_Tribal Feud_Kadikoy
25.03.2011_Tribal Feud_Gaziosmanpasa
26.08.2011_Arson Attack_Sancaktepe
10.01.2010_Tribal Feud_Basaksehir
16.01.2011_Tribal Feud_Beyoglu
06.12.2009_Tribal Feud_Sultangazi

16.05.2011_Arson Attack_Beyoglu
18.09.2011_Tribal Feud_Taksim
15.02.2011_Trinal Feud_Kartal
18.09.2011_Arson Attack_Zeytinburnu
29.07.2011_Tribal Feud_Beyoglu
25.10.2009_Tribal Feud
10.04.2010_Tribal Feud_Kadikoy
19.04.2011_Arson Attack_Beyoglu
24.05.2009_Tribal Feud
27.03.2011_Tribal feud_Taksim
30.12.2011_Tribal Feud_Esenyurt
24.09.2010_Tribal Feud_Istanbul University
22.06.2011_Tribal Feud_Taksim
20.06.2008_Tribal Feud_Bakirkoy
A.101. market_Arson Attack
20.02.2010_Tribal Feud
24.04.2011_Tribal Feud_Aksaray
21.04.2011_Arson Attack_Sancaktepe
03.01.2010_Tribal Feud_Taksim
13.12.2009_Tribal Feud_Beyoglu
13.03.2011_Arson Attack_Atasehir
SILAN CAFE_Arson Attack
18.09.2011_Arson Attack_Beyoglu

Two mode matrix, 550x31

H. TRAINING TIES

Definition: "Any designed event that teaches the knowledge, skills, and competencies of terrorism and insurgency." (Cunningham, 2014, p. 12)

List of Trainings

27.11.2010_Training
02.12.2010_Training
23.11.2010_Training
24.12.2010_Training
26.01.2011_Training
22.12.2010_Training
18.02.2011_Training
04.02.2011_Training
26.12.2010_Training
30.11.2010_Training
02.02.2011_Training
23.12.2010_Training
16.02.2011_Training

29.01.2011_Training
22.02.2011_Training
05.02.2011_Training
03.02.2011_Training
28.01.2011_Training
09.02.2011_Training
30.01.2011_Training
14.02.2011_Training
21.12.2010_Training
10.02.2011_Training
04.12.2010_Training
31.01.2011_Training
24.11.2010_Training
21.02.2011_Training
25.12.2010_Training
01.12.2010_Training
01.02.2011_Training
24.01.2011_Training
29.11.2010_Training

Two mode matrix, 550x32

I. ATTRIBUTE DATA

1. Node Title

Each actor's name is not used in the data. One to 550 numbers are used as an identifier for each actor.

2. Target Status

"Defined as the physical status of the actor" (Cunningham, 2014, p. 7).

1. Detained
2. Deceased
3. Free and alive

3. Cell Member Function

"Defined as the role an actor has in the terrorist group" (Cunningham, 2014, p. 8).

1. Supplier: An actor who supplies operational materials
2. Trainer: "An actor who teaches the knowledge, skills, and competencies of terrorism and insurgency" (Cunningham, 2014, p. 12).

3. Financier: An actor who is explicitly stated as transferring or collecting funds for the organization
4. Spiritual Leader: An actor who serves as an ideological leader
5. Recruiter: An actor who is enlisting new members for terrorist-related activities
6. Operational Member: An actor who engages in the operation events
7. Bombmaker: Actor who constructs bombs
8. No information

4. Organizational Field

Defined as responsibility field inside the PKK:

1. Executive Committee
2. Political Field
3. Women Field
4. Justice Committee
5. Financial Field
6. Social Field
7. Ideological Field

5. Member

“Any actor explicitly stated as a member of the terrorist organization” (Cunningham, 2014, p. 2).

0. Nonmember
1. Member

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