EVOLUTION OF A BODY OF KNOWLEDGE: AN ANALYSIS OF TERRORISM RESEARCH

EDNA O. F. REID

School of Communication, Information and Library Studies, Rutgers University, New Brunswick, NJ 08903, U.S.

Abstract—This study provides an analysis of the development of contemporary terrorism research in the United States. Using on-line bibliometrics, tracing and citation analysis, it explores how terrorism researchers interacted with other knowledge producers to shape the perception of terrorism. The results indicate that the research area was influenced directly by knowledge producers such as the media and the U.S. government. They had major impacts on the definitions of terrorism, the types of data used in analysis, and the diffusion of ideas. This resulted in the creation of invisible colleges of pro-western terrorism researchers and generation of many terrorism studies from a one-sided perspective of terrorism from below (small insurgent groups). Copyright © 1997 Elsevier Science Ltd

INTRODUCTION

Exploring the development of contemporary terrorism research in the United States produced a model for the analysis of how knowledge in specialized communities evolves and influences decision making regarding some of the broad assumptions underlying policies and programs. In analyzing contemporary terrorism research, a series of questions is addressed, including: how did knowledge in this specialty develop? How did researchers interact with other knowledge producers to shape the development or perception of the phenomenon? How did they influence the growth of knowledge?

The importance of this study is that it provides an analysis of factors that influence the growth of knowledge in a specialty. The growth of the field of terrorism research is interesting to analyze specifically because it is so vulnerable to political pressures.

HISTORICAL BACKGROUND

Contemporary terrorism is a young research front, which started to evolve in the 1960s. According to Schmid and Jongman's (1988, p. 179) survey of terrorism authors, the initial analyses of contemporary terror have resulted in a massive amount of prescriptive studies. Much of this research has as its underlying purpose advising policy-makers on how to prevent or control the problem.

Currently, differing viewpoints prevail about the origin of contemporary terrorism. Although the use of terror to bring about political changes has a long history, dating from far before the Reign of Terror following the French Revolution, scholars interpret the emergence of contemporary terrorism from several different historical perspectives. Wilkinson (1986) defines contemporary terrorism as a form of political violence that started to evolve in the 1960s,

characterized by an increase in terrorist attacks carried out across international boundaries, or against a foreign target in the terrorist's state of origin.

Rapoport (1988, p. 3) provides a more structured framework by categorizing the history of modern terrorism as occurring in three waves: an initial wave in the late nineteenth and early twentieth centuries; a colonial wave contained within national geographical boundaries from 1921 to the present; and a contemporary wave, beginning in the 1960s, which introduced international terrorism that crossed national boundaries. Other perspectives have resulted in two main schools of thought which divide the phenomenon into terrorism from below and terrorism from above. (Crelinstein, 1986b; Wittebols, 1991b). Terrorism from below is also known as small group insurgent terrorism because of the use of violence by guerrilla groups to bring political pressure on governments. The campaigns of terror from above are also referred to as state-sponsored terrorism because of selected campaigns of violence used by governments to sustain their economic and political powers.

According to Schmid and Jongman's (1988, p. 179) survey, most of the recommendations on how to handle terrorists focused on terrorism from below; limited studies are available on terrorism from above. Many studies focusing on terrorism from below have failed to address the relationships between different types of terrorism and their impact on the perceptions of the terrorism phenomenon. As a result, there has been limited systematic analysis of the full range of issues surrounding contemporary terrorism.

THE METHODOLOGY

The development of terrorism research is explored using a model for analyzing the evolution of knowledge in a specialized community and the influence on decision-making. The model presents a snapshot of an integration of quantitative and qualitative research strategies used to investigate how a specialty evolves, how its ideas are dispersed and marketed, and which ideas are selected and applied in decision-making processes. It uses several research techniques such as bibliometrics, content analysis, on-line bibliometrics, citation analysis, and tracing.

Figure 1 provides a schematic of the research model. The model consists of four phases: Phase I, Measure the Size of Science in a Specialty; Phase II, Measure the Dispersion of Works and Ideas; Phase III, Measure Influence on Decision-making; and Phase IV, Measure the Impact on Growth of Knowledge. This model is particularly applicable to the generic methodology outlined by Haas (1992, p. 34) for demonstrating the impact of knowledge-based groups on policymaking. He recommends identifying the membership of knowledged-based groups, determining the community members' causal beliefs, tracing their activities and demonstrating influence on decision-making, and identifying alternative outcomes. This model goes further by applying an integration of on-line retrieval techniques to quantify the approach and analyzing the impact on future growth of knowledge.

DESIGN OF THE STUDY

Phases I and II reported on in this article, present the model as a means of analyzing how a specialty evolves and the factors that influence it. Major impetus for Phase I was provided by the works of Price (1963) and Crane (1972). Price identified the existence of invisible colleges and defined them as scientists who maintained close liaison among themselves through informal channels. Crane's detailed analysis of the invisible college concept provided some theoretical explanations of the social processes underlying the growth of science.

Bibliometrics was used to provide a quantitative measure of the growth of specialty and analyze how it evolved. Bibliometrics, the application of mathematics and statistical methods to books and other media of communication, is particularly useful for analyzing longitudinal trends in disciplines. Therefore, the initial steps in Phase I are to identify major members of the specialized community as well as their related works and subject them to a bibliometric analysis.

Phase I	Phase II	Phase III	Phase IV
Measure Size of Specialty	Measure Dispersion of Works and Ideas	Measure Influence on Decision-Making	Measure Impact on Growth of Knowledge
A. Identify major members of a community	A. Identify dispersion patterns of their works, etc.	A. Identify how the community's ideas are marketed and promoted	A. Identify the community's communication activities linking the retrieval and integration of ideas
B. Identify & measure their related works, research and publications	B. Determine the common beliefs, ideas, assumptions and/or theories	B. Outline the selection processes indicating how specific ideas made successful integration into decisions, programs or policies	B. Map the relationships between community's common beliefs and current publications
C. Identify the community members' casual beliefs	C. Trace the dissemination of their works and associated ideas	C. Trace how the works seem to influence the broad assumptions and beliefs underlying programs and policies	C. Conduct trend analysis and make projections about impact future works/publications
D. Outline their communication, dissemination & funding activities in informal & formal domains	D. Identify the dispersion patterns of the common beliefs and processes by which communities package their ideas	D. Identify alternative outcomes that were excluded as a result of the community's influence	

Fig. 1.

In the bibliometric analysis, the initial unit of analysis is the author whose publication references, subject areas, journal titles, conferences, and selected publications provide subsequent units of analysis.

Identification of major members of the community

The initial issue in the design of this study was the selection of major members of the research community. Prior works on other research fronts as well as on terrorism researchers pointed the way (Abdullah, 1990; Crane, 1969; Bingham, 1980; Herman & O'Sullivan, 1989; Reid, 1983). Schmid and Jongman (1988) used questionnaires to solicit information on terrorism concepts, databases and authors. Based on the responses of their 1985 survey, the leading authors in terrorism were identified.

Since the selection of experts is considered most relevant when done by peers who share common research interests and expertise (Kochen *et al*. 1982), Schmid and Jongman's 1988 list became the sample data for this study. From the list, 32 leading terrorism researchers were identified. Of the list, 47% had been identified in the citation analysis of Reid's earlier study and 50% in Herman and O'Sullivan's work. Table 1 lists the terrorism researchers who comprised this sample. They are primarily from academic institutions, policy research institutes and think-tanks located around the world.

Identification of related works

A bibliography of publications was compiled for each researcher from prior bibliographies and from on-line data base searches to supply publication reference data. All publications by the

Table 1. List of terrorism researchers

	Name	Institution	Specialty	Country
1	Alexander, Y.	ISIT, SUNY & CSIS, Georgetown U.	Intl. Relations	U.S.
2	Bassiouni, M. C.	DePaul Univ.	Law	U.S.
3	Bell, J. B.	Institute War & Peace Studies, Columbia Univ.	History	U.S.
4	Carlton, C.	Univ. Warwick	Intl. Relations	U.K.
5	Cline, R. S.	CSIS, Georgetown Univ.	Pol Science	U.S.
6	Clutterbuck, R. L.	Control Risk Intl	Intl Relations	U.K.
7	Cooper, H. H. A.	Aberrant Behavior Center	Intl Relations	U.S.
8	Crenshaw, M.	Wesleyan Univ.	Government	U.S.
9	Crozier, B.	NATIONAL REVIEW	Intl Relations	U.K.
10	Dobson, C.	NOW (London Magazine)	Intl Relations	U.K.
11	Evans, E. H.	Catholic Univ.	Pol Science	U.S.
12	Ferracuti, F.	Univ. Rome	Psychology	IT
13	Friedlander, R. A.	Ohio Northern Univ. College of Law	Law	U.S.
14	Gurr, T. R.	Univ. Maryland	Pol Science	U.S.
15	Hacker, F. J.	USC Medical & Law Schools	Psychiatry	U.S.
16	Horowitz, I. L.	Rutgers Univ.	Sociology	U.S.
17	Jenkins, B. M.	Kroll Associates	Corporate Crime	U.S.
18	Kupperman, R. H.	CSIS; R. H. Kupperman & Assocs.	Crisis Mgmt	U.S.
19	Laqueur, W.	CSIS	History	U.S.
20	Merari, A.	JCSS, Tel Aviv Univ.	Psychology	IS
21	Mickolus, E. F.	Vinyard Software, Inc.	Pol Science	U.S.
22	Paust, J. J.	Univ. Houston law School	Law	U.S.
23	Payne, R.	NOW (London Magazine)	Intl Relations	U.K.
24	Schmid, A. P.	Leiden Univ.	Intl Relations	NT
25	Sloan, S.	Booz Allen & Hamilton, Inc.	Pol Science	U.S.
26	Sterling, C.	Freelance Journalist	Intl Relations	U.S.
27	Stohl, M.	Purdue Univ.	Pol Science	U.S.
28	Thornton, T. P.	U.S. State Dept.	Intl Relations	U.S.
29	Walter, E. V.	Harvard Univ., Medical School	Pol Science	U.S.
30	Wardlaw, G.	Australian Inst. Criminology	Criminology	AU
31	Wilkinson, P.	Univ. St. Andrews	Intl Relations	U.K.
32	Wolf, J. B.	John Jay College Crim Justice, CUNY	Crim. Justice	U.S.

sample authors listed in terrorism bibliographies (Lakos, 1986; Mickolus, 1980; Mickolus & Flemming, 1988; Ontiveros, 1986; Schmid and Jongman, 1988) were pursued. The systems consulted included: DIALOG, NEXIS, Research Library Information Network (RLIN), RAND Index, terrorism index (Alexander, 1990), specialized terrorism microfilm collections, as well as collections at the Library of Congress, the University of California, Berkeley, and San Jose State University. The publications focused on terrorism or terrorism-related concepts such as political kidnapping, bombing and political assassinations. The concepts were derived from Crelinstein's (1988) bibliometrics study, which demonstrated how newspaper and periodical indexers categorized terrorism articles.

Altogether 1166 publications including journal articles, books, anthology chapters, reports, proceedings, and papers presented at conferences were identified for the period 1960–1990. Dissertations, book reviews and newspaper articles were not included. Publications were supplemented with the authors' biographical data, Congressional testimonies and terrorism conference information. They were used to generate the following datasets: publication references, author collaboration, author recognition, funding sources, terrorism conferences, and journals.

In addition, each publication was assigned a subject classification to identify the structure of terrorism research. The subject classification is based on a revision of Reid's (1983) typology. Schmid and Jongman (1988, p. 178) used Reid's typology for the explanation of the structure of terrorism literature. It identifies two major categories of terrorism research: macrostudies (general treatments) and microstudies (specialized aspects).

Identification of members' beliefs, etc.

In Phase I, the next steps are to identify the community members' causal beliefs, funding sources, communication and dissemination activities. Content analysis provided a qualitative measure for identifying and studying such activities.

Using the publication references dataset and a random number table, a sample of 130 (12%) was selected for content analysis. The content analysis involved developing a codebook to analyze the publications, reading and coding the publications, designing content analysis and citation datasets, and interpreting the results (Gerbner et al., 1978). The content analysis focused on several variables such as communication patterns, funding sources, research methods, and causal beliefs about terrorism. Many of the variables were identified in Gurr's (1988) assessment of empirical research on terrorism.

Identification of dispersion patterns

The major steps in Phase II are to identify and trace the dispersion patterns of authors' works and common beliefs. The process for outlining systematically the activities of sample researchers involved retrospective tracing of key political events (U.S. National Science Foundation, 1968). The tracing matrix included such variables as terrorism incident, government response, terrorism conference, legislation, and author participation. Furthermore, the on-line bibliometrics procedure allowed for tracing the dissemination of author's publications and ideas (Reid, 1993). It identified how far selected ideas had diffused throughout the popular research and Congressional literatures and what authors participated in Congressional hearings, government committees, consulting projects, and news broadcasts. On-line bibliometrics involved searching the sample researchers in 16 data bases in the DIALOG Information Service (Reid, 1992). In addition, the authors were searched in the Social Scisearch citation and NEXIS data bases.

FINDINGS

The development of the terrorism research area as evidenced by the number of publications generated per year had progressed through several of the stages of logistic growth which Price

(1963) described as characteristics of the growth of scientific knowledge in general. In agreement with Crane's (1972) prediction, an increase in specialization and socialization was identified as the research front matured. Through the use of bibliometrics and content analysis, this progression to more microstudies level of analysis could be identified. In addition, the development of communities of terrorism researchers and their dispersion patterns are presented. The development was influenced by knowledge producers such as the media and the U.S. government.

Growth of the specialty

The first stage, 1960–1969, is characterized by a sprinkling of terrorism studies and a domination of macrostudies of political violence. Limited collaborative relationships were identified. The second stage, 1970–1978, is classified as a "take-off" stage with eventual doubling of publications. During the "take-off" stage, there was an increase in media reporting of terrorism incidents, funding of terrorism studies, collaborative relationships, and micro-studies. The third, "stabilizing", stage spanned 1979–1985 with linear growth in publications and increased controversy and specialization among researchers. The fourth stage, 1986–1990, is characterized by crisis and may include the eventual demise of a research area. It had major declines in publications and memberships as well as limited intergroup communication activities.

By measuring the number of terrorism publications, we can begin to discern how the specialty developed. The rate of growth over this 30 year period shows 40% of the sampled literature being produced during the "take-off" period, 1970–1978. During the "take-off" period, the driving forces in the development of contemporary terrorism can be explained in light of political developments in the 1960s and 1970s. In the late 1960s and 1970s, the media reported an increase in terrorism incidents such as the Lod Airport massacre. Governments as well as private industries organized divisions to handle terrorism threats, funded research, and sponsored terrorism conferences. As a result, more authors were recruited to analyze the problem, collaborate on research, generate publications, and create visible presences at institutions in the form of terrorism study groups and interdisciplinary research projects.

During the "take-off" stage, the number of researchers doubled (63%). Table 2 lists the researchers who recruited 54 new authors.

During Stage 3, only six percent of the researchers in the sample joined the research area. Sixty-one more authors were recruited. By Stage 4, all the researchers in the sample had joined

Table 2. Institutions active in terrorism research during Stage 2 (1970–1978)
Sorted by Terrorism Publications

Institutions	No. of terrorism publications	Sample authors	# New recruits	Terrori. database	No. of terrorism conferences sponsored
Rand Corporation	62	Jenkins	11	Yes	
Institute of War & Peace Studies (IWPS), Columbia Univ.	41	Bell	2		
Union College, NJ	41	Wolf	0		
Center for Strategic & Int'l Studies (CSIS), Georgetown Univ.	33	Kupperman (11)	3		
		Laqueur (22)	0		1
Northwestern Univ.	31	Gurr	17	Yes	
Institute on the Studies in Int'l Terrorism (ISIT), SUNY, Oenota	29	Alexander	5		5
College Of Law, Lewis Univ.	21	Friedlander	2		
Central Intelligence AGency (CIA)	19	Mickolus	2		
Livingston College, Rutgers Univ.	20	Horowitz	0		
Institute for the Study of Conflict (UK)	19	Crozier	0		
Univ. of Cardiff (UK)	18	Wilkinson	3		
Univ. of Exeter (UK)	17	Clutterbuck	0		
Study Group on Int'l Terror., Oklahoma Univ.	15	Sloan	8		1
Wesleyan Univ.	13	Crenshaw	0		

the area and 31 new authors were recruited. Clearly, there was a dramatic decline in collaboration, the number of new authors entering the field and the level of financial support.

In all stages of the specialty, the trend is clearly that of single authorship (81%). The trend towards single authorship is similar to the authorship patterns identified in Crane's (1972) study of rural sociologists. As shown in a study of collaboration in the Information Exchange Group (IEG) by Price and Beaver (1966), the level of multiple authorship in a field is related to the amount of financial support given to research. This is highlighted in Schmid and Jongman's (1988) survey of terrorism researchers in which the respondents indicated the limited level of research funding.

A closer review of the authorship reveals the extent to which selected sample researchers did collaborate and their increased level of productivity. There were 229 cases of multiauthorships. During Stage 1, only two percent of the publications was collaborative. In Stage 2, the collaborative publications increased to 24%. Selected sample researchers contributed numerous publications and began to emerge as influential members of the research area. For Stage 3, the collaborative publications doubled to 50% and larger research teams (7–9 members) began to appear. In the final stage, the collaborative publications decreased to 23%, about the same level of Stage 2.

These collaborative relationships are examined by reviewing sample researchers' level of productivity and commitment to the research area. Using Crane's (1969 p. 344) criteria for analyzing the relationships among rural sociologists, different levels of productivity and of continuous commitment to the area were used to categorize the terrorism researchers. The researchers were grouped as follows: fourteen High Producers, each of whom published more than 34 papers in the area; (2) 10 Moderate Producers, each of whom published more than 14 papers but less than 34 papers in the area; (3) eight Transients, each of whom had published less than 13 papers and did not continue to do research in the area.

Although High Producers are the most collaborative (76%), 11% of the collaborative works were with other sample researchers. They shared preprints and participated in informal collaboration with each other. The High Producers published their first papers in the area either during Stage 1 (43%) or the "take-off" stage (57%). They remained in the field, defined research agendas, recruited other authors with specialized expertise, affiliated with research groups, and shared research issues.

The next subgroup, the Moderate Producers, had limited collaborative works (13%). In the Transients subgroup, researchers were not collaborative and produced less than 11 publications each. Although 25% of the Transients subgroup published their first publications in Stage 1, they did not continue to contribute to the area. Within the interdisciplinary nature of terrorism, researchers have several interrelated areas of research interest that they pursue at various times. Because of the commitment of the High and Moderate Producers and their development of a network of productive authors linking separate research groups of collaborators, the research area flourished.

How the specialty developed

These collaborative efforts while they do not dominate production, ultimately led to the creation of invisible colleges of terrorism researchers. They are identified by patterns of communication among key productive scholars such as sharing one another's work, maintaining informal contact, presenting at the same conferences, and establishing vehicles for diffusion of information. Klein (1985) described similar patterns in the interdisciplinary problem-focused research (IDR) area. Like many invisible colleges, the emergent field of research on terrorism has been shaped by the interests of its most productive members, who in this case are concerned primarily with policy-oriented research. The interactions of these members with other knowledge producers was critically important to the development of contemporary terrorism research.

The development of the research area was also influenced directly by knowledge producers outside the scientific community such as the media and the U.S. government. The participation of the media is examined first. The analysis established that the media played a primary role in

increasing public understanding of the terrorism phenomenon (Reid, 1993, p. 23). According to Schmid and deGraaf (1982), the media, with its reliance on government sources for information, has played a major role in the amplification and **diffusion of minor violence incidents**. The media is defined here as the mass media, that is, the newspapers and magazines on one hand and the electronic media, radio and television, on the other (Schmid & deGraaf, 1982, p. 2). Unlike researchers in other specialties, researchers in terrorism base their work mainly on sources supplied by the news media (Schmid & deGraaf, 1982, p. 57).

Since there is a scarcity of raw data on terrorist organizations (due to the clandestine nature of terrorist activities) while there is an abundance of data on media coverage of insurgent terrorism, journalistic reporting is the major source of data for terrorism incident data bases such as the CIA's File on International Terrorist Events (FITE), the Rand terrorism data base, and the International Terrorism: Attributes of Terrorism Events (ITERATE) data bases (Fowler, 1981). For example, the ITERATE data base has been utilized for a variety of purposes such as the study of diffusion patterns of transnational terrorism (Heyman & Mickolus, 1981), comparison of American policy responses (Evans, 1977) and terrorist trends analysis (Milbank, 1976). It is available from the Inter-University Consortium for Political and Social Research (ICPSR), Ann Arbor, Michigan.

In fact, many researchers questioned the objectivity and reliability of the media coverage of terrorism events (Epstein, 1977; Herman & Chomsky, 1988; Schmid & deGraaf, 1982; Wardlaw, 1982, p. 50; Wittebols, 1991b). Wardlaw's (1988) and Wilkinson's (1986, Appendix) comparisons of the Rand and CIA data bases for the years 1968–1977 emphasized the problem of unreliable data. The situation is further complicated by the fact that each data base relies on a different definition of terrorism. Without a well-accepted definition, the phenomenon is difficult to measure and analyze. Organizations such as the CIA will continue to redefine, reclassify and rewrite old estimates of terrorism incidents.

This trend of reclassifying old estimates of terrorism incidents was identified in the CIA research report: *Patterns of International Terrorism 1980* (Paull, 1982, p. 43; Schmidt, 1983, 260; Wardlaw, 1982, p. 50; Wardlaw, 1989; Wilkinson, 1986, p. 44). Furthermore, Paull (1982, p.44) and Schmidt (1983, p. 260) analyzed the wide disparity in coverage and reports of terrorism under the Ford, Carter, and Reagan administrations. Whereas eight types of incidents were classified as terrorism under the Ford administration, as many as 17 were classified as terrorism under Reagan.

For examples of such reclassification, an overview of CIA's statistical reports on international terrorism is presented (U.S. Central Intelligence Agency, 1977, 1978, 1979, 1980, 1981; Milbank, 1976). According to Schmid (1983, p. 253), the Rand chronology (developed by Jenkins) was first published in 1975 and has been the prototype for many other chronologies of terrorism incidents. Rand chronologies and press accounts for U.S. media sources were used to produce the ITERATE dataset (Schmid, 1983, p. 257). The ITERATE data set apparently formed a basis for the CIA's annual terrorism statistical report published in July 1977 (Schmid, 1983, p. 260).

For several years, the CIA has maintained computerized records on international terrorism (Wardlaw, 1982, p. 50). Although published in June 1981, their 1980 report completely revised many of the terrorism statistics published in previous years. Paull's (1982, p. 46) thesis study presents charts illustrating the reclassification of terrorism incidents under different administrations. In particular, under the Ford administration, the CIA classified international terrorism into the following categories: bombing, incendiary attack, armed assault, kidnapping, barricade-hostage, hijacking, assassination and other actions. Under the Carter administration, letter bombing, explosive bombing and incendiary bombing were added in place of the term "bombing". Additionally, the definition of terrorism was extended to include sniping and break-in theft.

In 1981, the CIA, now under the Reagan administration, changes the previous administration's definition of terrorism in several ways, it increased the number of categories classified as terrorism incidents and it further expanded the data base, retroactive to 1968 (Paull, 1982, p. 43; Schmid, 1983, p. 260; Wardlaw, 1982, p. 50; Wilkinson, 1986, p. 44). Thus, whereas the 1979 report said that there had been 3336 incidents of international terrorism between 1968 and 1979,

the 1980 report claimed that there were 6714 incidents between 1968 and 1980 (Wardlaw, 1982, p. 60; Wilkinson, 1986, p. 44). As summarized by Paull (1982, p. 43), the CIA rewrote the history of contemporary terrorism under three successive administrations, so that no meaningful comparison of "statistics" is possible. The reports are policy-directed intelligence not statistics on terrorism (Paull, 1982, p. 47).

Some researchers go as far as to maintain that the media is one of the indirect causes of terrorism. According to Alexander (1978a,b), Laqueur (1978), and Cooper (1977), the media sympathizes with terrorists and sides with the groups. Similar beliefs are evident in other research and emerge in Congressional testimonies (Cooper, 1977, p. 146). But Herman and O'Sullivan (1989, p. 43) consider such studies focusing on terrorists' manipulation of the media as part of an approach to deflect attention from the deeper causes of terrorism. In their study, they analyzed corporate ownership of the media and the role of the government in manufacturing terrorism images. According to Lee and Solomon (1990), the government plays a dominant role in shaping media coverage of many news stories.

The U.S. government certainly had a major impact in stimulating scientific growth in terrorism research by providing resources for research, dissemination of ideas, and retrieval of information. This was evident during the "take-off" stage when the U.S. government contracted with several think-tanks to conduct research on terrorism. These institutes, included but were not limited to, the Rand Corporation, the Center for Strategic and International Studies (CSIS) at Georgetown University, and the Institute for Studies of International Terrorism (ISIT) at SUNY. Table 2 lists some of the major institutions in terrorism research.

For example, in 1972 the U.S. government contracted with Rand to conduct research on international terrorism. Under the guidance of Brian Jenkins, one of the highly productive authors, the research team developed the Rand terrorism data base and produced numerous policy-oriented empirical research studies. Jenkins made presentations at 27 terrorism related conferences. In addition, he is a consultant to the U.S. government, foreign governments, mass media organizations, and private industries, and a former member of U.S. task forces on terrorism.

Rand's studies provide some empirical evidence to justify the government's increased use of force, rather than negotiations, to end hostage episodes (Jenkins, 1981; Jenkins, 1985, p. 39; Jenkins et al., 1977). The 1977 study of hostage incidents has been cited in at least 20 publications and used as evidence of the effectiveness of hostage taking and the need for appropriate countermeasures (Aston, 1981, p. 80; Crenshaw, 1981, p. 393; Kupperman & Trent, 1980, p. 56).

The sample identified 65 institutions and only 160 *acknowledged* sources of funding of terrorism research. The most frequently cited organizations were the U.S. government, the Rand Corporation, and the Institute for the Association of Chiefs of Police (IACP). Private industry was acknowledged by 41% of the publications, U.S. government 32%, foreign organizations/ governments 19%, universities/research centers 12%, and foundations 9%. The other publications did not identify funding sources. Twenty-six percent were identified as politically conservative, four percent as liberal, and the political affiliations of the others are unknown.

In addition to financing research, the institutions were active in sponsoring terrorism conferences. A total of 195 conferences were identified. Sponsorships by universities/research centers were acknowledged 27 times (14%). The U.S. government sponsorship was identified 27 times (14%). The government conferences provided some of the early forums for networking and exchanging ideas. They have been major forces in stimulating the development of a network of productive researchers.

Besides the exchange of ideas, formal dissemination of information was another result of the conferences. Of the conference papers presented during Stage 2, 64% were published: 29% as journal articles, 15% in conference proceedings, and 15% as reports. Many conference proceedings or summaries are published in terrorism journals founded by high producers such as Alexander, Jenkins, and Wilkinson.

Another result of government support for the research area is that most of the published studies in the sample can be identified and retrieved easily. The findings of an on-line bibliometric analysis indicated that the most relevant on-line commercial data bases for the

retrieval of terrorism information are government sponsored (Reid, 1992, p. 281). A search of 16 commercial data bases on DIALOG revealed that the National Criminal Justice Reference Service (NCJRS) and the Library of Congress bibliographic data bases were the most relevant for the identification of unclassified terrorism publications. During the "take-off" stage, the NCJRS was founded as a central information service for the U.S. law enforcement community (Terrorism, 1974, p. 4340). It is produced by the U.S. National Institute of Justice which also sponsored terrorism research projects.

Dispersion of publications

Other characteristics in the development of the research area are the domination of the journal article and the broad dispersion of publications among many journals. The dispersion was analyzed by using a Bradford distribution, Law of Scattering, that groups journals and articles to identify a nucleus of periodicals more particularly devoted to the subject (Leimkuhler, 1967).

The Bradford distribution plots the cumulative number of publications in the N journals carrying the most publications on terrorism research, against the N journals on a logarithmic scale. The 402 articles are scattered over 181 different interdisciplinary journals. According to the distribution, 21% of the sample terrorism research literature is in only five journals. These five journals comprise the nucleus for terrorism research. But, with the broad scattering of journals, 22 journals must be scanned to cover 43% of the literature, and more than 70 journals must be scanned to cover 75%.

The five journals which comprise the nucleus included two journals that are devoted exclusively to terrorism and were founded by highly productive authors in the sample. Of the 181 journals publishing terrorism articles, the journal *Terrorism* was the most productive. It produced eight percent of the publications and has dominated the research area since its conception. During Stage 2, Alexander founded the journal with Jenkins and Wilkinson as members of the board of directors. In addition, Jenkins founded *Terrorism, Violence, and Insurgency (TVI)* which is the next most productive journal.

The results of the on-line bibliometric analysis provided additional insights into the dispersion patterns. The increased occurrence of sample publications at diferent times in different types of data bases indicated the origin and spread of terrorism information. Lancaster and Lee (1985) provided the foundation for this type of investigation when they hypothesized that an important issue gradually moves from the science literature to the applied science literature to the popular press (newspapers and magazines), to Congressional testimony. But in contrast to their results, the contemporary terrorism issue has moved from the popular press to the social science research literature, back to the popular press and to Congressional testimony. Many terrorism publications are based on incident data bases that use media coverage as the source of raw data, so the movement has actually been from the popular press to research literature. Later, selected ideas inspire further discussion in reviews, editorials, broadcast interviews, and, eventually in legislative testimonies.

According to additional on-line searches in NEXIS and DIALOG's National Newspaper Index (NNI), Newspaper Abstracts and Magazine Index data bases, researchers such as Jenkins and Kupperman are often featured in broadcast interviews and in daily major newspapers. In the NNI, there are five articles about Kupperman's perspective on terrorism and sixteen articles written by him. There are nine articles featuring Jenkins' forecasts and seventeen articles by him. Thus, selected ideas are formulated by high producers who receive substantial media attention. The symbiotic relationship between high producers and the media industry is analyzed in Herman and O'Sullivan's (1989) study of the "terrorism industry".

On-line searches of the Congressional Information Services (CIS) data base revealed that 34% of the sample researchers have at some point given expert testimony on terrorism. Kupperman, former chief scientist of the U.S. Arms Control and Disarmament Agency and senior researcher at CSIS, has appeared before seven Congressional hearings and his terrorism study was provided for Congressional reading. Jenkins has appeared before five terrorism hearings and six of his publications have been used for Congressional background information.

Alexander, director of ISIT and researcher at CSIS, has testified at three hearings and is credited with creating a forum for the debate on terrorism (Schmid & Jongman, 1998, p.181).

The researchers were categorized into different levels of influence. Factors involved in assessing their influence were such activities as serving as a terrorism expert for government hearings, being the subject of media interviews, and being an author of a highly cited publication (cited more than 30 times). Table 3 identifies Jenkins and Kupperman as highly influential and Alexander as moderately influential researchers.

Dispersion of ideas

In further analysis of dispersion patterns, the sample researchers fall into two major subgroups with opposing ideas in such areas as the definitions of terrorism, etiology, role of media, and countermeasures. Table 4 lists some of the researchers' causal beliefs.

One group of researchers believed terrorism to be a particularly threatening form of political violence because of its revolutionary consequences. The other group considered this as a widely-accepted myth (Gurr, 1979, p. 23). Such ideas are examined in many publications (Herman & O'Sullivan, 1989, p. 39; Laqueur, 1978; Stohl, 1979; Szumski, 1986). Not only are there several opposing views about terrorism but there is a lack of consensus on the definitions, causes and theories of terrorism (Schmid & Jongman, 1988, p.133).

In the development of terrorism research, several basic considerations help to structure the research. Although media coverage of terrorism incidents is the major source of raw data, Schmid and Jongman's (1988, p.137) survey of terrorism researchers indicated a strong reliance on the sample researchers' publications such as Kupperman and Trent's study (1980) and government documents as other major sources of data. Therefore, the research process and the flow of terrorism information such as researchers' publications, government documents and media reports constitute a closed system in which information is created, processed, published, and disseminated.

Later the information feeds back into the circular system to stimulate further creation, processing, publishing, and dissemination. Since the closed system indicates a static environment, the same ideas, definitions, hypotheses, and theories continued to be analyzed, assimilated, published, cited, publicized by the media, and eventually retrieved. Selected ideas are given redundant dissemination and publication, thereby increasing their authors' visibility and the successful dissemination of their ideas.

For instance, Alexander's article on terrorists' exploitation of the media was presented at conferences and published five times in two journal articles and several anthology chapters (Alexander, 1978a; 1978b; 1980a; 1980b; 1984). His article in *Police Studies* was indexed in four data bases such as NCJRS and PAIS. Also, his 1977 conference paper and an anthology chapter were identified in NCJRS. He emphasized that terrorism is theater, an idea which is in agreement with several sample authors cited in his article such as Laqueur and Cooper (Alexander, 1980b, p. 332). In addition, he cited himself seven times to identify some of his earlier publications supporting his hypothesis (Alexander, 1980b, p. 346).

Also, his article described how and why some news organizations adopted specific guidelines to better manage their role in reporting on terrorist incidents (Alexander, 1980b, p. 344). Some of these same news organizations, such as the Chicago Sun-Times and Chicago Daily News, are cited in reports as examples of how the media has established standards for controlling its coverage of terrorism incidents. The encouragement of media self-restraint has been adopted as one of the U.S. policy options for combating international terrorism (Congressional Research Service, 1991).

According to Garvey (1979, p. 29), a closed system is characteristic of the communication system of science. Ideally, scientific research should be isolated from control outside of the scientific community. But in terrorism research, the influence of knowledge producers is severely skewed by the limited types of data used: the invisible college's publications, government documents and media coverage. Thus, development of knowledge in terrorism research has resulted in many political bias and policy-oriented studies such as Kupperman and Trent's study (1980).

Table 3. Influential relationships

Attribute	Highly influential							Moderately influential					SUBTOTAL
	CLIN	JENK	KUPP	ALEX	BELL	CLUT	CREN	CROZ	GURR	LAQU	STER	WILK	
1. Member—U.S. govt. committee/task force	×	×	×						×				4
2. Official—U.S. govt.	×						×						2
3. Employee—U.S. govt.	×		×										3
4. Consultant—U.S. govt.	×	×	×	×		×		×	×	×			9
5. Expert witness—U.S. Congressional hearing	×	×	×	×	×	×	×	×			×		8
6. Publication disseminated—U.S. Congressional hearing		×					×				×		3
7. Expert witness—media	×	×	×	×	×					×	×	×	8
8. Affiliated think-tank (RAND, CSIS, etc.)	×	×	×	×	×			×	×	×		×	8
9. Presentation—terrorism conference		×	×	×	×	×	×	×	×	×	×	×	12
10. Consultant—private industry		×	×			×	×	×	×			×	8
11. Consultant—govt. (non U.S.)		×									×	×	2
12. Author—highly cited publication		×	×		×	×		×	×	×	×	×	8
TOTAL	8	10	10	6	6	5	5	5	5	5	5	5	75

CONCLUSION

In this study, a model was used, based on numerous data sources, to analyze the evolution of knowledge in a scientific specialty and identify its influences on decision-making. In this article, Phases I and II of the model provided the framework to answer several strategic questions, including: how did knowledge in this specialty develop? How did researchers interact with other knowledge producers to shape the perception of a phenomenon? How did political factors influence the growth of knowledge?

Using a case study approach to a particular field, terrorism research, a series of measures were presented for analyzing the growth of the literature, influences of knowledge producers, and dispersion of the publications. The results indicated that the development of terrorism research area was influenced directly by knowledge producers such as the media and the U.S. government. They had major impacts on the definitions of terrorism, the types of data used in analysis, the selection of research problems, the dissemination of research findings, and the marketing of ideas. This resulted in the generation of many terrorism studies that are based on preconceived government policies and programs such as *Patterns of International Terrorism 1980.* The majority of the research has been presented from a one-sided perspective of terrorism from below (small insurgent groups) as opposed to research on the broader issues of etiology and state sponsored terrorism (terrorism from above).

This has major implications in the retrieval of terrorism information since there is an abundance of studies on terrorism from below; clearly, information specialists must utilize additional approaches for the identification of data generated from different schools of thought.

Table 4. Causal beliefs

Issue	Group A	Group B
Definitions of Terrorism	Political violence used by insurgency groups. Types of low-intensity or international warfare. All insurgency violence is terrorism.	Symbolic acts designed to influence political behavior by extranormal means, use or threat of violence. Threat or use of violence for political purpose when such action is intended to influence attitude and behavior of a target group wider than its immediate victims.
Causes	Want to overthrow democratic societies. Antigovernmental forces who want to produce chaos. Need to disturb society and orderly existence.	Hostility towards particular policies and political figures. Social and political issues—reigns of terror, imperialism.
Reasons for Rise of Terrorism	Defeat of Arab states in June 1967 war with Israel. Resurgence of extreme neo-Marxist and Trokskyist left among student population.	Need of communication, a way of ensuring public attention and even of channeling particular messages to chosen targets.
Profiles of Terrorists	Terrorists—madman, criminals. Members of disposed groups, irrational and suicidal people. Modus operandi—hijacking, assassination	Actions often social nuisance than serious threat to life and property. Members of groups operating clandestinely and sporadically (areas they do not control).
Roles of Media	Terrorist exploits the media. Media make terrorism theater. Create emotional state of extreme fear in target group to bring changes in government or society.	Fabricate and intensify the terrorism threat. Disseminate pro-government policies and definitions of terrorism. Ignore the dangerous issue of state sponsored or terrorism from above.
Responses	No concessions. Terrorist acts are criminal acts. They are not political prisoners. They are part of growing international network of terrorists. Government use of force is necessary.	Negotiation is necessary. Investigate etiology of terrorism. There is no international network of terrorists.

Such approaches could include the retrieval of information generated by excluded terrorism authors such as Chomsky and Cockburn, resources produced by groups operating clandestinely, and data compiled by grass root organizations such as the Human Rights Internet Reporter and Amnesty's Annual Reports (Herman, 1983; Herman & O'Sullivan, 1989, p. 246). Herman and O'Sullivan's (1989, p. 143) survey of terrorism experts examined the concept of excluded terrorism authors and described them as terrorism authors who cannot be relied upon to give the pro-Western perspectives of terrorism. Therefore, they are not accredited as terrorism experts by the mass media and are thus not allowed to define the issues, give expert testimony before Congress, participate on Congressional task forces and terrorism conferences sponsored by government agencies.

Further, information specialists must use innovative approaches to identify a broader range of studies on terrorism from above such as research by Stohl and Lopez (1986), Paull (1982) and Herman (1983).

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