

# **Q-Analysis of Inter-Ethnic Relationships can Support Information Operations<sup>1</sup>**

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## **Introduction**

This paper reports on the use Q-analysis to study the degree of inter-ethnic linkages between the Serbs, Croats, and Muslims in Bosnia-Herzegovina reflected in the results of public opinion poll data provided by the United States Information Agency (USIA). The degree of inter-group linkage is specified in terms of a property known as the Q-connectivity. Changes in this property reflect changes in the degree of mutual concurrence with specific sets of public opinion poll data. The material in the following paper is based on work described in previous papers (Woodcock and Heath, 1999, 1998a and 1998b) that has demonstrated the utility of the Q-analytic approach to examine the degree of linkage and division between these ethnic groups in Bosnia-Herzegovina in the period between 1995 and 1998.

Two clusters of poll data have been used in the study. One of these clusters, called the *Ethnic Relations Data Set* by the authors, reflects answers to questions on matters related to the relationships between the three groups mentioned above. The other cluster, called the *International Relations Data Set*, reflects to a major extent the opinions of these groups on the nature of their relationships with several international entities and with the Dayton Accord.

Q-analysis of the Ethnic Relations Data Set is one in which the ethnic groups appear to have an overall level of confidence in the local government, the police, and the courts and express the need to forget the injustices of the past. However, there is a corresponding unfavorable opinion by the other ethnic groups for their counterparts and pessimism about peaceful coexistence and the risk of living as an ethnic minority. The major feature that emerges from the Q-analysis of the International Relations Data cluster is the generally relatively high level of concurrence with the Dayton Accords and the belief that they are better than continued war.

## Q-Analysis Of Time-Specific Public Opinion Poll Data From Bosnia

Q-analysis is a method based on algebraic topology developed initially by Atkin (1972, 1974, 1979) that has stimulated research by many investigators including Dockery (1982) and Griffiths (1983). The process of observation establishes relationships between the sets  $\{P\}$  and  $\{A\}$  where  $\{A\}$  is the set of the physically-possible phenomena permitted by the observational technique. In the following paper the set  $\{P\}$  is identified as the three ethnic groups: Serb, Croat, and Muslim in Bosnia-Herzegovina. The set  $\{A\}$  is identified with specific poll data reflecting the public opinions of these groups on a series of topics related to their beliefs and feelings of security and related matters in Bosnia-Herzegovina. The Q-connectivity of entities is described in terms of structures called simplexes. Entities that are linked by two relationships form a 1-simplex and those with three relationships form 2-simplexes, for example.

The direct relationship,  $\phi$ , between the ethnic groups and their poll results is expressed in terms of the sets  $\{P\}$  and  $\{A\}$ , as follows:  $\{A\} \xrightarrow{\phi} \{P\}$ . This relationship can be represented as a matrix array with entries representing the relationships between the different components of the sets  $\{P\}$  and  $\{A\}$ , as described in more detail below. In this paper, the incident matrix will be chosen to represent the opinion of the different ethnic groups on specific poll questions. Furthermore, it is also possible to define the inverse relationship  $(\phi^{-1})$  where:  $\{P\} \xrightarrow{\phi^{-1}} \{A\}$  in which the corresponding incidence matrix is the transpose of the matrix formed for the direct  $(\phi)$  relationship.

Incidence matrices have been constructed for the public opinion poll data and used as input to the Q-analytic process. Before such analysis was performed, it was necessary to use the “slicing” process defined by Atkin in order to prepare the data as described below (also see Atkin, 1974, and Woodcock and Heath, 1999, for example). Slicing the data has the effect of filtering out some of the data elements with values below the threshold slicing level.

Q-analytic methods have been used to study data collected by the United States Information Agency between December 1995 and February 1998 in order to determine whether or not changes have occurred in the nature of the answers provided to specific questions by these ethnic groups between 1995 and 1998. As mentioned above, two clusters of poll data have been used in the study. One of these clusters, called the *Ethnic Relations Data Set* by the authors, reflects answers to questions on matters mainly related to the relationships between the three groups mentioned above. The other cluster, called the *International Relations Data Set*, reflects to a major extent the opinions of these groups on the nature of their relationships with several international entities and with the Dayton Accord.

### The Ethnic Relations Data Set Cluster

The so-called Ethnic Relations Data Set cluster involves data on the answers to the following public opinion poll questions, listed below as questions E1 to E9, collected by the United States Information Agency during 12/1995, 4/1996, 1/1997, 7/1997, and 2/1998 and published in 1998.

- E1. Do you believe that the Serbs, Croats, and Muslims can live peacefully together in the country or has the war done too much damage for them to live together peacefully anymore?
- E2. People can feel completely safe only when they are in the majority in their country.
- E3. What is your opinion of the Muslims in Bosnia?
- E4. What is your opinion of the Serbs in Bosnia?
- E5. What is your opinion of the Croats in Bosnia?
- E6. We need to forget the injustices of the past and concentrate on the future.
- E7. How much confidence do you have in the local government?
- E8. How much confidence do you have in the police?
- E9. How much confidence do you have in the local government?

A sample of the data used in this study consisting of public opinion poll answers to the question: “How much confidence do you have in the local government?” (here listed as question E7) is shown in Figure 1. Some 49 per cent of Serbs had confidence in the local government in 12/1995 and 65 per cent in 2/1998; the corresponding data for the Croats changed from 39 per cent (12/1995) to 57 per cent (2/1998); and the figures for the Muslims change from 62 per cent (12/1995) to 72 per cent (2/1998).

<b>Bosnian Serbs</b>					
	12/95	4/96	1/97	7/97	2/98
<b>Total Confidence</b>	49	52	67	75	65
<b>Total Non-confid.</b>	45	46	31	19	31
<b>Bosnian Croat</b>					
	12/95	4/96	1/97	7/97	2/98
<b>Total Confidence</b>	39	57	47	59	57
<b>Total Non-confid.</b>	60	43	49	37	41
<b>Bosnian Muslim</b>					
	12/95	4/96	1/97	7/97	2/98
<b>Total Confidence</b>	62	70	66	77	72
<b>Total Non-confid.</b>	38	30	30	22	25

*Figure 1: Public opinion poll answers to the question: “How much confidence do you have in the local government?” (Source: USIA, 1998, Table 109).*

The public opinion poll data were subjected to Q-analysis using the computer facilities outlined in Woodcock and Heath, 1998. A more extensive analysis of these data has been carried out and is reported in Woodcock and Heath (1999, 1998a). Results of the Q-analysis of the data collected in 2/1998 are shown in Figure 2. Analysis of the data sliced at the 40 and 50 per cent levels is reported below for both the direct and indirect relationships.

1. 40 per cent Slicing: The Direct Relationship ( ). The Serbs concur with questions E4 and E6 to E9, The Croats concur with questions E5 to E9, and the Muslims concur with all questions except E4. This latter reflects a continuing distrust of the Serbs by the Muslims. As a consequence, the Serbs were involved in a mutual 4-

simplex and in a 3-simplex with the Croats and Muslims. The Croats were involved in a mutual 4-simplex and in a 4-simplex with the Muslims and the Muslims were involved in a mutual 7-dimensional simplex (Figure 2).

2. 40 per cent Slicing: The Inverse Relationship ( $\neg$ ). Question E5 was involved in a mutual 1-simplex, and in 1-simplex relationships with questions E6 to E9. Questions E6 to E9 were involved in mutual and inter-question 2-simplex relationships (Figure 2).
3. 50 per cent Slicing: The Direct Relationship ( $\wedge$ ). The Serbs concurred with questions E4 and E6 to E9 and were involved in a mutual 4-simplex and in 1- and 3-simplices with the Croats and Muslims. The Croats were involved in a mutual 2-simplex as well as a 2-dimensional simplex relationship with the Croats. The Muslims were involved in a mutual 6-dimensional simplex. (Figure 2).
4. 50 per cent Slicing: The Inverse Relationship ( $\neg$ ). The question E5 was involved in mutual 1-simplex and in 1-simplex relationships with E6 and E7; E6 was involved in a mutual 2-simplex, in 2-simplex relationships with E7, and 1-simplex relationships with E8 and E9; E7 was involved in a mutual 2-simplex and in 1-simplex relationships with E8 and E9; E8 and E9 were involved in 1-simplex relationships (Figure 2).

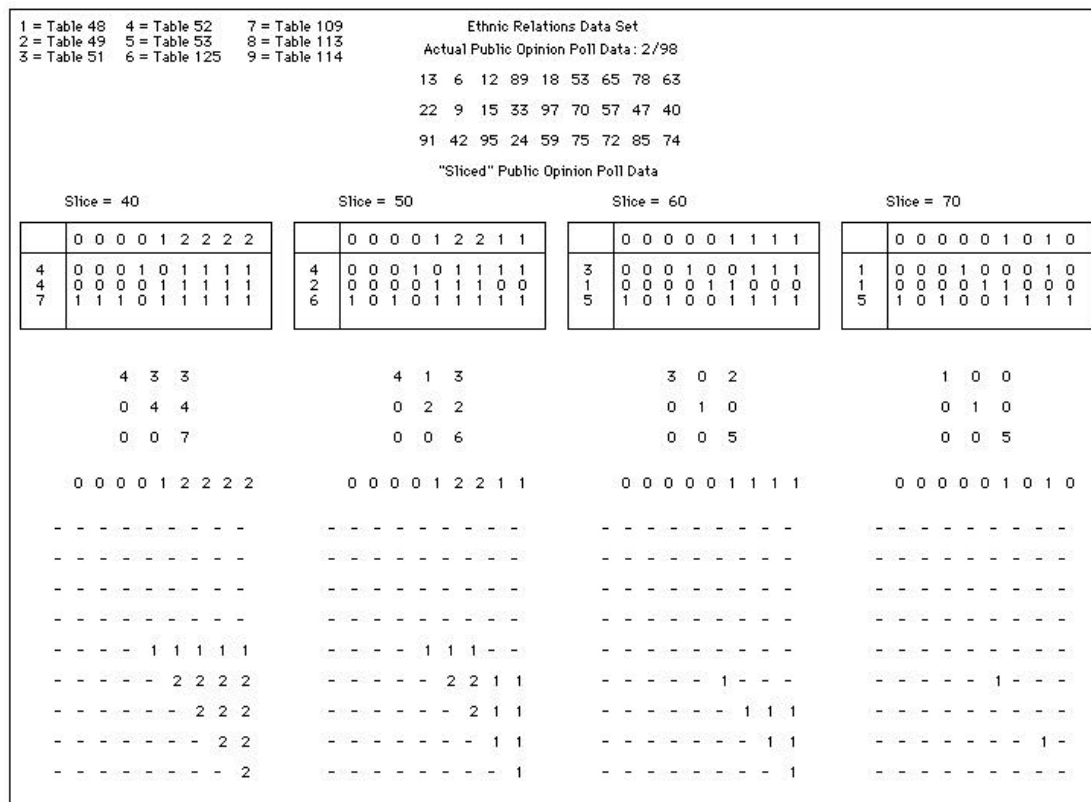


Figure 2: Q-analysis of the 'ethnic relations' public opinion poll data from 2/1998.

The picture that appears to emerge from the results of the time-dependent Q-analysis described in this section is one in which the ethnic groups appear to have an overall level of confidence in the local government, the police, and the courts (questions E7 “*How much confidence do you have in the local government?*”, E8 “*How much confidence do you have in the police?*”), and E9 “*How much confidence do you have in the courts?*”) and in the need to forget the injustices of the past (question E6 “*We need to forget the injustices of the past and concentrate on the future*”).

However, there is a corresponding generally unfavorable opinion by the other ethnic groups for their counterparts (questions E3 “*What is your opinion of the Muslims in Bosnia?*”, E4 “*What is your opinion of the Serbs in Bosnia?*”, and E5 “*What is your opinion of the Croats in Bosnia?*”) and pessimism about peaceful coexistence (question E1 “*Do you believe that the Serbs, Croats, and Muslims can live peacefully together in the country or has the war done too much damage for them to live together peacefully anymore?*”) and the risk of living as an ethnic minority (question E2 “*People can feel completely safe only when they are in the majority in their country*”).

This seems to suggest that there is an apparent willingness of the ethnic groups to look for support from, and to have faith in, entities that are potentially above the immediate group level. It also suggests that each of the ethnic groups have relatively low opinions of the other groups on a more personal level and that there is a real fear of being placed at risk by being in an ethnic minority.

### **The International Relations Data Set Cluster**

Having considered the inter-personal and inter-ethnic dimensions of public opinion in Bosnia, attention was paid to the opinions of the different ethnic groups with regard to questions concerning the more international aspects of that environment. In order to support these activities, a so-called *International Relations Data Set* cluster has been identified. This cluster involves data on the answers to the following public opinion poll questions (identified as questions I1 to I9) collected by the United States Information Agency during 12/1995, 4/1996, 8/1996, 1/1997, 7/1997, and 2/1998 and published in 1998.

- I1 Do you favor or oppose the Dayton Peace Accords?
- I2 This question asked whether or not the [Dayton] Accords are better than continued war.
- I3 How much confidence do you have that these [Dayton] accords will result in a lasting peace for us?
- I4 What is your opinion of the provision that Bosnia Hercegovina (sic.) will remain a single state?
- I5 What about the Bosnian Serb Republic? Do you favor or oppose the existence of a Bosnian Serb Republic?
- I6 Do you favor or oppose the Muslim-Croat Federation between Bosnian Croats and Muslims?
- I7 And what about the Confederation agreement between Croatia and the Muslim-Croat Federation?

- I8 How concerned are you that fighting might start again in a few years?  
 I9 What is your opinion of the presence of SFOR [IFOR] peacekeeping troops in Bosnia Hercegovinia (sic.)?

Sample public opinion poll data in answer to the question “*Do you favor or oppose the Dayton Peace Accords?*” (listed here as I1) are presented in Figure 3. The Accords were favored by a clear majority of the three ethnic groups for the period of interest. Some 67 per cent of the Serbs favored the Accords in both in 12/1995 and in 2/1998. The corresponding figures for the Croats were 74 and 73 per cent and the figures for the Muslims were 85 per cent and 97 percent.

<b>Bosnian Serbs</b>						
	12/95	4/96	8/96	1/97	7/97	
2/98						
<b>Total Favor</b>	67	81	68	63	79	67
<b>Total Oppose</b> 33	18	31	34	19	26	
<b>Bosnian Croat</b>						
	12/95	4/96	8/96	1/97	7/97	
2/98						
<b>Total Favor</b>	74	79	79	76	76	73
<b>Total Oppose</b>	25	20	21	23	22	24
<b>Bosnian Muslim</b>						
	12/95	4/96	8/96	1/97	7/97	
2/98						
<b>Total Favor</b>	85	95	94	94	97	97
<b>Total Oppose</b> 15	5	6	6	3	3	

Figure 3: Public opinion poll data in answer to the question “*Do you favor or oppose the Dayton Peace Accords?*” (Source: USIA, 1998, Table 18).

The public opinion poll answers to the questions listed as I1 to I9 were subjected to Q-analysis in order to determine the pattern of direct relationships ( ) between the opinion of the Serbs, Croats, and Muslims with regard to the international relations data cluster as well as the inverse relationship ( <sup>-1</sup> ) between the answers to the public opinion poll questions. The major difference between the results of the Ethnic and International Relations data clusters is the greater level of concurrence with the International relations questions. This results in a greater connectivity between the opinions of the different ethnic groups with regards to international matters. This observation can be seen as a possibly partial extension of the results obtained from analysis of the Ethnic Relations data set. In that case, there appeared to be less inter-ethnic group agreement about relatively personal matters and more agreement concerning local government and the judicial system, matters that are local or regional in scope.

Simplex relationships and other data for Serb, Croat, and Muslim ethnic groups are shown in Figure 4 for the opinion poll information collected in 2/1998. Analyzed poll data show a reduction in the level of entity question concurrence and entity simplex connectivity. Results of the Q-analysis of 2/1998 data sliced at the 40 and 50 percent levels is reported below for both the direct and indirect relationships.

1. 40 per cent Slicing: The Direct Relationship (  $\lambda$  ). The Serbs concurred with all questions except I4, I6, and I7, the Croats with all but questions I4 and I6, and the Muslims with all but question I5. As a result, the Serbs were involved in a mutual 5-simplex, and in 5- and 4-simplexes with the Croats and Muslims, respectively. The Croats were involved in a mutual 6-simplex and a 5-simplex with the Muslims, and the Muslims were involved in a mutual 7-simplex relationship (Figure 4).
2. 40 per cent Slicing: The Inverse Relationship (  $\lambda^{-1}$  ). Questions I1, I2, I3, I8, and I9 were involved in mutual 2-simplex connectivities, questions I5 and I7 were involved in mutual 1-simplex relationships, and I4 and I6 were involved in no connectivity relationships (Figure 4).
3. 50 per cent Slicing: The Direct Relationship (  $\lambda$  ). The Serbs were involved in a mutual 5-simplex and in 3- and 4-simplex relationships with the Croats and Muslims, respectively. The Croats were involved in a mutual 4-simplex and a 3-simplex with the Muslims and the Muslims were involved in a mutual 6-simplex, compared with a 7-simplex in 1/1997 (Figure 4).
4. 50 per cent Slicing: The Inverse Relationship (  $\lambda^{-1}$  ). Questions I4 to I7 were not involved in any connectivity relationships in 2/1998 (Figure 4).

The major feature that emerges from the Q-analysis of the International Relations data cluster is the generally relatively high level of concurrence with more of the questions compared with the concurrence with those questions in the Ethnic Relations data cluster. However, the levels of concurrence for the International Relations Cluster decline between 12/1995 and 2/1998 (Woodcock and Heath, 1999). In particular, the general persistent concurrence with questions I1 (*“Do you favor or oppose the Dayton Peace Accords?”*), I2 (*whether or not the [Dayton] Accords are better than continued war*), I3 (*“How much confidence do you have that these [Dayton] accords will result in a lasting peace for us?”*), I8 (*“How concerned are you that fighting might start again in a few years?”*), and I9 (*“What is your opinion of the presence of SFOR [IFOR] peacekeeping troops in Bosnia Hercegovina (sic.)?”*) is very noticeable.

This compares with the persistence of support for the Ethnic Relations questions E6 (*“We need to forget the injustices of the past and concentrate on the future”*), E7 (*“How much confidence do you have in the local government?”*), E8 (*“How much confidence do you have in the police?”*), and E9 (*“How much confidence do you have in the courts?”*). By contrast, there is a relatively marked lack of support for propositions suggesting support for one ethnic group by the other ethnic groups on an inter-group basis.

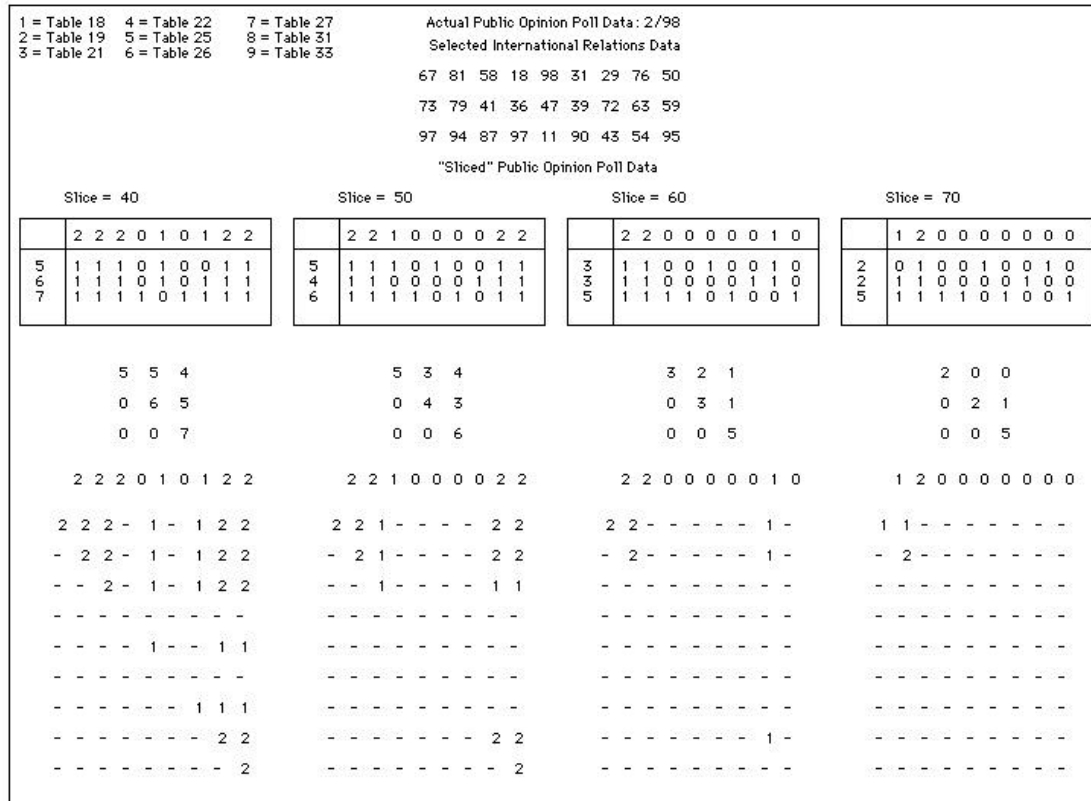


Figure 4: Q-analysis of the 'international relations' opinion poll data collected in 2/1998.

### The Way Forward

This paper has used Q-analysis to study selected public opinion poll data obtained from Serbs, Croats, and Muslims in Bosnia Herzegovina by the United States Information Agency and published in 1998. Two clusters of public opinion poll data, referred to as the *Ethnic Relations* and *International Relations* data clusters have been identified and used in the study. Q-analysis of the Ethnic Relations data set appears to suggest that there is an apparent willingness of the ethnic groups to look for support from, and to have faith in, entities that are potentially above the immediate group level. Another feature that appears to emerge from this study is the generally relatively higher level of positive responses to the different questions from the Muslim poll sample compared with those from the Serbs and Croats.

This analysis also suggests that each of the ethnic groups has relatively low opinions of the other groups on a more personal level and that there is a real fear of being placed at risk by living in a region where an individual would be in an ethnic minority. This finding clearly reflects the wide divisions between these different ethnic groups in Bosnia Herzegovina in early 1998. However, there appears to be a relatively high level of confidence in the local government as well as in the police and the courts.

The major feature that emerges from the Q-analysis of the International Relations data cluster is the generally relatively high level of support for the Dayton Accords, the likelihood that the



Accords would provide the basis for a lasting peace, and the presence of SFOR [IFOR] peacekeeping troops in Bosnia. There was a serious concern by all ethnic groups that fighting might break out again. The Q-analyses of inter-ethnic relationships reviewed in the paper provide an assessment of the degree of similarity or differences in the opinion of ethnic groups on matters of critical local, national, and international importance. The understanding generated by these analyses can support development of information operation tactics and strategies and can therefore contribute to a wide range of military activities.

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