

Titled An Association as a Belief Network and Social Network

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Abstract

A social network is composed of individuals who may have various relationships with one another. Each member of such a network may hold relevant beliefs and may connect each belief to other beliefs. A connection between two beliefs is a reason. Each member's beliefs and reasons form a more-or-less connected network. As members of a group interact, they share some of their respective beliefs and reasons with peers and form a belief-network that represents their common view. However, either the social network or the belief network can be disconnected if the group is divided.

This study mapped both the social network and the belief-network of a Rotary Club in the US Midwest. The Club's leadership found the results useful for diagnostic and planning purposes. This study also piloted a methodology that may be useful for social scientists who analyze organizations and associations of various kinds.

Theoretical Background

Members of any group typically constitute a social network in which the links are bilateral relationships, such as a supervisor and a subordinate or two fellow participants in the same team. The whole network may or may not be connected.

Meanwhile, each member of a group holds a set of relevant beliefs that may be connected to other beliefs with reasons. For instance, the opinions that "We need more young members" and "We should have more impact on youth issues" might be connected in an individual's network of beliefs, which I have labeled an *idiodictuon*—from the Greek words for "personal" and "network" (Levine 2022, Levine in press; cf. Dalege, Galesic & Olsson 2023).

When members of a group communicate about its work, they share nodes and links from their respective *idiodictuons* with individuals with whom they are connected, trying to make the others' beliefs resemble their own. For instance, one colleague might tell another that the organization needs more young members, hoping to add that belief to the recipient's thinking. The whole group can have a shared network of beliefs, a *phylodictuon*, which reflects its current stance. However, a divided group might be better modeled as a set of disconnected social- and belief-networks.

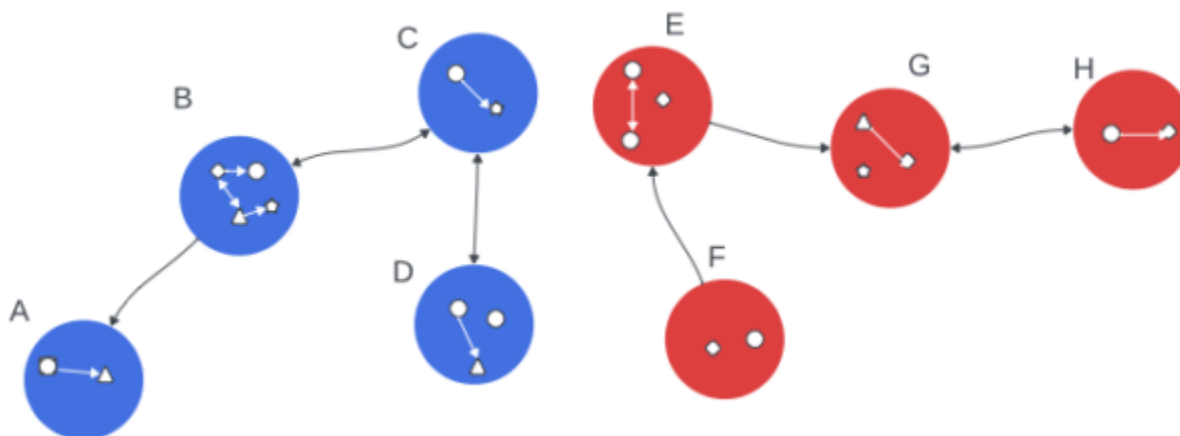


Figure 1: Hypothetical model.

Fig. 1 is an illustrative model of a hypothetical organization. The circles represent people: the members of the group. A link between any two members indicates that one or both have identified the other as an influence. That is a standard social network graph. The small shapes (stars, circles, etc.) represent the beliefs that individuals most strongly endorse. The arrow between a pair of beliefs indicates that one belief is a reason for another. (Links can be one-way or reciprocal). The network within each circle is one person's idiodictuon.

The same data could also be represented as one network of ideas (the group's phylodictuon) with indications of how many members endorse each belief and each connection between beliefs. That is how I represent the actual data from this pilot study in fig. 4.

Some psychological research suggests that mapping explicit reasons will not yield worthwhile insights because people do not know how their own beliefs are connected. A prominent overview of Moral Foundations Theory asserts that "Individuals are often unable to access the causes of their moral judgments" (Graham, Nosek, Haidt, Iyer, Koleva & Ditto 2011, 368). We are good at inventing retrospective justifications for our intuitions (Thiele 2006; Swidler 2011, 147-8; Haidt 2012, 27-51). Factor analysis and other methods that elicit *latent* variables from survey data are especially promising if people do not really know why they hold the opinions that they express. A latent variable is an explanation that the subject may not recognize.

However, the "interactionist" theory of Mercier and Sperber (2017) suggests that explicit reason-giving plays an essential role in groups. When we offer a justification for a belief, this may not be the best explanation for why we originally adopted the belief. Nevertheless, it is a reason that other people can consider. Offering reasons can change opinions, change the agenda of debate, change norms and assumptions, and change who is influential in a group. Mercier and Sperber propose that "reasons are primarily for social consumption" (Mercier & Sperber 2017, 220; 127). The method I propose here maps the reasons of a functioning group.

To be sure, an organization is more than its members and their beliefs and reasons (Epstein 2015). It is also constituted of assets (physical, financial, and otherwise), its external reputation, its own rules and any rules enforced from outside, its history, and many other features. Nevertheless, its social and belief-networks are significant, and understanding them has practical benefits. For leaders and for active members of an organization, a valuable basis for effective action is to understand who believes what, who is connected to whom, which beliefs are connected to which, and how those things come together. Tools and techniques for “Participatory Modeling” allow groups to create shared models of their situation, and the method I discuss here has similar potential (Voinov and colleagues 2018).

Opportunities for analysis

For any organization, it is possible to test several hypotheses using social-network and belief-network data. These hypotheses are not meant to apply generally to groups. On the contrary, I would expect that for each organization, most of the hypotheses will turn out to be *false*. The purpose of testing them is to provide a description of the specific group that is useful for diagnosis and planning. If the same method is replicated in numerous groups, it may be possible to begin understanding which of these phenomena are most common under various circumstances.

H1: The group is unified.

H1a: The group is socially unified to the extent that its members belong to one network connected by interpersonal influences. The denser the ties within the connected network, the more the group displays social unity.

H1b: The group is epistemically unified to the extent that members endorse the same beliefs, and to the extent that these shared beliefs are central in their belief networks.

H2: The group is polarized.

H2a: The group is socially polarized if many members belong to two separate subgroups that are connected by interpersonal influences but are not connected to each other, as depicted by the red and blue clusters in my hypothetical image.

H2b: The group is epistemically polarized if many members endorse belief A, and many other members endorse B, but very few or no members endorse both A and B. If A and/or B also have high network-centrality for the people who endorse them, that makes the epistemic polarization more serious. (Instead of examining specific beliefs, we can also look at constructs derived from factor analysis.)

H3: The group is fragmented.

H3a: The group is socially fragmented if many members are connected by influence-links to zero or just one other member.

H3b: The group is epistemically fragmented if no specific beliefs are widely shared by the members.

H4: The group is homophilous if individuals who are connected by influence-ties are more likely to endorse the same beliefs, or have the same central beliefs, or reflect the same constructs, compared to those who are not connected. If the opposite is true—if socially connected people disagree more than the whole group does—then the group is heterophilous.

H5: There is a core and a periphery.

H5a: There is a social core if some members are linked in a relatively large social network, while most other members are socially fragmented.

H5b: There is an epistemic core if many (but not all) members endorse a given belief, or a given belief is central for them, or they share the same constructs, while the rest of the organization does not endorse that belief.

H6: Certain members are bridges.

H6a: A person is a social bridge if the whole group would be socially polarized without that person.

H6b: A person is an epistemic bridge if the whole group would be epistemically polarized without that person.

H7: Members tend to hold organized views: This is true if the mean density of individuals' belief networks (the mean number of links/nodes) is high, indicating that people see a lot of logical connections among the things they believe.

What to do with the results?

Although the practical implications of these results would depend on the organization's goals and mission, I would generally expect polarization, fragmentation, the existence of cores, and homophily to be problematic. These variables may also intersect, so that an organization that is socially polarized, epistemically polarized, and homophilous is especially at risk of conflict, particularly if members hold tightly organized beliefs. A group that is fragmented and reflects disorganized belief-networks at the individual level may face a different kind of risk, which I would informally label "entropy."

Being unified can be advantageous unless it reflects group-think or social exclusivity that will prevent the organization from growing. I would generally anticipate that bridges are helpful and should be supported and encouraged.

Once an organization knows its specific challenges, it can use appropriate programming to make progress. For instance, if the group is socially fragmented, maybe it needs more social opportunities. If it is polarized, maybe a well-chosen discussion could help produce more bridges. If it displays entropy, maybe it needs a formal strategic plan.

Pilot study: Sample and method

To explore this theoretical model and to begin developing practical tools that might inform organizations, I collaborated with a Rotary Club in the Midwestern United States (“the Club”) to map its social and belief networks.

In an open-ended survey, I asked members of the Club to suggest beliefs that were relevant to the organization. A colleague and I coded these responses to produce a list of 30 statements that captured most of their ideas. In a second survey, I asked individuals to identify statements on that list with which they strongly agreed. I then showed them pairs of their own ideas in a format that looked like fig. 2.*

You said that Rotary needs younger members. Is that a reason for any of these statements? In other words, do you believe any of these things because Rotary needs younger members?

(Please check as many as apply or leave this question blank if none apply.)

- Rotary should influence local government
- Rotary needs more diverse members
- There are not enough highly engaged Rotarians
- Rotary has a positive reputation

Figure 2: A sample survey item.

The response-options displayed to this hypothetical respondent are all the beliefs that this respondent had strongly endorsed. Checking any of the boxes creates a link between two beliefs: the one that is in the prompt (here, the Rotary’s needs for younger members) and the statement next to the box. The respondent sees one such question for each endorsed belief.

* Respondents first answered some light questions about ice cream to train them on thinking about this kind of item and its logic.

I also asked a social network question in the following form: “Please write the names of up to five other [Club members] who influence you most. Please try put the most influential first and the others in descending order. (No one will be told whether they were named, how many people named them, or who named them.)” When any respondent names another person, that creates a link in the social network.

Sample: I contacted 132 Rotarians. In response, 48 people completed at least one of two surveys, and 32 people (or 24% of the club) answered all questions. Because the size of the sample is modest, the results that I report here should be interpreted with caution. We do not know what the non-respondents would have said if they had completed the survey. On the other hand, I collected a lot of information from each of the respondents, so this study is like an intensive focus group of some members. The main limitation is that non-response could be correlated with a particular set of beliefs or a certain standing in the social network, and that would threaten the validity of the results.

The survey included a battery of demographic questions, so that I could test whether any polarized subgroups or core groups have similar demographic characteristics. Hypothetically, for example, a group could polarize epistemically or socially along gender lines. And I asked general evaluative questions, such as whether each individual feels valued in the association, which allowed me to test whether phenomena such as social- connectedness and agreement with others were related to satisfaction.

Findings

In sum, I find that Rotary Club members agree about many ideas and form one connected social network. Many members would endorse the same coherent story about the Club: they join to associate with friends and serve others, they have created a positive model for their community, but they need more highly engaged members, especially younger ones. They disagree about some matters, but there are no signs that these disagreements have polarized the Club or created factions.

1. The social network.

I asked individuals to name other Rotarians who influence them, to see whether the club is a unified social network or else divided into subgroups. Fig. 3 shows each member as a dot. An arrow between dots indicates that a member named another member as an influence. The more people who named each person, the larger the dot. Some people are not shown because they did not name any connections and were not named by anyone else.

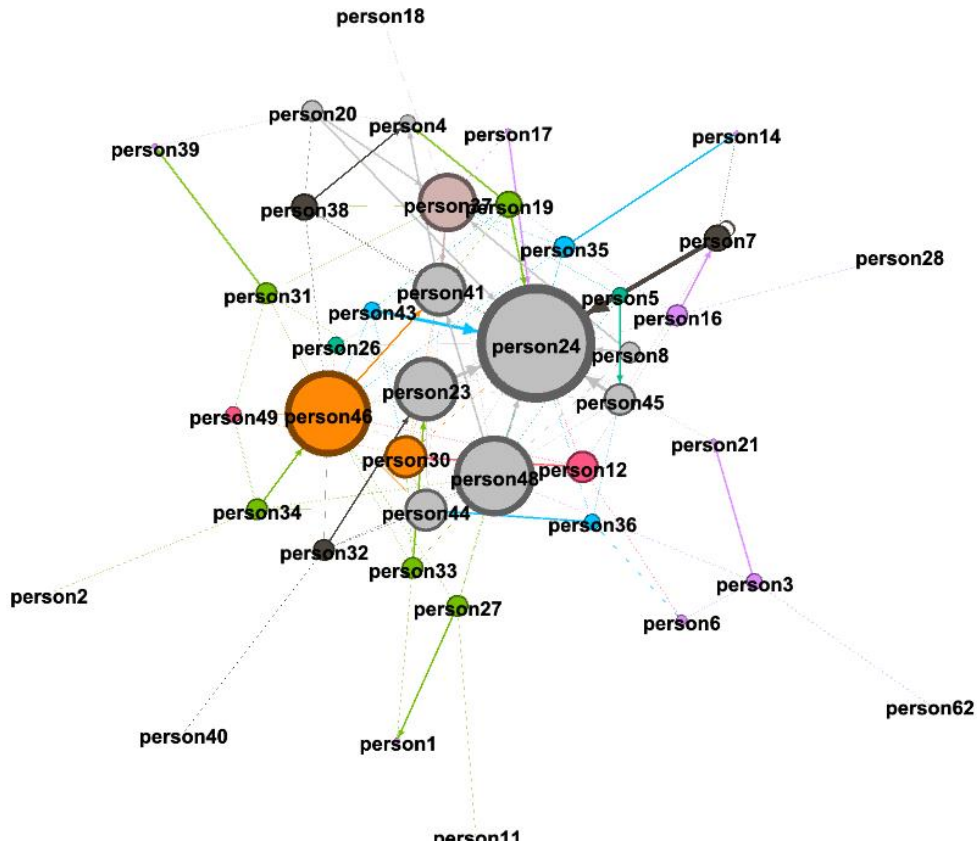


Figure 3: The social network.

Overall, fig. 3 reveals that some members are much more connected than others. One person (#24) was named as an influence by 17 peers, whereas several members were not named at all. However, the whole club is not split into separate clusters. The most socially connected five or six individuals tend to be connected to each other, and most members are connected to someone else who is highly connected.

For each individual, I calculated social-network metrics: the number of incoming and outgoing connections. Gephi software used an algorithm to categorize participants into two clusters, with two respondents left out of either cluster because they had very few links. Those clusters generate the colors in fig. 3.

I was unable to find statistically significant relationships between how connected members are and such factors as age, years spent in Topeka, sex/gender, or race. It does not appear that the Rotary Club has an insider faction that differs from everyone else demographically.

2. The belief-network

At the heart of the project were opinion questions based on ideas that the Rotarians themselves had generated in my first survey. Table 1 shows the percentage of respondents who agreed or disagreed with each belief, in rising order of agreement.

Table 1: Agreement with the 30 beliefs

	Mean (1-10 scale)	SD
Liberals/progressives are too influential	7.39	1.34
Our city is not thriving economically	7.69	1.17
Rotary should influence local government	7.75	1.16
Americans are uncivil	7.80	1.02
Our city youth do not have good enough opportunities	8.08	0.87
Our city is divided	8.14	0.80
Local public schools do not get enough support	8.44	1.03
Our city has a thriving business community	8.50	1.11
Rotary needs to do more for our city	8.63	0.73
There are not enough highly engaged Rotarians	8.66	0.84
It's difficult to get young people involved	8.71	1.07
Rotary members are highly engaged	8.72	0.91
The pandemic continues to affect us	8.75	0.91
Our city is diverse	8.83	0.81
Our city's downtown needs development	8.92	1.00
Crime is a serious problem in our city	8.94	0.83
I participate in Rotary to serve others	9.06	0.83
Rotarians model better ways of relating to others	9.08	0.69
Rotary should promote voting and civic engagement	9.08	0.91
Rotary should empower women	9.11	1.06
Rotary needs more diverse members	9.14	0.81
Rotary needs more members	9.25	0.77
Rotary needs younger members	9.31	0.79
I learn from Rotary participation	9.33	0.89
Homelessness is a serious problem in our city	9.33	0.93
Rotary has a positive reputation	9.41	0.50
I enjoy Rotary meetings	9.42	0.65
I participate in Rotary for friendships and community	9.47	0.61
Freedom and constitutional government are core American values	9.56	0.91
Rotary's international work is valuable	9.67	0.59
		n = 33

This table suggests that the group is largely in agreement. Some are unsure whether America is uncivil and divided, whether Rotary should influence local government, and whether youth need more opportunities. The highest level of disagreement is about whether the city’s economy is doing well (measured by two items) and whether liberals/progressives are too influential in society.

I ran factor analysis on the data displayed in Table 1. This method presumes that it is illuminating to identify latent variables which, in some sense, “explain” or “underly” actual survey responses. As shown in Table 2, four factors did have some explanatory or elucidatory value. These factors have some face-validity as well. The first factor is about the Club as an enjoyable social venue. The second focuses on gender, age, and other kinds of diversity. The third overlaps with the second but emphasizes social problems more. And the fourth is negative or critical of the external context.

Table 2: Factor Analysis

	Key components	% of variance
Factor 1	friendship, enjoyment, learning, serving as a model	20.67
Factor 2	voting, women, diversity, schools	14.62
Factor 3	younger, serve, diverse, homeless	9.12
Factor 4	divided, downtown, difficult, uncivil	7.75
		n = 33

Verimax Rotation Kaiser Normalization

I do not dispute that factor analysis is meaningful, but I propose that we can derive additional insights from a belief-network approach. Per Mercier and Sperber, this approach takes more seriously the reasons that people give for their own beliefs.

In fig. 4, all the opinions that people endorsed are shown as dots. The larger a dot, the more often respondents connected it to another idea as a reason or justification. (The connections are indicated by lines.) The darker the dot, the higher proportion of respondents endorsed it when asked whether they agreed or disagreed with it. These are two different ways of indicating the importance of each idea.

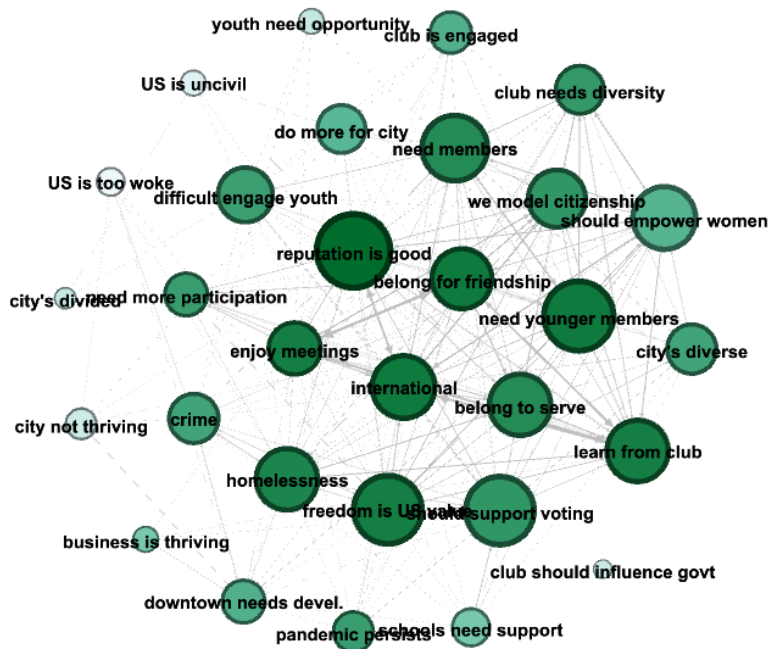


Figure 4: The *Phylodictyon*

The larger and darker dots near the middle of fig. 4 illustrate a widely shared mental model in the Rotary Club. According to this model, people join Rotary to serve and form friendships. International work and empowering women are important to the success of the Club. Rotary has a positive reputation and offers a model of good citizenship for others. But it needs more members, especially younger ones.

The lighter colored and smaller nodes represent ideas that are present in the Club, but they are less widely shared and they rarely serve as explanations for members' views.

There is no evidence that the contested ideas are driving any kind of wedge through the group. I asked respondents to say whether any ideas that they endorsed also served as reasons for any of their other ideas. Beliefs about Topeka's economy and excessive progressive influence were only mentioned in 0.4% of these responses. This shows that even people who hold these opinions are not using them as the basis of their other beliefs.

The two beliefs with the strongest negative correlation (-0.497) are the opinions that the city's business is thriving and that the city (as a whole) is *not* thriving. No individual holds both views strongly. I explored these two opinions further to test whether they might represent a subtle cleavage in a group that otherwise looked unified.

Fig. 5 shows separate phylogenetic trees or belief-networks for the 5 individuals who think that the city's business is thriving (left) and the 7 individuals who believe strongly that the city is not thriving (right).

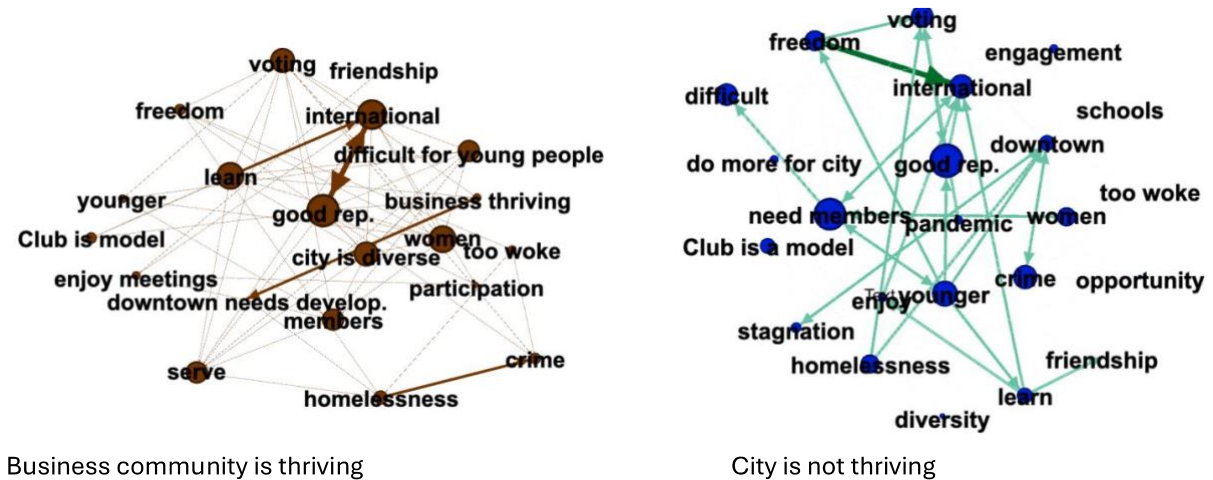


Figure 5: Two sub-networks

Despite a difference of opinion about an important question, these two belief-networks look generally similar. The lack of substantial differences can be explained by the fact that beliefs about whether the city is thriving or not are not central in either phylogenetic tree. Again, this is a point of disagreement does not translate into a different set of views. One relatively subtle suggestion is that those who believe the city is not thriving give more network-centrality to the belief that the Club needs more members.

I generated a second social network map for the Club, limiting it to those who strongly endorsed either of the most sharply opposing beliefs (that is city is not thriving or the city's business is thriving). That map is shown in fig. 6, with those who see business as thriving depicted in the darker color. Seven individuals are not shown because they were not connected to anyone. The five individuals who are shown are not evidently divided into two social groups; instead, Person 43 and Person 19, who hold opposing views, are connected.

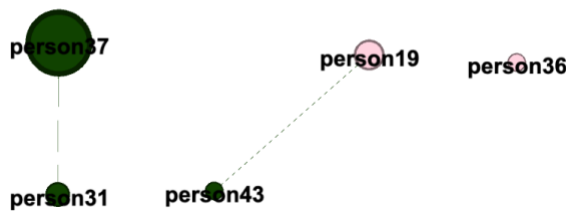


Figure 6: Restricted social network

I also asked for assessments of Rotary meetings and events. Most respondents (out of the 32 who answered this question) feel that Rotary connects them to the community and to one another. Most feel that they are heard and understood most of the time. See Table 3. Results were not related to social network centrality.

Table 3: Assessments of meetings

	Mean (1-5 scale)	SD
The other Rotarians genuinely want to hear my point of view	4.00	0.67
The other Rotarians show me that they understood what I said	3.90	0.87
The other Rotarians pay attention to me	4.06	0.80
The other Rotarians genuinely want to hear my point of view	3.84	0.85
The other Rotarians make me feel a part of the group	4.47	0.80
I look forward to coming to more meetings of Rotary	4.41	0.76
Through Rotary, I feel more involved in the community	4.53	0.67
		n = 40

A different battery asked about the Club’s overall impact. Most respondents feel that Rotary benefits the community and that they benefit from Rotary participation. Fewer feel *highly* involved or say that they know most other members. See table 5.

Table 5: Assessments of the Club

	Mean (1-5 scale)	SD
I am heavily involved with Rotary	3.88	1.20
I am very satisfied with Rotary	3.93	1.27

I know most members of Rotary	3.93	1.05
I get personal benefits or satisfaction from Rotary	4.68	0.92
Rotary does good in our community	4.45	1.11
		n = 29

Implications for the organization

I presented most of these findings to the leaders of the Club, who shared them with their members and told me that they had found the results useful. The findings are generally favorable, suggesting that the Club is unified—both socially and philosophically.

I proposed (and they appeared to agree) that it would be useful to organize additional discussions about the state of the local economy, since members seem to disagree about that topic. The data also indicated considerable support for recruiting younger members. That would be another worthy topic for additional discussion.

The members at the center of the social network in fig. 2 should perhaps reach out more intentionally to members who don't know many of their peers to make everyone feel more included. Because I promised anonymity, I could not tell the Club the names of the central members, but they had ideas about who those might be.

Limitations and future research

The response rate (24% for the items about network connections) is not unusually low for survey research, but it is problematic for this kind of project. If people who hold controversial opinions—or members who are disconnected socially from those who completed the survey—were systematically less likely to participate, then it would be incorrect to conclude that the group is unified.

Apart from encouraging a higher response rate, a group could test the validity of results like these by bringing them back to the whole body. Indeed, the Club's leaders shared these findings at a meeting, where they were met with approval, but it's possible that the attendance at that meeting was not fully representative.

I have cited Mercier and Sperber for the idea that explicit reasons play significant roles in groups. In this study, I did not study the reasons that people offer explicitly in group discussions. Instead, I asked individuals to say privately whether they endorsed various reasons. They may never have considered these reasons before, and they may never offer them in public. Therefore, fig. 4 is not really a model of the discussions of the Club, but rather a representation of the reasons that arose as people took a private survey. Possibly, these reasons had previously arisen in Club discussions, or they might come up in later meetings, but I do not know whether either is true.

I believe this method is useful for understanding where people stand. It is especially valuable for a leader who is thinking about which discussions to launch and how to frame them. However, it would also be useful to map the reasons that are expressed in real discussions.

This is a study of a voluntary association, which is one type of organization. Studying hierarchical organizations might create different challenges. For example, there might be a greater tendency to give socially desirable responses in a bureaucracy.

Finally, the group analyzed in this study happened to be unified, or at least it appeared unified based on the data and method. It will be important to investigate other associations to see whether the same method can detect polarization.

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