Appendix A
Measuring the Network

This task involves creating one or more tables of relations between people or groups in a study population. There are variations from the usual, but the typical output is a table of people down the rows by people across the columns, in which the cell where row i crosses column j is a measure of the strength of connection from person i to person j. I will refer to that cell as variable z_{ij}, a variable that increases with the strength of connection from i to j. Quality network data are available from archives, such as the z_{ij} in Chapter 5 that measure the dollars of goods sold by industry i to industry j (not to mention the varied network data available as joint involvements in archival records). It is a fortunate break when interpersonal data are available as a by-product from normal company operations, such as email traffic, or job applications, or, as in Chapters 4 and 6, annual peer evaluations in which z_{ij} is employee i's acknowledgement and evaluation of working with employee j. Peer evaluations are an under-utilized asset. They are a subjective judgment in that only relations deemed worthy of acknowledgement are cited. They are unobtrusive with good response rates in that everyone knows that the data are a consequential, but routine, process in company operations. Companies typically average elements in a column of the table to record the peer evaluation of an employee, then discard the data. Those discarded data contain a wealth of productive information on the informal organization of the company and the social capital of each person in it.

I usually end up measuring the network with a survey. When I find that archival data are not available on a population, I go through four steps to measure the network: define the study population, run a network survey, check for selection bias, complete the network with perceived relations. Marsden (1990, 2005) provides comprehensive review of network measurement. With respect to web-based surveys in particular, I strongly recommend Vehovar et al. (2008) when designing the instrument. They experiment with alternative formats for name generators and interpreters, among other

things showing an expected effect of graphic layout (multiple name boxes increases the number of names elicited), and respondents are more likely to continue when name interpreters are listed by question (respond about each contact for one interpreter, then move on to the next interpreter and respond to each contact). At the current time, there are no generally accepted standards for network surveys as there are for opinion surveys more generally. Item conventions, wording effects, order effects, selection biases, scaling and the like are determined by personal wisdom and experience, which varies considerably between people selling network analysis. I do not propose what follows as optimum. It is what I have found to be simple and productive. I draw illustration from the product-launch, the supply-chain, and HR populations because details on them are readily available in the text.

The measurement process can be completed in a day, or require a few weeks, depending on population boundaries, response rates, and name difficulties. For example, the network of supply-chain managers was measured quickly because I had a definitive roster of who was in the study population, people responded quickly to the initial survey invitation and follow-up reminder, I was familiar with English naming conventions, and I had direct access to everyone involved. Measuring the network required only a few days. It was quite another story for the product-launch network. It was not clear who was in the population because the product-launch was a new layer imposed on existing structures. Response was delayed because people invited to the survey were not sure that their part-time contribution to the product launch warranted the bother of completing the survey. Alphabets, names, and naming conventions varied in unfamiliar ways across Japan, Korea, China, India, Australia, and the many ASEAN countries between India and Australia. I had to rely on the HR staff for assistance much more than usual, and the HR staff itself had a long chain of indirect connections to the regional clusters in the product launch network, as illustrated in Figure 3.1. Measuring the product-launch network required a month.

Population Boundary

The study population has vertical and horizontal boundaries. The vertical concerns the job ranks to include. The horizontal concerns are the organizational groups, or silos, to include. Neither boundary decision is final. This step is just to define core people who

should be included in the study population. These people will be asked to name the people with whom they discuss their work. If those named colleagues come from lower ranks, the population can be "snowballed" into lower ranks. If those named colleagues come from other divisions, the population can be "snowballed" into the other divisions.

The key to the vertical boundary is to include all job ranks in which people are in large part the authors of their jobs. They are expected to find ways to create value with their work. In lower job ranks, where people are told what to do, their networks have less to do with performance differences than with differences in personal taste (Burt, Jannotta, and Mahony, 1998). Among the supply-chain managers, for example, the lowest two managerial ranks show little benefit of social capital while the upper three ranks show strong and increasing benefit (Burt, 2004:371).

The key to the horizontal boundary is to include all groups that have a direct effect on the issue under study. The network of supply-chain managers was mapped to learn how the managers were organized and where they tied into the surrounding organization. The horizontal boundary was drawn around anyone who was a manager in the supply-chain. There were no often-named discussion partners outside the supply-chain organization, so the population boundary remained supply-chain managers. The product-launch network was more complicated. The network was mapped to learn where coordination was strong and where it needed to be facilitated or encouraged. At the center of the population were 87 employees targeted for study by the launch director. The 87 employees included 14 people on the leadership team plus 73 direct reports to the people on the leadership team. The 87 people received an email explanation of the survey and directions to the online survey. The invitation was followed by two reminder messages, yielding 70 completed interviews, which included everyone on the leadership team. The social network connecting the 87 people involved chains of command through people elsewhere in the company and discussion relations with colleagues adjacent to the target population. Another 98 completed interviews resulted from inviting to the survey other employees working below the targeted people. Another 115 people, employees who were invited to the survey but did not respond, were added to the network because they were cited as contacts by two or more survey respondents. This so-called "snowball sampling" expanded the network to include people who provide indirect connections around the target population.

Network Survey

There are two kinds of questions on a network survey: name generators and name interpreters. Generators elicit the names of contacts: "Who is your boss?" "With whom do you most often discuss company policy?" "Who are essential sources of support for your job?" Name generators have the general form: "Who do you _____?" Selecting name generator items involves filling in the blank. There is no limit to the words you can use to fill in the blanks. Respondent patience and design elegance are the limiting factors. My two baseline questions are to ask for the boss and key discussion partners. Responses to the two questions are sufficient to map the formal and informal organization of a study population.

I used four name generators in the product-launch survey. Figure A1 contains two of the name generators. These are screen shots of the items as they appeared on the survey webpage. Respondents come to the survey after receiving an invitation (typically by email) from the senior person or people sponsoring the survey. The invitation states the purpose of the survey, assures confidentiality of individual responses, and states whatever feedback will be provide on the survey results (typically a workshop in which interested participants can discuss the results). There is a screen preceding Figure A1 that contains a welcome message that re-states the three points in the invitation. The survey begins with the respondent identifying himself or herself by name and email address. The email address is important in case names and nicknames become an issue later. The boss is named, then the respondent is asked to name seven or eight people with whom the respondent has had "the most frequent and substantive work contact." The organization was large so full names were elicited to facilitate later identifying the contacts. There were some additional questions asked (items 2, 3 and 4 are not listed in Figure A1). After describing a "change that would most increase the value of the business in which you work," respondents were asked to name a person whose support would be essential to making the idea happen and the name of a colleague with whom the respondent had discussed the idea (if the idea had been discussed with a colleague). A maximum of eleven contacts could have been cited in the survey. Nine respondents named the maximum. Five named only one. On average, respondents named 7.9 contacts.

Figure A1
Survey Network Name-Generator
and Name-Interpreter Questions

Network Diagnostic Survey

What is the first and last name by which you are most likely to be listed by colleagues citing you as someone with whom they work? (e.g., John Smith)	Your Name: _____ (required) Your Email Address: _____ (required)

1. Who is your immediate supervisor? (person most responsible for your annual review and initial salary-promotion recommendations) Please enter the person's first and last name, then the approximate years for which you have known the person, and the typical frequency with which you have direct contact with the person (not email lists).	Name (enter full first and last name, e.g., John Smith)	Years Known	Contact Frequency
	_____	__	About Once a Week ▾

5. More generally, who are the seven or eight people with whom you have had the most frequent and substantive work contact over the last six months? Limit yourself to people with whom you have had direct contact (not email lists). Include any of the people you named above if they qualify under the "most frequent and substantive contact" criterion. And once more, please enter first and last names, then the approximate years for which you have known each person, and the typical frequency with which you have direct contact with the person.	Name (enter full first and last name, e.g., John Smith)	Years Known	Contact Frequency
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾
	_____	__	About Once a Week ▾

Figure A2
Survey Network Name-Interpreter
Matrix Question

6. This final question asks for your view of connections among the people you named. Please don't quit here. You are almost finished. The people you cited in the previous page are listed in the table below. The task is to select a letter indicating your view of the connection between each pair of people, where

"Often" means that, to your knowledge, the two people speak often with one another such that they are probably familiar with current issues in one another's operations.

"Some" indicates that you know only that the two people sometimes talk to one another, such that they have some familiarity with current issues in one another's operations.

"Rare" indicates, again as best you know, that the two people speak infrequently or not at all to one another.

"Difficult" indicates that, for reasons that could be no fault of either person, there has been difficulty in coordinating work between the two people.

For example, if you named three people (Jose, John, and Jody) who speak often with one another and haven't had difficulty coordinating their work when they should, the table would look like this:

Jose A

O   John S

O   O   Jody Y

If you named four people (Jose, John, Jody, and Wen) where Jose and Jody are closely connected, Jose and John have had difficulty coordinating their work, and the others rarely speak to one another, the table would look like this:

Jose K

D   John S

O   R   Jody Y

R   R   R   Wen Q

HERE IS THE TABLE WITH NAMES OF YOUR CONTACTS ON THE DIAGONAL. People are listed with the default that they speak often. **USE THE PULL-DOWN MENUS IN THE CELLS TO INDICATE YOUR VIEW OF THE CONNECTION BETWEEN EACH PAIR OF PEOPLE.** If you wish to change or add names, hit your browser's "BACK" button, edit your citations on the previous page, and return here to describe the network.

don r				
O	charlie c			
O	O	tracy c		
O	O	O	bill s	
O	O	O	O	holly r

[Submit]

Click the SUBMIT button to save all your data.

After a name is generated, there are two name interpreters in Figure A1: For approximately how many years have you known the person? How often do you have direct contact with the person? Years are entered directly. Frequency is a drop-down menu distinguishing four options: "almost every day," "about once a week," "about once a month," or "less often." In small study populations with concrete boundaries, the survey can be simplified by listing everyone in the population and going straight to name interpreters. Given a list of everyone in a remote office, for example, people could be asked to indicate the frequency of their contact with each person on the list. This "roster" method has virtues. The disadvantage is that it will not reveal the variable extent to which people are connected outside the people put on the roster.

The final name-interpreter item is a matrix asking about relations between cited contacts. The item is given in Figure A2. There is a matrix at the bottom of the screen. The matrix contains one row and column for each person the respondent named. Figure A2 shows the matrix for a respondent who named five contacts. The respondent is to click on the cell between each pair of cited contacts to indicate whether connection between the contacts is "often," "some," "rare," or "difficult." The response categories are explained in the text above the matrix.

Figures A1 and A2 define a simple survey. The network survey used with the HR employees in Chapter 4 contained many more items. There were a dozen name generators (qualifying phrases deleted and bank name replaced by "[bank]"):

1. From time to time, most people discuss important matters with other people, people they trust. The range of important matters varies from person to person across work, leisure, family, politics, whatever. The range of relations varies across work, family, friends, and advisors. If you look back over the last six months, who are the three or four people with whom you discussed matters important to you?

2. Consider the people with whom you like to spend your free time. Over the last six months, who are the three people you have been with most often for informal social activities such as going out to lunch, dinner, drinks, visiting one another's homes, and so on?

3. Turning to your formal job description, who would be considered your primary HR manager?

4. In your opinion, who is the most promising of the people you supervise?

   5. Thinking of your job in more general terms, success usually requires the support of colleagues and contacts well beyond the formal job description. Suppose you were moving to a new job and wanted to leave behind the best network advice you could for the person moving into your current job. Who are the three or four people you would name to your replacement as essential sources of support for success in your job?

   6. Of the many [bank] employees with whom you have worked, who has been the most difficult?

   7. Considering all your personal contacts within [the bank], who are your most valued contacts in the sense that they have been the most important to your accomplishments?

   8. Is there anyone who could have been one of your most valued contacts, but for one reason or another the relationship never developed?

   9. If [the bank] were going through a re-organization, and you could select someone to represent your interests on the subcommittee deliberating the re-organization of HR, who would you select?

   10. Suppose you learned that you are one of two finalists being considered for promotion to an attractive job assignment. Suppose further that the other finalist is a [bank] employee. Who would be your best guess to be the other finalist in competition with you for the promotion? This isn't a question about tension between people. It is a question about the [bank] labor market.

   11. If you decided to find a job with another firm, who are the two or three people with whom you would most likely discuss and evaluate your job options? These could be people inside [the bank], or outsiders such as family, friends, or people at other firms.

   12. Now that you have a list of contacts, please give it a quick scan. Is anyone significant missing? Is there someone without whom your job would be much more difficult, or someone without whom you would be much more effective?

Respondents were then asked how close they were to each named contact, how

often they spoke with each contact, how long they had know each contact, and how

each contact was connected to the others (the matrix question in Figure A2). It was

a long questionnaire that required almost an hour to complete. There was a strong

center to the HR organization (Figures 4.1 and 4.2), so people were patient with a

long questionnaire. I would not attempt such a questionnaire in a decentralized study

population — especially since I now know that I get the bulk the network information

likely to be useful in an organization diagnosis from the simple questions in Figures A1 and A2. I know this by mapping the extent to which responses to multiple network items provide the same names.

Figure A3 is a network content "map" distinguishing kinds of relationships cited by the HR respondents. The map begins with a rectangular matrix of binary data. Each row describes a respondent's relationship with a contact. A "1" in a column indicates that the respondent has the column kind of relationship with the row contact. The 219 HR respondents cited a total of 2,863 contacts, so the data file for the map in Figure A3 contained 2,863 rows and 23 columns, one column for each kind of relationship distinguished in the map. The solid dots refer to the above dozen name generators and the hollow dots refer to responses on name interpreter items. The map results from combining the data columns where they are similar. Of the many ways one could go

Figure A3: Spatial Map of HR Network Contents

Multidimensional scaling of tendency for same contacts to be named for multiple kinds of contact. The cross-hair marks the (0,0) point in the multidimensional scaling.
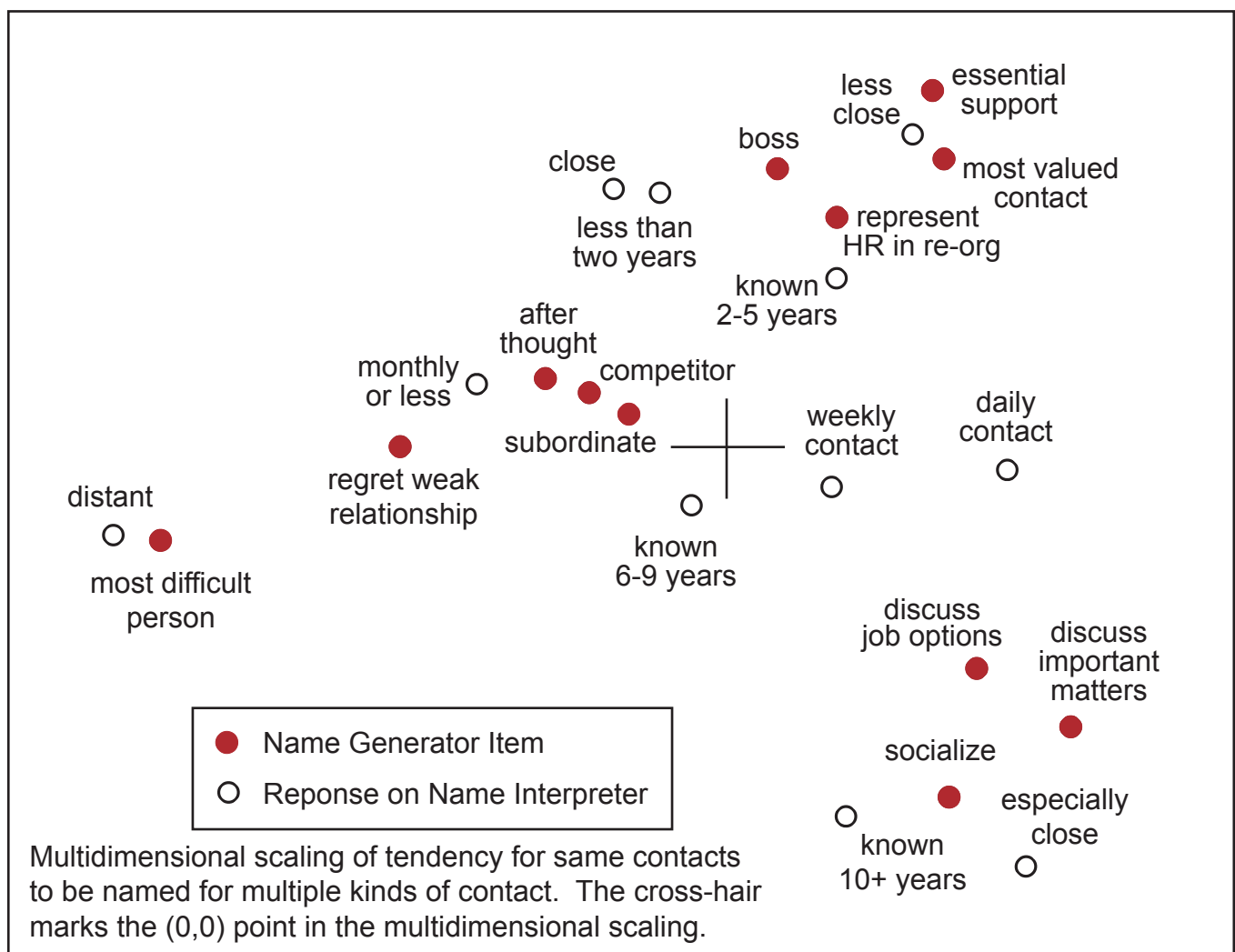
about the task, Figure A3 is a multidimensional scaling of Jaccard coefficients between the columns (using the STATA default option for mutidimensional scaling). Two kinds of relations are close together in the map when the same people were named for both kinds of relations. For example, "most difficult person" refers to contacts named as the person who "makes it most difficult for you to do your job." The word "distant" (located next to "most difficult person") refers to the closeness name interpreter in which some of a respondent's cited contacts were people from whom the respondent felt "distant." The two kinds of relations, "distant" and "most difficult person," are close together in the map because the same contacts were named on both items; people who made a respondent's job difficult were often people from whom the respondent felt distant.

The pattern in Figure A3 is something I now expect to see in detailed network surveys (cf. Burt, 2005:52, for almost identical patterns in an American electronics company and a French chemical company). The east-west axis is an evaluative axis on which negative relations are to the left, positive to the right. The north-south axis is a contrast between personal relations at the bottom and work relations at the top. There are nuances captured by the detailed name generators, but the boss and work discussion items in Figure A1 provide much of the positive content on the right. The dozen name generators in Figure A3 generated a median eight contacts per employee in the HR organization. The items in Figure A1 generated a median of six contacts in the product-launch network and seven contacts in the supply-chain organization. What will not be captured by the items in Figure A1 are negative relations (network content to the left in the Figure A3 map). Data on negative relations require an explicit question about colleagues who make work difficult (Labianca, Brass, and Gray, 1998; Labianca and Brass, 2006).

Selection Bias

As responses come in, the data can be analyzed for selection bias. Two issues: Are the people responding representative of the study population? Are there additional people who should be invited into the survey? If people not initially in the survey are named by multiple respondents as a discussion partner, the outsiders are part of the informal organization and can be invited to the survey. If certain groups are not responding, they can be encouraged with special attention.

Non-response should be random across the network. If it clusters, in the sense that a disproportionate number of people in a certain area of the network are not responding, then non-response can be a diagnostic indicator of a problem.

Consider Figure A4. Lines in Figure A4 indicate that one of the two connected people supervises the other and kinds of work are distinguished by symbol shapes (see Figure 3.1). Symbol color distinguishes people by their participation in the survey: 168 respondents (red dots), 17 people in the target population who did not respond to the survey (black dots), and 115 snowball-sample contacts beyond the target population who were invited to the survey but did not respond (grey dots). As in Figure 3.1, white dots indicate the 31 administrative people outside the survey population. The scatter of red dots across the sociogram is visual evidence of survey respondents scattered across the study population, providing network data on each organization in the product launch. If there is any group not taking the survey seriously, it is the finance group at

Red indicates a survey respondent

Black indicates a nonrespondent in the target population

White indicates a person not invited to the survey (n = 31, of whom 25 were cited as contacts in the survey)

Grey indicates a person outside the target population who was cited by two or more survey respondents

Figure A4

Survey Network Response
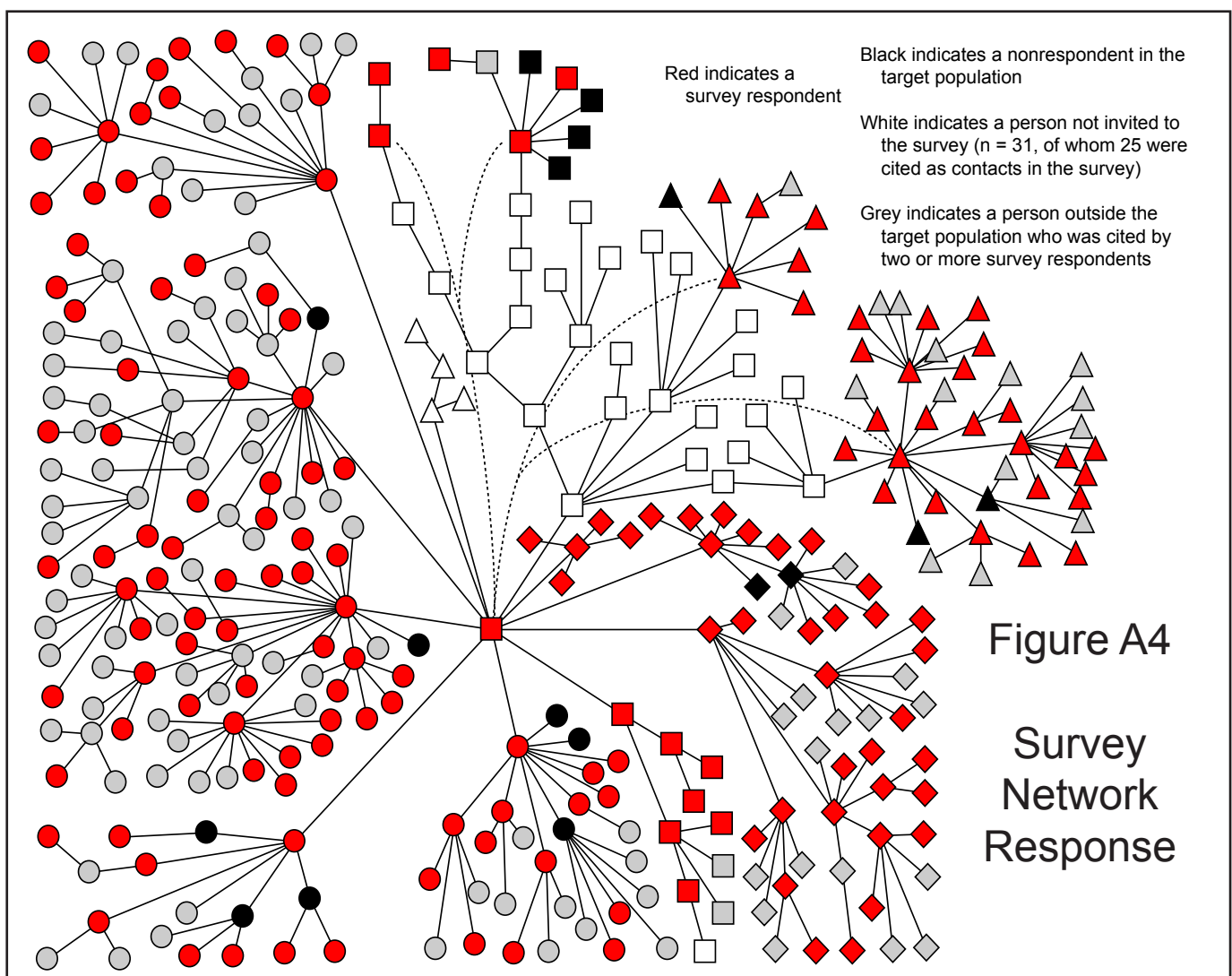
Table A1
Predicting Response to the Network Survey

Northeast Cluster	-1.97 (1.33)
Northern Cluster	-2.55 (1.29)
Southern Cluster	-2.17 (1.30)
Western Cluster	-1.74 (1.36)
Southeast Cluster	-2.46 (1.27)
Compensation (z-score)	.54 (.34)
Annual Evaluation (z-score)	-.19 (.17)
Job Rank (individual contributor)	-.08 (.20)
Job Rank (manager)	-.56 (.35)
Age	-.01 (.03)
Female	-.06 (.35)
Sales Function	-.65 (.39)
Years with Company	-.03 (.04)
Regional Headquarters	.38 (.70)
In the Target Population	1.85 (.49)**

NOTE — These are logit coefficients predicting which employees responded to the network survey. Clusters are Asia-Pacific regions, distinguished in Figure 3.2. The cluster of 31 administrative people in the network but not in the product launch (white symbols in Figures 3.1 and A4) were not eligible to respond to the survey and are excluded. The contrast group is the administrative hub at the center of the Figure 3.2 sociogram. Standard errors are in parentheses (* $p < .05$, ** $p < .001$).

the top of the sociogram. Finance contains the largest concentration of black dots. The indifference is not a serious issue, however, since the non-responders are few and the product launch depended on sales people more than accountants.

I have seen clustered non-response indicate two kinds of serious problems in other networks. One is non-response from a key stakeholder group. For example, it would have been a problem for the product launch if non-response had been concentrated in one of the regional clusters. A second kind of serious problem is more unique to informal organizations. When an initiative depends on a charismatic person to recruit employees to the initiative, non-response can cluster around the periphery of the charismatic person's reach. Non-response clustered on the periphery of a network is an indicator that the network will have difficulty growing and will survive only as long as the central person's energy.

With respect to selection bias more generally, Table A1 shows that the survey respondents represent the kinds of people in the product-launch population. A high proportion of the target population completed the survey (70 of 87, or 80%), but a

smaller proportion responded from lower job ranks (98 of 213, or 46%). With the low response rate at the outer reaches of the study population, it is important to know that the people who responded are not a biased sample. I used employee characteristics to distinguish people who responded to the survey (red dots in Figure A4) from people who did not (black and grey dots in Figure A4). The employee characteristics include whether the employee was in the target population, geographic cluster, job rank, age, gender, years with the company, years in the employee's current job, annual compensation, and most recent performance evaluation. Response is independent of every tested employee characteristic, except one: People in the target population — the people central to the product launch who received two reminders to respond — were significantly more likely to respond (3.1 z-score test statistic, P < .01). Otherwise, no kind of employee is more represented in the survey than other kinds of employees.

Perceived Relations

With caution, respondent perceptions of relations between cited contacts can be used to flesh out the network around non-respondents. The 168 survey respondents in the product launch cited 1,327 contacts and reported on 4,985 relations between their cited contacts. The more often two people were cited together, the more respondent perceptions I have on the relationship between the two people. For example, the most-often described relationship is between the head of one of the five regional organizations and one of his lieutenants. Fourteen respondents cited both people as contacts. All 14 reported that the two people "often" speak with one another. In fact, when the head of the regional organization responded to the network survey, he did cite the lieutenant as a discussion partner.

The empirical question is how often observed discussion citations correspond to respondent perceptions of relations between cited contacts. The results in Table A2 answer the question. For example, there are 16 relationships on which I have five or more reports that the two people "often" speak to one another, and most of the relations are cited for discussion in the survey (14 are cited, which is 87.5% of the 16 five-report relations). A discussion citation occurs between two people when one or both of the people cited the other as someone with whom they discussed their best idea for improving the value of their business or as someone with whom they often discuss

Table A2
Perceptions of a Relationship and Probability of a Discussion Citation

Respondent Perception of the Relationship:	Number of Respondents Reporting on the Relationship						
	None	One	Two	Three	Four	Five or More	Total
"Often"	9.6 (750, .11)	40.1 (511, .39)	56.2 (169, .56)	67.8 (59, .63)	70.0 (30, .81)	87.5 (16, .92)	29.1 (1535)
"Some"	31.4 (1132, .31)	23.4 (363, .23)	19.4 (36, .19)	0.0 (4, .15)	-	-	29.1 (1535)
"Rare"	38.7 (1058, .39)	8.2 (449, .09)	4.4 (23, .02)	0.0 (5, .00)	-	-	29.1 (1535)
"Difficult"	30.9 (1442, .31)	1.1 (91, .01)	0.0 (2, .00)	-	-	-	29.1 (1535)

NOTE — Rows distinguish kinds of respondent reports on the relationship between two cited contacts. Columns distinguish number of reports. Cells give the percent of cell relations cited for discussion in the network survey. Parentheses contain the number of relations on which the row kind of report was made with the column frequency, and the average logit probability of a discussion citation between two people (the logit coefficients are 1.06 for a reporting relation between the two people, .45 for each report of "often," -.26 for "some," -65 for "rare," and -1.83 for "difficult"). Tabulation is based on the 1,535 relations in which one or both people responded to the survey (so their relationship could have been cited for discussion in the survey).

their work. The data in Table A2 are limited to reports on relations between pairs of people in which one or both the people responded to the survey (citations between non-respondents cannot occur) and both people are in the network of 331 displayed in Figure 3.1 (I made no effort to trace contacts cited by one respondent).

The results in Table A2 show that the odds of a discussion relation between two people is high if two or more respondents report that the two people speak "often" and no respondent says that contact between the two people is "rare" or "difficult." Only reports of "often" are associated with discussion citations. Reports of anything less than "often" are associated with decreased odds of a discussion citation.

I used the above results to extrapolate beyond respondent relations. Across the 1,535 relations in Table A2, I estimated a logit equation in which discussion citations were predicted from supervision and the number of respondents reporting each level of connection in Table A2. I then used the logit equation to predict the probability of a discussion citation in each of the 1,906 relations for which one or more respondents

reported their perception of the relationship. The logit coefficients are given in the note to Table A2. Parentheses in each cell contain the average probability of a discussion citation as predicted by the logit model. The pattern of predicted citations across the cells of Table A2 follows the pattern of observed citations (e.g., 87.5% observed citations in the upper-right corner of the table corresponds to the high .92 predicted probability of a discussion citation). Dichotomizing the predicted probabilities at .5 to identify connections with better than a fifty-fifty chance of being cited for discussion, I have a total of 415 predicted discussion citations in the network, which brings to 1,034 the total number of discussion relations in the network: 330 reporting relations between boss and subordinate (the 331st person is the CEO and deemed to report to himself), another 585 relations cited in the survey for discussion without supervision (171 of the 756 cited discussion relations were with the boss, leaving 585 discussion relations beyond the boss), and a final 119 perceived relations between colleagues reported in the survey to "often" speak with one another.

The HR employees were asked to distinguished how close they felt to each of their contacts, so instead of scaling a perceived relationship by how often it was cited (columns in Table A2), I can scale by how often it was cited as strong (columns in Table A3). There are three rows in Table A3 because the HR questionnaire only distinguished three categories of perceived relationship: especially close, rare or distant, and something between those extremes. Loglinear effects within the table show that perceptions of "especially close" are only associated with insider reports of "especially close" (10.90 z-score versus negligible or negative association with other categories). The category of "close" is separate in that it has negligible association with other categories; it is neither especially close nor distant. "Some connection" is definitely not "especially close," but neither is it associated with any other categories. "Distant" and "less close" are similarly not "especially close" and similarly associated with perceptions of "rare/distant."

Applying a one-dimension loglinear association model to Table A3 yields the scale values plotted in Figure A5 (Goodman, 1984; .92 for "especially close," -.24 for "some connection," -.67 for "rare/distant" down the rows, and .98 "especially close," -.13 for "close," -.46 for "less close," -.40 for "distant" across the columns).

Figure A5: Loglinear Association Scores for Table A3.
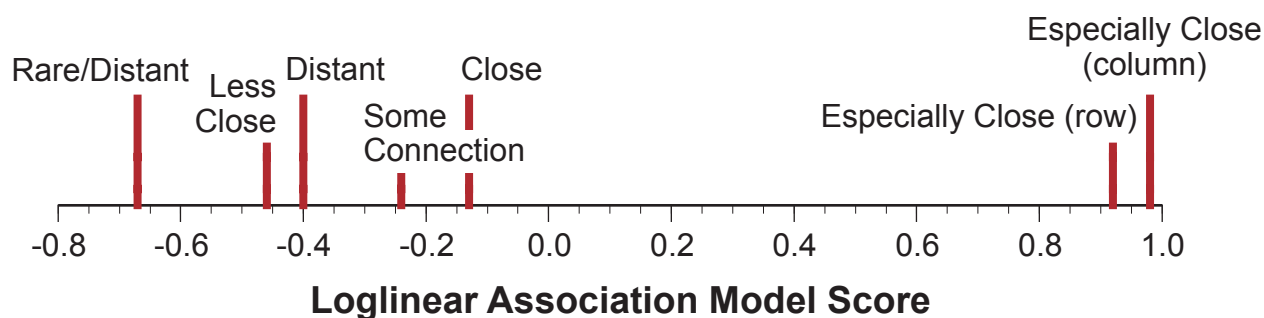
Perceived and cited "especially close" relations stand so far apart from other relations that perceived "especially close" relations can be added as maximum-strength relations while all other relations are ignored as weak.

At the same time, there are many "close" and "less close" cited relations and they can be valuable bridge relations ("strength of weak ties"), so I used a continuous measure of relationship strength. I normalized the association-model scores to vary

Table A3: Perceptions of a Relationship and Strength Reported Inside the Relationship

Respondent Perception of the Relationship:	Insider Report on Strength of Relationship				
	"Distant"	"Less Close"	"Close"	"Especially Close"	Total
"Especially Close"	11 (-2.17)	18 (-3.08)	54 (-1.24)	240 (10.99)	323
"Some Connection"	66 (.69)	120 (1.34)	250 (.74)	298 (-3.98)	734
"Rare/Distant"	56 (2.56)	99 (3.30)	176 (1.04)	135 (-9.72)	466
Total	133	237	480	673	1,523

NOTE — Rows distinguish kinds of respondent reports on the relationship between two cited contacts. Columns distinguish reports made by either of the two people in the reported relationship. Cells are the frequency of column relations reported as the row relationship. Parentheses contain unadjusted loglinear test statistics showing the extent to which observed frequencies exceed the frequencies expected if perceptions were independent of insider reports. Tabulation is based on the 1,523 relations in which one or both people responded to the survey (so their relationship could have been cited by one or the other in the survey).

from zero for no relation to 1.0 for an especially close relation (relation strength equals

[association score - min]/[max - min], where min is the minimum association-model

score and max is the largest): 1.00 for an "especially close" cited relation, .96 for an

"especially close" perceived relation, .33 for a "close" cited relationship, and so on. This

preserves the distinctions in relation strength and adds 103 relations to the network

(of 731 perceived relations among the people in Figure 4.1, 628 were already in the

network as direct citations).