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Small World, Isn't It? Personal Networks and Infrastructural Development

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Draft: Prepared for the International Technopolis Conference, Linked Infrastructure- Smart Cities, Fast Systems, Global Networks, San Francisco, CA May 20-22, 1990. Comments from Pat Ray Reese, Ellen R. Auster, Nicole W. Biggart, and C. Kaye Schoonhoven were extremely helpful in revising this paper.

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Abstract

We review some key concepts that help managers and planners understand the characteristics of networks and how people's access to information is affected by their position in them. We emphasize the difference between direct ties and indirect ties, showing how indirect ties and their strength affect the number of persons we can reach and the diversity in our networks. Networking is heavily influenced by uncertainty, competition, and the social boundaries within which behavior occurs. After discussing how these factors may constrain networking, we examine some strategies for overcoming such barriers. We focus on planning and monitoring network activities and on strategies for increasing network diversity. Our review examines strategies at the individual, organizational, and public policy levels.

Small World, Isn't It? Personal Networks and Infrastructural Development

Howard Aldrich and Mary Ann Von Glinow

Why Are Networks Important?

Today's world is a very unsettled place. The four horsemen of the corporate apocalypse -- global competition, de-regulation, accelerating technological change, and hostile takeovers --are afoot in the land (Kiechel, 1988). But, according to classical economic theory, ambitious business owners thrive on unsettling and turbulent conditions. Their greatest gains are made when discontinuities and gaps appear in society's economic fabric, making traditional modes of doing business or traditional products and services obsolete. Even under normal conditions, hidden opportunities for linking new products or services to untapped markets may be available, if only businesses could obtain information about where they lie.

Business development is a result of, among other things, motivated entrepreneurs and managers with access to resources finding niches in opportunity structures. On the demand side, opportunity structures contain the environmental resources which can be exploited by new businesses as they seek to carve out niches for themselves. On the supply side, motivated entrepreneurs and managers need access to capital and other resources to take advantage of perceived opportunities. In short, business development involves value creation through mobilizing resources in response to opportunities. Central to this formulation is the following proposition: To add value, the people who are involved must create linkages or relations between key components of the process; in short, they must become involved in social networks.

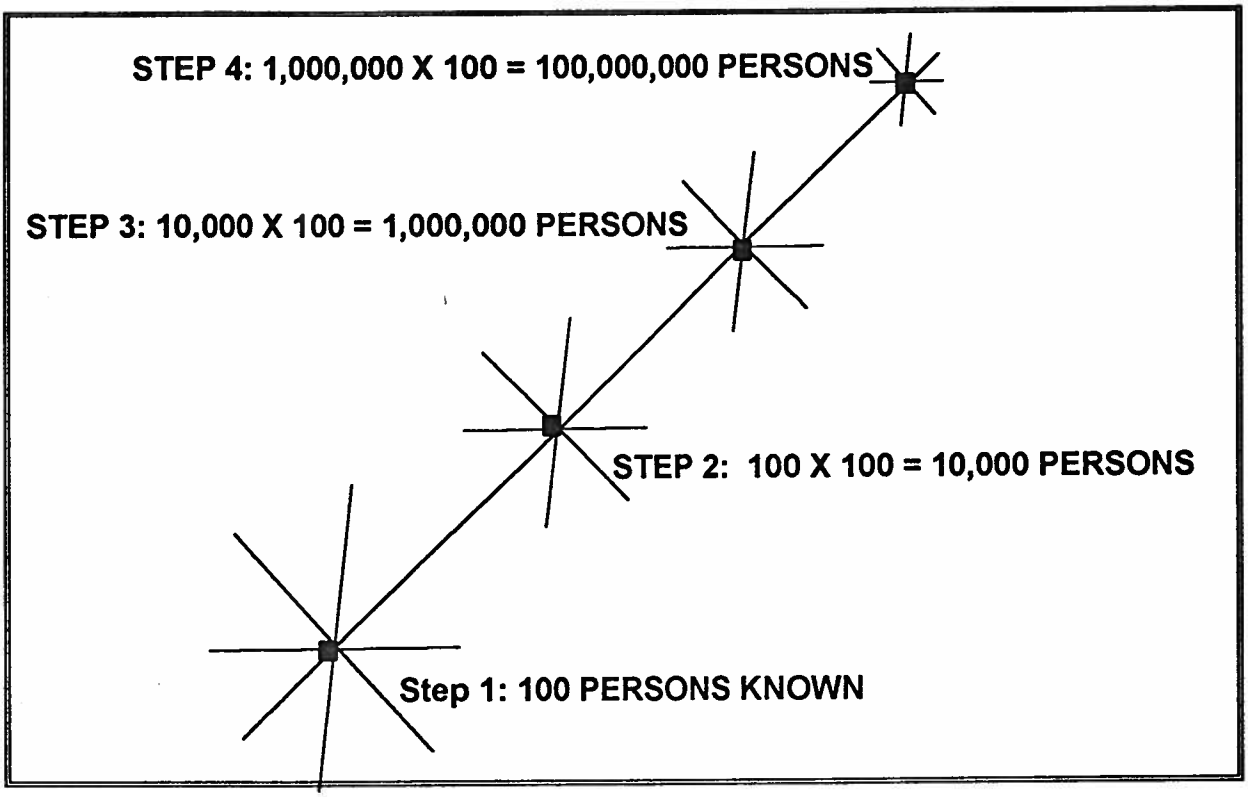
In this chapter we review some key concepts that help us understand the characteristics of networks and how our access to information is affected by our position in them. We emphasize the difference between direct ties and indirect ties, showing how indirect ties and their strength affect the number of persons we can reach in a network (and hence, the value of the network), as well as the diversity in our networks. Networking is heavily influenced by uncertainty, competition, and the social boundaries within which behavior occurs. After discussing how these factors may constrain networking, we examine some strategies for overcoming such barriers. We focus on planning and monitoring network activities and on strategies for increasing network diversity. Our review examines strategies at the individual, organizational, and public policy levels.

Are We Closer Together Than We Realize?

How big is the world of business? Consider for a moment how many ties it might take to reach all of the one hundred million business managers and owners in the developed world. Some simple mathematics shows that, in theory, each of us is no more than four steps away from anyone else in the workforce. Consider the following example. Think about the number of people on your office rolodex, or in the box on your desk containing other people's business cards. Inspection of these sources leads to the reasonable assumption that each of us knows 100 other people, that these 100 people also know 100

people, and so forth. Then, our direct ties include 100 people, and as they each know 100 people, we are two steps away from 100 times 100, or 10,000 people. In three steps, We reach 10,000 times 100, or 1,000,000 people, and in four steps, 1,000,000 times 1000, or 100,000,000 people! Figure 1 graphically displays this cascading effect. Obviously, most of us do not perceive that we are so closely linked to the rest of the business community, but the potential is there.

Figure 1. Multiplying Contacts Through Networks



Three kinds of constraints limit our ability to extend the reach of our ties: (1) uncertainty -- there will be some "unknowns" between us and a target, so that we do not know with whom to start; (2) competition and lack of trust on the part of others within our network's reach impose constraints on our willingness to contact others; (3) social boundaries of various sorts channel our interactions with others so that we are less likely to meet representatives of some groups -- many of the 100 people known to our friends are also known to us, and so our personal networks are somewhat confounded. We address these constraints later.

What Are the Key Concepts in Using Networks?

To start, we distinguish between personal networks and social networks. Personal networks are constructed from the viewpoint of a particular individual, but the concept of a "social network" is much broader -- it can include the local community, a region, or an industry. It may even span national boundaries. In examining social networks, we start from a population under study and identify all those connected by a certain type of relationship. Given a bounded system, we identify all the links between people within the boundaries.

This way of thinking about networks alerts us to the way personal networks either interconnect and overlap, or stand in isolation from one another. People might enjoy extensive connections within a limited region of a total network, but lack the indispensable relation needed to discover essential information in another region. Information and resources can be thought of as mapping onto networks, and networks can be thought of as the thread or channel along which information and resources flow.[1*]

What goes through the ties? Relations may be treated as containing: (1) communication content, or the passing of information and advice from one person to another; (2) exchange content, or goods and services; and, (3) normative content, or the expectations persons have of one another because of some special characteristic or attribute, such as moral support provided by close friends.[2*]

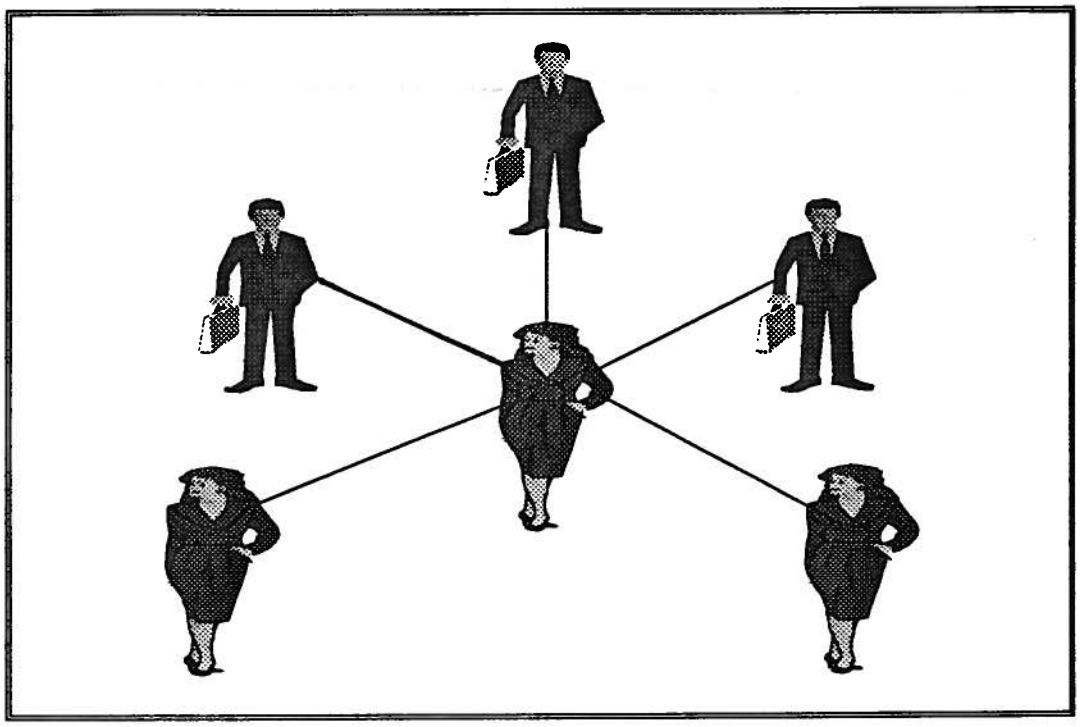
A personal network, or role set, consists of all those persons with whom we have direct relations (or, for some purposes, indirect relations via direct relations). For example, for entrepreneurs, we could think of key stakeholders, including partners, suppliers, customers, venture capitalists, bankers, other creditors, distributors, trade associations, and family members.

Direct Ties

The simplest kind of personal network includes direct ties linking people with persons with whom they have direct contact, as shown in Figure 2. The figure shows the five closest personal ties of a woman executive, and includes 3 men and 2 women, a ratio supported by some research on women entrepreneurs (Aldrich, Reese, and Dubini, 1989). She meets these persons on a face-to-face basis and obtains services, advice, and moral support from them.

When we use the term "networking" as a verb to describe behavior, we are usually thinking of special kinds of relations within personal networks -- a network built on strong ties, relations entrepreneurs can "count on." By contrast, weak ties are superficial or casual, and people typically have little emotional investment in them (Granovetter, 1973). The strength of ties depends on the level, frequency, and reciprocity of relations between persons, and ties can vary from simple, one-purpose relations to multiplex, all-purpose relations. Brief examination of this idea gets at the heart of why networks are important.

Figure 2. Personal Network Example:
Direct Ties Between a Manager and Her Network



Networking is often mentioned because people feel the need to distinguish networking behavior from ordinary business behavior. Picture behavior at two extremes: first, one-of-a-kind, short-term, non-sustaining transactions between people who never expect to see each other again (e.g. buying a magazine at a corner newsstand in downtown San Francisco), and second, contact between two persons who expect to see each other frequently, interact meaningfully, and who are in a relation for the long term (e.g. taking an R & D consortium manager to lunch to discuss specifications for a new type of equipment you would like the consortia to investigate).

The first behavior is a straight-forward pragmatic transaction between people whose personal characteristics are rarely important; in many circumstances, it can be an efficient way of doing business. However, there are three problems associated with these short-term, market-mediated transactions: competition, uncertainty, and exit.

First, competition is always a possibility. In short-term, non sustaining relationships, competitive behavior makes perfect sense (Thomas, 1976).3 Second, this problem is exacerbated under conditions of uncertainty, quite akin to the prisoner's dilemma. It may be impossible to predict all the conditions under which a contract will have to be carried out, or to know precisely

all the specifications a piece of equipment will have to meet. Third, when problems crop up, the other party may simply exit (Hirschman, 1972). Whereas you might like to collaborate (Maier, 1973), the other party may simply walk out, leaving you in the lurch.

"Networking," by contrast, refers to the expectation that both parties are investing in a long-term relationship. Consider three benefits that follow from creating a social context in which people expect to deal with each other frequently over an extended period: trust, predictability, and voice.

First, regardless of what popular fiction says about business, trust --assured reliance on the character or truthfulness of someone -- is an important component of business dealings. As Thorelli (1986:47) noted, "networking places a new emphasis on personnel. Power, expertise, perceived trustworthiness, and social bonds are often person-specific rather than firmspecific." Trust is enhanced -- purely through self-interest -- under conditions when people feel there is a good chance of dealing with each other again. Self-interest is involved because a reputation for reliability and keeping one's word raises the probability that other people will continue to deal with you. As Gee (1981:15) noted, "the optimal communication mode for successful technology transfer is person-to-person contact."

Second, predictability is increased when long-term relations are established Predictability, to some extent, depends on trust. If trust exists in a relationship, then behavior tends to be predictable. The inherent uncertainty in a situation is not reduced. However, based on that trust, what is reduced is the uncertainty about whether the other party will do something to assist you when things do not go according to plan. Uncertainty is also reduced when your network contacts tell you where to go for assistance and provide information or resources you might not otherwise obtain.

Third, people are more like to use voice rather than exit in response to problems in long-term relations. Voice means making one's complaints known and negotiating over them, rather than sneaking silently away, and is a canon of good problem-solving techniques (Maier, 1973).

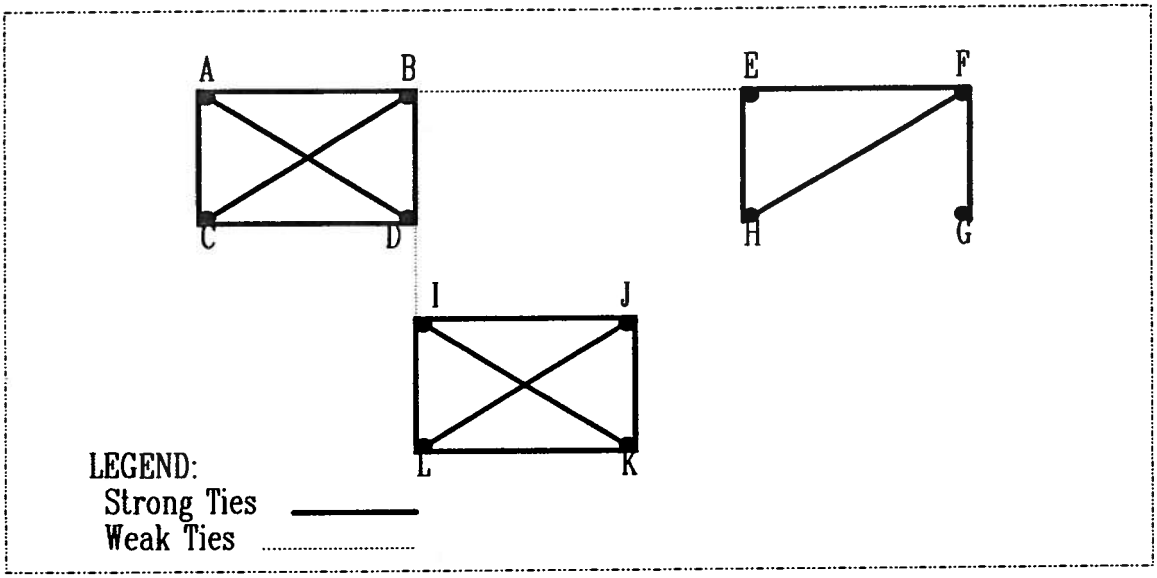
Thus, "networking" with one's direct ties to turn them into strong ties is first and foremost a way of overcoming the liabilities inherent in purely market-like transactions with other people. "Networking" involves expanding one's circle of trust. In network terms, relations of trust are strong ties, as opposed to casual acquaintances, who are weak ties.

Indirect Ties

Direct ties, especially strong ones, are significant not only for the persons directly linked to you, but also for the indirect access they provide to people beyond your immediate contacts. Including indirect ties takes us closer to the essence of networks, as we begin to see how people can

expand their direct connections by the judicious choice of contacts who have access to others. Figure 3 shows a business person, labeled B, linked to her direct ties, who in turn are linked to several other people with information or resources of value. In addition to strong direct ties to A, C, and D, shown as solid lines, one of her direct ties is weak, shown as a dotted line to E. Are there only four ties present, or are there really more?

Figure 3. Three Interconnected Personal Networks: Weak and Strong Ties.



Indirect ties enable entrepreneurs to substantially increase their access to information and resources, multiplying by many times over what is available through their direct ties. We will use Figure 3 to illustrate three aspects of entrepreneurs' personal networks: density, reachability, and diversity.

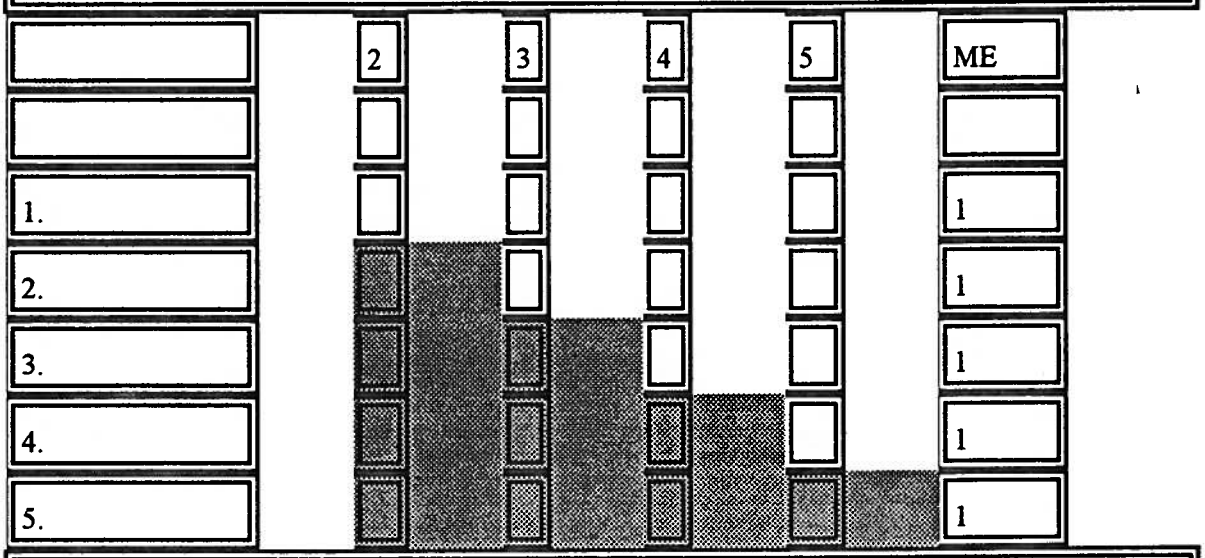
Density. The density of a network refers to the extensiveness of ties between persons, and is measured by comparing the total number of ties present to the potential number that would occur if everyone in the network were connected to everyone else. The simplest measure of density just considers the presence or absence of a tie, but more sophisticated measures take into account the strength of ties. In Figure 3, the number of persons in entrepreneur A's direct personal network is four, including A, B, C, and D, and the maximum possible number of ties is given by the formula (N)*(N-1)/2, or (4)(3)/2-6. (The six ties could be AB, AC, AD, BC, BD, and CD, if all were active.) As this is also the actual number present -- all 4 persons directly know each other --

density is 100 percent. (In the personal network centered on F, neither G and H, nor E and G, know each other directly, and so density is 4/6 or 67 percent.)

At this point, it may be useful for you to chart your own personal network. Turn to Figure 4 and fill out the chart, following the instructions at the top and bottom of the page. When we discuss some strategic possibilities in networking later in the paper, you will need to refer back to your completed Figure 4.

Figure 4. Personal Network Questionnaire

Think of the 5 People with whom you feel especially willing or able to discuss your ideas for new products, processes, or organizational changes. Write their first name or initials down the left side of the figure, one person in each row. Write them in at the top, also.



For each pair of people, put a "0" in the cell if they are strangers to one another, or a "1" if they are acquainted. Put a "?" if you don't know whether they're acquainted or not.

Maximum Possible Density = [(n)* (n-1)] - 2

15 = [(6) * (5)] - 2

Actual Density = Number of Relations [#of 1s] - 15

Reachability. Reachability refers to the presence of a path between 2 persons, either directly connecting people known to each other or using direct ties as intermediaries to indirect ties. Persons can be ranked by the number of intermediaries through which a path travels before one person is indirectly linked with another. Some people are completely isolated from others, as no path links them. For most of us, however, there is a path to many other people, although it may be quite lengthy. In Figure 3, all persons have paths between them, with the longest between G and K -- a path of six relations (GF, FE, EB, BD, DI, and IK) and five intermediaries.

Fairly short paths are responsible for the often-heard comment "Isn't it a small world?!" When two apparent strangers meet and discover that they have a mutual friend in common. Think back to the example with which we started the paper: In theory, we are all no more than four steps away from any other business person in the developed world.

Diversity. Because we are likely to associate with those most like ourselves, many of our network members are similar to each other -- they have similar personal characteristics and are known to each other, as well. The diversity of a network depends on those people different from yourself, and is crucial to the scope of opportunities open to you.

You may have a small group of friends you know well, each of whom knows the others quite well, such as the network centered on person A in Figure 3. That network is a high density one. Information known to one person in this group is rapidly diffused to the others, and you learn little from talking to C beyond what you already knew from talking to D. These people are relatively insulated from the outside, and interaction mostly produces redundant information. Some research on entrepreneurs has found that their strong ties are typically of long duration, extending over periods of ten years or more.

You may also have many casual acquaintances, each of whom also has a circle of close friends, such as person B's weak tie to E in Figure 3. These close friends of your casual acquaintances (F and H) are unlikely to be known to you, and thus your only possible ties to them are through the casual acquaintance. Thus, if either F or H has information of value, your only possible access to the information will be through the weak ties.

People with whom we have weak ties, such as casual acquaintances, are less likely to know one another than are persons with whom we have strong ties, such as close friends. Therefore, a personal network made up of a person's direct and indirect weak ties will be a low-density network, with many persons unknown to each other, whereas a personal network made up of a person's strong ties will be high-density network, with most persons known to each other (Granovetter, 1973). Of course, most personal networks will include a mix of weak and strong ties, and it is the relative balance of weak to strong that is crucial.

Individuals with few weak ties "will be deprived of information from distant parts of the social system and will be confined to the provincial news and views of their close friends" (Granovetter, 1982:106). Alternatively, having enough diversity in one's strong ties, such that one's immediate network includes strongly-linked people who have ties to very different parts of the social system, could provide information channels otherwise unavailable. For example, in Figure 3, D is strongly tied to B, and provides B with an indirect channel to I, who is in a very different network.

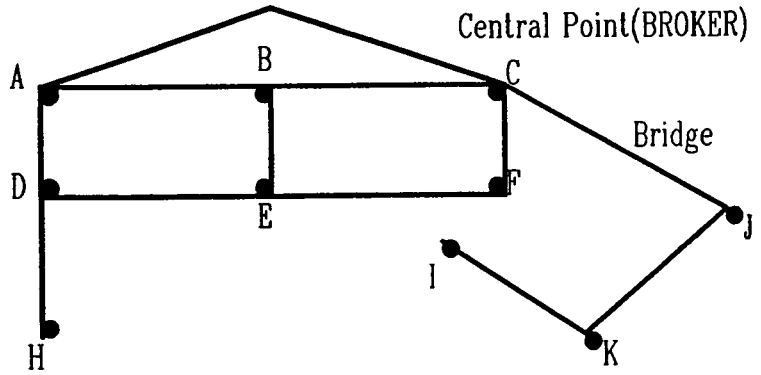
Successful networkers are more likely, therefore, to be found in positions which are connected to diverse information sources. Information about new business locations, potential markets for goods and services, sources of capital or potential investors, and innovations is likely to be spread widely among individuals. Other things being equal, someone with a small set of overlapping ties is at a disadvantage when competing for information with someone with a large set of diverse ties.

Social Systems as Networks

Most of the concepts necessary to analyze social networks have already been introduced, including density, reachability, and diversity. Three additional concepts are important: centrality, broker roles, and bridges.

Centrality. The centrality of a person in a network is determined by two factors: (1) the total distance from a person to all other persons following all paths leading outward from that person; and, (2) the total number of other persons which can be reached. The more persons that can be reached and the shorter the aggregate distance to these persons, the higher the centrality of a person. Figure 5 illustrates a social network, with person C in a central role, directly linked to 4 other people. Person C is in the middle of many paths, and thus may play several important roles.

Figure 5. Social Network: Centrality, Bridges, and Brokers.



Persons who have extensive ties to different parts of a network can play a key role in infrastructural development. They can serve 3 important functions: (1) They may serve as communication channels between distant persons; (2) They may provide brokerage services linking unconnected parties to one another by transferring resources; and, (3) If they are dominant or high-status individuals, they may serve as role models for others or may use their positions to direct the behavior of others. Their central role gives them more power and influence in networks than would otherwise be possible, if they had to rely merely on the resources they directly control.

Brokers. Brokers are people who serve as intermediaries. They link persons having complementary interests, transferring information or resources, and otherwise facilitating the interests of persons not directly connected to one another. For example, venture capitalists are probably as important for their broker role as for the funds they provide to struggling entrepreneurs, because they bring together technical experts, management consultants, and financial planners to supplement the entrepreneur's knowledge and experience.

Some social settings facilitate brokerage, and some associations and organizations are themselves brokers in the role they play. Many voluntary associations, trade associations, public agencies, and other organizations increase the probability of people making contact with one another. The complex pattern of social organization in Silicon Valley illustrates the synergistic effects of brokers, central meeting points (bars and restaurants), and family and friendship networks in supporting high start-up rates (Rogers and Larson, 1984).

Bridges. Brokers create bridges. Bridges are links that join two regions of a network that would otherwise have little, if any, contact with each other. For example, in Figure 5, there is a bridge between C and J which links two otherwise isolated sections of the network. Bridges in social networks play a role analogous to those Kanter (1977) identified in the opportunity structures of organizations -- they allow people to leap over otherwise unbridgeable gaps in their development.

Personal networks and social networks are simple but powerful ideas, allowing us to conceptualize the opportunities and constraints facing owners, managers, and policy makers in the pursuit of their goals.

What Are the Barriers to Information Flow and Technology Transfer Through Networks?

We return now to the question implicitly posed by our example of how each of us is potentially only 4 steps away from 100 million people. What prevents us from easily reaching everyone in the business world? Earlier, we listed three possibilities: uncertainty, competitive behavior, and social boundaries. We have already discussed the first two in describing the advantages of networking, and so in this section we concentrate primarily on social boundaries.

Uncertainty and Competition

Uncertainty is a generic problem in economic life, and networking is no exception. The problem is exacerbated when we are dealing with people over whom we have no authority or influence. Transferring information to persons whom we do not know on a face-to-face basis, through persons as yet unknown to us, is a central problem in technology transfer. As Arrow (1962) pointed out, the market for "know-how" is notoriously inefficient, and it is precisely this "know-how" that is critical to successful technology transfers (Von Glinow, Schnepp, and Bhambri, 1991). Under conditions of high uncertainty, people are likely to turn to non-task related characteristics as a guide to assessing the validity of information (Auster, 1989).

Competition is a problem whenever the other party you are dealing with expects that you are engaged in a one-time transaction, and they will never see you again. It also arises at the start of many transactions which might grow into a long-term relationship and the parties are jockeying for relative advantage. Each national culture has developed ways to deal with the mistrust generated by the possibilities of opportunism. In the United States, businesses rely on lawyers, contracts as thick as phone books, and a high level of secrecy surrounding transactions. In Japan, businesses rely on a series of small, incremental steps, spending a great deal of time with persons from the other side, and the preservation of their business's "face." In China, the practice of "mutual favors,n called guanxi, is at heart of most business arrangements. "When a contract is negotiated between joint venture partners, it is the relationship between the two parties, not the legalities supporting the document, that upholds the contract and prescribes future action" (Von Glinow and Teagarden, 1990:29).

Social Boundaries

Social boundaries are perhaps the most pervasive interaction barriers limiting reach and diversity in networks. We refer to the boundaries that groups, organizations, and countries construct around themselves, erecting barriers which thwart interaction with others not within the same boundaries. These barriers include: national culture and language, industry differences, organizational commitment and loyalty, and occupational and professional socialization and training.

National culture and language barriers have slowed the impact that modern transportation and telecommunication systems have had on the distances separating persons in different regions of the world (Fulk, Rogers, and Von Glinow, 1990; Von Glinow, Schnepp, and Bhambri, 1991). Various institutes and training programs have sprung up to bridge cultural gaps (e.g. between Japanese and American managers), but we suspect that the personal networks of most business people are fairly homogeneous with respect to country of origin.

Within industries, recipes and rules of thumb about acceptable ways of doing things are taken for granted by most participants. People build their careers within industries, and typically develop a high degree of loyalty to them, especially in the West. Within organizations, similar forces lead to high identification and commitment to one's employing organization, especially in Japan. Finally, within many occupations and professions, a common vocabulary and set of taken for granted assumptions, plus long-term career interests, lead to markedly different views of the world.

These factors, among others, create a world fragmented by socially constructed boundaries in which networks build rapidly within boundaries but slowly across them. The boundaries are both the cause and effect of different interests, commitments, vocabularies, world views, and ways of interacting.

What are the consequences for networking?

Within social boundaries, a homogeneity of outlook often develops -- reinforced by strong ties between persons -- which produces a reluctance to risk communicating with outsiders. Or, more often, communicating with outsiders occurs but misunderstandings arise because people are not aware they have different assumptions, or even world views, and attach different meanings to the same events. Clearly, interaction within boundaries has some advantages: Communication is faster and easier within our own circles, and we may find strong emotional and social support for our behavior. However, respecting boundaries too much often leads to missed opportunities and reduced innovativeness.

We need to recognize that social boundaries often create tacit or implicit knowledge which we take for granted. People within an industry, organization, or group often know more than they can consciously articulate. As Millett (1990) noted, "technologies" are not simply hardware and products, and non-technological knowledge has profound effects on processes such as research and development. This knowledge is embedded in unconscious processes, customs, and traditions. Implicit knowledge is what adds authenticity to local products -- whether they are goods, services, or "know-how" --and makes them so hard for outsiders to reproduce. It is also this knowledge which makes networking so valuable, to the extent that face-to-face contact reveals the existence of such knowledge to both parties.[4]

For example, when Toyota executives wanted to determine how American consumers actually used their cars, they created research teams to study Americans' life styles. They "attended a cocktail party in Houston, where they concluded that people preferred a distinctive grille because it made the car more impressive when brought to the door by a valet. They also went to baseball parks, where they measured how close cars were parked to one another, to help decide on sliding doors instead of swing-open doors for mini-vans" (Levin, 1990).

The potential of networking is thus limited by uncertainty, competition, and the presence of many social barriers than constrain information flow. Uncertainty is a generic problem, present to some degree in most social and economic transactions, whereas competition may be partially dealt with cultural arrangements and negotiations between the persons involved (Williamson, 1981). Social boundaries emerge naturally as a product of human interaction and as a deliberate construction by persons and groups attempting to limit entry into, or exit from, some social unit.

How Can the Barriers Be Overcome?

What strategic implications follow when considering infrastructure development from a personal network perspective? Can "networking" be managed? We note that true networking is heavily influenced by chance and the number and level of social boundaries. Public policy makers, owners, and managers can create conditions promoting (or inhibiting) networking, but they cannot truly manage it. Observers often refer to "networks" when discussing administratively-mandated arrangements, either within or between organizations, but such use of the term fails to capture the dynamism and vitality of true networking behavior.

Concepts from network analysis suggest two principles : (1) systematically plan and monitor networking activities; and, (2) attempt to increase network diversity.

Planning and Monitoring Network Activities

Many of the divisions and barriers limiting the reach and diversity of networks are unplanned, institutionalized structures and processes that can be overcome with proper planning. We discuss planning from the viewpoint of individuals and their personal networks, and from the viewpoint of administrators concerned with their organization's innovativeness and vitality.

What Can Individuals Do?

Individuals, regardless of their organizational position, can enlarge their network reach by systematically charting their current networks and increasing their explicitly network-oriented behavior. A good place for individuals to begin is with an inventory of current ties. They should start with their current ties -- list the persons to whom they would go if they had a business problem and needed someone whom they could trust to both give advice/support and to hold their conversation in confidence.

Next they should inventory their weak ties. Whereas they may have listed as few as 4 or 5 people under "strong ties," their weak-ties relationships should be substantially larger. Entrepreneurs, for example, report that on the average they have spoken to nine or ten different people for business advice in a six-month period (Aldrich, Reese, and Dubini, 1989). In an inventory, weak ties might be placed into categories by what resources or sources of information they represent.

Then, people should examine how active they have been in maintaining and expanding the circle of trust represented by persons in their strong tie network. When was the last time they saw them? How frequently have they seen them in the past year? Have they phoned them recently or sent a note?

As important as their strong ties might be to them, their weak ties are equally significant. How many lunch dates have they had in the past month with persons they don't know personally but who are of value to their business (Welch, 1980)? Have they been seeing only people they know as friends? They might need to make a list of ideas on where and how they can meet those (unknown) people who are important to the success of their business.[5*]

Networkers should put themselves in the path of important people by joining or attending meetings of trade and professional associations, civic groups, cultural institutions, charities, and other voluntary associations (Welch, 1980). Join, attend, participate, and volunteer -- take on committee assignments and responsible jobs, and make themselves visible.

Finding people who play broker or bridging roles will allow someone to economize on the maintenance of their personal network, as such persons substantially extend the reach of their network at the cost of maintaining only one more direct tie. They might find brokers by asking 5 or 6 people they know only casually (weak ties) to suggest someone with an expertise in the area with which they need help. It is not a good idea to ask their strong ties to suggest someone, as the reason for getting to know a broker well is to break out of one's personal network.[6*]

What Can Managers Do for Their Organizations?

Managers could look at all interorganizational transactions as opportunities to increase the level of networking by their employees. Many firms have reduced the size of their corporate research staff in response to increased competitive pressures, heightening the need for information from outside their boundaries. For example, during the 1980s, downsizing and reductions in hierarchical levels became the central theme of most U.S. Fortune 100 firms. These tactics systematically cut line and staff jobs dramatically, sometimes up to 25 percent. Such developments amplify a firm's need for increased external contacts to compensate for possible information deficits.

Thorelli (1986:46-47) viewed network management as a core function of managers, and although he was thinking primarily about inter-organizational ties rather than inter-personal, his suggestions are well-taken. He argued that managers should take a holistic view, integrating the various functional areas "both for internal effectiveness in serving other network members and for a unified approach to them." Adoutte (1989) pointed out that high technology firms, in pursuing a strategy of technology valorization, are looking for ways to generate new uses of their technologies. Working with other firms in exploring alternative uses for their technologies allows people to

transcend the social boundaries that may have blinded them to hidden assumptions and implicit knowledge embedded in their current practices.

Consider a list of ways in which information and technology are shared between firms: licensing, joint ventures, turn-key operations, trade shows, direct sales, consultants, research and development consortia, cooperative alliances, hiring away each other's employees, as well as merger and acquisition activities. In many cases, these arrangements present managers with an opportunity to encourage their employees to engage in networking behavior. For example, most large Japanese and Korean trading companies devote substantial resources to tracking their business's interdependencies with other organizations (Auster, 1990). Within their industries, they show a high level of awareness of what other firms are doing. Many Japanese firms have their own in-house tracking and monitoring staff, and this function could be extended to maintaining records of their employees' significant business contacts. Only recently have U.S. firms begun to share research findings and information on new technologies via their participation in R & D consortia and as members of "best practices" company networks.

People in boundary-spanning roles of organizations play an important role in representing their organization to the outside, and in collecting and interpreting information for their organizations (Aldrich, 1979:243-264). Such people are often under-valued or even viewed with suspicion, and efforts may be made to routinize and formalize boundary roles to limit their discretion and power. If their activities are seen as including personal networking which may expand their organization's network linkages, managers may tolerate a higher level of ambiguity and discretion in such roles.

What Role Can Public Agencies and Consortia Play?

Professional societies, workshop seminars, short-term consulting, and other activities that bring people face-to-face are repeatedly cited as the major ways in which technology is transferred. For example, Cutler (1989:74), in studying technology transfer in the United States and Japan, found that "researchers say they allocate the time they devote to exchanging new ideas as follows: Two-thirds is spent participating in talks, meetings, and working with leading colleagues; and, one-third is spent reading, extracting, or preparing new information for publication or for patents." For the fields of robotics, bio-technology, and ceramic materials, these conclusions were as true of the U.S. as they were of Japan. Personal contacts were the preferred ways for obtaining substantive information.

Cutler found that the Japanese had an advantage because Japanese companies had a much more positive attitude about cooperative research, their researchers knew one another very well because of an extensive network of academic and business committees, and "personal commitment, trust, and desire for cooperation among researchers" was very high. Industry-wide meetings made

it possible for people in different companies to become familiar with new research, resulting in a rapid diffusion of ideas (Eager, 1985). Moreover, at these meetings, people who were familiar with work outside Japan acted as brokers and bridges, communicating their knowledge to people in different networks.

An example of an organization playing a broker role in the United States is the Marketing Sciences Institute [MSI], which is a private consortium of firms, each paying approximately $25,000 to belong. MSI focuses on improving research on marketing, and does this in part by promoting networking activities: sponsoring conferences, running competitions, supporting research by academics through small grants, and distributing working papers.

Radosevic (1990) argued that small firms played an extremely important role in technological development, in part through learning by interacting and by linking firms to one another. He proposed the concept of a national system of learning, in which public agencies could play an important role in encouraging cooperative relations between firms. In Japan, a branch of MITI - the Japanese External Trade Organization [JETRO] -- tracks all forms of publicly announced linkages (Auster, 1990), and in Korea, KOTRA performs a similar function. By contrast, in the United States there is no centrally collected public information on the total spectrum of interorganizational linkages, although some information is available on joint ventures.

Public agencies and private planning bodies can create action sets --organizations formed for a specific purpose within a limited time frame by autonomous firms -- and form new organizations that play broker roles, increasing network connections and information flow (Aldrich and Whetten, 1981). Since the National Cooperative Research Act was passed in 1984, more than 120 research and development consortia in the United States have formed (Evan and Olk, 1990).7* Their characteristics are well-known, and so we simply wish to point out that their success hinges, in part, on how successful they are at enlarging the personal networks of their participants (Rogers and Valente, 1990). For example, Admiral Inman, head of the Microelectronics and Computer Technology Corporation [MCC], planned that the managers who are in charge of their company's technology project would make frequent trips to the MCC. These monthly trips bring the managers into contact with managers from other member companies, widening their weak-tie networks.

In Japan, the Small and Medium Enterprise Agency of MITI began encouraging the formation of Inter-Industrial Networks for Technological Activities [INTAC] about ten years ago, and in 1986 almost 1000 were in existence (Furukawa, Teramoto, and Kanda, 1990). They are true action sets, composed of autonomous organizations, but many have evolved toward more formal structures.

INTACs are formed with very loose and flexible structures, and begin with a stress on personal interaction between members -- meetings, visits, and so forth. Eventually, members come to share those resources which are mutually beneficial and supplementary. These networks lead to the sharing or acquisition of resources which would not be possible through standard, armslength, market mechanisms. Note that they are allowed to evolve naturally --no administrative hierarchy actually puts people in touch with one another.

Action-sets come in various guises, but all share a common characteristic: They concentrate and interpret information for their members. They make information more decision-relevant than the information obtained on the open market. Thus, persons who play boundary-spanning roles, joining such organizations to outsiders, serve a very significant networking function.

Increasing Network Diversity

A paradox of strong ties is that they provide strong socio-emotional support for a person's activities while simultaneously limiting the diversity and chance encounters so essential for new idea generation. Expanding one's circle of weak ties is one way to increase diversity, but more direct measures are also needed.

What Can Individuals Do?

The great danger facing all business persons is that the daily struggle to cope with pressing problems and keep up with expected routines gradually eliminates time and energy spent in innovative activity (Mintzberg, 1974). People need to set aside time for purely "random" activities -- things done with no specific problem in mind. Attending cocktail parties, dinner engagements, get-togethers after work or on weekends, and other sociable occasions can lead to chance connections which increase their weak ties network.

As a quick check on whether they may be sacrificing diversity for density in their personal network, people can take the list of persons they generated for their strong tie inventory and ask, how many of them know one another? The answer will probably be 50 percent or higher.8* Then, do the same thing for their list of weak ties. If that answer is also 50 percent or higher, they may be involved in a network that is too in-grown and insulated to be of maximum benefit to them.

People can increase diversity in their network by consciously trying to increase the age range of persons they know. For women, because the occupational distribution for younger women is significantly more like that for men than the distribution for older women, they can make an effort to include younger women in their network. They are likely to have the connections with men which they need to overcome gaps in their own personal network because of gender barriers they have previously encountered.

Assertiveness and an instrumental orientation pay off in building personal networks, and are especially important in increasing network diversity. People should be self promoting, not

reluctant to explain to others how their product/service or skills complement the other person's, thus establishing a common ground. When appropriate, follow-up meetings should be arranged with people who have something to offer. Finally, people can play broker roles themselves by bringing persons together whose needs are complementary, and can increase their visibility as brokers by taking credit for the results.

What Can Managers Do?

In addition to the strategies we have listed to promote more networking, managers could also pay attention to the diversity of their firms' organization set -- the set of all organizations to which they are directly connected (Aldrich and Whetten, 1981). The recruiting of new employees can be an occasion for increasing network diversity. In the past year or so, hundreds of Soviet mathematicians and physicists have immigrated to the United States, substantially affecting thinking about many problems that had stumped American scientists for years. Although the Soviets were theoretical, rather than applied scientists -- their laboratory facilities tended to be inferior to those in the United States -- they still brought fresh insights and new ideas to the universities and businesses that hired them.

Managing diversity has become a new theme to many firms in the 1990s. By the year 2000, two-third of all new jobs will go to women, minorities, and immigrants. Failure to recognize workforce diversity will result in decreased productivity and isolation of ethnic groups. Those companies that actively seek diversity, such as Proctor and Gamble, Hewlett Packard, and Xerox, will capitalize in the benefits of a diverse workforce. Numerous diversity awareness and training programs have emerged since Proctor and Gamble initiated its first in 1979. Two-thirds of all global migration is now to the U.S., and thus U.S. managers must be pro-active in encouraging diversity training in their domestic as well as their international firms.

For MNCs operating abroad, hiring foreign nationals as managers has become a critical method for capturing and preserving local or implicit knowledge that can feed into an organization's internal network. Notwithstanding expatriate difficulties in assimilating into a new culture, this practice has gained in popularity in recent years. Even the Japanese have begun to place Americans in positions of power and authority in their American operations. Mitsubishi refers to this as "Americanization" and Nomura Securities, the world's largest securities firm, now has an American chairman.

Some firms keep their business units small and regionally-oriented, in recognition of the value of implicit knowledge. For example, ECCO, a leading French services company (human resources, safety, industrial cleaning, banking and financial services), creates small operational units in various EEC countries which are run by small teams of local nationals who have also had one or two years of work experience in France. They have had an opportunity to experience

culture-clash, heightening their consciousness of the implicit knowledge of their own societies which they bring to ECCO.

Some MNCs are setting up complementary research and development facilities in more than one country. "This strategy allows technological developments to be monitored, establishes communication links for technical flows across national boundaries, and establishes networks with universities and technical associations in other countries (Keller and Chinta, 1990:39). Keller and Chinta suggest that networking across firms and countries will be facilitated if companies place sophisticated technical personnel with a cosmopolitan orientation in boundary-spanning positions.

What Can Public Agencies and Consortia Do?

Many of the strategies we have suggested for planning and monitoring networking can also affect the diversity of networks. For example, in Japan, membership in INTACs is limited to only one or two firms from the same industry. The ostensible purpose of this restriction is to limit the risk that business rivals will snatch away information and use it to their advantage, but it has the unintended consequence of making the INTACs much more industrially diverse than they otherwise would be (Furukawa, Teramoto, and Kanda, 1990). Membership in the U.S. Marketing Sciences Institute is also deliberately spread across manufacturing, retail, and service industries, to maximize the possibilities of cross-fertilization of ideas. Many U.S.-based consortia have published their "best practices," and these practices then are distributed across other networks.

In a technopolis, planners should deliberately create settings that facilitate face-to-face meetings between people from different organizations. Central meeting halls, recreation facilities, diverse cultural and entertainment activities, and many other tactics provide occasions for the chance encounters so essential to broadening the reach and diversity of personal networks (Segal, 1988). Morita and Hiraoka (1988:38) noted that planners of the Osaka technopolis were concerned with preparing an alluring urban environment "with good housing and living conditions; a highly developed medical system; a favorable educational environment and opportunities; cultural, artistic, sports, and recreation facilities; and open-minded local communities. Such qualities will ensure the gathering of creative persons and the facilitation of face-to-face interchanges that are key factors in the creation of a successful technopolis."

Conclusions

We have reviewed some key concepts of network analysis and shown how people's access to information is affected by their position in networks. We emphasized the difference between direct ties and indirect ties, showing how indirect ties and their strength affect the number of persons we can reach in a network, as well as the diversity in our networks. Networking is heavily influenced by uncertainty, competition, and the social boundaries within which behavior occurs.

After discussing how these factors may constrain networking, we examined some strategies for overcoming such barriers. We focused on planning and monitoring network activities, and on strategies for increasing network diversity, examining strategies at the individual, organizational, and public policy levels.

Recent political developments suggest we might be moving toward a world **divided not** by East vs. West, or North vs. **South, but by regional** trading blocs (Belous and Hartley, 1990): Europe, dominated by **a united and** prosperous Germany; Asia, dominated by Japan and the NICs; and North America, dominated by the United States. The rest of the world will then be the last frontier of economic competition between these three central spheres. Networks may be strongest within these three spheres, but be unable to penetrate very far into the others. Or, some MNCs may develop networks that cut across regional boundaries, such as those occurring in the Maquiladoras,9 and therefore avoid being shut out. In the race for global competitiveness, networking will be an important strategy.

Individuals, firms, and public policy-makers must pay more attention to systematically monitoring and planning networking, and to increasing network diversity if they are to retain economic influence. Organizations of the future will be much more self-conscious about networking -- open information flow and diverse memberships, including partnerships and collaborative units, will expose organizations to more of their environments (Aldrich and Auster, 1987).10* In short, "boundaryless" organizations may dominate future organizational forms.

Footnotes

[1]Not all kinds of information are important. The information that businesses need most is rare, valuable, and inimitable (Barney, 1986). It must be rare, for otherwise, all businesses could obtain it and no competitive advantage could be gained. It must be valuable in the sense that it works. And, it must not be easily imitated or acquired by others, or else it again loses its competitive advantage.

[2]Sometimes the normative component is referred to as a "relational" component (Watzlawick, Bavelas, and Jackson, 1967), denoting the level of relationship between the communicants and how the communication content is to be taken.

[3]The other party, expecting never to deal with you again, may engage in "self disbelieved" statements of competence or performance (Williamson, 1981).

[4]For example, when technology transfer is attempted, several problems involving implicit knowledge arise. First, the technology -- at whatever level -- may work as intended only when coupled with the tacit knowledge of the originating person, subunit, or organization. Second, the target organization or subunit may not be capable of absorbing -- or even recognizing -- the implicit knowledge needed to make the technology work.

[5]For women, this list ought to specifically include cross-gender contacts, i.e. include men in positions of importance, to compensate for the high proportion of same-sex contacts most people make.

[6]When you find a potential broker, take them out to lunch and pick up the tab. Follow the suggestions in Bixler (1984) regarding how to project a professional image when dealing with weak ties and potential brokers, who will not know others in your circle and thus have no pre-formed ideas about you.

[7]Toshihiro Sasaki and Howard Aldrich are currently researching the longevity of the R & D consortia formed in the United States, and comparing their governance structures to those in Japan. Tentative results show that about one in seven R & D consortia have disbanded within the past 5 years.

[8]In a study of the Research Triangle, density was about the same for men and women entrepreneurs: 55 percent for women and 58 percent for men (Aldrich, Reese, and Dubini, 1989). Similar findings have been obtained for Italy, Norway, and Sweden.

[9]Mexico's Maquiladoras have recently emerged as an attractive manufacturing alternative to the rising costs and political instability of the Pacific Rim.

[10]A recent content analysis (Cummings, 1990) of the top business leaders in the Fortune 500 revealed that networking will be central to the quasi-firms, hybrid organizations, and polymorphs that will dominate our organizational horizons in the future.

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