

A Blueprint for Developing Organizational Networks

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1 Introduction

1.1 How a Virtual Interorganizational Network is Created and Develops: An Interesting and Relevant Topic for Research and Practice

The social network perspective on individuals, groups, and relations, has its roots in sociology, social psychology, and anthropology (see Scott (2000) for a fuller historical account of social network analysis), and has more recently been applied to management. It holds the promise of providing a more useful understanding of organizing principles, one that will lead to advice for actively creating and optimizing individual and organizational performance.

Focusing on the field of management in organizations, the concept of networks in organizations applies to the *structure* of organizations – the observed pattern of organization (Nohria & Eccles, 1992) – as well as to the *process* of how individuals work in organizations. Necessarily, these are social processes by definition, involving not just atomistic actors operating in isolation, but actors embedded within larger social groupings. Thus process and structure are never really independent. The structural perspective provides an important dimension to understanding the effects of interaction within these larger units, because it explicitly considers the effects of relationships on economic, political, and other types of decision-making. This dimension is often ignored or discounted altogether in more impersonal economic models of behavior (such as those that focus on markets, exchanges and transactions).

There has been a long evolution of organizational forms over time. In characterizing the evolution of societies as moving from the agricultural era, through specialization, industrialization and into the current information and knowledge age (Lipnack & Stamps, 2003; Savage, 1994; Toffler, 1980), different ways of organizing are illustrated as well (Table 1).

Table 1: Organizational Forms Over Time

Era	Agricultural	Specialization	Industrialization	Information and Knowledge
Characteristics	Individuals performing a wide variety of tasks	Division of labor and increased productivity through resulting specialization	Addition of machinery and automation to specialized tasks, replacing labor with capital to increase productivity	Separation of knowledge and physical artefacts, application of information technologies to increase productivity
Organizational form	Individual	Collective or guild	Hierarchical firm	Network organization

source: adapted from Toffler, 1980 and Lipnack & Stamps, 1990

Although new organizational forms have evolved, they have not necessarily superseded those that dominated previous eras. Individual forms, e.g. the sole proprietor or independent professional, and collective forms, e.g. partnerships, are still very much alive today. However, imperatives of speed, flexibility, and efficiency are encouraging network organizations or ways of working. These ways of working are also a response to a lack of enduring institutionalized structures within and between organizations (Nardi, Whittaker, & Schwarz, 2000).

Such changes are also being driven by demographics, where an increasingly aging workforce may play multiple roles throughout an extended working career. A diverse workforce, including part-time, job-sharing, and telecommuting, also gives rise to different forms of association and relationships.

Technological change has also enabled the network perspective to flourish. With the rise of internet and networked communication technologies, mobile, portable, and increasingly powerful technologies have allowed workers to both be removed from a centralized structure and remain in close contact with it. Implications of mobility on international companies and human resources management have been explored by Hilb (2001). New structures, virtual in fact, can be created and recreated using the capabilities gained from such technologies. The possibility to

form cross-organization networks of individuals from different organizations, who can interact virtually, is one example of the new structures that become possible.

Globalization, the trend towards integration across geography, politics, and culture, has also encouraged the development of network structures. Exploding the value chain to different parts of the planet, to reap the benefits of locating different parts of the production and consumption cycles to where the natural advantages lie (or political or culturally originating ones as well), can itself give rise to network forms.

Running global operations, using advanced technologies, in an increasingly faster, efficient, and distributed fashion, has also given rise to enormous complexity. While the processing power of technology has helped provide tools to manage complexity, the cross-discipline convergence that arises makes new demands on individuals who must cope with such complexity. The information gathering benefit to networks can help individuals cast a wide information gathering net and adopt the multiple perspectives that are required to deal with such complexity.

Taken together, an impartial overview is needed that takes into account the scope and complexity of this evolution into the knowledge era. Other views such as transaction cost economics face limitations that a network perspective can address (Granovetter, 1985; Uzzi, 1996; Williamson, 1980). The variety of actors, scope of relations, and multiplicity of contexts as well argues for a network perspective, because it is one that considers higher-order patterns of interaction. A network perspective can provide a multi-level view that is able to consider the individual, group, team, community, organization, and intra-organization units of analysis, in isolation or combination.

The processes, or way these structures emerge, are through seemingly independent actions of actors within the network. As noted, the social network perspective addresses the limitations of more economically driven views of actors in organizations. The network perspective provides for richer motivation besides

economic, one that encompasses the social dimension of business relations, as well as the economic. The social network perspective can even be extended to redefine concepts such as the “business environment” and industry, which can be more clearly articulated with the addition of a network perspective (Burt, 1998). The idea of performance in a network perspective could thus encompass a more holistic view that considers economic and related socially negotiated concerns such as quality and environmental objectives.

In the realm of networks, a challenge for current research is to move from understanding organizations through a network perspective, to considering the creation of networks, and to a dynamic perspective of network growth and development.

1.1.1 Networks: From a Research Point of View

There is an intuitive congruence between the network perspective and the broad social and economic developments discussed above. This is captured in the colloquial phrase, “it’s who you know, not what you know” that matters in getting things done. Moving to the organizational level, a network perspective can be usefully employed to study organizations, given five underlying premises (Nohria, 1992).

1. All organizations are in important respects social networks and need to be addressed and analyzed as such
2. An organization’s environment is properly seen as a network of other organizations
3. The actions (attitudes and behaviors) of actors in organizations can best be explained in terms of their positions in networks of relationships
4. Networks constrain actions, and in turn are shaped by them
5. The comparative analysis of organizations must take into account their network characteristics

The network perspective allows multiple units of analysis – individual, group, organization, and intra-organization – in an attempt to better understand the organization in terms of the knowledge era. If one of the central challenges of the knowledge era is creating and sharing knowledge because this is the key to competitive advantage, as widely posited, the idea of knowledge as a socially negotiated outcome fits well with the social network perspective. Theories of knowledge creation and sharing, such as that put forward by Nonaka and Takeuchi (1995), suggest that the knowledge creation process includes not only individual actors, but also links to larger units through processes of socialization and justification. So from a research perspective, the possibility exists to illuminate the individual-organizational link, or the structural underpinnings of knowledge creation and generation processes.

The social network perspective is not limited to networks for knowledge creation and sharing. It focuses on a cross-sectional slice of actors and relations, of which knowledge creation and sharing could be one slice. Additional slices, or social network analyses, from advice to workflow networks, can be undertaken in relation to the purpose and desired outcome of a network. Such analysis can provide insight into roles actors play and provide individual actors with an idea of how they can modify their own behavior and invest in or divest relationships. Alternatively, from a whole network perspective, insight can be gained into improved network configurations and global behaviors that enhance network performance.

The structure of networks has piqued the curiosity of researchers in various fields for decades. For instance, the small-world phenomenon originated with the contention that six degrees of separation are the longest path required to connect every individual in the United States (Milgram, 1967). Although subsequently highly doubted (Kleinfeld, 2002), more relevant is the actionable span. Further research has indicated that for useful purposes this span is two or three (Friedkin, 1983; Krebs, 2002). (One knows one's direct contacts and some of their activities, and even some of their contacts and their activities, but one's contact's contact's

contacts are much less visible to you). Such considerations can prove helpful in architecting a network that is most efficient for a given purpose. In this way there is a clear link between research and practical, actionable advice that has a direct impact on performance.

For networks as a principle of ‘the way things are done’, the creation and negotiation of shared understanding between participants in a network can define challenges and afford their resolution as well. This view of networks underlies the concept of social capital, which sees relationships as assets to be invested in, or capitalized, against returns, or exploitation, of the accumulated capital.

The theory of social capital, which posits that investment in social relations can be exploited for returns, is a potentially powerful new theory. It complements the individual-centered view of human capital, which focuses on investment in individual capabilities. The organizational capabilities gained by linking individuals – holders of human capital – justify the investment in such relations, by creating new and unique capabilities as well as those that are greater than the sum of the parts.

Finally, a network perspective allows for the analysis of interorganizational networks – networks that organize around knowledge and purpose, not traditional organizational boundaries built on function, task, or geography. Disintermediation effects of forces such as distributed information technologies have weakened traditional organizational boundaries. The networks perspective, applied to individuals, groups, and organizations – networks for knowledge creation and sharing, and for other purposes – is the means to greater capabilities as expressed through the theory of social capital.

1.1.2 Networks: From a Management (Business) Point of View

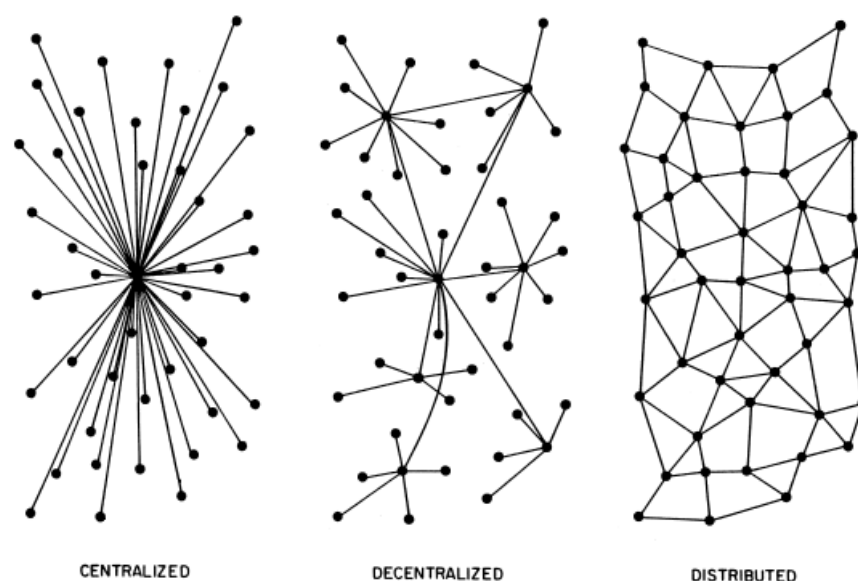
Organizations are facing pressures to operate faster, yet in a more complex and uncertain business environment. At the same time, they have an increasingly

constrained capacity to act, having less control over employees, suppliers, customers, and shareholders.

On the positive side, technological change has made widespread the availability of virtual communications, with time and space advantages. When applied by teams, communities of employees, and interorganizational networks, there is the potential for radical change: the redefining of the meaning of management away from command and control towards more open forms of engagement. Yet existing structures hold current mindsets in place, even in the face of the impetus for change such as that brought on by the shift to the knowledge era. Knowledge creation and sharing activities are as unresponsive to control mechanisms as are the distributed and often decentralized network structures that are associated with them.

A balanced perspective may be found in certain network conceptions. For decades, three basic forms of networks have been put forward – centralized ‘stars’ or hub-and-spoke networks, highly structured ‘distributed’ networks, or decentralized (in between centralized and distributed)¹ (Baran, 1964) (Figure 1).

Figure 1: Baran’s Three Different Network Structures



¹ The notion of randomly composed networks can be added to this scheme, whereby a certain network population or membership is defined, but the links or ties between network members are not purposefully created.

In the past few years, much insight has been gained into the decentralized form and it has been seen as widely applicable to a great variety of networks in many fields. Because such networks have elements of both structure and randomness within, they are posited to be the transition between order and chaos (Barabasi, 2003). This region between order and chaos holds the potential for the best of innovation and creativity to be married with practical implementation possibilities (Stacey, 1992).

The network perspective has been pragmatically applied to teams (Baker, 1995). At this level of analysis, network maps of teams can be produced to guide an intervention to improve teamwork in a focused manner. By focusing on selected aspects of the mapped teams, local improvements can be made that benefit the overall structure. A post-intervention network map can then illustrate these benefits.

Another form of network perspective has been applied to teams by Schwaninger (Espejo, Schwaninger, Schuhmann, & Bilello, 1996). Based on principles outlined by Beer (1994), team synteegrity is a structured approach to team-based problem solving. It allows comprehensive input on all issues under consideration by all parties, in a highly structured and closely timed sequence of interactions. The underpinnings of such an approach draw more from the traditions of systems sciences and even structures found in the natural sciences. Such natural and artificial extensions have been popularized, for example, in the works of Buckminster Fuller relating to geodesic domes and their special properties (lightness and strength increase per unit volume, for example, the opposite of other constructions) (Marks, 1960). The notion of tensegrity, a combination of tension and integrity, also arises from such considerations and has found its way as a principle into team synteegrity.

Overall, we may be entering an era of networks as a general management principle of organization and operation, versus a specific 'problem' to which networks are the solution. In this spirit it makes sense to investigate the creation of networks for

knowledge sharing and creation around topics important for organizations, rather than networks as a means of process improvement. To summarize, the move from the information era to the network era has begun.

1.2 Objectives – Research Questions

The social network perspective has already been usefully employed in dozens of organizations (Cross & Prusak, 2002), as a perspective on existing organizations. There is a need for greater insight into network creation and development (Kanter & Eccles, 1992). To see network creation and development in action, one approach that has been successfully employed is to start before the organization exists, i.e. to use networks as a core organizing principle (Baker, 1992). Alternatively, looking to networks created where no prior significant relationships exist – in the interorganizational space – is another approach that could prove fruitful. In this interorganizational space, virtual communications have become a reality and perhaps a necessity, given the efficiency, time and space advantages. Also, using virtual communications technologies, it becomes possible to assume identities to match different roles, one or more within an organization and others in an interorganizational network. Multiple memberships are facilitated in practice. Overall, virtual interorganizational networks are a promising and fertile ground for understanding network creation and development.

Therefore, the research questions are:

Can social network analysis be applied to virtual interorganizational networks in a meaningful way, from a network structure and dynamics perspective? If so, how does a virtual interorganizational network form and develop over time, with respect to the network measures inherent in social network analysis?

Related questions are:

To what degree can a virtual interorganizational network be formed and developed through interaction over an online discussion forum?

What are the patterns of interaction that develop and the roles derived from such patterns, that are associated with individuals in the network?

The insights gained from researching these questions will provide insight to network organizers who seek to orchestrate and tap the collective capacity of a virtual interorganizational network, for a purpose, leading to an outcome.

To “orchestrate and tap” implies a process by which social network analysis methodology is applied, as a lens on network creation and development and step towards action. By network, a “whole network” perspective is taken, in contrast to a personal network that centers on one individual (Degenne & Forsé, 1999). “Purpose and outcomes”, are defined with respect to the network participants’ priorities, drawing on identities either as individuals or as members of another organization. For example, an organizational purpose and outcome might be for knowledge creating and sharing leading to increased profits and growth.

For outcome, the possible dimensions on which virtual interorganizational networks impact appears limitless. This issue leads to the question of how performance can be defined, or what are the knowledge age measures that matter? For the virtual interorganizational networks under consideration, performance is defined as interaction that creates enduring structures (social capital) that can be exploited for knowledge creation and sharing on a particular topic. Performance under this definition is related to participation and to quality of output from the network. While the first measure will be operationalized for this study, the second measure currently falls outside the scope of commonly applied social network analysis.

1.3 Dissertation Objectives

An objective for this dissertation is to discover whether applying social network analysis methods yields useful results for influencing the creation and development of the virtual interorganizational networks under study, from the network

organizer's perspective. As well as social network analysis methodology, social capital theory underlies this research. "Social capital contains three components intersecting structure and action: structure (embeddedness), opportunity (accessibility through social networks), and action (use)" (Lin, 2001). Social capital is conceptualized here by Lin at the individual level, in terms of individuals *acting* through social network *structures* to take advantage of some *opportunity*. The focus of this dissertation is on the whole network level, on the collective membership. Opportunity is equal(ized) for individuals. Network structure is the focus and to some extent the action that is facilitated by structural considerations. So the advice is directed towards the entire network and not to specific groups or individuals, except to the extent that such groups or individuals may take on network roles as illuminated through the structural analysis.

Another aim of this dissertation is to make a contribution towards a framework for applied social network analysis – the strength of sociological contribution has been to illuminate the structures; the strength of a management contribution such as this thesis is the alteration and the animation of these structures over time, given how initiatives are actually implemented in practice. Given that the network organizers have their own constraints, e.g. in terms of time and resources, results must be practical and accessible given these constraints.

By studying an ongoing networks initiative, there will be the potential for direct and relevant impact on practice. This research will also inform management education, since it is being carried out in the context of a group of young managers in a yearlong management development program. Among this group, it will help to create an alternative view of organization other than market or hierarchical relations, a path to a freer, more flexible concept of organization that may be beneficial to follow in future circumstances.

Finally, given the relative paucity of literature on virtual interorganizational network creation and development, this research will make a contribution to the networks and organization literature in this regard.

1.4 Methodology and Research Design

Social network theory posits that groups and organizations can be understood as a network of relationships between individuals. To discover whether this perspective can be extended to virtual interorganizational networks, social network analysis methods will be applied to fifteen virtual interorganizational networks that use discussion forum messages as their primary vehicle for interaction between network members (Appendix A). This approach will test social network analysis concepts on virtual interorganizational networks, to discover which existing concepts apply and which new ones may be appropriate to a virtual network. Further, by analyzing the networks from their inception, and thereafter at two-week intervals for a period of six months, I will take a longitudinal approach to gain insight into how a virtual interorganizational network develops over time. Other researchers have proposed that “network analysis can be used to study the process of change within a group over time” (Wasserman & Faust, 1994), as well as positing that social network analysis can be useful in studying virtual networks (Garton, Haythornthwaite, & Wellman, 1999).

The network organizers also act as participants in the network and will therefore be included in the analysis. Message meta-data and content will be used as the basis for determining relations. If a message refers to an earlier message, it will be evidence of a tie to that author. In this sense, it is a ‘strong’ tie, versus ‘weak’ tie which would be indicated by a mere page view or reading of that message. The study of these weak ties is beyond the scope of the methodological design of the present study, which has chosen broad coverage of several networks over time, versus the in-depth study, including weak ties, of a single network. It should also be noted that weak ties have been excluded from other network analyses, especially when all members are considered to be weakly tied (Krackhardt, 1992).

To gain some comparative insights, the analysis will be performed on 15 different virtual interorganizational networks. The approach to do so is to create blockmodels and sociograms, also known as network maps, that represent actors as nodes and relations as lines that link nodes. These network representations can

then be analyzed in terms of network measures, to uncover patterns of relationships relative to the network's purpose. Specific analysis includes measures of network density, identification of groups and roles. For actors, centrality measures will be calculated to assist in the identification of roles as well as in describing the structure of the network. The visual representations will serve to concisely communicate such patterns, through graphical versus statistical representations.

Results will be generalizable for networks that have similar characteristics, i.e. where communication is primarily virtual through an asynchronous medium, membership is limited in certain respects, and the network's topic or purpose is clearly defined and articulated. Since the organization and running of the virtual interorganizational networks initiative under study will continue in an ongoing fashion, results could also be the basis for actions to encourage certain network configurations that can potentially better deliver on the network's priorities.

One measure of performance for these networks has been defined as generating and sharing knowledge about the network's particular topic. This knowledge is to be distilled and distributed in a white paper that is created by the network organizers at the conclusion of the organizer's tenure. Another measure, participation, as expressed by the size of network membership as well as by the number of ties between network participants, is another measure of performance that will be used. Network performance, as measured in specific ways, is not the sole focus of the study: understanding how these networks grow and develop, as expressed through evidence of structures and roles emerging in the network, is the larger objective.

At this stage in the understanding of virtual interorganizational network formation and dynamics, depth will be emphasized over breadth: so cross-network analysis will be limited, since the longitudinal dimension will be explored. A specific causal relationship is not proposed, but rather an illustration of the processes and of the concept of analyzing virtual interorganizational networks using social

network analysis is sought. The research design, which considers 15 networks over a six-month period, is appropriate for these purposes.

The data for social network analysis can be generated from archives of the discussion forum. These archives contain message content, sender, and date and time information. Interviews with network organizers will also illustrate the challenges and dynamics of network creation, maintenance, and growth. These interviews will provide organizers with a vehicle to express their views on their network's growth and development. In this way, qualitative data will supplement the quantitative analysis. This qualitative data will help to generate a more rounded understanding of the organizer's choices relative to the network's growth and development.

In applying social network analysis methodology in this case of a virtual interorganizational network, a relational tie is defined by the posting of a message in response to a posting by another network member. The networks will be analyzed every two weeks to create a set of chronological views of the development of the network. However, because of the experimental nature of these networks, many networks are not expected to have sufficient activity to support further analysis, ie of cliques or subgroups. Networks will be ranked on several measures. For those networks above the threshold, the emergence of structural patterns will be investigated, including the emergence of roles. For example, the network organizers may play already recognized roles, e.g. acting as connectors, bridges, or facilitators between various parts of the network.

Other social network analyses could incorporate the present virtual network analysis methodology, as part of a larger analysis. Such multidimensional social network analyses are performed on different dimensions already, such as advice, or trust, most commonly based on survey data. The 'message' dimension of the present virtual network analysis would thus be another form of relation between network members, albeit collected differently.

Even with the added insights of these multidimensional analyses, there are limitations of the social network perspective and social network analysis. The network perspective gained through such analysis:

- is linked to the exercise of power and influence to achieve personal gains at the expense of others – “it’s not what you know but whom you know that counts”. As such, it legitimizes this behavior. The use of social network relations to advance ideas and people based on these factors can appear to contradict the principles of a meritocracy, which relies on equal rules for advancement, applied impartially and from an objective perspective.
- tends to be descriptive, versus diagnostic and prescriptive. Social network analysis excels at surfacing or illustrating structures, but it is not clear what to do with this insight.
- trades off a more holistic view versus a richer description of relations and actors. Therefore the complexity of relations and actors behavior tends to be simplified. There are different degrees to “relation” that describe who we really know – outsiders vs. confidants, for example (Degenne et al., 1999).
- is a static view – a snapshot in time that is based on analysis of current or past activities, not future ones (Cross, Parker, Prusak, & Borgatti, 2001).
- provides little insight into network creation, formation, and development processes over time.
- leads to structural bias: an emphasis on structural constraints on action, as opposed to agency, the active shaping and mobilization of networks of relationships (Ibarra, 1992).

There are methodological measures that can be taken to address some of these limitations. For example, multiple types of networks can be illustrated to overcome the whole view / rich description tradeoff, at least for relationships. Also, the static view can be addressed through a longitudinal approach that takes regular snapshots and by looking at these comparatively over time, addresses the network creation, formation, and development processes.

The study will make use of inductive reasoning (Easterby-Smith, Thorpe, & Lowe, 2002): emerging structures and the data set will provide the impetus for hypotheses about virtual interorganizational networks as viewed through the social network lens. The results of this iterative process will be seen in the ultimate measures chosen and when reviewing the results vis-à-vis the hypotheses.

Given this qualification, the hypotheses for structures and dynamics within networks have been formulated as follows:

H1. The structures under study will display the structural characteristics of groups according to the patterns of interaction between network members.

Basically, if it displays network properties in terms of commonly defined social network analysis measures, the structure can be thought of as a network. Some common measures are density, stress level, in-degree and out-degree, and therefore this hypothesis is that such measures can be calculated according to existing methods for the structures under study. Furthermore, the structures under study should be able to be visualized with a stress level measure that indicates a reasonably accurate depiction of the derived network.

H2. Roles will emerge according to the structural characteristics of the structure's population.

Basically, if roles emerge that are commonly found in networks, the structure can be thought of as a network. Roles are be imputed from differences in structural characteristics among the structure's population, for example, in differences between in-degree and out-degree measures among network members. This hypothesis implies that such measures will display some variability, and therefore that these measures will be a meaningful basis for imputing roles to network members. By specifying that roles will emerge, it also implies that there will be an element of increasing variability between the initial homogeneous state of the network and future states.

H3. The structures under study will reach critical mass when the network organizer's participation in the network activities as a percent of total participation in the network falls below a certain threshold.

Identifying this threshold could provide the useful benefit of providing network organizers with more concrete targets, to develop the network to a self-sustaining level. This notion of critical mass (Hout, 2001; Schelling, 1978), is that below a certain level, the reinforcing effects of positive action are overwhelmed by the complacency of actors who are inactive. At some point, to borrow the epidemiological term popularized by Gladwell (2000) as the “tipping point”, an equilibrium is reached, and then a *self-reinforcing* spiral of positive action is encouraged by surpassing this equilibrium point. The critical mass and tipping point may vary from network to network, depending on task, structure, and network performance (Ahuja & Carley, 1998). I leave the complex interaction of these factors to future research, and instead focus on the dynamics of critical mass and tipping point, through the above hypothesis, to determine whether such concepts can usefully apply to the virtual interorganizational networks under consideration here.

H4. At early stages, the emergence of certain roles or structures is associated with faster network density growth rates.

Participation in one of the virtual interorganizational networks under study should lead to an increase in members' own human capital, which also becomes accessible to network members via network structures. Some network members may recognize these dynamics and act accordingly, resulting in higher network density growth rates.

H5. The structures will move from an initial random (chaotic) state to a more structured (ordered) state, in a way that is consistent with a power-law distribution of links per node.

As understanding of network dynamics grows, the states between order and chaos, rather than those at these two extremes, are proving the more common in many fields. In the case of virtual organizational networks under study, the networks will prove consistent with this trend and display the properties of such networks, namely that the node-links follow a power-law distribution rather than a normal distribution.

1.5 Definitions

Most of the relevant variables and structures will be defined through the literature review in the next section. However, a few terms need to be briefly clarified before proceeding.

As already discussed, *social network analysis* is a methodology for elaborating the structures and patterns of relations among a set of actors, or members. The patterns of relations are known, in addition to relations, as ties, links, edges, or connections, interchangeably. Actors and members are also terms used interchangeably with each other and with nodes, points, agents, and even ego and alter. These latter two terms are more often used in conjunction with ego networks, which are networks illustrated from the perspective of an individual node. Ego network are contrasted with whole networks, in which all ties and nodes are illustrated for a given population. By collecting complete data from each node and on each tie, we are able to take a whole network perspective.²

In this study, we take a whole network perspective in applying social network analysis methods to a virtual interorganizational network. Such a *virtual interorganizational network* is defined as one in which members interact “across space, time, and organization boundaries” using communications technologies (Lipnack & Stamps, 2000). Five principles of networks described earlier by

² Due to the nature of the whole network perspective, sampling is rarely an issue, since the whole (network) population is targeted. Bounding can be more of an issue in determining network membership or composition, and respondent validity concerns often affect the accuracy of data collected. However, such concerns are common to survey techniques and not specific to network analysis.

Lipnack and Stamps (1993) are still relevant for the virtual interorganizational networks of today (Table 2).

Table 2: Five Principles of Networks

Principle	Description
Unifying Purpose	Purpose is the glue and the driver. Common views, values, and goals hold a network together. A shared focus on desired results keeps a network in synch and on track.
Independent Members	Independence is a prerequisite for interdependence. Each member of the network, whether a person, company, or country, can stand on its own while benefiting from being part of the whole.
Voluntary Links	Just add links. The distinguishing feature of networks is their links, far more profuse and omni directional than in other types of organization. As communication pathways increase, people and groups interact more often. As more relationships develop, trust strengthens, which reduces the cost of doing business and generates greater opportunities.
Multiple Leaders	Fewer bosses, more leaders. Networks are leaderful, not leaderless. Each person or group in a network has something unique to contribute at some point in the process. With more than one leader, the network as a whole has great resilience.
Integrated Levels	Networks are multilevel, not flat. Lumpy with small groups and clustered with coalitions, networks involve both the hierarchy and the “lower-arch y,” which leads them to action rather than simply to making recommendations to others.

source: Lipnack & Stamps, 1993

There are myriad *purposes* for networks to exist. In the case of the virtual interorganizational networks under consideration, they have been created for the purpose of knowledge creation and sharing.

Knowledge, for creation, sharing, and exploitation, is defined as information that has value to an individual, group or organization, validated and justified (“true belief”) among those units, where value is determined by the context of performance (“knowledge to do what”). It is thus inseparable from the act and

process of knowing (the realization of knowledge) (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; Nonaka, Von Krogh, & Ichijo, 2000).

The actionable dimension to knowledge can be defined as *learning*, which is then the ability to replicate the above knowledge-related process under different conditions.

When learning together, as in a network, it is *collective capacity* that is augmented. Collective capacity is the potential represented by a collection of diverse individuals that exceeds that of one or more homogeneous individuals (Senge, 2001). This is the potential due to *social capital*. Before discussing social capital further, it is necessary to review the social network concepts as discussed in the literature.

2 General Theoretical Background

2.1 Literature Review

There are two aspects to the term “social networks”, one that focuses on actors, and the other on the (social) relations between them. The network part of “social networks” is defined as individuals with ties to other individuals, who can then have none, one, or more ties to other individuals (Wasserman et al., 1994). The network is bounded by the set of individuals with at least one tie, and was defined by Granovetter as a loose association of individuals with strong and weak ties (Granovetter, 1973). If we consider individuals as social entities or actors, collective social entities such as teams, groups, departments, and business units, can also be the units or nodes in a network. Relationships between these actors then produce the structure that is known as the network.

2.1.1 Relationships in Networks

Turning to relationships, one of the principle ways of characterizing relationships is as strong or weak (Granovetter, 1973). Strength depends on four criteria, according to Granovetter, and summarized by Degenne and Forsé (1999):

- duration (of time spent together, and how long one has known another)
- emotional intensity
- intimacy
- exchange of services

Granovetter’s operational definition of weak ties are those existing between actors who interact more than once per year and less than twice per week. Strong ties are operationally defined as existing between those actors who interact at least twice per week. Others have interpreted the properties of strong ties differently, as noted by Krackhardt (1992). He notes other interpretations such as reciprocated nominations (Friedkin, 1980), recency of contact (Lin, Dayton, & Greenwald, 1978), and named relations such as “friend”, “relative” or “neighbor” (Lin, Ensel, & Vaughn, 1981).

Research into strong ties and weak ties has indicated that both can be potentially useful in a network, but for different purposes. For example, strong ties have been associated with better sharing of network resources or effective tacit knowledge exchange (Hansen, Podolny, & Pfeffer, 2001). According to the homophily principle, individuals tend to associate with others that share similar attributes (McPherson, Smith-Lovin, & Cook, 2001), and under these conditions strong ties are expected to be forged. Further, the number of shared attributes or types of ties tend to be numerous and grow over time (Degenne et al., 1999), leading the relationship to be characterized as multiplex, that is, having several ties within the relationship (Garton et al., 1999).

In contrast, weak ties have been associated with better information gathering, because weak ties are strongly connected elsewhere and can access resources that are not available through one's own strong ties (Granovetter, 1982; Krackhardt, 1992). This phenomenon has been noted by Scott (2000) in diverse applications such as the search for a job (Granovetter, 1974) and the search for an abortionist (Lee, 1969).

The definition of strong vs. weak ties is contextual. It depends on the type of network, or the purpose of the network. In taking a broad context, studies of individual's lives in the Americas and France indicate three strong ties, characterized as intimate confidants (Degenne et al., 1999). Other types of networks, such as friendship, advice, workgroup, or any of the other myriad types of networks conceivable, will differ in the number and proportion of strong ties, however defined.

Considering strong and weak ties is useful, however, especially in examining the degree of strength of ties. For a virtual interorganizational network, strength of ties may be better determined not along the dimension of duration, but frequency. Virtual teams research has indicated that the idea of a regular frequency to interaction is a critical to the success of virtual teams (Maznevski & Chudoba, 2000). Thus a tie may need to be refreshed at regular intervals, to maintain the

degree of strength. Refreshing a weaker tie may correspond to a visit to a discussion forum, for example, whereas refreshing a stronger tie may imply active participation in a discussion on that forum. The individual's "decision" to maintain a weaker or stronger tie may depend on the desire to have the information gathering properties which weaker ties are better configured for, or the resource building and development that stronger ties are more appropriate for.

Another consideration is that relationships tend to deteriorate over time, unless they are maintained. This rate of deterioration, or decay, has been shown to slow over time, and is also hindered by a rich number of third-party connections (Burt, 2000a; Burt, 2001a). An actor that participates in a network with a high number of overlapping connections is said to be embedded in the network of social relations – or to exist in a network of high embeddedness (Granovetter, 1985).

2.1.2 Roles in Networks

Distinguishing between strong and weak ties can also be useful, because such a distinction, along with the number (density) and configuration of such ties, affords the emergence of different roles within and between networks. Roles vary according to the type of network under consideration, and arise because of structural difference and structural equivalence in networks. Measures of structural equivalence have been mathematically refined (Wasserman et al., 1994) to be generalizably recognized for a given network. Within the realm of business organizations, Cross et al. (2002) have identified four roles: central connectors, information brokers, boundary spanners, and peripheral specialists.

Central connectors link the most people in a network together. As a consequence, central connectors know who is likely to know information sought by other members of the network. Alternatively, central connectors might also be bottlenecks in terms of a group's knowledge creation and sharing activities (Cross, Parker, & Prusak, 2000). This alternative possibility is consistent with the idea that not all network roles provide positive social capital (Brass & Labianca, 1999).

Information brokers, also known as knowledge brokers (Burt, 1992), keep different subgroups together. By communicating across these subgroups, they prevent one network from fragmenting into several smaller networks.

Boundary spanners have connections with other groups or organizations primarily outside of the network under consideration. They therefore provide access to different kinds of expertise.

Peripheral specialists provide in-depth expertise to any member of the network. Alternatively, some network members may be peripheral because of poor integration into their network of colleagues.

Multiple roles are played for different purposes in different types of networks, so that a central connector in an advice network may be an information broker in a task network. It has been noted that there are personality correlates to roles (Burt, Jannotta, & Mahoney, 1998), however, so that this correlation may constrain somewhat the range of roles played by actors in different types of networks.

The value of the broker lies in being the conduit for information and a control point for resources to flow between the two different groups (Burt, 2000b). The position between two groups has been termed a ‘structural hole’ in a network, where structural holes separate nonredundant sources of information (Burt, 1992). Information sources are often redundant when connected by strong ties, or when connected through a third party to the same source of information (Burt, 2000a).

The concept of brokerage has been further refined. Five types of brokerage have been identified through a study of government organizations (Fernandez & Gould, 1994): Liaison, representative, gatekeeper, cosmopolitan or itinerant, and local broker or coordinator. These have been summarized by Morten (Morten, 2002) (Table 3).

Table 3: Five Types of Brokerage Roles in Networks

Role	Structure
Liaison (e.g. mediator or arbitrator)	All three actors occupy different groups
Representative	One member of a group takes upon himself or is given the role of communicating
Gatekeeper	An actor screens or gathers resources from outside and distributes them to members of his own group
Cosmopolitan or Itinerant	The two actors belong to the same group, while the intermediary belongs to a different group
Local broker or coordinator	All three actors belong to the same group

source: Morton, 2002

The idea of brokerage has been extended to knowledge brokerage in a study of Thomas Edison's innovations (Hargadon, 1998):

Brokers are more than simple conduits moving valued resources from one domain to another; valuable solutions seldom arrive at the same time as the problems they solve, they seldom arrive to the people working on those problems, and they seldom arrive in forms that are readily recognizable or easily adaptable. Edison's laboratory did more than just transfer knowledge between groups; this organization acquired potentially valuable information, stored it, and retrieved it to create new combinations of old ideas.

Thus other organizational capabilities in the areas of knowledge management and organizational learning are suggested as critical by Hargadon to effectively capitalize on the brokerage role in a network. In this vision, brokerage is a useful but not sufficient role for effective network performance

A structural analysis of networks has proved fruitful in generating role descriptions based on positions in networks. This line of development has been strengthened through links to attributes of actors, such as personality, and refined as well. The power of positional analysis is that the role descriptions often do not correspond to positions dictated by formal responsibilities, and those associated with hierarchical organizations (command and control, review, validate, etc.) However, structural

analysis alone needs to be complemented with qualitative data such as that gained through interviews (Cross et al., 2000) to identify whether a role is helping or hindering the development of (positive) social capital.

In addition to fulfilling roles, network actors can be considered to have attributes or relational variables (Scott, 2000). One important attribute is the network centrality of an actor. Among centrality measures, the three most common are degree, closeness, and betweenness (Freeman, 1979). The definitions and explanations of these measures have been summarized by Krackhardt (1992). Degree is the simplest measure and comes in two forms: indegree and outdegree. “The indegree of an actor in the network is the number of other people who choose that actor in the particular relationship”, while the “outdegree is the number of people chosen by the actor” (Krackhardt, 1992). It is further noted that indegree and outdegree often good indicators of status in organizations.

Betweenness is defined as an actor who is “in a position to act as a gatekeeper for information that flows through the network” and “indicates the nonredundancy of the source of information” (Krackhardt, 1992). It is further noted that “to the extent that a person is connected to otherwise disconnected parts of the network, and therefore has access to different, nonredundant sources of information, that person will have a higher betweenness score”.

Closeness is also known as “global centrality”, and is defined as follows: “a point is globally central if it lies at short distances from many other points” (Scott, 2000).

Such analysis is helpful in determining the actors likely to be central connectors and information brokers within a network. The distinction of betweenness is especially consistent with central connector properties of nonredundancy and defines well the role of a broker or the concept of a bridge.

2.1.3 Network Properties and Performance

A number of different variations of groupings within networks have arisen: cliques, clusters, components, cores, and circles (Scott, 2000). Although there are distinctions between these models of groups, in overall general terms, the reason for dividing networks into groups is to explore the dynamics of the sub-network so formed. In this way the conceptual issues with respect to the dynamics of networks apply equally well to sub-networks. Exploration of groups has been important for sociologists understanding issues of identity, association and the sense of belonging, in the development of group norms, values, orientations, and counter-culture (Scott, 2000).

A key property of networks is a measure of their closure, or degree of connectedness of the actors in the network: density. Scott (2000) nicely contrasts density with centrality in describing them as complementary measures: “density describes the general level of cohesion in a graph [while] centralization describes the extent to which this cohesion is organized around particular focal points” (Scott, 2000). The density of a network has been identified as important for conserving access to resources (Lin, 2001).

Networks with a specific purpose have been described as intensional networks (Nardi et al., 2000). This term is meant to capture both the idea of intention, the purposeful action that is the reason for the network’s existence, and also the stress involved, or energy required, to maintain the relationships that keep the network in existence. Other purposes for networks have been more general, such as knowledge creation and sharing, or innovation and product development (Hansen et al., 2001). Some networks have more functional purposes rather than task-oriented outcomes, such as workflow, communication, or friendship networks (Brass & Burkhardt, 1992).

A general theory for network purpose has been derived as the theory of social capital: that networks exist as the expression of an investment in relational resources for an expected return in the marketplace (Lin, 2001).

This return, as noted above, could be in the form of knowledge creation and sharing. Research into this topic has uncovered four characteristics of relationships that are important for this purpose (Cross et al., 2000):

- knowing what others know
- having access to other people's thinking
- having people be willing to actively engage in problem solving
- having a safe relationship to promote learning and creativity

Hansen has also discovered that openness and knowledge transfer are related to project cycle time (Hansen, 2002). He noted that the characteristics of effective relationships were task dependent. In tasks requiring transfer of explicit knowledge, weak ties were effective, while in tasks requiring transfer of tacit knowledge, strong ties were more effective. While effectiveness here was defined as project completion time, quality control measures were incorporated into the process to prevent tradeoffs between quality and completion time.

Thus an overall prescription for effective network characteristics is elusive, since it depends on purpose and the task at hand. The two main hypotheses about network performance have been the closure argument, and the structural hole argument (Burt, 2001c). Burt has provided empirical support for structural hole over closure, but more nuanced approaches have also emerged. For example, there may be a spectrum of network perspective, with markets and hierarchy at extremes, and networks in between, along the dimension of integration (Lin, 2001; Piore, 1992; Powell, 1990). Uzzi's doctoral thesis work on the optimal network properties for a network of small to medium sized entrepreneurial fashion trade businesses (Uzzi, 1996) also lends support to this idea of a spectrum. His finding was that there were disadvantages with both extremes, with best performance in a network structure composed of elements of both strong and weak relations. In network density terms, dense, closed networks were suboptimal, as were networks

composed of only weak ties – more characteristic of sparse networks of low density.

A similar general finding in recent studies has been that too disperse a network weakens ties, while too dense a network binds its members too tightly, leaving them vulnerable to external shocks or cut off from new sources of resources and information (Kim, 2001; Obstfeld, 2001; Uzzi, 1996). The relation between formal structure and network integration, specifically, the extent to which formal organizational dimensions are barriers to interpersonal ties, has been studied by Baker (Baker, 1992). He concludes that on certain dimensions integration is impeded, while on others it is not. So not only may structure impede integration depending on its degree, but other dimensions can influence it as well.

While network analysis is situational and requires interpretation and context, more general propositions on the utility of networks has developed as a theory of social capital. So, an alternative conceptualization is the building and exploiting of social capital embedded in relationships. However, there is a cost to building and maintaining relationships. These costs, a negative social capital, could lead to building social liabilities (Gabbay & Leenders, 1999; Hansen et al., 2001).

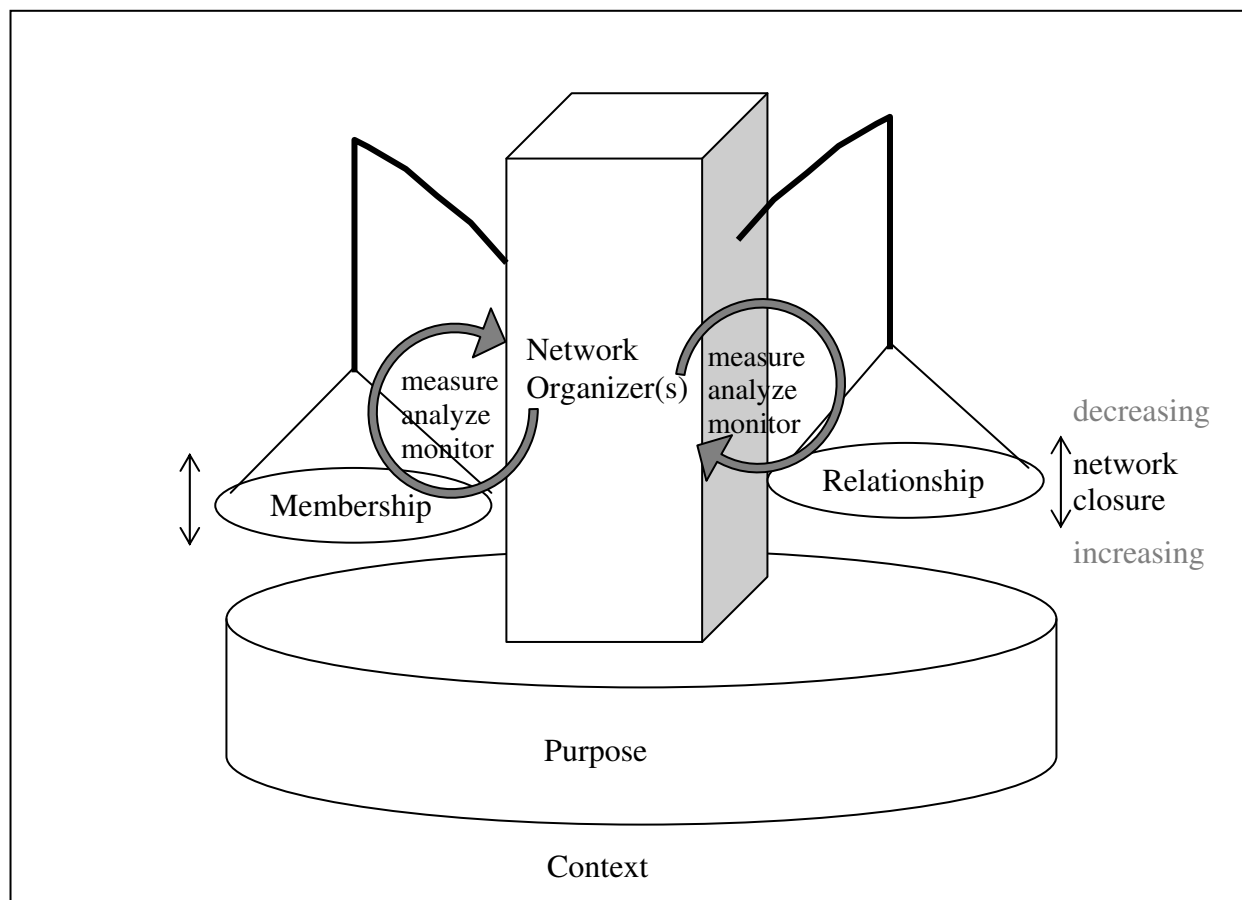
The network creation and development process can also be conceptualized as a process of creation of social capital. The theoretical base for this conceptualization would be social network theory, which at this stage of its development can be thought of as a set of smaller theories on network properties, e.g. ties, and the more formally developed theory of social capital. Social capital theory adds the notion of investment in relational structures for returns and emphasizes the active nature of maintaining, accessing, and adding resources through social networks (Lin, 2001). A key presumption of social capital theory is that “a social network is more than the sum of its parts, and must be studied according to particular network dynamics” (Davies, 2003).

As such, this research will be based on both social network analysis methodology and the theory of social capital. Lin has outlined the propositions of social capital theory, linking social capital to action. It is proposed that social capital is positively associated with success; that structural positions, social ties both strong and weak, and network locations that lead to roles, all have advantages with respect to action that leads to successful outcomes. These propositions are consistent with the social network literature reviewed and together form a basis for the proposed research.

2.2 Conceptual framework

Based on the literature review and the author's conceptualization, a framework linking network creation, dynamics, and performance has been generated (Figure 2).

Figure 2: Conceptual Framework



One or more network organizers occupy the central pillar of the framework, as the focal point for network management responsibilities. Network organizers rely on a solid foundation, the network's purpose, and the entire network operates within a particular organizational (or interorganizational) context. Whether a network purpose is mandated from above or grows from the grassroots, the two primary areas of concern for organizers are the membership, and relationships between members. Imagine the relation between membership and relationship as a balance. As active membership increases (and the membership 'tray' moves downwards), network potential increases (representing the potential for more interaction in the network). Network potential is akin to the concept of requisite variety, whereby a certain breadth of knowledge and experience base in the network can fuel activity when the spark arises.

On the other side of the balance, as relationships develop between network members (and the relationship 'tray' moves downwards), network closure increases. Network closure is associated with a common professional language, sharing, trust, and the basis for meaningful exchange.

Through measurement, analyses, and monitoring of both membership and relationship, network organizers can direct attention to either or both aspects of the network. Such analyses could involve membership levels, activity levels, defining roles, and illuminating structures. Monitoring emergent roles and structures can allow focus on unengaged members or on access to expert members. Thus patterns of relationship can be mapped and influenced towards, for example, the development of hubs of activity. Such hubs are the foundation of shared understanding for knowledge creation and sharing. Successful outcomes in this realm build human and social capital as network closure is generated.

The relation between the two sides of the balance represents the separation in management attention and time spent on each side of the balance. Activities to build the membership base, such as encouraging enrollment, are distinct from relationship-building activities. Too much of either can be counterproductive:

with network potential, a heavily populated network with sparse interaction can result, whereas with network closure, saturation and excessive inwardness can result. Discovering a way to bridge the balance, so that attention to membership produces relationship benefits for existing members, without reaching either extreme, is a worthy objective for network organizers.

2.3 Conclusions

The central principles of the network perspective (Wasserman and Faust, 1994) are as follows:

- relationships are the focus
- actors and their actions are interdependent
- relations between actors are channels for transfer or “flow” of resources
- the network structural environment provides opportunities for action or constrains action
- structure (social, economic, political, etc.) represents a lasting pattern of relations among actors

These central principles can apply to the study of virtual interorganizational networks, with some special considerations. One is that relationships are defined by actors’ actions: in a virtual space, without action, the actor is not visible and becomes a silent, invisible ‘lurker’ known only by registration and appearance in the profile or roster. Relations between actors are a little more complicated than in a face-to-face exchange: the discussion forum is an intermediary between actors, so that the exchange sequence is somewhat more drawn out. Finally, the lasting pattern of relations depends on some consistency of actors’ behavior, given the more fleeting nature of identity in on-line relations and the lack of corroborating information and social cues available in other means of interaction.

Once these considerations are taken into account, the network perspective appears promising in generating a structural view as well as ideas of roles and actions that be helpful in the growth and development of virtual interorganizational networks.

3 Empirical Research: Data

Fifteen virtual interorganizational networks known as Dynamic Learning Networks, are considered for study. Masters of Business Administration students, as part of their program at IMD – International Institute for Management Development, an executive education institute based in Lausanne, Switzerland, are responsible for the creation and development of Dynamic Learning Networks. There are 15 of these networks, each organized by a group of 6 MBAs, on 15 different subjects. Membership in the networks is drawn from individuals who work for companies that have paid a membership fee to IMD to join its learning network of companies. There are a number of membership benefits that a company receives, including the right to have its employees participate in these Dynamic Learning Networks. Thus membership is limited to this population, and each request to join a network is reviewed and approved individually and personally by the MBAs responsible for that network. The exceptions to the above membership rules are that staff and faculty of IMD, the network organizers, and specially selected and invited guest participants, usually chosen for their specific expertise, can also be invited to join networks.

3.1 Data Collection

The heart of the virtual interorganizational networks under study consists of online asynchronous discussion forums. Note that the term “forum” is used to describe a given network’s discussion area, to distinguish it from other aspects of the network’s online resources such as a welcome webpage or membership listing section. Thus referring to “forums” describes a number of forums found in this discussion area, all under the theme or subject of a particular network.

The fifteen networks’ forums were captured and archived approximately every two weeks for a period of about six months, resulting in 12 sets of data or network time slices for each network. Each time slice contains a complete record of all discussions in a network’s forums up to a particular point in time.

Each network’s discussion area is organized differently, with some networks having a small number of separate forums, organized by topic and/or chronology.






Other networks have a larger number of forums. Still others began with a small number of forums, and later grew. The choice of discussion area structure was left to each network's organizers. However, the lowest level, of messages or postings, retains the same structural elements across all networks and therefore allows a consistent methodology to be applied to all networks on this basis.

To ensure the lowest level of messages or postings was completely captured for each network, the entire structure of the discussion area was captured. The discussion area consists of three levels. The first level is reached upon entering the discussion area and contains the list of forums. Selecting a forum produces the topic level (or discussion threads), which lists topics being discussed in that forum. Finally, selecting a topic or discussion thread produces the final level, containing the postings or messages.




To illustrate, the first level of a network's discussion forums lists the network name and a brief description, followed by the forum names. In the example below, we see five forums, for this particular network at this point in time (Figure 3).

Figure 3: Forum – First Level

Online Now: 2			
There are currently 2 members and 0 guests on the boards. JohnDoe			

	Forum	Posts	Last Post
Virtual Teams Welcome to the DLN forum. To join a discussion, simply select a topic of interest from the list below. Our goal, throughout each forum, is to create new knowledge and to provide each other with solutions to urgent questions. For more information, link to the Virtual Team Homepage			
	Introduction - opened Jun/02 In this introductory forum, we will take the opportunity to get to know all participants of the Virtual Team Management DLN. Discussions will focus on understanding and defining "Virtual Teams" as well as the structure and sequence of our DLN topics.	50	25-SEP-2002 23:04
	Creating Community - opened Jun/02 Creating a sense of trust across virtual communities is essential for optimizing performance. We look at best practices involved in assembling a virtual team as well as issues involving team composition, team building and skill requirement.	36	27-SEP-2002 10:28
	Managing Activity - opened Sep/02 Today, HR and senior executives working with Virtual Teams face a series of unique challenges including: developing a heartbeat and sense of trust across physically dispersed members and selecting managers who can lead-by-empowerment. Forum discussions will explore how to effectively manage virtual teams through goal setting, coaching and motivation.	4	08-OCT-2002 10:04
	Facilitating Communication - opened Sep/02 Distinguishing between the myriad of IT tools available for managing Virtual Teams is critical. Learn how to facilitate team communication by matching the complexity of the message with the technology used, paying close attention to cultural differences.	1	26-SEP-2002 08:32
	Comments on White Paper Please enter your comments/feedback to our White Paper.	0	

All times are CEST

Icon Key  New Posts Since Your Last Visit  No New Posts Since Your Last Visit  A Read Only Forum	Search <div> <input type="text"/> <input type="button" value="Find"/> </div> Advanced Search
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Entering any one of the five forums produces a list of topics within that particular forum (Figure 4).

Figure 4: Forum – Second Level






Introduction - opened Jun/02

» You are not logged in. Login	» IMD Dynamic Learning Networks » Introduction - opened Jun/02
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In this introductory forum, we will take the opportunity to get to know all participants of the Virtual Team Management DLN. Discussions will focus on understanding and defining "Virtual Teams" as well as the structure and sequence of our DLN topics.




You are invited to review and respond to current topics by entering into one topic below.

Return to the [Virtual Team Management](#) home page.

	Topic	Topic Starter	Replies	Views	Rating	Last Post
	Leadership and Virtual Team	John Doe	14	501		by Jane Doe
	Please tell us more about yourself.	Jane Doe	13	605		by John Doe
	What is a virtual team?	John Doe	13	638		by Jane Doe
	All you always wanted to know about this DLN.	Jane Doe	4	305		by John Doe
	This is what I expect from this DLN.	John Doe	1	189		by Jane Doe

[New Topic](#)

All times are CEST

Icon Key	Search Introduction - opened Jun/02
 New Posts Since Your Last Visit	<input type="text"/> <input type="button" value="Find"/>
 No New Posts Since Your Last Visit	
 A closed topic: no new replies accepted	
Advanced Search	
Hop To: <input type="text" value="-Introduction - opened Jun/02"/> <input type="button" value="Go"/>	







Finally, selecting a topic will produce a list of messages (Figure 5).

Figure 5: Forum – Third Level







Previous ◀ ▶ Next

» You are not logged in. [Login](#) » [IMD Dynamic Learning Networks](#) » [Introduction - opened Jun/02](#) » Leadership and Virtual Team

Rating: Not yet rated

Author	Topic: Leadership and Virtual Team
John Doe Member Registered: 16-JUN-2002 Posts: 74 	<div style="text-align: right;">? posted 17-Jun-2002 11:54 “ ” </div> <hr/> John Doe's message appears here. It has been replaced by this text for confidentiality purposes.
Jane Doe Member Registered: 13-JUN-2002 Posts: 5 	<div style="text-align: right;">📅 posted 25-Sep-2002 23:04 “ ” </div> <hr/> John Doe, Jane Doe's message appears here. It has been replaced by this text for confidentiality purposes.
John Doe Member Registered: 16-JUN-2002 Posts: 74 	<div style="text-align: right;">📅 posted 09-Sep-2002 10:19 “ ” </div> <hr/> Jane Doe, John Doe's message appears here. It has been replaced by this text for confidentiality purposes.

All times are CEST

New Topic Post a Poll Post Reply	 Printable  Email a Friend  PopIt!	 MailMe™  Private Topics  Contacts
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Previous ◀ ▶ Next

To summarize, the structure of the online discussion area has three levels (Table 4).

Table 4: Online Discussion Area Structure

Level	Description	Example
	Network topic	Virtual Teams
1	List of forums (by topic/chronology)	Introduction – opened Jun/02 ...
2	List of topics (threads)	Leadership and Virtual Teams ...
3	Posting (message)	John Doe John Doe's message appears here. It has been replaced by this text for confidentiality purposes.
	Posting (message)	Jane Doe Jane Doe's message appears here. It has been replaced by this text for confidentiality purposes. ...

In addition, the network membership directory was captured simultaneously, thus providing a record of current membership at each particular point in time.

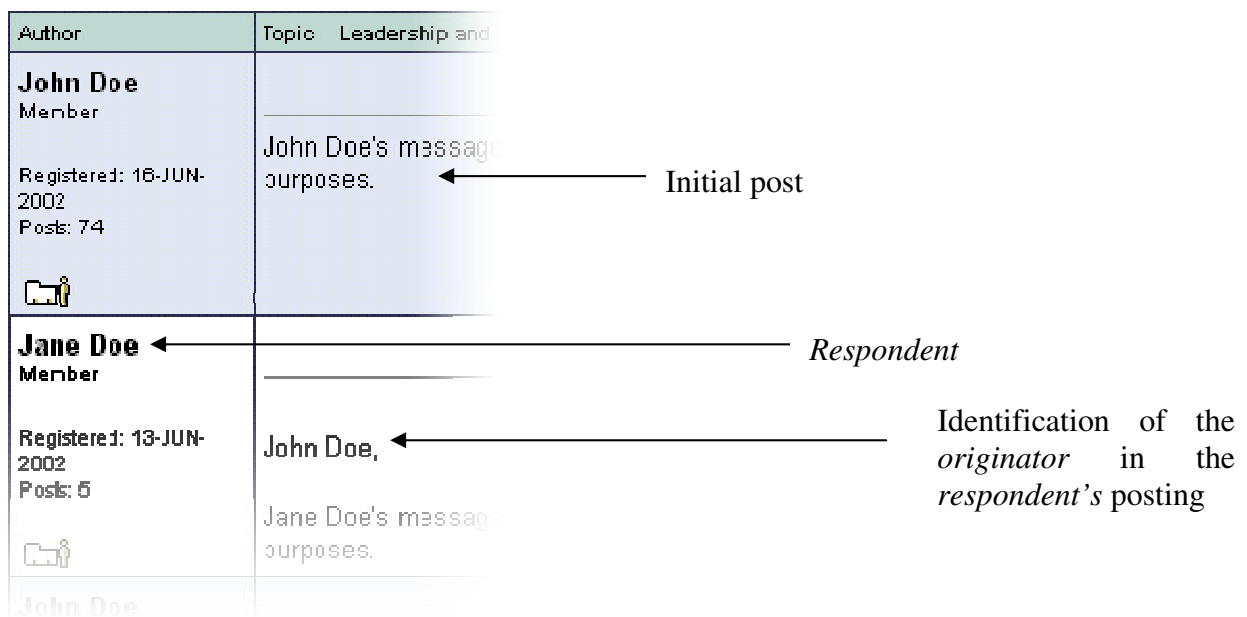
Technically, these captures are similar to those provided by such services as The Web Archive (www.archive.org) in which the content of internet world wide web pages are saved at particular points in time. The result is a historical document that can be accessed electronically as at a specific date.

Because the network membership directory and online discussion forums were both database-driven creations, they exist as dynamic web pages that are created on the fly, only when accessed. For this reason, a static record was created for each time slice, rather than relying on message date encoding or a similar scheme to create the time slices posthumously. Also, in this way, the captured forum contents at a particular point in time resemble as closely as possible the contents as experienced by the network's membership.

3.2 Data Coding

The data collected above was then coded according to the following coding scheme. The initial post in a forum, whether by a network organizer or by a network member, is ignored for relationship purposes. (Without a response to this posting, there is no relationship between two posters to code). In the next message, by direct naming or through topical inference to the previous posting, the first message's poster is identified as the "originator". The "respondent" is the poster of the response to the originator's message. Implicit in this coding is the dual nature of the response: when the response itself is responded to, the poster becomes the "originator" for the new response (Figure 6).

Figure 6: Identifying Originators and Respondents in Messages



A number of refinements to this coding scheme were made to handle specific situations.

When *no specific reference to an originator has been made*, and content of message is consistent with the previous message in the thread (e.g. an answer to the previous message or a comment on the previous message), the "originator" is implicit and is taken to have been referred to in this way, and coded accordingly.

When specific reference has been made in a response to an earlier message, but *the response does not directly follow chronologically the earlier message* (i.e. an intervening message has been posted), the originator is identified by the specific reference made.

When *multiple originators are referred to in the same message*, they are all counted as originators. This situation arises when such a posting is made as a convenience of the poster, who could simply post separate messages but instead groups them into one.

This applies to messages i.e. "Hi Anton, Bertha, Caesar...", and to messages that address individual points i.e. "Anton, your point on this is well taken, while Caesar, I think you should rethink this point".

As noted, *"orphan" posts - those with no replies* - are not coded since two nodes with a relationship are not present (until someone replies).

Finally, *"introduction" forums* -- where members are invited to introduce themselves to the network -- often have one post per topic (instead of all the posts being in the same topic). It is assumed that posters read the last introduction message posted and respond to it by posting their own introduction message (i.e. all the messages could have been in one topic).

For conciseness and confidentiality purposes, originators and respondents' names are disguised. The coding scheme is the first initial plus a number, starting at 1 and incrementing until the next first initial in the list of members is reached. A zero prefaces single digits. For example, Albert Mueller is coded as A01 and Anton Johnson is coded as A02.

Network organizers are coded slightly differently: instead of the first initial, the letter O is used, and single digits are not prefaced by a zero in order to differentiate between members whose names begin with an O. For example, Bertha Smith is coded as O1 and Charles Jones is coded as O2, whereas network member Oscar Baker is coded as O01 and Otto Petersen is coded as O02.

The above names are fictitious examples only, in order to preserve the confidentiality of the network participants.

3.3 Data Transformation

The above coded data was transformed into a block model, consisting of originators on the rows and respondents on the columns. The value at each intersection indicates the number of times a message was posted.

The resulting block model appears as a grid of numbers. An example is shown below, of the Intrapreneurship network at time slice 4 (Table 5). In this example, the network organizers (O2 to O4) are the only ones at this point to have communicated more than once with others (as indicated by the number 2's).

Table 5: Block Model of Intrapreneurship Network, Time Slice 4

		Respondent																		
		A06	A14	C05	I01	J01	J02	J05	J07	K04	L01	M02	O01	O1	O2	O3	O4	O5	O6	T02
Originator	A06																			
	A14																			
	C05																			
	I01							1				1	1		1		1			
	J01							1												
	J02																			
	J05																			
	J07					1											1			
	K04																			
	L01																			
	M02																1	1		
	O01								1											
	O1					1														
	O2						2													
	O3					2						1								
	O4					2	1								1					
O5																	1			
O6																				
T02																				

These ties are taken to be a form of relationship between the message posters and recipients and thus at this point the data is suitable for analysis using social network analysis techniques. Individual-oriented measures and whole-network measures, as well as visualization techniques, can be applied to this data. However, this data is only one of twelve time slices of one of fifteen networks analyzed. Therefore, the complete data set consists of $12 \times 15 = 160$ networks.

Additional measures, such as growth rates, will supplement the more common social network analysis measures, which are designed to analyze a network at one point in time.

3.4 Data Analysis

Statistical analysis was performed on block models. The condensed results for 160 network time slices appear in Appendix B . As some of the measures are peculiar to the area of social network analysis, the following sections describe this analysis in more detail.

3.4.1 Ties

A tie is a connection between network participants, created by posting a message in response to a previous message. A tie exists between two network participants regardless of whether one network participant is the originator and another the respondent. However, analyzing ties along this dimension can also illuminate possible roles played in the network. To perform this analysis, the indegree and outdegree for a network participant is calculated, which are part of a broader category of network measures of centrality.

3.4.1.1 Indegree and outdegree

When looking at how central a network participant is in a given network, a number of centrality measures can be employed. A network participant's indegree and outdegree is one of the simplest examples. For a given tie, a network participant who originates the tie with another has an outdegree of one. The respondent has an indegree of one. Calculating indegree and outdegree for a network member involves examining each tie above and summing the result to produce a total (Table 6).

Table 6: Indegree and Outdegree of Intrapreneurship Network, Time Slice 4

Network Member	Outdegree	Indegree
A06	0	0
A14	0	0
C05	0	0
I01	5	6
J01	1	3
J02	0	0
J05	0	1
J07	2	2
K04	0	0
L01	0	0
M02	2	2
O01	1	1
O1	1	0
O2	2	2
O3	3	2
O4	4	3
O5	1	0
O6	0	0
T02	0	0

Note that two messages are required to result in a tie: one originator and one respondent make a connection in this way. If only one message is posted, there's no connection. This is a bit confusing when thinking about indegree and outdegree; essentially two messages are needed since the first message increases the outdegree and the second message increases the indegree of the members involved. In a conversation thread the second message can also increase the outdegree of the member if it is answered, and indeed it does so when answered, the (new) answer increasing the indegree of the concerned member.

Various combinations of indegree and outdegree can be associated with various roles, which can be found across different networks.³ These combinations will be discussed in Section 4.

³ Indegrees and outdegrees can be normed for more direct comparison with other networks of different size, by expressing these values as a proportion of the number of elements in the row or column. For example, network participant J01 originates ties with 5.6% of the remaining actors. However, this interpretation is valid only if the blockmodel is binary. Otherwise, the interpretation is more one of potential: A1 sends ties that could have reached a potential 5.6% of the remaining participants. This potential would be realized if the ties were evenly distributed among network participants (but they are not since some ties are with the same participants).

3.4.1.2 Members percentage of ties

In terms of the overall network, the members' percentage of ties indicates how much participation is due to the organizers' active presence. A low members' percentage of ties indicates that organizers are dominating the discussion and possibly crowding out the formation of ties with members and between members. It is a relatively straightforward calculation of the number of ties involving a member as a percentage of all ties in the network.

3.4.1.3 Member-member ties

Member to member ties indicate how much interaction is taking place between members, as opposed to discussion with organizers. A steady growth in member-member ties indicates that initial ties with organizers are being augmented with member-member discussion.

3.4.1.4 Organizer-organizer ties

Organizer-organizer ties indicate discussions among the network organizers. This type of discussion may spark members to join in, but because it is passive with respect to the membership, it may in fact inhibit network development and growth by crowding out members.

3.4.1.5 Mixed ties

Member-organizer ties, where either the member or organizer originates the tie, may result from several situations. In early network stages, organizers may reach out to members to actively engage them. Also, members may initiate contact with organizers to raise issues of concern for discussion, treating this as the means to express to the wider network their concerns. In later network stages, it could indicate that organizers have taken on a 'hub' or 'connector' status and that they are sought out for their ability to address a topic or to direct it towards those who may be able to provide insight. Alternatively, such patterns could indicate the lack of successful diverse growth in ties among the membership, or dominance of the organizers.

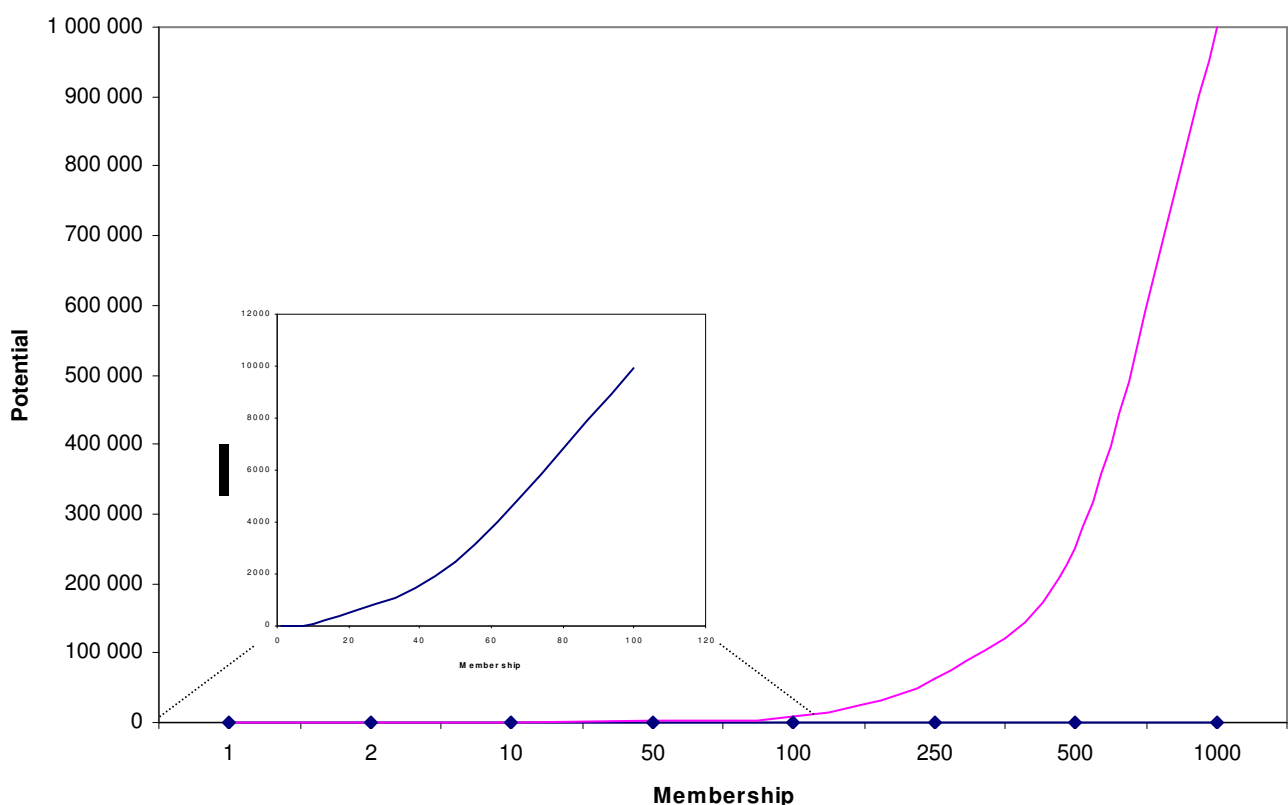
3.4.2 Membership

Network membership is a critical variable in the growth and development of networks. While large networks focus on the establishment and maintenance of ties among their members, the networks under study here consider attracting new members as well as encouraging the active participation of all members to be key processes in the pursuit of the network's purpose of creating and sharing knowledge. Attracting new members provides the potential for diverse input and activity. However, the integration challenge of engaging new members arises. Growth in membership without engagement, without absorption into the network, can lead to network disintegration.

The potential ties that could exist between members describe another view of network potential. Since this is one part of the network density calculation, increasing network membership increases network potential exponentially

Figure 7). Therefore care must be taken even with small increases in network membership as these can have a large effect on network dynamics.

Figure 7: Network Membership vs Network Potential



3.4.2.1 Active members

Active members are members who have contributed one or more messages that have been responded to. Other members are inactive, for several potential reasons. Some members will be satisfied with “listening in” on the conversations, which is sometimes referred to as “lurking” in the context of computer-mediated communications. Others may not have had their concerns addressed and have not been engaged to participate by network organizers or other network members. Still others will find resources other than the forums within the context of an online network, such as reference materials, and choose not to participate in the core discussion activities of the network. However, one of the goals of the network organizers is to generate participation, in order to liberate knowledge and facilitate sharing. Active members are a means to fulfill this goal, and by activating members – and through interaction, creating relationship as well – organizers pay attention to a critical part of a network’s ability to generate benefits.

3.4.2.2 Membership base

The members come from one of 150 companies in the IMD Learning Network (Appendix E) and are therefore somewhat uniform professionally, especially in terms of work experience compared with an unrestricted population at large. The organizers’ profiles are similar, although with a somewhat narrower range of work experience skewed towards the less experienced, as MBA students. However, IMD MBA students, with around 5 years’ work experience, do possess on average more experience than typical MBA students.

For purposes of illuminating network structures and roles, the membership base is not sub-categorized. Such analysis could lead to the relations between different groups, and involve analyzing cliques and the relations between them. This analysis would be suitable for testing hypotheses along demographic or other dimensions. We return our attention to whole-network analysis.

3.4.3 Density

A second critical network measure is density. As the membership base grows, density falls, while as new members are engaged, density rises. At some point, the tipping point or critical mass, a network comes together into a single unit -- where some path connects almost every member to each other. For large networks, i.e. with greater than 100 members, that point is at approximately 100 ties, according to random network models (Watts, 1999). However, most networks do not in fact follow random patterns (Barabasi, 2003), and analyzing the growth and development of networks comprising individuals, from their origins, often entails starting conditions of small networks, such as those under consideration here. Therefore, the density measure, being relatively low for small early-stage networks, reflects the large potential for growth and development. As it rises, that potential is converted into network structure.

3.4.3.1 Network density

Network density can be expressed in different ways, depending on the way in which the network is conceptually and graphically represented (Table 7).

Table 7: Network Representations – Characterizing the Relations

Type	Allowable Range	Coded As (e.g.)
Binary	Absent or present	0 or 1
Signed	Negative, neutral, positive	+, 0, or -
Ordinal	Positive integers (rankings)	1, 2, 3, ...
Valued	Positive integers (weightings)	2, 1, 5, ... (according to weighting e.g. frequency)

source: adapted from Hannemann, 2001

On another level, tie representations can be directed or bonded-tie, and can represent simplex (one dimension) or multiplex (multiple dimension) relations. The examples above are all bonded-tie; in the absence of a direction to the ties, it is a single characteristic, e.g. friendship, which binds together two given nodes. The examples are also simplex, representing a single characteristic such as “works with”. A multiplex tie example would be “friendship” and “communicates with”

and could be represented graphically by different line colors on the same graph, for example.

The coding scheme chosen for this study produces valued networks, where the value represents a count of communications between nodes.

In a valued network representation, multiple ties are permitted between the same nodes, whereas a binary network representation allows for only either the existence or absence of a tie between two nodes. A binary network would express any number of ties between the same nodes as a '1', and the absence of ties in the same way as a valued network, as a zero.

In the case of valued networks, therefore, the density measure considers the strength of relationship as contributing to network density. Stronger ties, resulting from repeated interaction between two nodes, are taken into account in the network density calculation (Figure 8).

Figure 8: Density Calculation for Corporate Philanthropy Network, Time Slice 12

Number of ties in the network	=	59	
Number of possible ties in the network	=	3080	= 2%

In the example above, network density is calculated to be 2%. Since this is a valued network, we can't say that 2% of all possible ties are present, as we would be able to for a binary network. However, we can say that the average strength of ties, relative to all possible ties in the network, is 2%. This means in effect that two ties between two nodes (strength of tie = 2) are equivalent to 1 tie between 2 nodes (strength of tie = 1) and another tie between 2 different nodes (strength of tie = 1).

To be able to express network density as the percentage of all possible ties present, the network representation must be transformed. It is possible to transform a valued network into a binary network via a simple transformation – any value greater or equal to 1 becomes 1. While there is a loss of information as a result, it can be useful to binarize the network so that we calculate the percentage of all possible ties present (Figure 9). This figure more faithfully indicates the degree of network closure, or the degree to which all nodes can be reached from each other⁴.

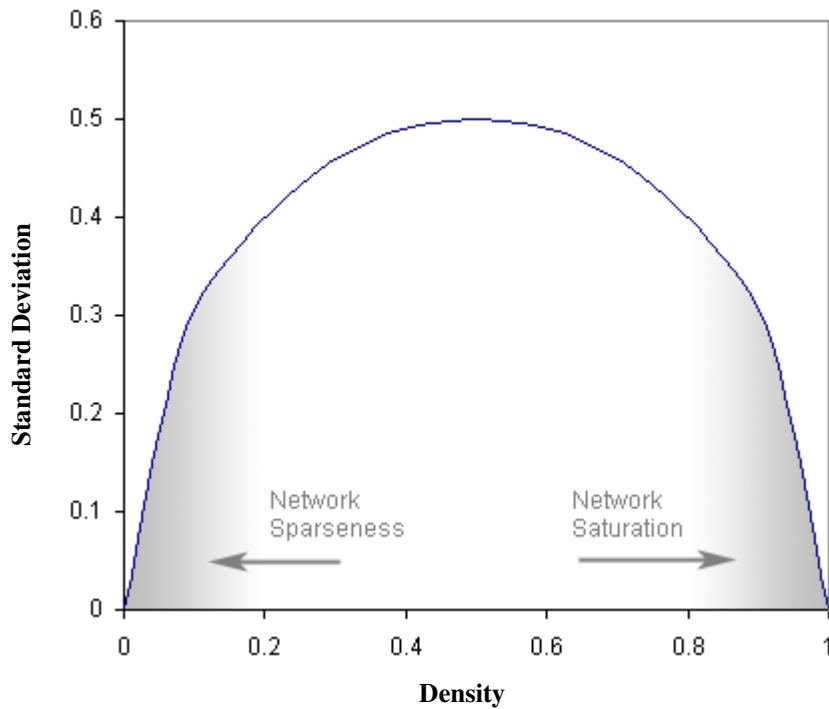
Figure 9: Density Calculation for Corporate Philanthropy Network, Binary Representation, Time Slice 12

Number of unique ties in the network	=	45		
Number of possible ties in the network	=	3080	=	1.5%

With respect to the density calculation, the standard deviation is the measure of how much variability in connectedness exists among the nodes; a network of all 1's or all zeros has a standard deviation of zero, indicating no variation. The maximum variation occurs at network density of 50% for binary networks, because at this point there exists maximum uncertainty about a tie being present or absent. Low standard deviation values can indicate network sparseness, or network saturation (Figure 10).

⁴ A “reachability” measure exists that can more precisely describe the reachability of each individual node, and that of the overall network as well. However, in the networks under study here, this measure does not add appreciably to the insight gained from the density measure.

Figure 10: Standard Deviation vs Density, Indicating Network Sparseness and Network Saturation



For low average standard deviation in a relatively sparse network, the valued network and binary network representations both give reasonable indications of the degree of network closure. The two values differ little by definition under these conditions. Such an observation will allow focusing on density as calculated based on the valued network representations, when considering the degree of network closure.

3.4.3.2 Network Density Variants

By changing the basis on which ties and population are calculated, variations on the network density calculation can be created (Table 8). Such variations can more precisely target sub-populations within the network for measurement.

Table 8: Network Density Variations

Measure	Numerator	Denominator	Comment
Active member density	All ties involving members (member only and mixed ties)	Network potential based on active members	Percentage of possible ties between active members
Active population density	All ties	Network potential based on active population	Percentage of all possible ties in the network
Active member-originator density	Ties originated by members	Network potential based on active population	Percentage of possible ties between members that are originated by members

These alternative network density calculations illustrate the balance between interaction between network population, membership, and an outward-looking membership, respectively, and the addition of new members to the network. This balance is meaningful when comparing network densities between time slices. With small networks that have just been established, the density values themselves are low. The overall density measure is more meaningful as the networks grow to larger scales.

4 Visualization I: Structures and Roles

Data analysis using numerical and statistical techniques provides one lens for viewing networks. A powerful complement is network visualization, which can illuminate sparseness, saturation, hubs, spokes, and roles as well, through a visual representation of a network. Because of the power of such visualizations, in this case, we could say that a picture is worth a thousand numbers.

To visualize a network as a sociogram, network members are represented as nodes, and the relations between them as lines. Because sociograms are non-Cartesian plots of networks, the challenge is to choose positions of nodes so that the differences in distance between them are meaningful according to the (non-cartesian) relationships that the network is representing.⁵ Such a transformation can take place in terms of x-y (and even z) physical space in order to produce a visual plot that is a reasonably faithful spatial representation of the network. Non-metric multidimensional scaling (NMDS) is a method of representing nodes and relations that, as its name implies, calculates the position of nodes along two or more dimensions. Through NMDS, an attempt to visualize the network, where distances between nodes are meaningful, is made. Thus, two nodes that appear far apart in fact are less connected to each other than those nodes that appear close together. Similarly, nodes appearing close to many other nodes are more centrally located in the network than nodes that are distant from many others.⁶

DLN networks are asymmetric, or directed. The asymmetry can be seen in the Intrapreneurship Network below (Table 9), by comparing the originator values, which appear in rows (e.g. I01 to O3 = 0) with the respondent values, which appear in columns (e.g. I01 from O3 = 2).

⁵ For example, the frequency of information flow is a form of “relation” between two nodes; the higher the frequency of interaction between two nodes (relative to other nodes in the network), the closer these two nodes would appear to each other in a Cartesian plot.

⁶ Metric MDS techniques try to represent coordinates that reflect the distance, in graph theory terms, of the input data (graph theory distance being a direct line between nodes even if such a path does not exist). Non-metric MDS techniques try only to keep the rank order of input data intact. Non-metric MDS techniques are often preferred with large networks because they produce less stress (a more accurate visualization). (source: (Everton, 2002))

**Table 9: Network Blockmodel of Intrapreneurship Network at Time Slice 2
(asymmetric)**

		Respondent															
		A14	C05	I01	J02	J05	J07	K04	L01	M02	O01	O1	O2	O3	O4	O5	O6
Originator	A14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I01	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0
	J02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J07	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
	K04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	L01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M02	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	O01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	O1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1
	O2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	O3	0	0	2	0	0	0	0	0	0	0	1	1	0	1	1	1
	O4	0	0	2	0	0	0	0	0	0	0	1	1	1	0	1	1
	O5	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	O6	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

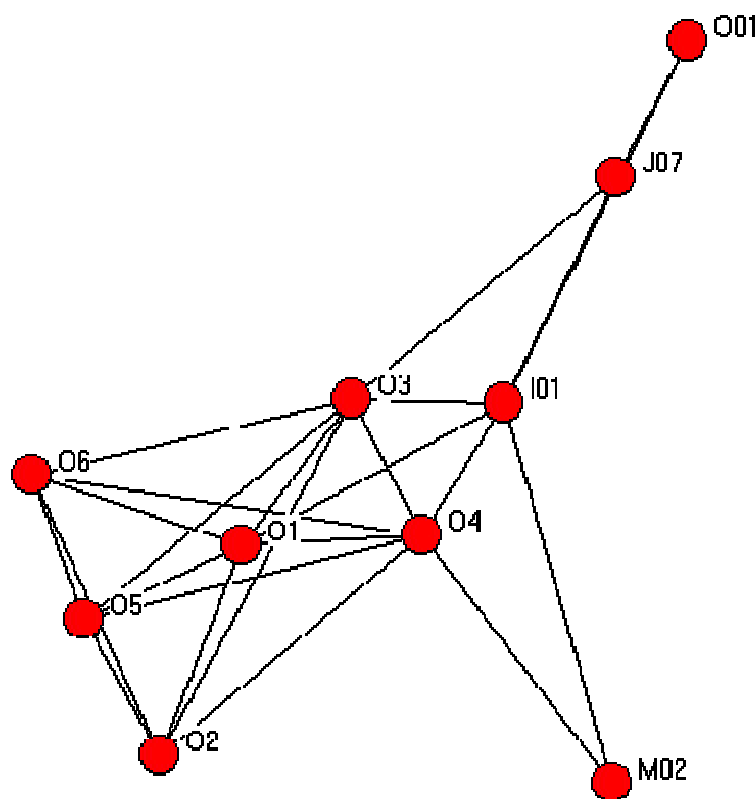
MDS scaling techniques, in order to represent these networks visually, so that distances are meaningful, require symmetric networks. Therefore, an equivalent matrix is calculated “based either on the distances (e.g., Euclidean) or the correlations between the nodes of the directed matrix” (Everton, 2002). This equivalent matrix is symmetric (Table 10) and can thus be analyzed using MDS techniques.

**Table 10: Equivalent Matrix of Intrapreneurship Network at Time Slice 2
(symmetric)**

		Respondent															
		A14	C05	I01	J02	J05	J07	K04	L01	M02	O01	O1	O2	O3	O4	O5	O6
Originator	A14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I01	0	0	0	0	0	1	0	0	1	1	1	0	2	2	0	0
	J02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J07	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0
	K04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	L01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	M02	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
	O01	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	O1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1
	O2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	O3	0	0	2	0	0	1	0	0	0	0	1	1	0	1	1	1
	O4	0	0	2	0	0	0	0	0	1	0	1	1	1	0	1	1
	O5	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	O6	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

Having performed this transformation, we are able to calculate coordinates in two-dimensional space by using NMDS, in order to visualize this network time slice (Figure 11).

Figure 11: Network Visualization of Intrapreneurship Network at Time Slice 2

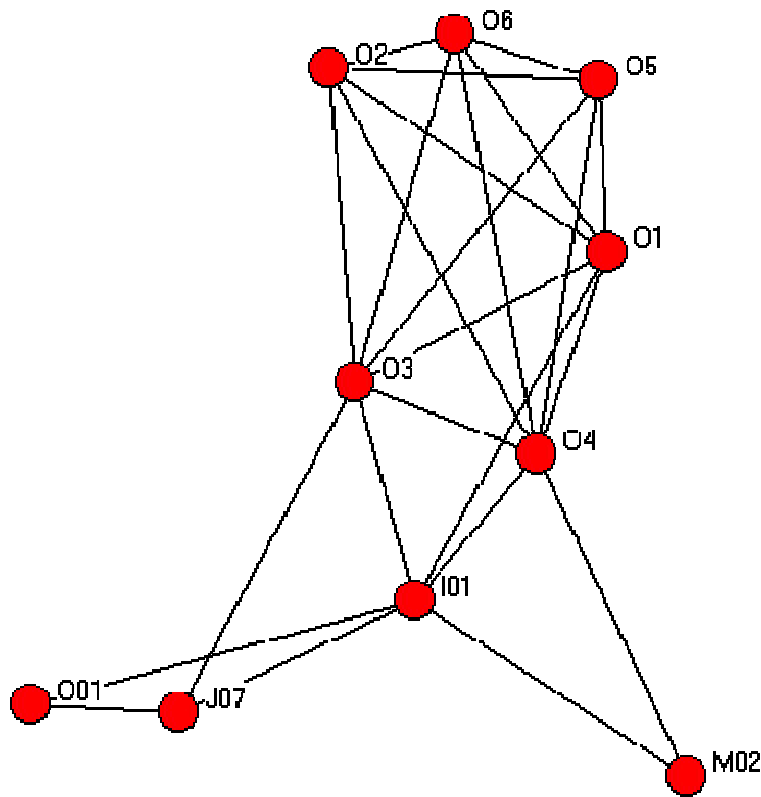


The dominant role of the network organizers at this early stage is clearly illustrated. An interesting member for this network is I01, who appears to be similar in structural terms to the organizers. A few other members have achieved some degree of involvement, which can be watched for further development, to see how they position themselves as the network develops.

A measure of how accurate this visualization of the network is can be achieved by examining the goodness of fit, as expressed through stress levels. Stress levels under 0.2 are generally considered acceptable (Borgatti, Everett, & Freeman, 1999), meaning that such a result indicates a reasonably accurate representation through visualization – distances are meaningful. In the figure above, the stress level is 0, indicating a perfect fit.

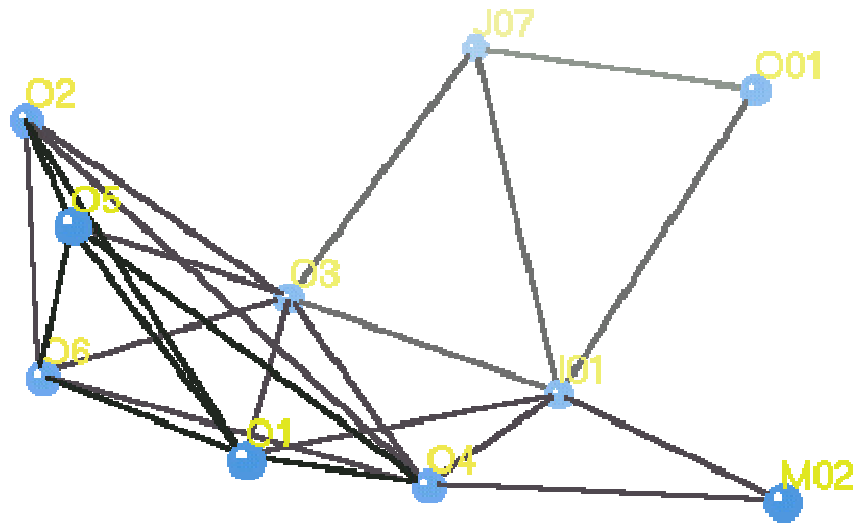
By way of illustration, the following visualization has a generally unacceptably high stress level of 0.3. It is the result of Metric MDS technique applied to the same data above, producing the following visualization (Figure 12).

Figure 12: Network Visualization of Intrapreneurship Network at Time Slice 2, based on Metric MDS with an unacceptably high stress level



With relatively small data sets such as the above, the differences between a visualization with a valid stress level and one without can be minor. For larger data sets, where the difference is significant, there are many refinements that can be made to network visualization techniques (Freeman, 2000). A simple example is to increase the number of dimensions to 3. Doing so for our example above produces the following 3D visualization (Figure 13).

Figure 13: Network Visualization of Intrapreneurship Network at Time Slice 2, based on Metric MDS, in 3D



As such models are computer-generated, they are also best manipulated in their native environment, which allows for real-time manipulation of the visualization (i.e. rotation, zoom, animation). The above figure provides an indication, however, of the benefit of 3D visualization: the stress level of the above visualization is 0.2.

4.1 Structural Roles and Structural Equivalence

As we have noted, some nodes are positioned and connected differently in the network. According to the network structure, these nodes play different roles.⁷ Structural roles are imputed from the network structure, in turn based on the network characteristics. No comment is made here on the suitability of network members to occupy these roles. However, research has been done on the personality correlates of certain structural roles (Burt et al., 1998) and indeed correlations may well exist along other dimensions.

⁷ Not to be confused with the attributes that these nodes possess, e.g. personality, experience, education, nor with the multitude of other identities these nodes play in organizations, e.g. functional or task identities.

Certain measures, taken together, imply structural equivalence – nodes with equal measures function, from a network structure point of view, identically. With network members who reach a certain level of centrality, one that approaches network organizers' levels, structural equivalence can illustrate how they have become embedded in the network.

A simple relationship between network roles and network growth and development was not observed, nor was sought. Other factors are at work beyond network roles. Network members' characteristics, along with the members' tasks or role, and network structure, constitute three essential factors affecting network growth and development. We examine the network roles part of the equation in more detail in the following section.

4.2 Roles in Dynamic Learning Networks

Centrality measures are not only useful for exploring the hypotheses on whether network analysis produces meaningful results for these online networks. These measures are also useful for defining roles based on structural equivalence.

For the networks under study, the two facets of the degree measure, indegree, and outdegree, can be combined and the result associated with various roles⁸. The roles of broadcaster and unengaged were added to roles described by Cross et al. (2002) in Chapter 2.1's literature review (central connectors, information brokers, boundary spanners, and peripheral specialists). Specifically, the central connectors, information brokers, and boundary spanners were combined, while the role of peripheral specialist was retained⁹. Two other roles were added, unengaged, and broadcaster (Table 11).

⁸ Cutoff points of 50% of network average and 150% of network average values for indegree and outdegree are chosen to indicate a clear distinction from network average activity.

⁹ Cross et al.'s (2002) central connectors ("connectors"), boundary spanners ("bridges"), and information brokers ("facilitators") were combined into one category since no distinction in subgroups within a network is made in the present study. It is such a subgroup analysis that would give rise to such distinct roles. The more widely used and generic terms of connectors / bridges / facilitators are also therefore used to avoid confusion with the more distinct roles described by Cross et al. (2002).

Table 11: Indegree, Outdegree, and Roles

Indegree Value	Outdegree Value	Role Imputed
50% or less of average	50% or less of average	Unengaged (U)
50% or less of average	150% or more of average	Broadcaster (B)
150% or more of average	50% or less of average	Peripheral Specialist / Sink (P/S)
150% or more of average	150% or more of average	Connector / Bridge / Facilitator (C/B/F)

Unengaged network members are defined as participating half or less than the average network member. Such members have joined the network and appear in the roster but are otherwise mostly invisible, akin to the “lurker” in internet discussion terms. In network analysis terms, such members are more commonly known as “isolates” (Scott, 2000) and can be thought of as having latent ties (Haythornthwaite, 2003) which are only converted into actual ties on the basis of a communication with other network members.

Broadcaster members have high outdegree values, indicating one-way dissemination of information or influence. Broadcasters are not engaged in the give-and-take of discussion but may produce summaries or otherwise provide information to the network.

Peripheral Specialists or Sinks are either experts who are called upon for their expertise, or information receivers who rarely respond. Peripheral Specialists or Sinks receive many more requests for their response than they are willing or able to respond to.

Connectors, Bridges, or Facilitators have relatively high indegrees and outdegrees, indicating active participation in several possible ways. Connectors bring two network members into contact that would otherwise not have been so. Bridges (also known as brokers) perform a similar function, but for subgroups of network members. Each subgroup may communicate within itself, but rely on the Bridge to pass information back and forth between the subgroups. Facilitators engage

network members in order to surface and structure interaction for the benefit of the larger network.

Note that Broadcasters, Peripheral Specialists/Sinks, and Connector / Bridge / Facilitators, because by definition they have a relatively large indegree or outdegree, will tend towards (high) centrality in the network.

For the networks under study, only Unengaged and Connector / Bridge / Facilitator roles were observed. The network organizers often played the latter roles, and in addition, through such activity, balanced the indegree and outdegree values of members. Networks with a lower ratio of organizers to members would be expected to have more unbalanced indegree and outdegree values, thus giving rise to the Broadcaster and Peripheral Specialist / Sink roles.

To illustrate, members with roles from the Alternative Employment Models network appear below (Table 12)¹⁰.

Table 12: Individual Roles in the Alternative Employment Models Network

	Period	1	2	3	4	5	6	7	8	9	10	11	12
Member / Organizer	A02		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
	D01		U	U	U	U	U	U	U	U	U	U	U
	J01						U						
	M03		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
	M04		U	U	U	U	U	U	U	U	U	U	U
	N02									U	U	U	U
	O1									C/B/F	C/B/F	C/B/F	
	O3		U	U	U		U	U	U	U	U		
	O4									C/B/F	C/B/F	C/B/F	
	O5							C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F

Legend: C/B/F = Connector / Bridge / Facilitator U = Unengaged

In the above network, four members consistently maintain their roles over all time periods (A02, D01, M03, and M04). One of the organizers, O3, is unengaged for most of the time, although in periods 11 and 12 regains a normal profile. This trend of increased participation is also noted in the other organizers, beginning in period 7 with O5 and followed in period 9 with O1 and O4.

¹⁰ Complete individual role data for all networks appears in Appendix C

5 Results Along the Longitudinal Dimension: Beyond Structure and Topology to Flow and Interplay

This section focuses on the longitudinal element of the study¹¹. Network analysis has been used as a snapshot in many cases, as a before and after, or even with three time periods (Haythornthwaite, 1998). The present study's 12 time slices provide a sense of more continuous flow to these analyses. In this way, trends and inflection points are illuminated, and the topology of networks becomes visible over time, along different measurement dimensions. We begin by examining membership and relationship, before moving to more complex measures.

5.1 Membership Growth - Rankings

Growth in membership is necessary for breadth of experience and richness of conversation that attracts both increased participation and increased membership. This is a virtuous cycle, in theory. However, the interplay of participation and new membership calls for more sophisticated measures than straight membership growth. Membership growth indicates the potential for interaction, and so it was calculated for each network, from period to period, for each time slice (Table 13).

¹¹ Complete cross-network comparison data for all networks, for all time slices, appears in Appendix D

Table 13: Percentage Growth in Membership (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	Intrapreneurship	7	3.9	1.3	0.6	29	0.1	1.1	0.1	0.0	0.0	1.9	0.5	3.5	3.5
2	Emerging Markets	41	12	2.0	0.2	0.7	14	0.1	0.0	0.2	0.0	0.0	0.1	2.7	1.7
3	Attracting and Retaining Talent	16	15	2.5	0.1	1.5	0.0	0.7	0.0	0.0	2.3	0.0	0.0	2.0	0.7
4	Crisis Management	15	9.7	2.0	2.1	0.0	1.8	0.9	0.2	0.1	0.3	2.9	0.0	1.8	1.0
5	Innovation	21	12	1.8	0.7	0.9	0.9	0.4	0.3	0.1	1.9	1.0	0.0	1.8	0.8
6	Creativity	32	11	2.1	0.1	1.6	0.5	0.0	0.0	0.0	2.8	0.2	0.0	1.7	0.7
7	Virtual Teams	28	11	1.4	0.4	0.8	1.1	0.1	0.4	0.3	0.9	0.0	0.3	1.5	0.6
8	Corporate Philanthropy	12	9.8	2.3	0.4	0.9	1.1	0.5	0.0	0.0	0.0	0.0	0.0	1.4	0.5
9	IT	24	7.6	1.4	0.3	1.4	0.4	0.0	0.0	0.0	0.0	0.0	3.6	1.3	0.7
10	Mergers and Acquisitions	31	7.3	1.7	1.0	0.4	0.8	0.7	0.2	0.6	0.4	0.1	0.1	1.2	0.6
11	Alternative Employment Models	23	3.6	1.0	0.0	0.0	1.9	0.0	0.1	0.0	0.9	0.1	0.1	0.7	0.4
12	Supply Chain Management	22	3.3	0.8	0.6	0.2	0.7	0.0	0.7	0.0	0.5	0.1	0.6	0.7	0.4
13	Key Account Management	33	4.7	1.3	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.2
14	Leadership	116	2.7	0.9	0.1	0.8	0.5	0.0	0.4	0.0	1.0	0.2	0.1	0.6	0.4
15	Family Business	52	2.4	0.8	0.2	0.3	0.2	0.0	0.0	0.0	0.0	0.4	0.2	0.4	0.2
	Average	32	7.7	1.5	0.4	2.6	1.6	0.3	0.2	0.1	0.7	0.5	0.4	1.5	0.8

¹ Ranking based on average results (including launch period)
² Average including launch period (period 2)
³ Average excluding launch period (period 2)
⁴ Actual membership figures listed in period 1

A range of membership growth was achieved, reflecting both strategic decisions and operational challenges. For the former, for example, the Corporate Philanthropy network explicitly sought to limit membership as a strategic move designed to increase participation among a small group of members. Two networks, Intrapreneurship and Emerging Markets, had big membership increases at certain periods, which were fruitful in adding a sporadic rush of new members. The challenges in membership growth also were a reflection of different priorities of the organizers, as noted in the interviews. These different priorities applied to both activities within the network, and beyond the network to other demands on the organizers' time.

The only network to achieve membership growth in every period was the Mergers and Acquisitions network, although several networks came close. Overall, membership growth in the early stages – from founding to the first two time slices (representing a period of approximately one month) – was the critical factor in the resulting network size. Similar growth patterns – low, uneven growth – were observed afterwards, whether the network had reached 10 or 100 members in its initial stages.

For a measure of participation and the growth of such, we turn to network tie growth.

5.2 Tie Growth - Rankings

Ties between network participants also grew in a slow and uneven pattern (Table 14). The very large growth in beginning periods coincides with introductions between members, as well as housekeeping and other duties. When turning to more substantive contributions, a similar low, uneven growth pattern was observed.

Table 14: Percentage Growth in Ties (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	Attracting and Retaining Talent	1	264	1.5	3.9	0.0	2.2	0.0	0.0	0.3	0.2	0.2	0.1	24.7	0.8
2	IT	1	191	1.7	1.0	0.0	0.8	0.0	0.2	0.6	0.0	0.0	0.0	17.7	0.4
3	Key Account Management	2	86	2.7	1.7	0.8	3.0	0.5	0.3	0.0	0.0	0.1	0.0	8.7	0.9
4	Creativity	3	42	6.3	0.4	0.0	0.5	0.4	0.3	0.0	0.2	0.0	0.2	4.6	0.8
5	Alternative Employment Models	6	41	0.8	0.0	0.8	1.5	0.6	0.1	0.9	0.4	0.2	0.0	4.2	0.5
6	Family Business	1	36	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	6.7	0.0	4.0	0.8
7	Corporate Philanthropy	4	34	2.3	0.3	1.4	3.9	0.9	0.0	0.0	0.1	0.0	0.0	3.9	0.9
8	Crisis Management	6	17	1.5	0.7	0.3	4.4	2.4	0.9	0.1	0.6	2.1	0.3	2.7	1.3
9	Innovation	0	-	1.8	1.6	1.4	12	0.4	0.7	0.8	1.4	1.2	0.4	2.1	2.1
10	Mergers and Acquisitions	3	12	1.8	0.8	0.0	1.3	0.0	0.0	0.6	1.8	1.7	2.1	2.0	1.0
11	Emerging Markets	0	-	1.3	0.6	0.0	13	1.2	0.2	1.6	0.4	0.1	0.0	1.8	1.8
12	Supply Chain Management	0	-	6.3	0.0	3.8	3.1	0.9	0.0	0.0	0.0	0.0	0.0	1.4	1.4
13	Virtual Teams	0	-	7.3	0.2	0.6	2.5	0.8	0.3	0.6	0.3	0.0	0.0	1.3	1.3
14	Leadership	0	-	4.5	0.0	1.3	4.0	0.8	0.7	0.0	0.4	0.0	0.2	1.2	1.2
15	Intrapreneurship	0	-	4.7	0.3	0.3	1.9	1.5	0.6	0.2	0.4	0.6	0.0	1.1	1.1
	Average	2	80	2.9	0.8	0.7	3.6	0.7	0.3	0.4	0.4	0.9	0.2	8.3	1.1

¹ Ranking based on average results (including launch period)
² Average including launch period (period 2)
³ Average excluding launch period (period 2)
⁴ Actual number of ties figures listed in period 1

Organizer strategies also had an impact on tie growth. Interestingly, the membership's percentage of all ties in the network remained relatively consistent for a given network over time. One or two networks, for example, the Intrapreneurship and Innovation networks, saw increasing proportions of members involved in ties over time. This observation would be consistent with strong efforts initially by organizers to kindle participation, which are rewarded over time. However, the examples of the Virtual Teams network and the Emerging Markets network indicate that strong member engagement can be engendered from the start, without relying on extensive organizer participation.

5.3 Density Growth - Rankings

Combining the membership and tie measures into the density measure showed that many networks could not convert membership growth into increased participation. This is the conclusion from examining density growth over time (Table 15).

Table 15: Percentage Growth in Density (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	IT	0.1%	62	(0.7)	0.5	(2.0)	0.1	0.0	0.2	0.6	0.0	0.0	(3.8)	5.2	(0.5)
2	Attracting and Retaining Talent	0.2%	47	(2.1)	3.5	(2.2)	2.2	(1.2)	0.0	0.3	(2.9)	0.2	0.1	4.1	(0.2)
3	Key Account Management	0.1%	37	0.2	1.7	0.6	1.8	0.5	0.3	0.0	0.0	0.1	(0.2)	3.8	0.5
4	Family Business	0.0%	20	(1.2)	(0.3)	(0.5)	0.7	0.0	0.0	0.0	0.0	5.3	(0.3)	2.2	0.4
5	Alternative Employment Models	0.7%	20	(0.8)	0.0	0.8	(1.3)	0.6	(0.1)	0.9	(1.2)	0.0	(0.2)	1.7	(0.1)
6	Supply Chain Management	0.0%	-	3.8	(1.0)	3.3	1.6	0.9	(1.1)	0.0	(0.8)	(0.2)	(0.9)	0.6	0.6
7	Innovation	0.0%	-	(1.2)	0.2	(0.3)	7.6	(0.4)	0.1	0.5	(1.7)	(0.7)	0.4	0.5	0.5
8	Corporate Philanthropy	1.3%	5.1	(1.2)	(0.4)	(0.1)	1.4	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0
9	Leadership	0.0%	-	2.1	(0.2)	(0.3)	2.6	0.8	(0.1)	(0.1)	(1.3)	(0.4)	0.1	0.3	0.3
10	Virtual Teams	0.0%	-	3.1	(0.5)	(0.8)	0.2	0.6	(0.4)	0.1	(1.2)	0.0	(0.6)	0.1	0.1
11	Creativity	0.2%	3.0	1.0	0.3	(2.3)	(0.5)	0.4	0.3	0.0	(3.4)	(0.4)	0.2	(0.1)	(0.4)
12	Mergers and Acquisitions	0.2%	(1.6)	(1.1)	(0.9)	(0.7)	(0.3)	(1.2)	(0.4)	(0.5)	0.9	1.4	2.0	(0.2)	(0.1)
13	Crisis Management	1.4%	(1.0)	(1.5)	(2.2)	0.3	0.5	0.5	0.5	(0.1)	0.1	(2.3)	0.3	(0.4)	(0.4)
14	Emerging Markets	0.0%	-	(1.9)	0.3	(1.1)	(4.4)	1.0	0.1	1.1	0.3	0.1	(0.2)	(0.5)	(0.5)
15	Intrapreneurship	0.0%	-	2.3	(0.4)	(7.1)	1.7	(0.5)	0.4	0.2	0.4	(2.1)	(0.9)	(0.6)	(0.6)
	Average	0.3%	21	0.1	0.0	(0.8)	0.9	0.1	0.0	0.2	(0.7)	0.1	(0.3)	1.9	0.0

¹ Ranking based on average results (including launch period)
² Average including launch period (period 2)
³ Average excluding launch period (period 2)
⁴ Actual density figures listed in period 1

However, due to the lurker phenomenon, a network may have many passive members that disguise the vibrancy within its active members. Therefore, active population density indicates the density considering only those who are already active in the network (Table 16).

Table 16: Percentage Growth in Active Population Density (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	Alternative Employment Models	30%	0.0	0.8	0.0	0.8	0.2	0.6	0.1	(0.3)	0.4	0.2	0.0	0.3	0.3
2	Innovation	-	-	0.0	(0.2)	(0.3)	1.9	(0.5)	(0.1)	0.8	(0.3)	(0.2)	0.4	0.2	0.2
3	Leadership	-	-	1.5	0.0	0.1	(1.1)	0.1	0.0	0.0	0.4	0.0	0.2	0.1	0.1
4	Corporate Philanthropy	13%	2.7	(2.8)	(0.5)	1.4	(0.6)	(0.4)	0.0	0.0	0.1	0.0	0.0	0.0	(0.3)
5	Intrapreneurship	-	-	(1.1)	(1.0)	0.3	(0.5)	1.5	0.6	0.2	(0.8)	0.6	0.0	0.0	0.0
6	Attracting and Retaining Talent	50%	(1.5)	(2.7)	2.3	0.0	0.2	0.0	0.0	0.3	(0.7)	0.2	0.1	(0.2)	0.0
7	Virtual Teams	-	-	(1.1)	(1.0)	(0.7)	(1.2)	0.8	(0.5)	0.6	(0.5)	0.0	0.0	(0.4)	(0.4)
8	Supply Chain Management	-	-	0.0	0.0	(0.8)	(1.8)	(1.3)	0.0	0.0	0.0	0.0	0.0	(0.4)	(0.4)
9	Creativity	25%	(6.1)	3.4	(0.4)	(0.8)	0.5	(1.1)	(0.3)	0.0	(0.5)	0.0	0.2	(0.5)	0.1
10	Mergers and Acquisitions	25%	(4.5)	(2.8)	0.8	0.0	0.1	0.0	0.0	(0.5)	(0.5)	0.7	1.1	(0.5)	(0.1)
11	Emerging Markets	-	-	(1.3)	(0.7)	(1.2)	(2.1)	0.5	0.2	(0.5)	(0.1)	(0.3)	0.0	(0.5)	(0.5)
12	Key Account Management	100%	(8.0)	1.5	0.6	(1.0)	(0.1)	0.5	0.3	0.0	0.0	0.1	0.0	(0.6)	0.2
13	IT	50%	(6.5)	0.6	(0.1)	0.0	(1.4)	0.0	0.2	0.6	0.0	0.0	0.0	(0.6)	0.0
14	Crisis Management	14%	(3.1)	(0.4)	(0.2)	(0.6)	0.2	(0.4)	0.9	0.1	(1.4)	(2.6)	(0.3)	(0.7)	(0.5)
15	Family Business	50%	(6.1)	0.0	0.0	0.0	(0.9)	0.0	0.0	0.0	0.0	(1.6)	0.0	(0.8)	(0.2)
	Average	40%	(3.7)	(0.3)	0.0	(0.2)	(0.4)	0.0	0.1	0.1	(0.3)	(0.2)	0.1	(0.4)	(0.1)

¹ Ranking based on average results (including launch period)
² Average including launch period (period 2)
³ Average excluding launch period (period 2)
⁴ Actual active population density figures listed in period 1

Using active population as the base changes some of the network rankings significantly. For instance, the Virtual Teams network slips from apparent growth in density to an average negative growth. Others remain relatively unchanged, such as the Crisis Management network, with its large membership, placing 14th among the networks using both measures. One factor that influences these networks differently across these two measures is the organizer's influence. To account for this factor, or to put it differently, to move towards how sustainable a level of activation has been achieved, the active member density can be considered (Table 17).

Table 17: Percentage Growth in Active Member Density (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	Crisis Management	1%	34	0.1	(0.1)	(0.9)	(0.6)	0.1	1.3	0.2	(1.4)	(2.3)	(0.2)	2.8	(0.4)
2	Supply Chain Management	-	-	8.3	0.0	2.2	(1.0)	(1.0)	0.0	0.0	0.0	0.0	0.0	0.9	0.9
3	Mergers and Acquisitions	4%	7.1	(2.1)	1.0	0.0	(0.3)	0.0	0.0	(0.2)	0.2	0.1	0.6	0.6	(0.1)
4	Leadership	-	-	5.4	0.0	0.3	(1.3)	0.3	0.4	0.0	0.0	0.0	0.0	0.5	0.5
5	Key Account Management	0%	-	3.0	1.4	(1.3)	0.8	0.3	0.4	0.0	0.0	0.0	0.0	0.5	0.5
6	Corporate Philanthropy	7%	5.8	(2.5)	(0.4)	1.2	(1.1)	(0.2)	0.0	0.0	0.2	0.0	0.0	0.3	(0.3)
7	Attracting and Retaining Talent	14%	5.9	(2.2)	0.3	0.0	(0.7)	0.0	0.0	0.0	(0.5)	0.0	0.0	0.3	(0.3)
8	Alternative Employment Models	24%	0.6	0.7	0.0	1.0	0.0	0.7	0.0	(0.8)	0.0	0.0	0.0	0.2	0.2
9	Creativity	7%	(0.9)	4.1	(0.4)	(0.8)	0.4	(1.1)	(0.3)	0.0	(0.5)	0.0	0.2	0.1	0.2
10	Innovation	-	-	0.3	0.1	(0.3)	0.0	(0.3)	(0.1)	0.2	(0.6)	(0.2)	0.0	(0.1)	(0.1)
11	IT	14%	(2.6)	1.0	(0.3)	0.0	(1.1)	0.0	0.2	0.4	0.0	0.0	0.0	(0.2)	0.0
12	Intrapreneurship	-	-	(1.3)	(0.7)	0.4	(0.8)	0.0	0.6	0.0	(0.7)	0.5	0.0	(0.2)	(0.2)
13	Family Business	0%	-	0.0	0.0	0.0	(1.7)	0.0	0.0	0.0	0.0	(0.5)	0.0	(0.2)	(0.2)
14	Virtual Teams	-	-	(0.3)	(0.9)	(0.7)	(1.1)	0.8	(0.4)	0.6	(0.5)	0.0	0.0	(0.3)	(0.3)
15	Emerging Markets	-	-	(1.1)	(0.8)	(1.3)	(1.8)	0.4	0.2	(0.5)	0.0	(0.3)	0.0	(0.5)	(0.5)
	Average	8%	7.1	0.9	(0.1)	0.0	(0.7)	0.0	0.2	0.0	(0.3)	(0.2)	0.0	0.6	0.0

¹ Ranking based on average results (including launch period)
² Average including launch period (period 2)
³ Average excluding launch period (period 2)
⁴ Actual active member density figures listed in period 1

The big shift appears to be in Crisis Management, but on closer examination, high growth in its launch period accounts for this result. More subtly, the Virtual Teams network returns to its negative density growth, on average. The very high absolute scores on active member density are proving to erode over time – and coincidentally, the Virtual Team network had the lowest proportion of organizer participation. In contrast, the Alternative Employment Models network, also with a low proportion of organizer participation, appears to hold or slightly increase its active member density over time. Clearly, one unit of organizer participation is not equivalent to another, and factors such as the quality of participation, organizing scheme, and other influences discussed earlier have a significant role.

The active member density can provide a flag to networks to investigate the growth or decline patterns that they may be experiencing.

Finally, to see how much the members themselves are reaching out to create relationships and increase density, the active member-originator density provides an indication of organizer-independent member mobilization (Table 18). It is in this last, most restrictive measure that the sparks of active engagement are generated.

Table 18: Percentage Growth in Active Member-Originator Density (Period-on-Period), All Networks, Over Time

Rank ¹	Network	Period												Average ²	Average ³
		1 ⁴	2	3	4	5	6	7	8	9	10	11	12		
1	Corporate Philanthropy	2%	13	(1.6)	(0.2)	0.6	(1.2)	(0.5)	0.0	0.0	0.4	0.0	0.0	1.0	(0.2)
2	Leadership	-	-	4.6	0.0	1.4	(1.0)	0.1	0.4	0.0	0.0	0.0	0.0	0.5	0.5
3	Alternative Employment Models	12%	2.6	0.4	0.0	1.7	(0.3)	0.9	0.0	(0.9)	0.0	0.0	0.0	0.4	0.2
4	Key Account Management	0%	-	2.0	0.8	(1.1)	0.7	0.6	0.5	0.0	0.0	0.0	0.0	0.4	0.4
5	Supply Chain Management	-	-	3.5	0.0	1.2	(0.8)	(0.5)	0.0	0.0	0.0	0.0	0.0	0.3	0.3
6	Mergers and Acquisitions	0%	-	(1.9)	2.4	0.0	0.4	0.0	0.0	0.4	0.4	(0.1)	0.7	0.2	0.2
7	IT	0%	-	2.7	(0.8)	0.0	(1.1)	0.0	0.5	0.9	0.0	0.0	0.0	0.2	0.2
8	Creativity	4%	(0.9)	4.8	(0.4)	(0.8)	0.7	(1.1)	0.0	0.0	(0.7)	0.0	0.3	0.2	0.3
9	Innovation	-	-	(0.1)	(0.2)	0.3	(1.2)	(0.4)	0.5	0.4	(0.4)	(0.4)	0.0	(0.2)	(0.2)
10	Virtual Teams	-	-	0.1	(0.8)	(0.6)	(1.0)	0.7	(0.5)	0.8	(0.5)	0.0	0.0	(0.2)	(0.2)
11	Intrapreneurship	-	-	(1.8)	(0.4)	0.0	(0.1)	0.0	1.0	0.0	(0.9)	0.4	0.0	(0.2)	(0.2)
12	Emerging Markets	-	-	0.2	(0.3)	(1.3)	(1.2)	0.7	0.0	(0.1)	0.2	(0.2)	0.0	(0.2)	(0.2)
13	Attracting and Retaining Talent	0%	-	(2.4)	0.5	0.0	(0.6)	0.0	0.0	0.0	(0.5)	0.0	0.0	(0.3)	(0.3)
14	Family Business	0%	-	0.0	0.0	0.0	(1.7)	0.0	0.0	0.0	0.0	(2.1)	0.0	(0.4)	(0.4)
15	Crisis Management	0%	-	(0.3)	(0.2)	(0.9)	(0.8)	(0.4)	1.4	0.3	(1.4)	(1.9)	(0.4)	(0.5)	(0.5)
	Average	2%	5.0	0.7	0.0	0.0	(0.6)	0.0	0.2	0.1	(0.2)	(0.3)	0.0	0.5	0.0

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

⁴ Actual active member-originator density figures listed in period 1

Of the many differences from the previous ranking, the Crisis Management network's is the most striking (#1 in Active Member Density Growth to #15 in Active Member-Only Density Growth). The high potential of a large membership base remains untapped in this network.

5.4 Ties per Node - Rankings

Density is a measure of potential. An alternative and simple idea has been posited by Watts (1999) regarding the creation of a small world network¹². This idea is that only a few ties are needed to pull together such a network -- on average, just one tie per member. When experimental data did not confirm this idea, however, the addition of the idea of preferential attachment (Barabasi, 2003) went a long way to explaining why.

To explore this phenomenon, ties per node (where a node is a member or organizer of a network) were calculated (Table 19).

Table 19: Ties per Node

Rank*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Alternative Employment Models	0.2	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.1	1.1	1.1	1.1	0.9
2	Corporate Philanthropy	0.2	0.6	0.7	0.6	0.7	1.0	1.0	1.0	1.0	1.1	1.1	1.1	0.8
3	Key Account Management	0.1	0.4	0.5	0.6	0.6	0.8	0.9	0.9	0.9	0.9	1.0	0.9	0.7
4	Attracting and Retaining Talent	0.0	0.6	0.6	0.9	0.7	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7
5	Crisis Management	0.3	0.5	0.4	0.4	0.4	0.6	0.7	0.7	0.7	0.8	0.7	0.7	0.6
6	Virtual Teams	0.0	0.3	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5
7	Innovation	0.0	0.1	0.1	0.1	0.2	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.3
8	IT	0.0	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
9	Intrapreneurship	0.0	0.8	1.2	1.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.4	0.6
10	Creativity	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3
11	Leadership	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
12	Supply Chain Management	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
13	Mergers and Acquisitions	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1
14	Family Business	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
15	Emerging Markets	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Average	0.1	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4

*Ranking based on period 12 results

¹² A small world network is a single cohesive network in which any member can reach any other directly or indirectly.

Both the Alternative Employment Models and Corporate Philanthropy networks achieved sufficient growth in Ties per Node to reach and surpass the 1.0 barrier. However, it is clear, despite positive growth in most networks, that reaching this level did not produce significant effects. Both the above two networks experienced the same “leveling off” result as most other networks, albeit at different ties per node scores. As this level did not result in a small world network for these two networks, by definition the ties were accruing to already active members.

In fact, the shape of the cone of network participation is steeper for more closed networks such as these two. Innovation, Leadership, and Supply Chain Management networks experienced relatively high average growth in ties per node / active ties per node / member ties per active node / member-originator ties per active node. This is to say that these networks brought in a wider circle of their membership into active membership status, compared to other networks.

The ties per node growth and its derivative measures can therefore provide feedback on the strategy of the network. Values for ties per node must be gauged relative to different strategies, however. These values will differ for a small, controlled network in which close ties are sought, versus a larger network where more members involved in the discussion are sought. While density measures can also provide similar feedback, the effect is somewhat obscured by the nature of the construction of the measure. It is possible to reach 100% density, with all possible ties present, while ties per node can continue to rise. In this way, it is potential for closure that density measures, whereas ties per node et al provide actual closure indication, at least where changes in such are measured.

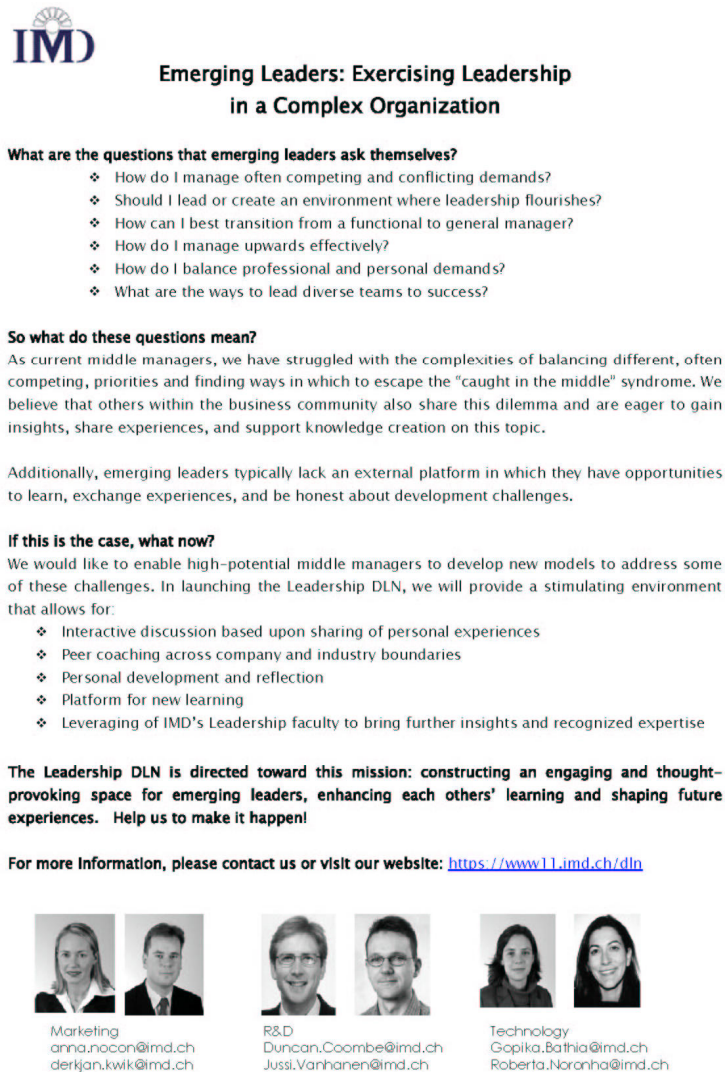
6 Visualization II: Networks Over Time

Applying network visualization techniques as described previously to data captured over time can result in a sequence of network maps. In such a sequence, each individual map represents the network at a particular point in time. By reviewing the ensemble of maps together, a dynamic picture emerges of the network's growth and development over time.

6.1 Network Visualization 1: Leadership - A Large, Diverse Network

The first set of network maps illustrates the growth and development of the leadership network. A description of the leadership network can be found in the network's charter (Figure 14). This charter was created by the network organizers to help guide their decision-making. Charters also served as an aid to recruit members and launch the network. (Network charters for all fifteen networks appear in Appendix A).

Figure 14: Leadership Network Charter



To examine the network's growth and development over time, we turn to the network maps (Figure 15 and Figure 16)^{13 14}. The first map is blank, indicating that while there are members and organizers who have joined the network, they have yet to create any interaction amongst themselves. By the time of the second

¹³ The following network visualizations are constructed using the "Multi-Component Kamada-Kawai" algorithm as implemented by Skye Bender-deMoll in the Social Network Image Animator (SoNIA) software application. Bender-deMoll describes this algorithm as imagining every node is connected to every other node by a spring, and the optimal length of a spring between two nodes is the shortest path distance between them. These imaginary springs then repel the nodes to their resting places (Bender-deMoll, 2003).

¹⁴ Stress levels, a goodness-of-fit measure, are approximately 0.2 or less for the network maps displayed here (excepting the relatively sparse first populated maps in each time series, which is unable to be optimized to this level due to this sparseness).

map, two weeks later, we can observe six members and six organizers who are active. Furthermore, many of the organizers have multiple ties, as indicated by multiple lines radiating out from or into a given node on the map. Also note that member R08 has two ties to two different organizers – we will see how this relationship develops over time.

The network organizers remain somewhat spread out in spatial terms, in time slices 3 and 4. However, the closely-knit nature of this group relative to the rest of the network is slowly becoming apparent over time, as a result of slow active member growth. In addition, the member R08 has grown closer to the organizing group. In fact, R08 has the profile, in terms of ties, of an organizer and from a structural point of view is indistinguishable from the organizers.

Scanning the maps from 3 to 6, we can see that ties have continued to build between organizers faster than between other members. By map 6, we can see that the result is a closely-knit group of organizers, with a few links out towards members who are not as central or tightly bound to the core of the network. Member R08 is actually mapped inside a ring of six organizers.

There are relatively minor changes in the network structure from time slices 3-5. With a significant increase in active membership in map 6, and strengthened ties between organizers, the network structure reflects these changes. The network again experiences few changes in maps 7-12, other than a strengthening of ties among existing nodes and the addition a few active members. The organizing group as a central core once again has become the dominant feature of the network.

Figure 15: Leadership Network, Time Slices 1-6

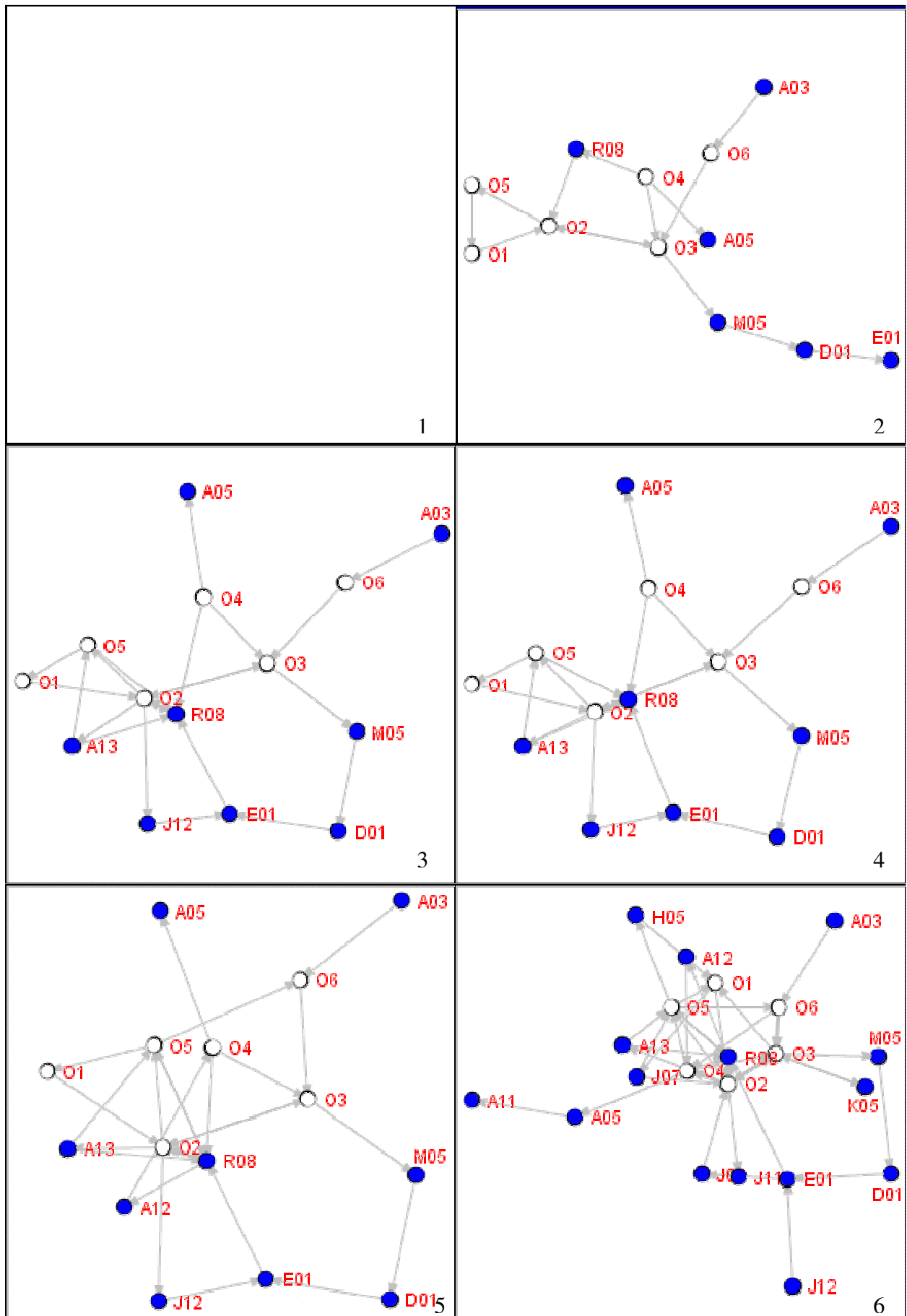
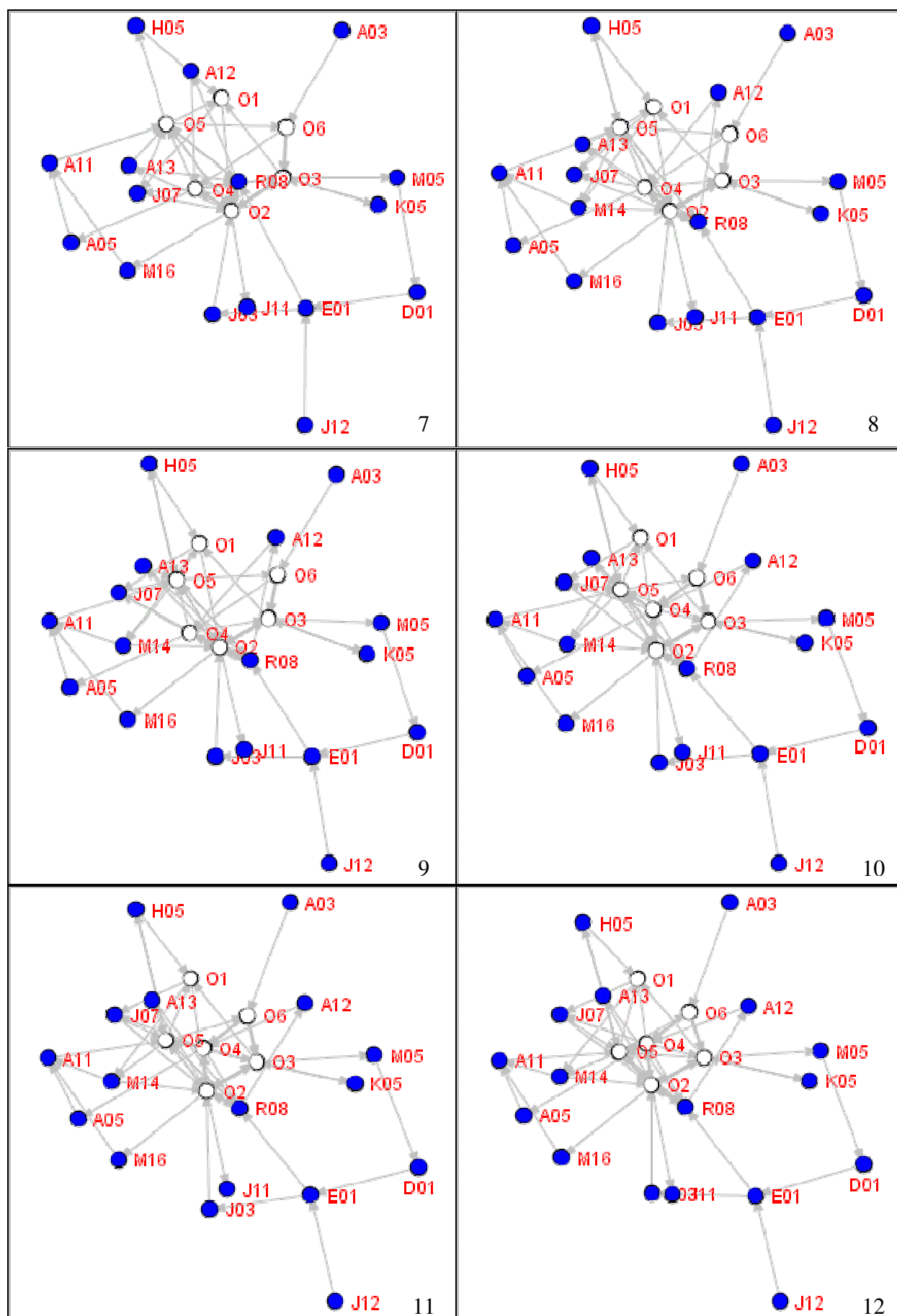


Figure 16: Leadership Network, Time Slices 7-12



6.2 Network Visualization 2: Alternative Employment Models – A Small, Homogeneous Network

The Alternative Employment Models (AEM) network presents a different profile. The charter (Figure 17) indicates a network with a very different purpose from the previous example of the Leadership network, and the network developed quite differently as well.

Figure 17: Alternative Employment Models Network Charter



The AEM network was highly ranked in terms of density measures and tie per node measures, ranking #1 or #2 in each of these measures and their variants, among the 15 networks. However, it was ranked much lower in terms of

membership, ranking in the bottom 3 in terms of both membership and active membership.

Therefore, over time, we can see that the AEM network begins with a small active population and grows the links between these nodes over time (Figure 18 and Figure 19). The result is a small network that is pulled more tightly together (e.g. time slice 7 versus time slice 12). Members A02, R01, M03, and later, J01, are in a central cluster with the organizers. From a structural perspective, these members and the organizers are homogeneous in their network properties. One organizer mentioned in an interview that a member had posted a summary of a discussion, something that the organizers were going to do.

Also according to interviews with the organizers, the AEM organizers handled the different roles of research, technology, and marketing for their network as a six-person team. Some specialization occurred later, but the organizers indicated that a great deal of cross sharing continued. In particular, moderation duties were rotated every two weeks among the organizers, and moderators were expected to access the online discussion area twice daily.

The AEM organizers also indicated that they felt it important but difficult to include experts in their topic in their network. They also indicated a preference for having a captive membership group with obligatory contributions required, i.e. members of a executive development program who would be required to contribute as part of their course. Given the structure of their network, it appears that the organizers are seeking outside expert input to counter network saturation among a small group of tightly connected individuals. In addition, they are seeking greater numbers of participants, which would again alleviate the network saturation effects.

Put differently, these wishes would lead to a more sparse, distributed network with different clusters around different nodes – a power-law distribution network as opposed to a star or single cluster that was achieved.

Figure 18: Alternative Employment Models Network, Time Slices 1-6

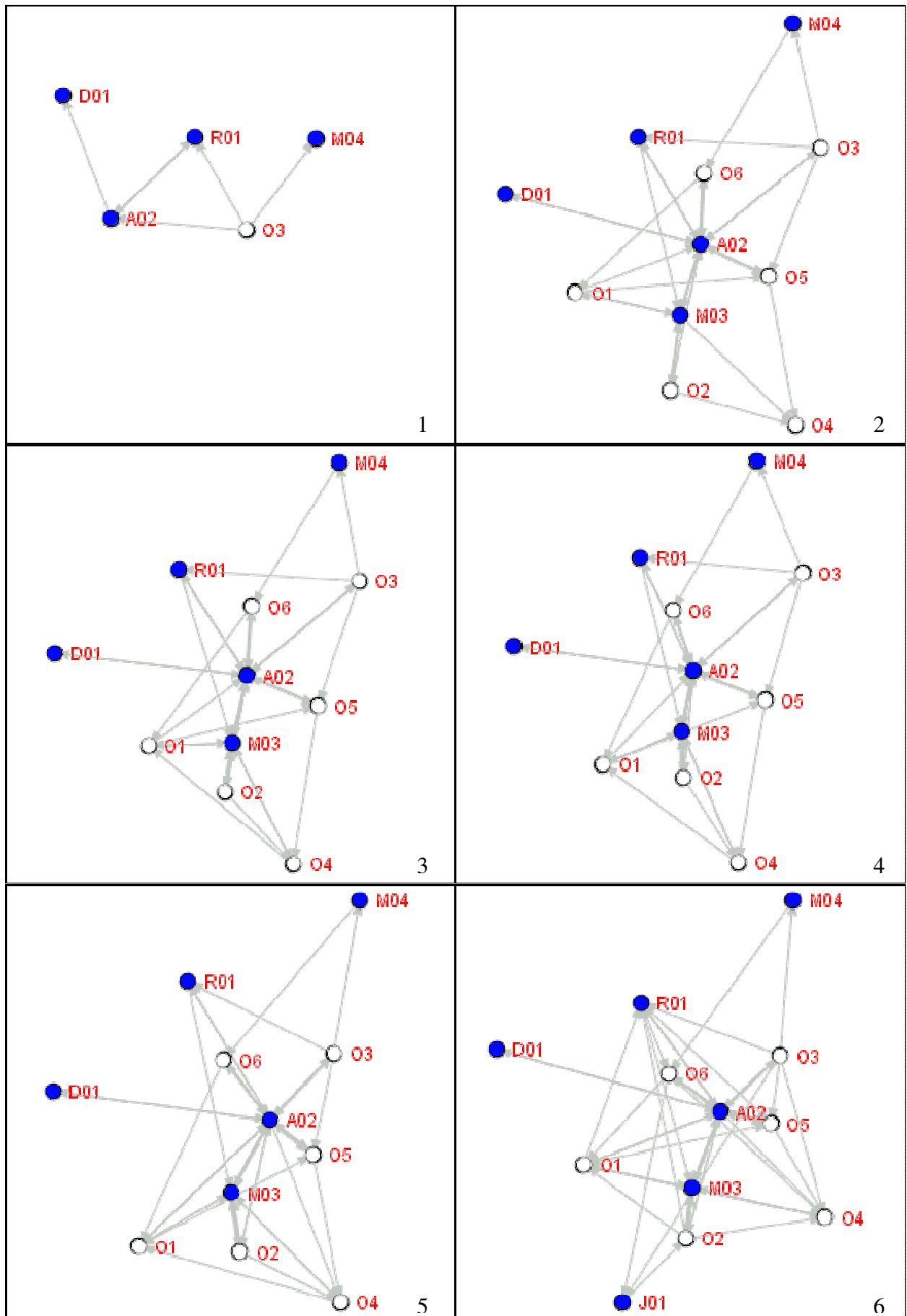
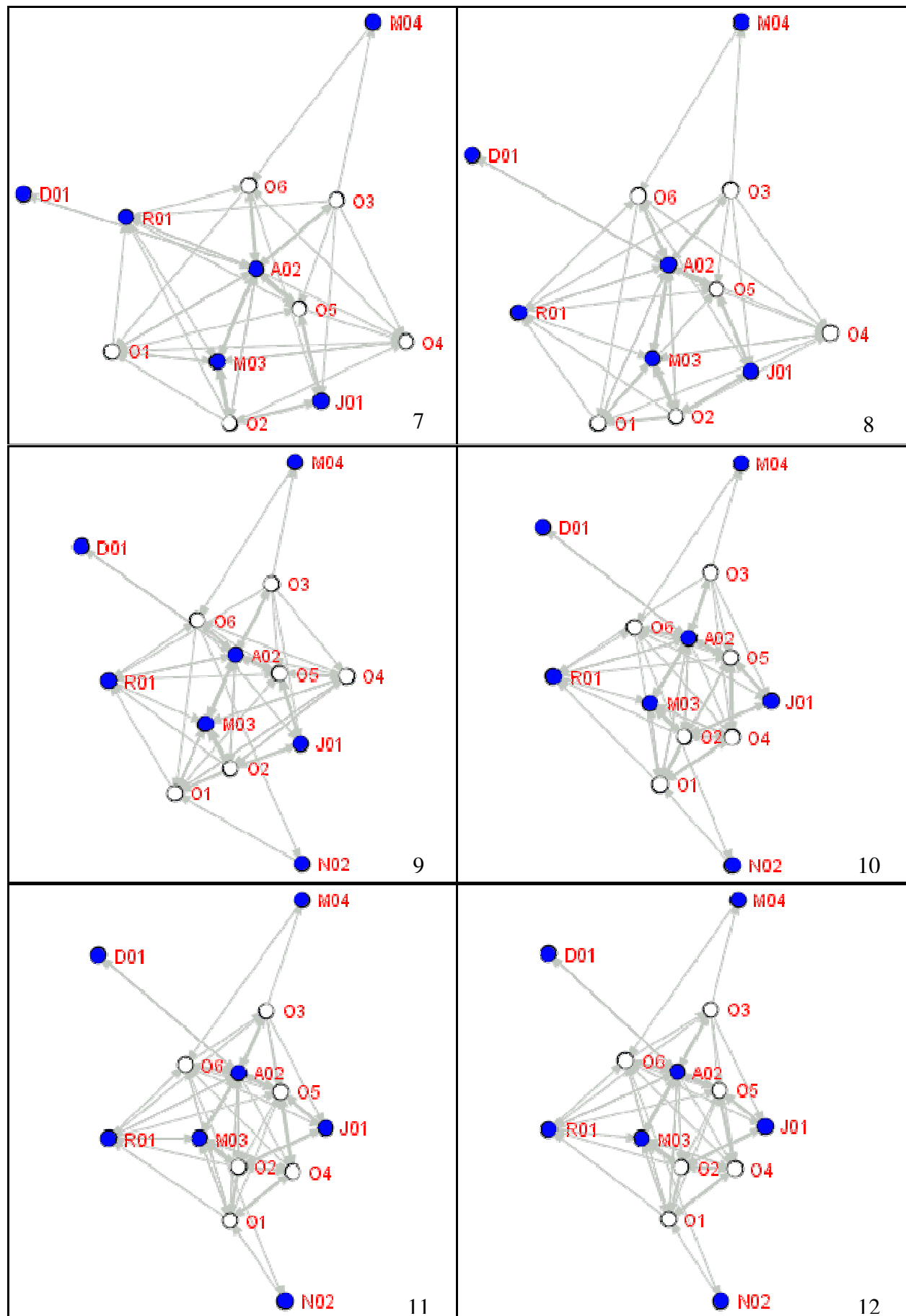




Figure 19: Alternative Employment Models Network, Time Slices 7-12



6.3 Network Visualization 3: Crisis Management – The Largest Network

In contrast to the AEM network, the Crisis Management network's charter positioned the network to achieve broad appeal (Figure 20). The network organizers built on this foundation to create the largest network among those considered here.

Figure 20: Crisis Management Network Charter



Crisis Management

"Next week there can't be any crisis. My schedule is already full."
Henry Kissinger, while secretary of State

"When preparing for crises, it is instructive to recall that Noah started building the ark before it began to rain"
Norman R. Augustine, president of Lockheed Martin Corporation

Can you answer the Questions Below?

Would you know what to do if a crisis hit you?

Have you agreed who does what for each type of crisis in your firm?

Who will be in charge and how will they manage from start to finish?

Have you ever faced a crisis and wished you had peers or experts to consult, test your ideas and get input from?

...
If so, then please read on.....

- The Crisis Management DLN aims to provide a topical, thought-provoking and useful community for decision makers to turn to when anticipating and/or resolving a crisis.
 - We have identified a range of crises both present and past that provide insights on what to do.....and perhaps as importantly what not to do
 - We believe that you could benefit by debating with players in similar circumstances on the approaches to take on crises that could affect your organisation
 - Product failures, financial 'revelations', publicity scandals, personnel crises
 - Would you find approaches, precedents and examples useful to contingency plan a crisis?
 - If so the target audience is you; key decision makers who may be subject (stakeholder or spectator) to a management crisis.
- At the DLN on Crisis Management, you can post your questions or share your experience. You will hear from others, get expert advice and discuss learnings on how to deal with or prepare your company for crises.
- Play a role in developing new points of view and approaches, drawing on the views and outlooks of the IMD Crisis Management community
 - Crisis case presentations with 'live' experts to provide new points of view on a weekly basis
 - Online discussions, private chats and summaries of relevant publications
 - Access to archives on case studies and approaches taken
- If you'd like to find out more, learn or contribute your experience please drop a mail to jason.forbes@imd.ch or inez.colyn@imd.ch or check our website <https://www1.imd.ch/dln>

Maps of the crisis management network are presented in Figure 21 and Figure 22. This network ranked number one in active population. From the network maps, it too eventually produces a star pattern, with a central core dominated by the organizers. Even though the organizers at first are spread out, they eventually

close together through the network's interactions to form a closely-knit core by map 5. Interestingly, member A03 has been present from the beginning and has become ringed by organizers in map 5. By map 11, member A03 has become slightly more distant from the organizing core, and has enough independent ties to perhaps be the beginning of a separate cluster. The tight linkage with the organizing core remains, however, indicating an overall pattern once again of a star.

Figure 21: Crisis Management Network, Time Slices 1-6

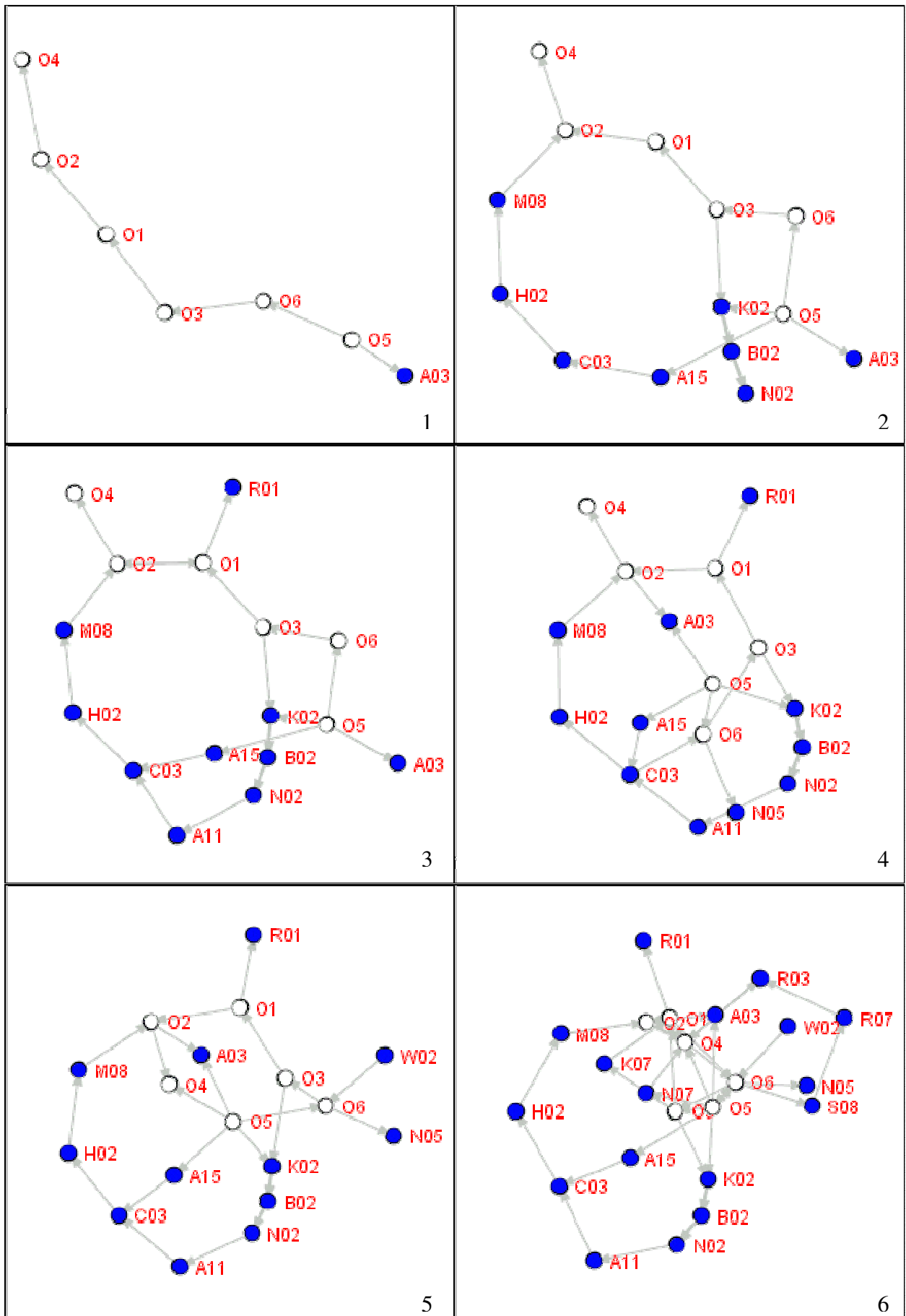


Figure 1 displays six network diagrams (7-12) illustrating the evolution of a network structure. The nodes are represented by blue circles with labels, and the edges are grey lines. The diagrams show a progression from a simple structure (7) to a more complex one (12).

Diagram 7 shows a central cluster of nodes (R01, F03, C05, M08, H02, C03, A11, N02, B02, K02, A15, N07, K07, J02, O1, O2, O4, O6, O5, O3, N05, S08, W02, R07, R03, A03) with a few peripheral nodes (F02, N02). Diagram 8 shows a similar structure but with a different arrangement of nodes. Diagram 9 shows a more complex structure with additional nodes (N03, S07, V02, A04) and a different arrangement of the central cluster. Diagram 10 shows a further evolution with more nodes (A10, R09, F09, F03, W02, R03, A04, S05, S07, V02, O01, C01, J06, S01, T01, J08, C02, A02, N10) and a more complex arrangement. Diagram 11 shows a similar structure but with a different arrangement of nodes. Diagram 12 shows a further evolution with more nodes (A10, R09, F09, F03, W02, R03, A04, S05, S07, V02, O01, C01, J06, S01, T01, J08, C02, A02, N10) and a more complex arrangement.

6.4 Network Visualization 4: Virtual Teams – The Most Active Members Network

Finally, we look at the network with the highest percentage of member ties relative to organizer ties, the Virtual Teams network (Figure 23).

Figure 23: Virtual Teams Network Charter



Have you ever worked in a Virtual Team... that worked?

67% of leading European executives have confirmed that virtual teams are still delivering mixed performance. To remain competitive, companies must consider Virtual Teams strategically. Our Dynamic Learning Network is dedicated to creating new knowledge and best-practices for virtual team management

- ✓ *How to assemble a remote team?*
- ✓ *How to manage a remote team?*
- ✓ *What tools are available for remote team management?*



Further information: amir.alon@imd.ch <https://www11.imd.ch/dln>

This network achieved over 76% of ties involving members, compared with below 50% for all other networks except for the emerging markets network at 72%. This measure indicates that network organizers did not play as significant a role in terms of participation in the network, and this fact is illustrated in the view of the network over time.

From the very first time slice with interaction, number 2 (Figure 24), there are network members who are more involved than the network organizers. The structure that evolves is similar to the previous examples, except that the central core contains many more members than in other examples. Also, there are network organizers who are on the periphery of the network. The overall flow over time of the network is similar to other examples, with a central cluster quickly forming, as early as time slice 3, and continuing to dominate the network over time (Figure 25).

In this example, significantly greater member participation as a proportion of all participation has not produced a more evenly distributed network. This result occurred despite the network organizer's strategy, as expressed in an interview, of not actively moderating the discussions. Participants, including network members, were expected to self-moderate the discussions.

Figure 24: Virtual Teams Network, Time Slices 1-6

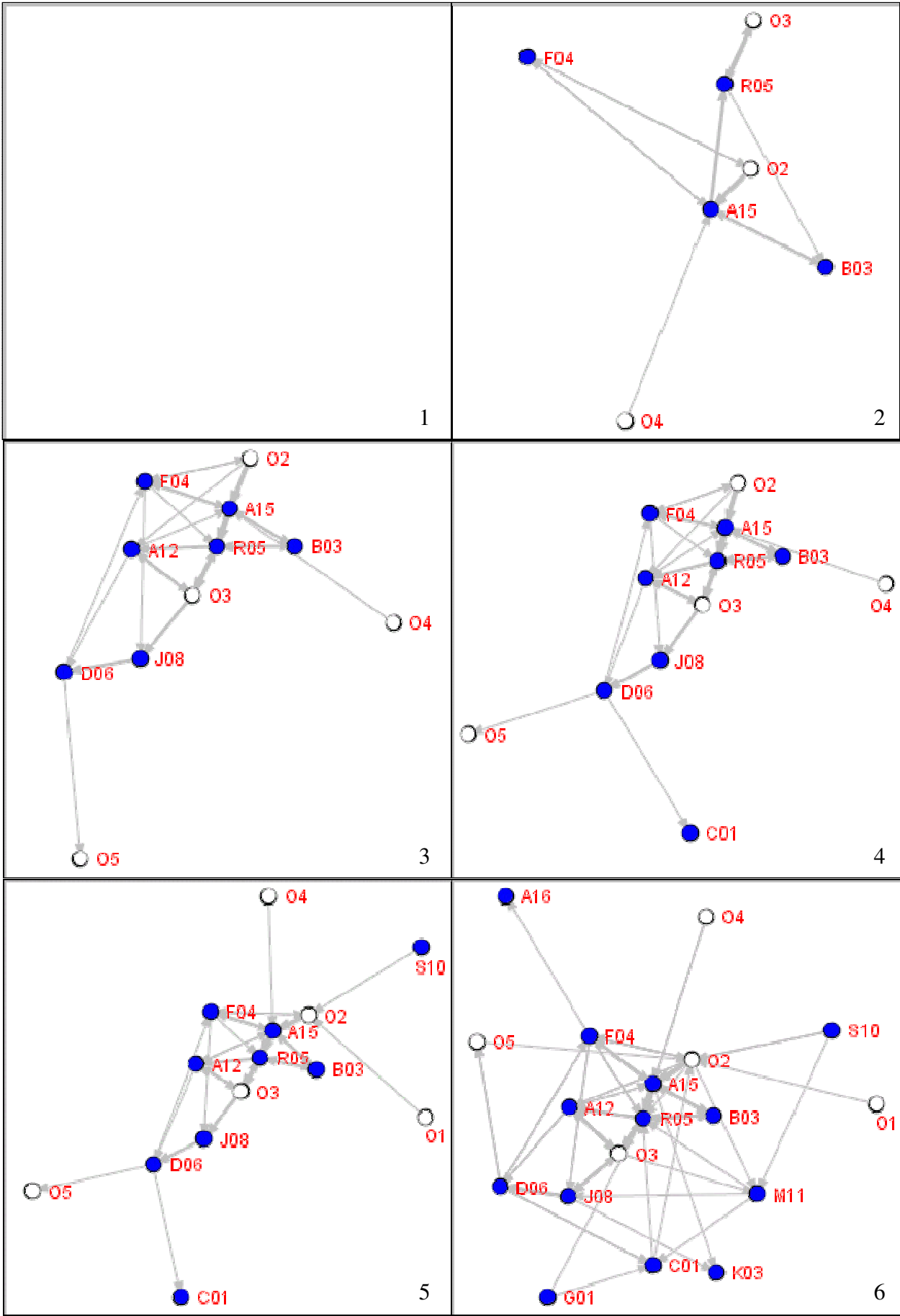
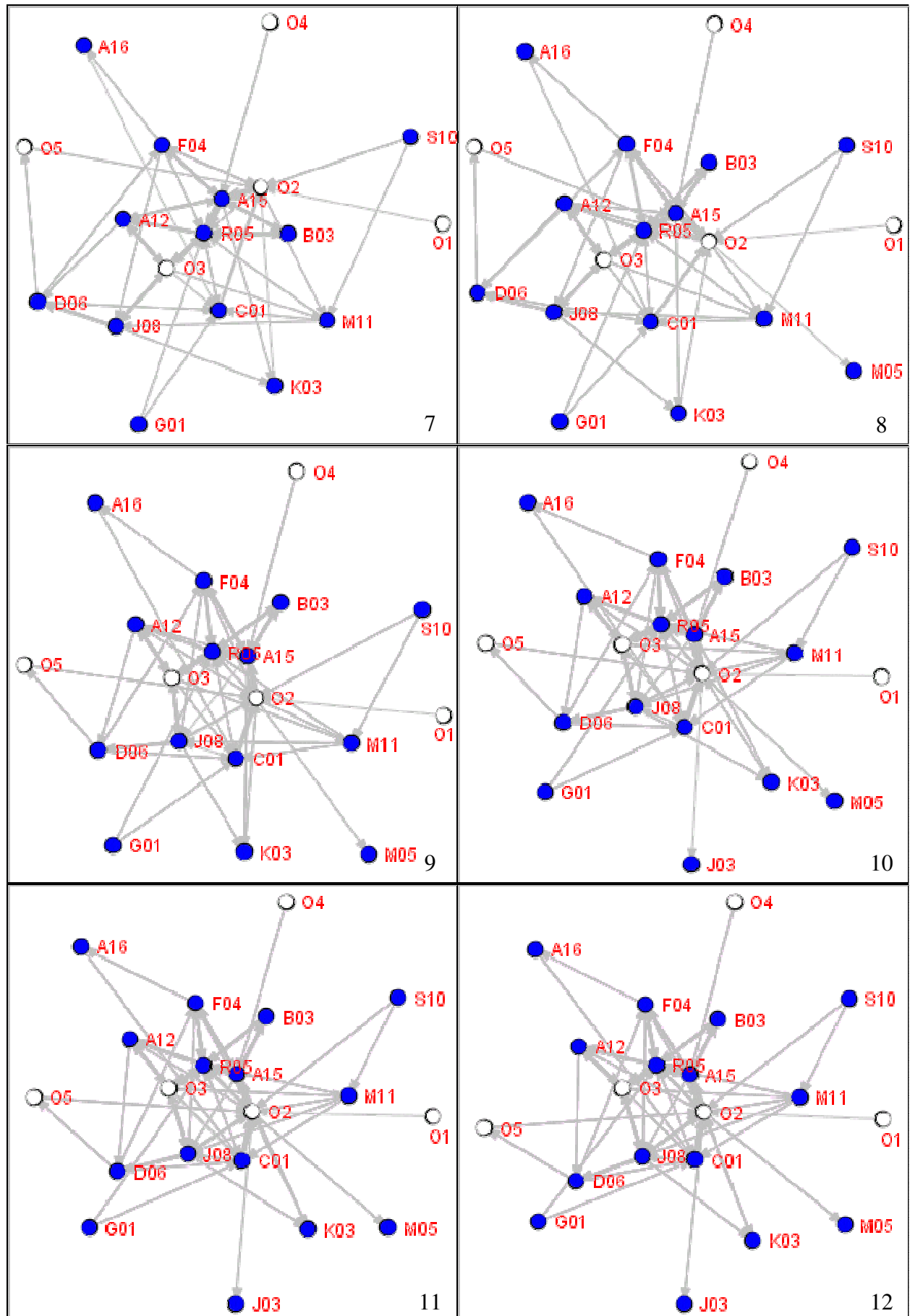


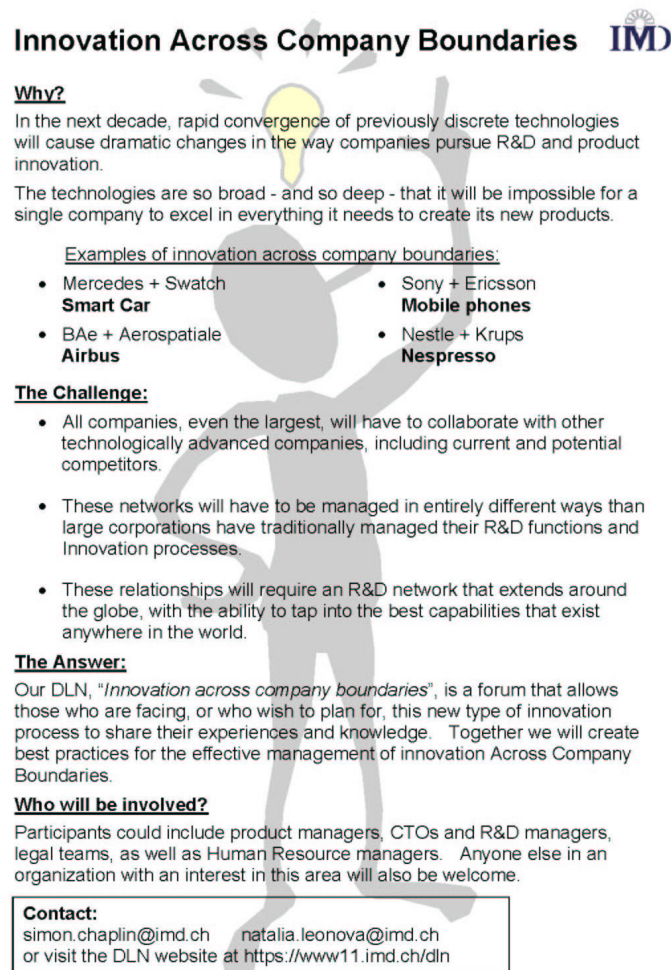
Figure 25: Virtual Teams Network, Time Slices 7-12




6.5 Network Visualization 5: Innovation – Towards a Cluster Network

The Innovation Network was chartered to create and share knowledge about various forms of corporate innovation (Figure 26).

Figure 26: Innovation Network Charter



Innovation Across Company Boundaries 

Why?
In the next decade, rapid convergence of previously discrete technologies will cause dramatic changes in the way companies pursue R&D and product innovation.
The technologies are so broad - and so deep - that it will be impossible for a single company to excel in everything it needs to create its new products.

Examples of innovation across company boundaries:

- Mercedes + Swatch
Smart Car
- B&Ae + Aerospatiale
Airbus
- Sony + Ericsson
Mobile phones
- Nestle + Krups
Nespresso

The Challenge:

- All companies, even the largest, will have to collaborate with other technologically advanced companies, including current and potential competitors.
- These networks will have to be managed in entirely different ways than large corporations have traditionally managed their R&D functions and Innovation processes.
- These relationships will require an R&D network that extends around the globe, with the ability to tap into the best capabilities that exist anywhere in the world.

The Answer:
Our DLN, "Innovation across company boundaries", is a forum that allows those who are facing, or who wish to plan for, this new type of innovation process to share their experiences and knowledge. Together we will create best practices for the effective management of innovation Across Company Boundaries.

Who will be involved?
Participants could include product managers, CTOs and R&D managers, legal teams, as well as Human Resource managers. Anyone else in an organization with an interest in this area will also be welcome.

Contact:
simon.chaplin@imd.ch natalia.leonova@imd.ch
or visit the DLN website at <https://www11.imd.ch/dln>

In terms of network growth and development, the Innovation network was one of the six networks without ties developing in the initial time slice (Figure). However, in time slice 2, what may be the beginning of an isolated network cluster is observed. Organizer O6 and network member A4 are connected to each other but not to the rest of the network. While this pattern persists until time slice 4, it does not develop, and the cluster is integrated with the rest of the network in time slice 6.

By time slice 6, it appears that the often-observed star or hub-and-spoke pattern is taking shape. As observed in other networks, it is the organizers who are forming

the core. This pattern does not persist in the case of the innovation network, but instead, a variation of this pattern can begin to be seen from this point onwards.

In time slice 7, the beginnings of a separate cluster appear to take shape. Two organizers, O1 and O2, are seen at some distance from the core of other organizers, and are developing ties that are not all in common with the core. Over time, a network member, P07, is positioned in the core, while the two organizers O1 and O2 remain bound but not closely integrated with the core. As such, they still represent a possible second cluster that could be encouraged to develop independently of the larger core.

Figure 27: Innovation Network, Time Slices 1-6

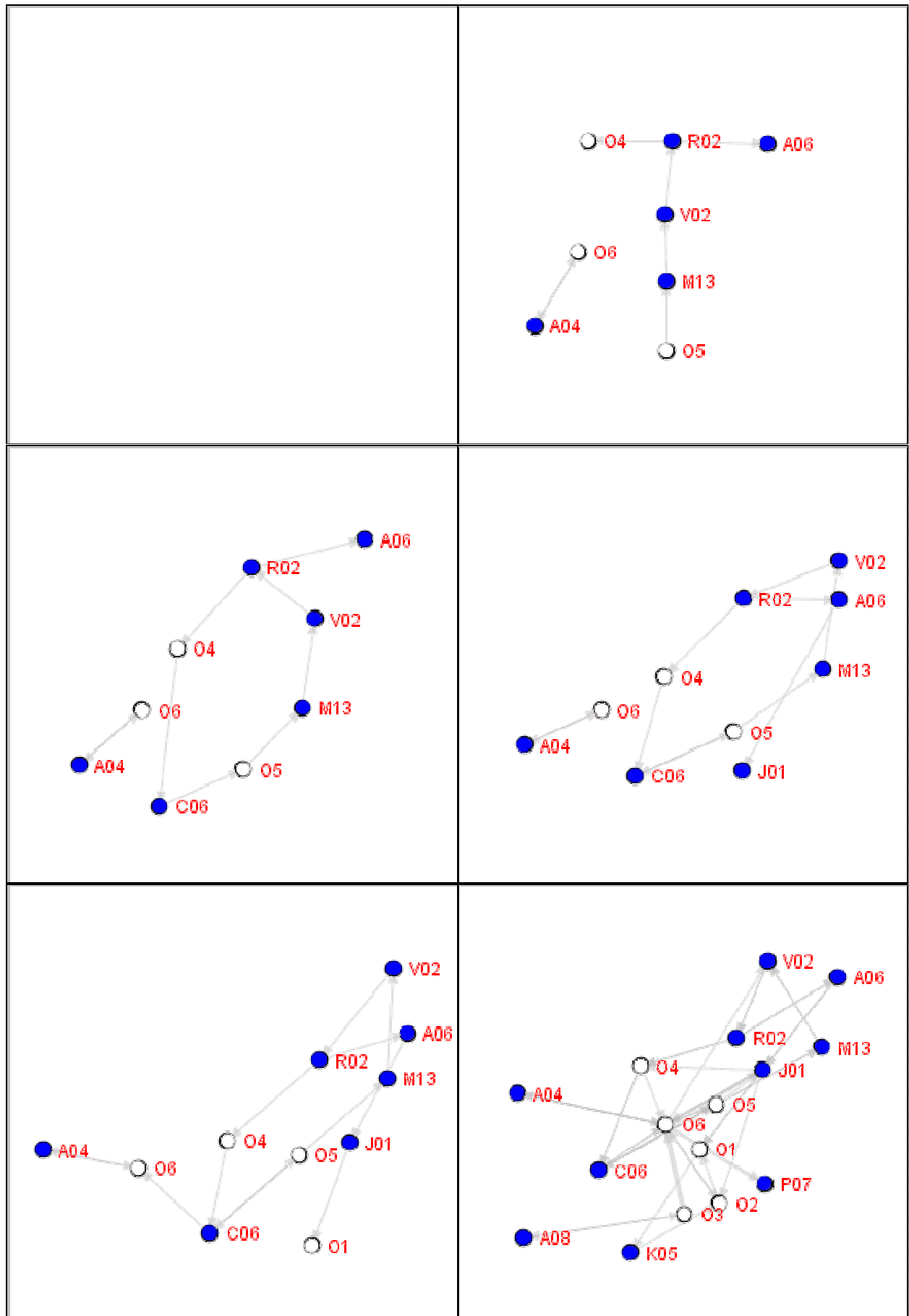
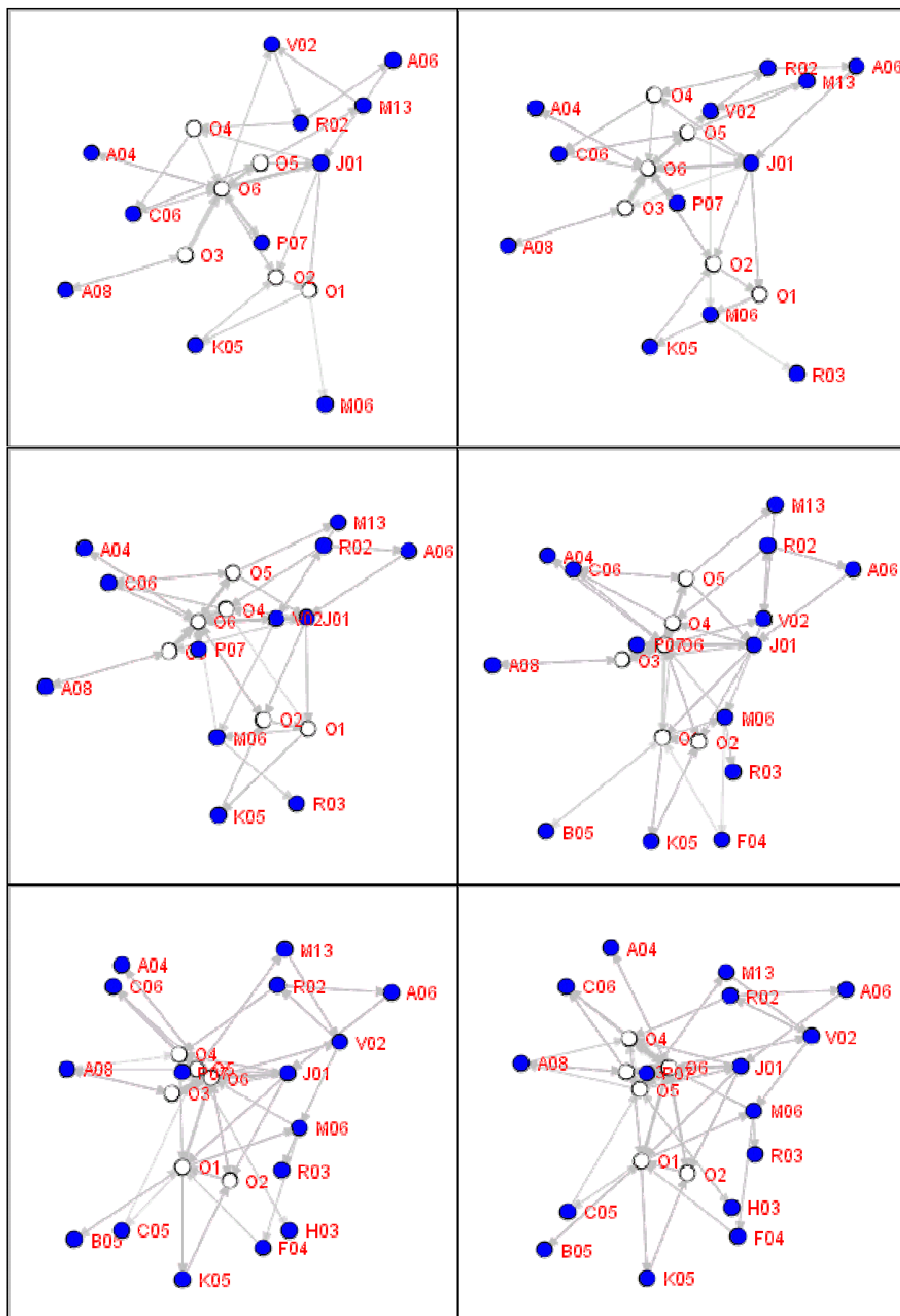


Figure 28: Innovation Network, Time Slices 7-12



7 Discussion of Results

Despite differences in approach, and a wide range of results in terms of membership and activity, a typical dynamic in the network maps emerged. This dynamic was that of an emerging star structure, with a central group of closely-knit participants (usually organizers) dominating the network. In most cases, through their attempts to create interaction, and attempting to spark discussion by interacting amongst themselves, the organizers created this dynamic. These networks are almost always contiguous and well connected to the network organizers, with extremely few isolated subnetworks.

One way to examine this dynamic is to consider it as an issue of discussion origination. Most members appeared to be always responding to organizers and then subsequently to each other, rather than originating discussions themselves. A focus on getting members to spontaneously originate discussions, directed towards other members, rather than on member participation, is a subtle but potentially significant shift in strategy that remains to be explored.

From a structural perspective, separating, engaging others, and then linking the resulting clusters may be a more effective strategy for widespread participation and knowledge sharing, given the overall goals of these networks. In this particular context, such a strategy also remains to be tested.

The star network pattern is appropriate for situations requiring activity to pass through a core group – in which case it is the most efficient structure. For the majority of cases, which involve less control and more freedom of association of ideas and workflow, a range of connected clusters provides the wide span to gather and distribute knowledge (the strength of weak ties). It is in these smaller clusters where the exchange and percolation of ideas can be most productive (e.g. skunkworks) before benefiting from the resources of the larger network.

Therefore, to produce a range of connected clusters, organizers should divide, engage, grow, and connect. Otherwise, the structure will develop to reinforce the looking to leaders or network organizers, a hierarchical perspective. As in the case

of the virtual teams network, not dividing but engaging, growing, and connecting members, will still result in a star pattern.

In considering how connections occur in networks, attachment bias has been noted in network formation, in the scale-free class of networks (Barabasi, 2003). Attachment bias is the attraction of new network members to nodes with an already larger number of relations than randomly probable – in fact, attraction is proportional as relations increase. Thus the ‘rich get richer’ and the result is the formation of hubs and connectors. This “preferential attachment” has also been noted in many different kinds of networks (Barabasi, 2003). The concept of fitness extends this concept further with a fitness score that takes into account attributes of a node.

Preferential attachment and further, fitness, suggest that nodes and links that form follow a bias and not a random form. To construct networks in which enthusiasm for the topic and for communicating with others combines, this bias should be on the basis of topical interest versus structure – a case of the classic rule of form following function. The structure should support such interactions without gravity to the centre. To this end, there must be a clear distinction between members and the discussions and relations in which they engage, from other members and their interactions. Such a distinction does not imply that overlap is neither permitted nor desirable, in terms of members, relations, or topics discussed. It does suggest that such sub-units be clearly visible for new members to attach to according to an attraction toward a part of the network and not necessarily engaged to and from the centre.

7.1 Observed Strategies and Approaches to Network Management

A number of different strategies and approaches were observed along different dimensions. For example, membership was increased in some networks through careful handpicked selection, and via concerted recruitment efforts in others. Online discussions were organized along themes, events (to discuss case studies, for example), or otherwise. The organizers’ approach itself to network

management varied, in some cases being performed as a team, in others, through roles. Yet others rotated roles by date. Selected examples are discussed here to highlight some of these different approaches. A correlation is not sought between these organizing choices and network growth and development, since the relationship is complex and the factors affecting organizing choices often are related to the subject of the network, the organizer's limitations in time and resources, and the membership themselves. There are no simple formulas, however, there are some instructive observations and patterns.

The membership and relationship values rise cumulatively over the course of the twelve time slices. This rise is due to the present methodology's handling of relationship decay. As discussed, decay is the disintegration of relationships over time when the relationship is not renewed. Because of one of the inherent characteristics of online discussion forums, decay is hindered due to persistence - the permanent record of interactions that is available anytime, anywhere. However, availability does not always translate into access, and in addition, some network organizers choose to manipulate their forums in such a way as to discourage repeated access in favour of promoting newer material. For example, archiving discussions into separate areas or managing discussion topics chronologically are two ways in which network organizers encourage decay. The counter benefit of these activities is renewal and renewed vibrancy, providing the opportunity for new discussions and new members to forge relations, and therefore the cost in decay may be weighed against these benefits and found to be outweighed by them.

7.1.1 Network-Specific Observations

The Attracting and Retaining Talent network's forums used a "moderator" (structure) to create hub-and-spoke kind of discussion pattern, for example, in discussing a case study. The moderator posed questions, jumped in to refocus the discussion, and posted summaries, for example. Note that this was apparently an online discussion transcribed into multiple messages in the discussion forum.

The Corporate Philanthropy network's forums had as discussion forum 1 an "off topic" - "Lounge" for discussing anything - sports, leisure pursuits, etc. There were many threads in some forums (e.g. 10 in forum 2), started by many different individuals (e.g. 8 different individuals in forum 2). Like many of the networks, this one uses "rolling" forums - topic forums that are open for a e.g. 1 month period of time, then closed (or ignored) as another forum is opened and promoted for discussion. In the Corporate Philanthropy network there is an overlap period of about a week between forum closing and opening.

The Supply Chain Management network's forums contained many posts by organizers with no responses. This seems to be due to small network membership, perhaps illustrating the effects of not achieving sufficient membership to support relationship-building discussions.

Large networks with very few ties, for instance, the Leadership network, raised other questions. One question is whether such a structure is really a network or a "crowd of strangers". A related question, from the member's point of view, is whether meaningful interaction is possible when faced with a large number of unknown people. It appears from this network's experience that a small number of one-to-one interactions, the personal touch, don't scale sufficiently to make an impact on vital network statistics such as network density. In the Leadership network, network density falls to the ground like an albatross due to crushing weight of network membership. Network membership is relatively massive to start (116 members) and then grows massively, more than doubling over the study time period to 257 members.

The implicit strategy of the Leadership network was to focus on growing membership numbers – but this was not successful in generating participation (even though this network ended up with many more active members and ties than other networks, in absolute terms). Success is relative here to the size of the network. The Leadership network organizers were unable to convert membership

growth success into activity, illustrating that a large membership will not necessarily lead to large-scale participation.

In contrast, the Innovation network reached a stable density in the last three time slices. Growth in members was strong, from 22 to 141 members, but this growth was matched by strong growth in ties, reaching 71, therefore resulting in a stable network density.

7.1.2 Limitations

Several significant limitations faced the network organizers. The technology for managing discussions was unfamiliar to most organizers and required significant effort to customize. The design philosophy of such technology was based on an information portal. The effect of portal elements could be to encourage passivity among the membership.

Another limitation was the parameters of the MBA program within which the organizers were participating. The effect of their participation was to limit their time available to spend on network management, as well as having synchronized schedules with other network organizers. Providing consistent attention to the network over time was therefore difficult.

Different sized networks are appropriate for different outcomes. Large networks are better suited for channeling and distributing information (but risk key nodes gaining privileges), while small networks are better for mutual support and trust, based on reciprocity and reputation (Davies, 2003).

7.2 Hypotheses Revisited: Supported, Not Supported, Inconclusive

We are now in a position to revisit the hypotheses for structures and dynamics within networks that were outlined earlier.

H1. The structures under study will display the structural characteristics of groups according to the patterns of interaction between network members.

Supported. Through the data coding and transformation procedures, online discussion forums were viewed as network structures. The commonly defined network measures of density, stress level, in-degree and out-degree, were able to be calculated and produced meaningful results. Further, network visualization was accomplished within acceptable stress levels.

H2. Roles will emerge according to the structural characteristics of the structure's population.

Partially supported. Emergent roles commonly found in networks were imputed from differences in in-degree and out-degree measures among network members. Such measures did display sufficient variability to be a meaningful basis for imputing some roles to network members. However, information broadcaster and peripheral specialist or sink roles were not observed.

H3. The structures under study will reach critical mass when the network organizer's participation in the network activities as a percent of total participation in the network falls below a certain threshold

Inconclusive. Some networks did display a marked drop in network organizer's dominance, however the effects of such an event were not clearly evident. This hypothesis may hold for larger networks, or may also need to incorporate the additional factors discussed earlier, to reach a tipping point or critical mass.

H4. At early stages, the emergence of certain roles or structures is associated with faster network density growth rates.

Inconclusive. The networks under study all displayed a star topology and network members held similar roles across the different networks. With increased understanding of hub and connector structures, a network growth strategy that

encourages the development of such alternative structures would allow this association to be tested.

H5. The structures will move from an initial random (chaotic) state to a more structured (ordered) state, in a way that is consistent with a power-law distribution of links per node.

Inconclusive. Network density did not rise enough to clearly indicate this phenomenon. In addition, the relatively low levels of activity in the networks were insufficient to provide great variability in the distribution of links per node.

8 Conclusions

This study has brought together elements of social network analysis, virtual communication, theories of social capital and network growth and development. It has provided graphic illustration of networks over time, to complement the statistical analyses of networks performed. Network visualization is a powerful way of gaining insight into network dynamics. Now that such powerful tools have been developed, it is in their application that future challenges lie. Nevertheless, there are also immediately relevant steps that apply to addressing current organizational issues through the network perspective. This emerging field may come to be known as organizational network analysis¹⁵.

8.1 Future Research

Future research into social networks will explore elements of complexity theory as applied to networks. In particular, power law distributions of relations per node can serve as templates for network growth and development (at least for networks of a certain size), thus building on insights of Barabasi (2003). Network characteristics could then be monitored to ensure that a certain number of nodes of sufficient size are being established, thus bringing down the average distance between nodes (beyond increasing density or closure – *where* the links go matters). Network composition as well as structure thus comes into consideration.

Network research methodologies could be applied to different levels of analysis. In this study we considered networks of individuals in different organizations. At the firm level, the explanatory power of network perspective in industry growth and development has been well illustrated – for example, in biotech industry research from a network perspective (Powell, White, Koput, & Owen-Smith, 2002) – and has tremendous explanatory power.

The importance of network size with respect to network dynamics has already been recognized. “Network size matters inasmuch as it aligns individual interests with collective interests” (Davies, 2003). In contrast, relationship performance is

¹⁵ A term used to characterize social network analysis as applied to organizations, often in relation to critical business issues (Cross, 2004).

an area that falls outside the scope of most social network analyses. Research into a standard and reliable indicator of relationship quality would provide some insight into network dynamics and network performance.

Yet to be researched in social network analysis terms is the opposite of decay -- relationships that are strengthened over time. Some pieces of the puzzle have been investigated by Burt, such as how structure affects one type of relation between actors, namely trust (Burt, 2001b). Yet the mechanisms for progression of relationships from weak to strong are little understood beyond general cutoff points. Ties can have magnitudes in current social network analysis methodology, so a dynamic treatment of relationship strength could be taken into account but the structural algorithm for doing so needs to be developed.

Further refinement of virtual interorganizational network analyses is also possible. For example, the difference between closeness and betweenness centrality measures may be relevant for virtual interorganizational networks. Such a difference could correspond to differences in a network organizer's behaviour and strategy. Network organizers could concentrate on building ties to many different network members (betweenness) or concentrating ties with each other or a few network members (closeness).

Also, the depth versus breadth tradeoff – which is better for network growth at a particular point in time, or at what point is it better to switch from promoting one to another – needs to be further researched. Perhaps there is an optimal point, or range on the spectrum, between markets and hierarchies at the extremes. We already know too sparse and too connected networks both have drawbacks. It is the middle ground, in-between, that requires greater understanding, for example, beyond the general rules on density passing 50%, which we have today.

In terms of the present study, an examination of other virtual interorganizational networks could provide the elements needed for a tipping point or critical mass to emerge, thereby producing self-sustaining networks. Whether larger networks in

membership numbers or number of ties, longer timeframes, different organizer strategies, or a combination of factors is needed remains an open question. If we know that in some other networks, density moving beyond 50% produces a cohesive network, a move from sparsity to connectedness, does this apply to virtual interorganizational networks, especially ones built with a “divide, engage, grow, and connect” strategy?

Within this middle ground between markets and hierarchies, there exists the scope to develop and refine real-time information tools to support network growth and development. Such research and development would focus on providing on-line, real-time measures to influence network growth as it happens, for example, in balancing membership growth and ties. Other tools could provide situational diagnoses, early warnings, suggested actions and remedies to network organizers.

In applying social network analysis to virtual networks, pragmatic tests of intelligibility and usefulness should apply. Further research should proceed along these lines.

8.2 Recommendations for Practitioners

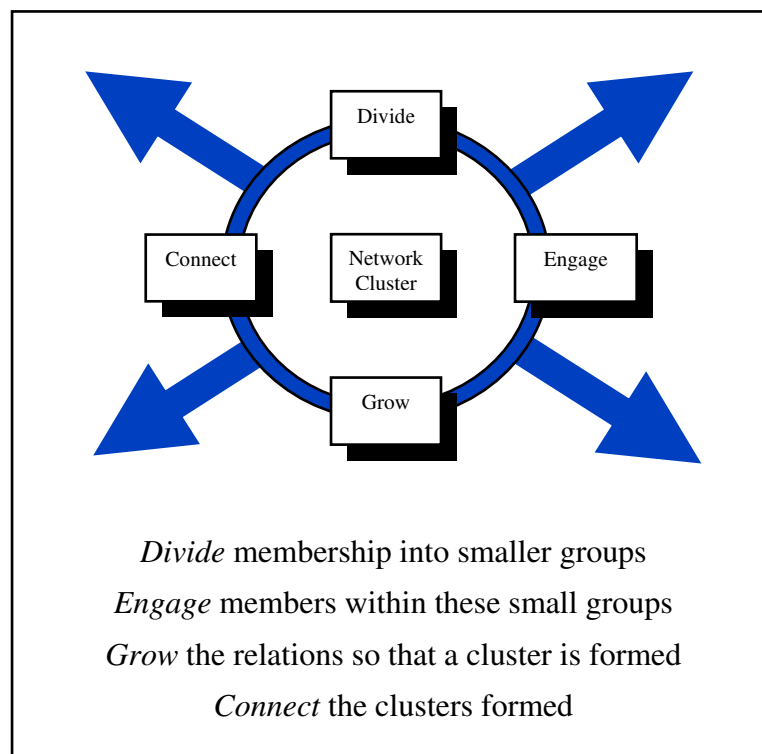
Network principles and management techniques have wide applicability. The issues involved with smoothly running and successful networks are of particular interest to three different audiences. To speak specifically to these audiences, recommendations are provided for network organizers, top management teams and boards, and international network organizations.

8.2.1 Recommendations for Network Organizers

Network organizers or administrators are charged with the ongoing care of a network, perhaps from its very founding. A first recommendation is to match the network’s purpose to an appropriate, desired structure. It has been argued earlier that a distributed structure, one that contains network clusters, will often be appropriate in many situations, to escape over-reliance on a centralized source such as the organizers. To architect such a network, it is recommended to

encourage the development of such a structure from the beginning. Four steps are proposed, as illustrated in the model below (Figure 29).

Figure 29: Four Steps to Encourage Network Cluster Formation



This sequence of steps is designed to replicate the formation of clusters found in many successful networks – ones that balance a significant membership base with meaningful interaction between members. Also, for new members in a growing network, a cluster is a natural entry point to integrate into a network.

Indeed, early network research models assumed that we naturally associate and build relations with others randomly. Later models of high-performing networks reflected the preferences we possess for building some connections over others, depending on the nature of the situation. Therefore, it is suggested that network organizers provide members with the information that they need to make such choices. Such action helps network structures to develop along the lines of these later, more realistic models.

One response on the part of network organizers to this information need is often to produce a directory, or member profiles. Such information, while helpful in listing

the attributes of members, does not address their relationships with others on a variety of levels. Relationships must be inferred by association with historical data, for example, by looking through profiles to see where an individual has worked, or attended educational institutions.

An additional solution is to map the relationships – relationships on relevant dimensions – to help members understand how individuals are involved in a network. Network maps go beyond profiles or ad-hoc meetings between selected individuals, to provide key insight on who's what and where in a network. So it is recommended that network organizers, as part of their stewardship of the network, engage in periodic network mapping. The insights gained from these maps can then be shared with members.

Two different strategies were observed among network organizers in the present study. First, in some cases, the organizers recruited a large number of new members into the networks. This produced a sparse network where most real connections of substance were between the organizers and the members. The result was a classic star pattern, with few interactions between members directly themselves. Second, some organizers chose to focus their efforts on encouraging intense interaction among a small group of members. This produced a saturated network where there was not enough diversity within the network to sustain intense interaction over time.

Therefore, a third strategy is recommended: organizers thus need to carefully balance their attention to growing memberships and relationships. At one extreme, sparse networks lack the commonalities to bring members together around an issue in order to drive it forward. At the other, saturated networks lack diverse input from a variety of members in order to bring a range of ideas and experience to bear. The middle ground allows both commonalities and diversities to flourish.

8.2.2 Recommendations for Top Management Teams and Boards of Directors

Top management teams and boards of directors are often engaged in the stewardship of organizations and are thus concerned with shaping mindsets and agendas rather than filling them with micro-initiatives. For example, many organizations see a need to encourage speed, responsiveness, and flexibility throughout the organization. Ironically, such needs are often fulfilled through one-off apparent panaceas; for example, through information systems implementations or restructuring that shifts workload distributions.

To not only put in place the capability to be fast, responsive, and flexible, but also to exercise this capability, an understanding of relationship structures and dynamics is needed. This additional dimension provides insight into the constraints and possibilities of ways of working, and it is in this area that the network perspective can be of greatest use. First, it can be helpful in surfacing existing networks, and secondly, through the purposeful creation of networks. To achieve their objectives, it is recommended that top management teams and boards consider both.

In terms of existing networks, the individuals in these roles often have limited regular interaction beyond one or two levels below the top team level. Yet these lower levels are important as they represent the future leadership of the organization, in terms of succession planning and talent development. But outside of roles and abilities, it is also critical to ensure that this pipeline has built up the links across the business that will enable them to effectively carry senior management responsibilities.

Secondly, top management teams and boards are well placed to consider the purposeful creation of networks. Attention to network creation and development can aid top management teams and boards with respect to concerns found at this level in many organizations. These concerns are often similar but expressed in different ways. For example, discovering how to leverage the capabilities of the

organization on a global level, while retaining local responsiveness and respecting local sensitivities. A glocal¹⁶ approach can be realized through network initiatives that allow multiple identities to co-exist. Members may retain their geographic or product line affiliations, but also develop or share functional and technical expertise. For a functional or technically organized firm, the opposite can also be the case. With network structures, a trade-off or hierarchical ordering of these dimensions is no longer necessary. Such cross-disciplinary requirements have often resulted in tensions within the organization. Such a network structure differs from matrix organization structures in that reporting lines or performance measurement do not necessarily flow along these lines. Instead, issue-driven or purposeful networks can be constructed to address central concerns of the business.

8.2.3 Recommendations for International Network Organizations

A different set of considerations applies to international network organizations. Organizations such as the Conference Board, World Economic Forum, or various industry associations function as interorganizational networks. Through publications, projects, research and events, members interact with the organizers and with each other. A ‘communities of practice’ approach is sometimes taken from the organizers’ perspective. Network management is seen through this lens. For example, according to the World Economic Forum, their “unique position at the hub of many trends and Forum communities helps ensure [they] anticipate patterns before anyone else”(World Economic Forum, 2004).

The communities of practice perspective can serve as a framework for the animation of these organizations’ networks. However, it can be supplemented with the network perspective to ensure that the structure supports the objectives of the network. To do so, it is recommended that these international network organizations add to the community framework the concepts described in this study. In particular, developing and linking clusters as described earlier (Figure

¹⁶ Glocal is the reconciliation of the conflicting nature of “global” and “local” as described by Hilb (2000).

29), and engaging in periodic network mapping, can assist in the development of these networks.

Furthermore, in monitoring the growth and development of these networks, these international network organizations can adopt the balancing of membership and relationship as a guiding principle. Membership is often a fee-based source of revenue for the network organizers, whether for participation in an event, access to research and publications, or on an annual fee for membership basis. In contrast, relationship building is an expenditure, such as that involved in staging events or in funding research and publications to circulate knowledge among the members and develop thought leadership.

While these organizations often see such activities as essential to their missions, a more explicit consideration of relationship building among the members can be developed. Rather than being the hub and members the spokes of the network, the network organizers' activities can bring about purposeful direct connections between the members. With this in mind, the events and other activities can be organized in such a way as to encourage these connections to form.

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Appendix A Dynamic Learning Network Charters

IMD Dynamic Learning Networks 2002

Alternative Employment Models

Attracting and Retaining Talent

Creativity

Crisis Management

Corporate Philanthropy

Emerging Markets

Family Business

Innovation

Intrapreneurship

IT

Key Account Management

Leadership

Mergers and Acquisitions

Supply Chain Management

Virtual Teams



Alternative Employment Models



Employment is changing! Jobs are becoming scarce! Demographics are changing!

People don't like being tied down anymore. Talent is moving around. People don't necessarily like having a lifeline as they did before. This means that there will be future implications for companies and employees. New employment models have arisen and these employment models are challenging the existing hierarchies of organizations.



The old work place



Alternative employment

What is an alternative employment model?

Do you realise that only 4 out of 10 workers are now on indefinite period contracts....
the contracts that go with a so-called permanent, "proper" job?

What will the implications be for you and your company?

How will you and your organisation manage this?

What will happen in the world of work if this trend continues?

Alternative Employment Models wants to discuss these questions and issues. With a network of highly experienced people, we seek to build on knowledge about current Employment Models, and investigate the implications of Alternative Employment Models.

- We will discuss the spectrum of Employment Models ranging from "Strong Link" (life management) to "Conventional" (9 to 5) to "Weak Link" (outsourcing).
- We will discuss how employees relationships with employers will be affected.
- We will provide real life examples and thought provoking articles.

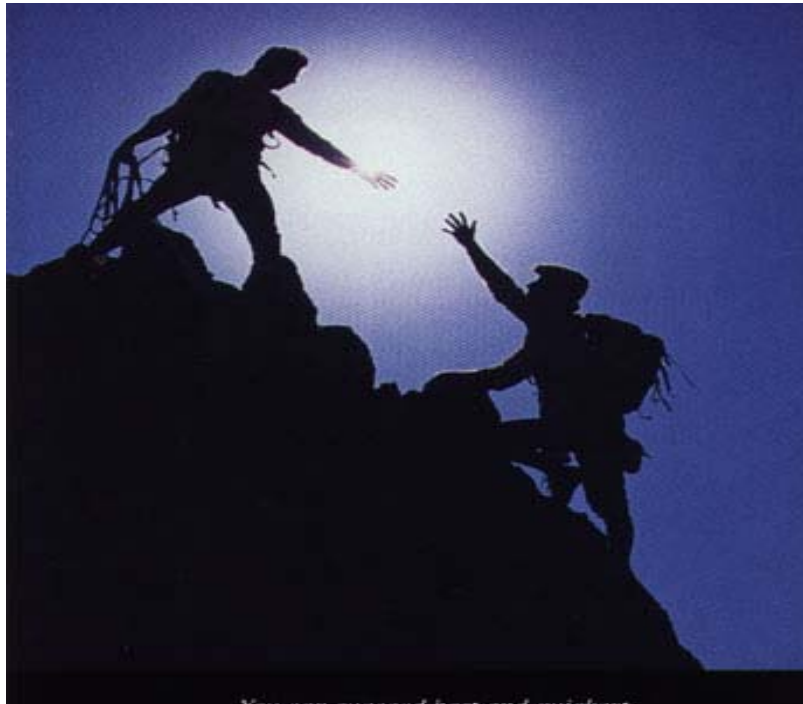
We invite you to join our DLN where together we can explore the future of work, alternative employment models and how you and your company can take advantage of them.

Contact Stefanie.vonJakitsch@imd.ch for more information

or visit our website <https://www11.imd.ch/dln>

Atttracting & Retaining Talent

The “ART” of making your people the best



When it comes to improving your company's profitability, where's the first place you look? Cutting your costs? Growing top-line sales? Optimising overhead costs?

Why not consider looking at your company's biggest asset? Its people.

How much does it cost your company to attract and retain talent? How many people leave after you have already invested resources in them?

ART wants to answer these questions and we can't do it without you. Based on real world experiences and using people working on the job, ART will investigate 5 key areas at the start of the Dynamic Learning Network:

- The ART of presenting a positive and true image of your company to prospective employees.
- The ART of making sure your corporate recruitment is in line with your corporate culture.
- The ART of using the Internet to maximize recruiting and training effectiveness.
- The ART of recruiting and retaining the best using more than just money.
- The ART of developing a good and effective mentoring programme.

People, more than anything, affect the bottom line of a company. Why not help your organisation by making your people the best?

Launching 6th June 2002. Contact peter.yorke@imd.ch for more info or <https://www11.imd.ch/dln>.



Measuring *success* in corporate philanthropy

Time and money are scarce resources. Despite this, companies all over the world continue to invest significant amounts of these into projects serving the greater public good. Corporate philanthropy seems to transcend cultural boundaries and industrial alignments. Philanthropic strategies that balance stakeholder interests with project objectives and results have the power to return value to participants and to truly reshape the world around us.

Through a virtual process of sharing and learning, this Dynamic Learning Network (DLN) will establish a foundation of knowledge for **corporate executives** interested in optimizing the impact of and value returned by corporate citizenship endeavors. A sound philanthropic strategy requires four critical success factors:

OBJECTIVES

Good philanthropy begins when an organization understands the objectives it wants to achieve. Making an impact and benefiting from a philanthropic investment begins with a clear purpose.

STAKEHOLDERS

Understanding the needs of stakeholders is vital in ensuring success. Executives must consider the interests of shareholders, employees, customers, government and the community.

STRATEGY

Effective strategies balance philanthropic objectives with stakeholder interests. Successful implementation requires clear communication of both purpose and stakeholder benefits.

METRICS

Once a strategy is in place, success metrics help to evaluate the efficacy of the strategy both in delivering on the objectives and meeting stakeholder interests.

We want to leverage this DLN to make a difference. To achieve this, we have created a seven-month virtual learning program that will explore the facets of philanthropic strategy and create knowledge to help your company make meaningful contributions to your community while maximizing the return on your investments to your stakeholders. Imagine what we could do, together.



<https://www11.imd.ch/dln>

For more information contact

Seng Wee Chua sengwee.chua@imd.ch

“Creativity is seeing what others see and thinking what no one else has thought”.

Albert Einstein

The spirit of creativity

How can you make creativity part of your company culture?

Have you ever heard about an organization that was transformed by a brilliant idea that came from within the company and thought “Wow – how did they do that? I wish my organization could foster a creative and innovative culture!”

Our Dynamic Learning Network will offer you the opportunity to explore methods and techniques to inject creativity into your workplace. We will provide a forum for sharing ideas on how to build an innovative culture and make creativity seem more like “the rule” instead of the “exception”.

Establishing a creative environment is not a science and is best learned by sharing thoughts, ideas and strategies across industries and then building on them for one's own specific circumstances. Through discussion forums, chat functionality and special events our Dynamic Learning Network will be a unique place to share experiences on the following topics:

- Success stories – examples from other companies that have successfully fostered a creative environment
- Unsuccessful stories – tried something and had it flop? You're not the only one! Share and compare your ideas that died a miserable death
- Creative industries best practices – what know-how do the experts have to share? Experience learnings from advertising, design, new product development, publishing and the film industry. We also have stories from non-traditional but very creative industries like chefs and conductors of orchestras!
- Organizational structure – what types of structures seem to foster creativity better than others?
- Idea generating processes – are some processes more productive to foster creativity? What brainstorming techniques generate the most innovative results?

Our knowledge platform will allow members to trade stories on how to identify, reward and capitalize on creativity within their organization.

And wait – there's more...

We will not be discussing creativity for creativity's sake – but we will explore the challenges of measuring the benefits of creativity and its importance as an indirect cause of sustainable growth.



For more information contact manuela.perraudin@imd.ch or visit our website at <https://www11.imd.ch/dln>



Crisis Management

“Next week there can’t be any crisis. My schedule is already full.”

Henry Kissinger, while secretary of State

“When preparing for crises, it is instructive to recall that Noah started building the ark before it began to rain”

Norman R. Augustine, president of Lockheed Martin Corporation

Can you answer the Questions Below?

Would you know what to do if a crisis hit you?

Have you agreed who does what for each type of crisis in your firm?

Who will be in charge and how will they manage from start to finish?

Have you ever faced a crisis and wished you had peers or experts to consult, test your ideas and get input from?

...

If so, then please read on.....

- **The Crisis Management DLN aims to provide a topical, thought-provoking and useful community for decision makers to turn to when anticipating and/or resolving a crisis.**
 - We have identified a range of crises both present and past that provide insights on what to do.....and perhaps as importantly what not to do
 - We believe that you could benefit by debating with players in similar circumstances on the approaches to take on crises that could affect your organisation
 - Product failures, financial ‘revelations’, publicity scandals, personnel crises
 - Would you find approaches, precedents and examples useful to contingency plan a crisis?
 - If so the target audience is you; key decision makers who may be subject (stakeholder or spectator) to a management crisis.
- **At the DLN on Crisis Management, you can post your questions or share your experience. You will hear from others, get expert advice and discuss learnings on how to deal with or prepare your company for crises.**
- **Play a role in developing new points of view and approaches, drawing on the views and outlooks of the IMD Crisis Management community**
 - Crisis case presentations with ‘live’ experts to provide new points of view on a weekly basis
 - Online discussions, private chats and summaries of relevant publications
 - Access to archives on case studies and approaches taken
- **If you’d like to find out more, learn or contribute your experience please drop a mail to jason.forbes@imd.ch or inez.colyn@imd.ch or check our website <https://www11.imd.ch/dln>**



How to Succeed in Emerging Markets



Do you have business interests in Emerging Markets?

Are you a Country or Regional Manager seeking knowledge in this area?

Would you value networking with managers facing similar challenges?

Do you believe in virtual knowledge building?

If so, then this is the DLN for you!

Why Emerging Markets?

- The world is becoming increasingly competitive and interest is shifting towards EMs as a source of growth and profitability for businesses; *however*,
- EMs, by their very nature tend to be volatile and constantly changing which brings about a different set of complications and challenges; *therefore*
- The ability to keep abreast of events and happenings in EMs will be a source of competitive advantage for businesses operating in these countries.

The Challenge

Managers must understand the EM environment well enough to deal with the different challenges they face. Crucial aspects of a manager's role in doing business in these markets include:

- a network of relevant contacts,
- the ability to think and act local, and
- the ability to remain flexible in the face of constant and unanticipated events.

Operating in EMs seems highly risky and plagued with uncertainty, but getting it right will yield tremendous benefits!

The Solution

Why wait? What better way to discuss your questions and your concerns than by joining this forum where:

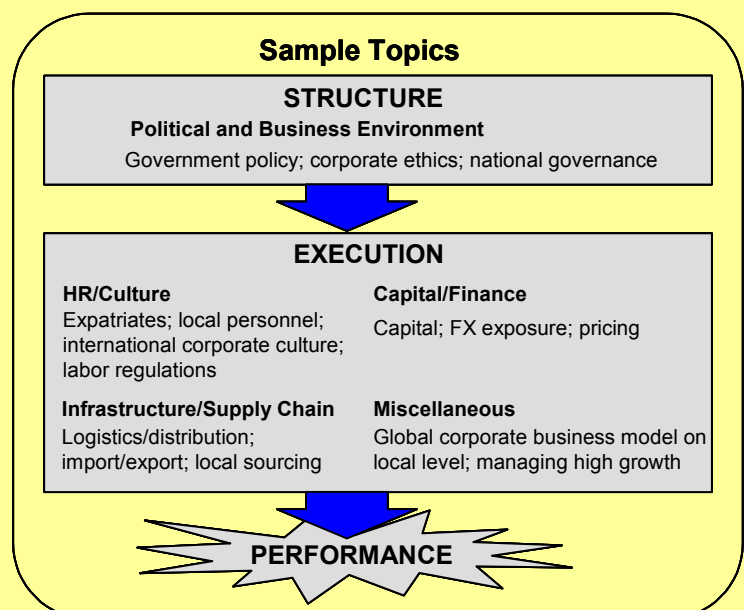
- direct and unbiased information and knowledge will be exchanged and openly debated;
- sudden unanticipated events can be discussed real time for better understanding and deeper insights...

both of which are advantageous for better decision-making.

Contact: Deborah.Wang@imd.ch
<https://www11.imd.ch/dln>

Emerging Markets DLN:

A platform where managers can exchange and develop solutions for succeeding in EMs.



- ***How do you tell a family member that his performance is unacceptable and you need to fire him?***
- ***How can you run the business in your way when your father's idea of retirement is sitting at home giving you "unsolicited" advice all day?***
- ***How do you decide which of your children is best suited to be your successor?***
- ***How do you successfully hand over a family business to the next generation?***

If you are interested in the answers to these questions, then this Dynamic Learning Network [DLN] is the right thing for you!!!

WHAT IS A DLN?

The IMD DLN project is an exciting new initiative that combines leading edge learning, knowledge creation and virtual collaboration to the benefit of its partners worldwide. In this project, networks of people from firms & families around the World will collaborate virtually to create knowledge about a topic of importance and interest.

The Family Business DLN will be coordinated through a home portal, using a combination of online features such as discussion forums, chats, net meetings, guest speakers, book reviews, etc.

WHY FAMILY BUSINESSES?

- 47% of Fortune 500 and 90% of all businesses worldwide are family owned businesses!
- Due to the involvement of family members, family businesses have interesting opportunities to create competitive advantage but also face specific problems that need to be dealt with. Successful transition of a family business from one generation to the next is probably the single biggest challenge family businesses face today.
- Currently, no global platform exists where family members can exchange their ideas and personal experiences on these common issues with people who can relate to them.

WHY SHOULD YOU JOIN?

- Our online DLN community will provide a platform for you to draw upon the knowledge of family members worldwide, including IMD's business network.

Just think about it! You are struggling with a problem in India and through the DLN can meet a colleague who has successfully dealt with a similar issue in Brazil. Why re-invent the wheel when you can learn from others now?

**DLN's will be tomorrow's way of communicating and sharing knowledge.
Get a head start. Join us now!**

**To join or for more information, email us today: MBADLN-FamilyBusiness@imd.ch
Or visit our website: <https://www11.imd.ch/dln>**

Innovation Across Company Boundaries



Why?

In the next decade, rapid convergence of previously discrete technologies will cause dramatic changes in the way companies pursue R&D and product innovation.

The technologies are so broad - and so deep - that it will be impossible for a single company to excel in everything it needs to create its new products.

Examples of innovation across company boundaries:

- | | |
|---|---|
| • Mercedes + Swatch
Smart Car | • Sony + Ericsson
Mobile phones |
| • BAe + Aerospatale
Airbus | • Nestle + Krups
Nespresso |

The Challenge:

- All companies, even the largest, will have to collaborate with other technologically advanced companies, including current and potential competitors.
- These networks will have to be managed in entirely different ways than large corporations have traditionally managed their R&D functions and Innovation processes.
- These relationships will require an R&D network that extends around the globe, with the ability to tap into the best capabilities that exist anywhere in the world.

The Answer:

Our DLN, "*Innovation across company boundaries*", is a forum that allows those who are facing, or who wish to plan for, this new type of innovation process to share their experiences and knowledge. Together we will create best practices for the effective management of innovation Across Company Boundaries.

Who will be involved?

Participants could include product managers, CTOs and R&D managers, legal teams, as well as Human Resource managers. Anyone else in an organization with an interest in this area will also be welcome.

Contact:

simon.chaplin@imd.ch natalia.leonova@imd.ch
or visit the DLN website at <https://www11.imd.ch/dln>

How can large corporations become intrapreneurial?

Despite increased competition and a faster changing environment, many large corporations continue to suffer from inhibitors that block entrepreneurial initiatives. Bureaucracy and procedures can stifle initiatives. So too can the hidden barriers like (financial) yardsticks that measure success on the same basis as for existing business. We strongly believe that companies miss out on opportunities if they do not benefit from the entrepreneurial drive that exists within and outside the company boundaries.

Are there no theories or proven concepts?

We have found many generic theories on how to deal with Intrapreneurship. Few give specific recommendations or solutions. One of the general rules is that radically new initiatives need to be kept apart from the existing business to blossom, but to what extent and why? Is a different location enough, should an outsider head the operations, who funds the business and many other questions remain unanswered. Little is known about the real key success factors. Successful initiatives differ widely in their choice of organization, processes and relationship to the parent company.

The lack of proven concepts has resulted in low success rates of new initiatives. Few concepts get fully developed and reach the market. If launched, often they are not successful because of the barriers put up by the 'old' business. Ultimately, if the new businesses are successful, re-integrating them with the traditional business poses new challenges. The lack of proven concepts is exacerbated by the fact that the whole process of development of new businesses takes a number of years. The opportunities for any company to experiment and to learn from the experiments are therefore limited.

Are these the issues you are facing?

In your company, you may be facing similar issues about how to make the best out of new, high potential but quite unrelated business opportunities. Do you also find textbook solutions insufficient and would you like to get a fresh perspective on matters and learn from other experiences? Would you like to discuss those matters with someone from outside your company, a peer or a thought leader in this field?

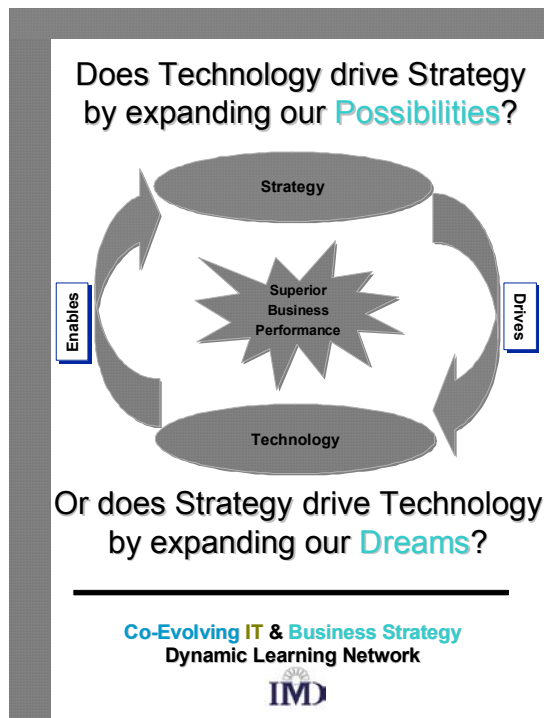
Come learn from others and us

Our Dynamic Learning Network on Intrapreneurship does just that. When you join, it will bring you in touch with knowledgeable people from the IMD network companies; people in large companies responsible for entrepreneurship or new growth opportunities but also spin-off entrepreneurs who have been through the process. In addition we will involve some of the IMD faculty who have done extensive research in this field, combining practice and theory. We have created a network and a platform to discuss the topic so you can exchange thoughts, share problems and test your ideas. The DLN team will document and synthesize the core lessons so you can review them later.

All you have to do is share YOUR THOUGHTS on the topics that are being discussed and be ready for constructive debate

To join or to learn more about Intrapreneurship, email us: mbadln-intrapreneurship@imd.ch
Or visit our website <https://www11.imd.ch/dln>

Co-Evolving IT & Business Strategy



How many business leaders have actually figured out how to link IT and business strategies to create value for their organizations on an ongoing basis? Our objective in launching this Dynamic Learning Network (“DLN”) is to provide business executives with a non-threatening, non-political arena where they can reflect upon topics related to the issue of how best to leverage IT, information residing within organizations, and people to achieve superior business performance. Through lively exchanges of ideas on several of today’s hottest business-IT issues, IT and business managers who join our DLN will create a new body of knowledge that they will be able to use to create tangible value for their organizations.

In our quest to enable the creation of new knowledge, we must first take note of the current status of our knowledge, the origin from which we embark upon this creative journey. ***What do we presently know?***

- ❑ IT-business projects, such as SCM, ERP, and CRM initiatives, often produce results that are, at best, mixed
- ❑ IT strategic plans are often only loosely connected to business goals and, consequently, do not bring any significant value to organizations
- ❑ IT-business initiatives often fail from a lack of sufficient levels of organizational support and project ownership, particularly from the business side
- ❑ For many business leaders, IT represents little more than a frustrating cost center

Why is what we are doing with this DLN so important? We believe that much of the difficulty the business community has had integrating IT initiatives with business strategy has been due to the simple fact that IT and business leaders are too often either unwilling or unable to communicate and share a common *business* vision with one another. Our DLN will provide a unique forum for IT and business managers from a broad array of industries to engage in candid, head-to-head discussions of business issues for which there are presently no simple answers—an important first step that all too often does not occur within organizations—and to conceive concrete, high value solutions for those issues. Most of our DLN members, we hope, will participate in the DLN along with an IT or business counterpart from their own organization. As our community members together develop new knowledge and become more effective agents of change and progress within their respective organizations, we are confident that this DLN will come to be viewed as an invaluable resource in the pursuit of superior business performance.

Co-Evolving IT & Business Strategy
Contact: Omar R. Allam – omar.allam@imd.ch

<https://www11.imd.ch/dln>

KEY ACCOUNT MANAGEMENT

Is your Key Account Management as effective as it could be?

The trends of globalisation, consolidation and de-layering of industries have increased the need for Key Account Management.

What we think are the issues?

Sharing Knowledge across Industries

- What is the added value of a KAM scheme in your company?
- How does each industry define Key Accounts?
- Is there a model for effective Key Account Management?

Extracting the Most from Key Accounts

- Too many or not enough Key Accounts?
- How do you find hidden opportunities that exist in key accounts

Managing Organizational and Cultural Issues

- How do Global Account Teams work effectively with Country and Regional Teams?
- Are Key Account Managers made or born?
- How do you reward Key Account Managers?

Key Account Management should interest many companies since more and more profit is anticipated to come from Key Accounts. This DLN intends to create knowledge that can not be found in any websites, books, or journals.



Nathalie Vaque
•10 yrs. experience in supply chain mgmt & purchasing in the luxury goods industry



James Henderson
•responsible for various account relationships in Formula 1 inc. Petronas, Red Bull, Bridgestone, Kenwood & MTV.



Edvinas Katilius
•7 yrs. FMCG experience inc. National Sales manager for Philip Morris and country manager for Pepsi Co.



Rob Price
•7 yrs. FMCG experience inc. National Sales manager for Bass Brewers



Alan Triggs
•6 yrs. experience working with Account teams in a global telecom environment.



Edward Gallagher
•worked with key account managers to develop client penetration strategies in global energy sector



Website address:<https://www11.imd.ch/dln>
please contact: nathalie.vaque@imd.ch;
robert.price@imd.ch



Emerging Leaders: Exercising Leadership in a Complex Organization

What are the questions that emerging leaders ask themselves?

- ❖ How do I manage often competing and conflicting demands?
- ❖ Should I lead or create an environment where leadership flourishes?
- ❖ How can I best transition from a functional to general manager?
- ❖ How do I manage upwards effectively?
- ❖ How do I balance professional and personal demands?
- ❖ What are the ways to lead diverse teams to success?

So what do these questions mean?

As current middle managers, we have struggled with the complexities of balancing different, often competing, priorities and finding ways in which to escape the “caught in the middle” syndrome. We believe that others within the business community also share this dilemma and are eager to gain insights, share experiences, and support knowledge creation on this topic.

Additionally, emerging leaders typically lack an external platform in which they have opportunities to learn, exchange experiences, and be honest about development challenges.

If this is the case, what now?

We would like to enable high-potential middle managers to develop new models to address some of these challenges. In launching the Leadership DLN, we will provide a stimulating environment that allows for:

- ❖ Interactive discussion based upon sharing of personal experiences
- ❖ Peer coaching across company and industry boundaries
- ❖ Personal development and reflection
- ❖ Platform for new learning
- ❖ Leveraging of IMD’s Leadership faculty to bring further insights and recognized expertise

The Leadership DLN is directed toward this mission: constructing an engaging and thought-provoking space for emerging leaders, enhancing each others’ learning and shaping future experiences. Help us to make it happen!

For more information, please contact us or visit our website: <https://www11.imd.ch/dln>



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The M&A Battlefield: Clash of Cultures and Personalities

"The typical M&A deal never realizes its intended financial and strategic impact. The failure is often due to the 'people' side of the deal, and it occurs as the result of the change dynamics created by the merger"

Tim Galpin & Mark Herndon,
The Complete Guide to Mergers & Acquisitions

"People problems and the way communication to people is managed represent the top failure factors"

Study of Fortune 500 CFO's
Towers Perrin, Consultancy

Is your business unit engaged in M&A activities?

How do you assess the attractiveness of a deal beyond strategy and cash flow?

How do you avoid miscalculations on the soft issues?

What would you like to know from peers and thought leaders in the M&A field?

Find out what you are letting yourself in for.....

- ✓ **The DLN M&A community brings together experiences from leading practitioners and thought leaders on cultural and people aspects of M&A deals.**
- ✓ **The DLN M&A community will develop innovative approaches to:**
 - Putting together winning management teams and retaining key employees
 - Merging remuneration systems
 - Managing internal and external communication
 - Managing relations with customers, business partners and investors
 - Developing integration performance measures
- ✓ **With the combined expertise from partner companies you will be at the forefront of knowledge creation by using:**
 - Polls to determine relevant topics for the audience
 - Case preparations with "live" experts, summaries and links to relevant information on a bi-weekly basis
 - Online discussions, chat, e-mail notification, video download
 - Access to archives on case studies and literature
- ✓ **The DLN on M&A will be an opportunity to raise questions, test ideas, share experiences, challenge and be challenged. You will hear from others and discuss learnings in order to improve the success rate of your M&A activities.**

For more information, or to contribute your experience, please send an e-mail to Jan.Nagy@imd.ch or Katrin.Siebenburger@imd.ch

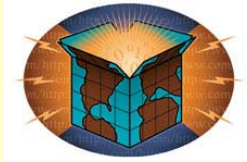
Please also see our website at <https://www11imd.ch/dln>

4/26/2002

Knut Karlsen, Jan Nagy, Virginia Porter
Katrin Siebenbürger, Richard Singh, Bart Vanhaeren



Dynamic Learning Network



Supply Chain Management

Value Proposition

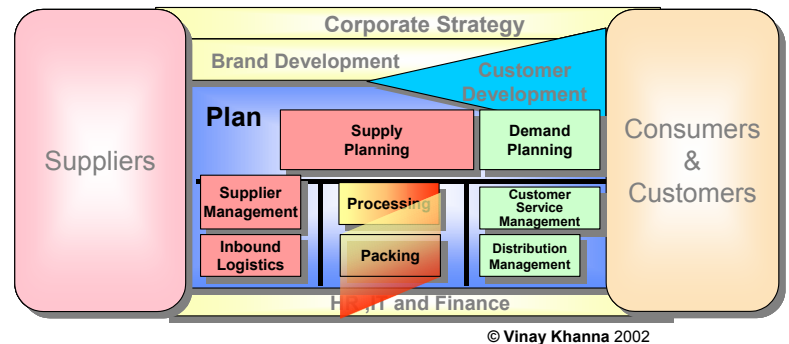
- **Share experiences** with other members of IMD's Learning Network:
A great opportunity to collaborate with other great companies on current Supply Chain Management challenges
- **Building long term relationships** with other leading companies:
This is a network that goes beyond short term relationships - meet your next customer or next supplier in the Supply Chain Management DLN
- **Learn how to collaborate virtually:**
This is a fantastic opportunity to learn how to collaborate virtually with your colleagues and/or partners around the world.

This is for you.....

- *If you have a decision making role in Supply Chain Management*
- *If you are willing to share and learn and deliver tangible and intangible benefits to your business.*
- *If you want to participate in this unique platform where you can interact with other leading industries and cross-pollinate creative ideas and thus create knowledge.*

DLN starts on 6th June 2002

Supply Chain Model



Benefits and enablers of world-class Supply Management

Benefits					
Approach	% Saving in purchase	Work in process turns	Product Cycle	Incoming inspection	Contracts
Traditional	0	4-8	5 years	100%	25 pages+
World Class	15 to 35	50+	3 years	0	2-3 pages

Ref: McKinsey Quarterly 1993 No.3 pp.63-68

*We would be happy to hear from you.
Please contact us.*

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The IMD Supply Chain Management DLN Team



Vinay Khanna

9 years in manufacturing and Supply Chain Management in FMCG and Chemical Industries.



Edoardo Tocco

8 years in general management, sales and manufacturing in Asia



Sakari Pihlava

7 years in software business, including subcontractor management



Karin Dahlstroem

7 years in business development and strategy, including B2B and emarketplace strategy



Wolfgang Bremer

6 years in international trade and supply chain management in Asia

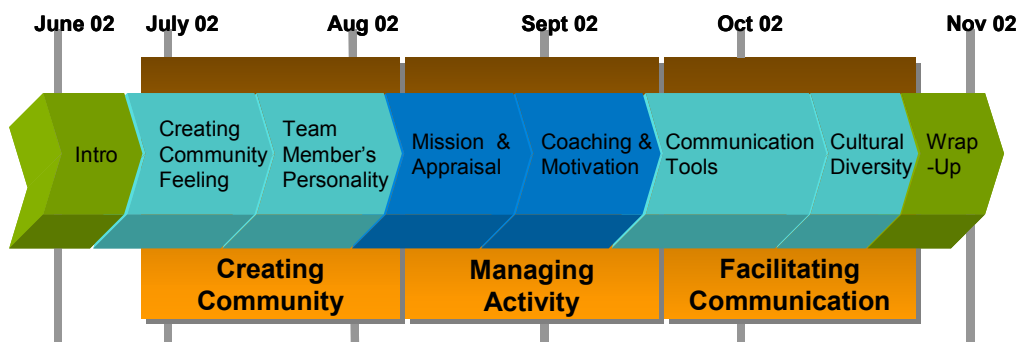


Have you ever worked in a Virtual Team... that worked?

67% of leading European executives have confirmed that virtual teams are still delivering mixed performance. To remain competitive, companies must consider Virtual Teams strategically. Our Dynamic Learning Network is dedicated to creating new knowledge and best-practices for virtual team management

- ✓ **How to assemble a remote team?**
- ✓ **How to manage a remote team?**
- ✓ **What tools are available for remote team management?**

Gear-up Your Virtual Teams In 3 Steps



Further information: amir.alon@imd.ch

<https://www11.imd.ch/dln>

Appendix B Network Statistics - Summary

**Alternative Employment Models (AEM) Network
Summary Statistics**

	1	2	3	4	5	6	7	8	9	10	11	12
Period	6	33	37	37	41	51	55	56	63	66	68	68
Total indegree	6	33	37	37	41	51	55	56	63	66	68	68
Total outdegree												
Members indegree	6	19	22	22	22	26	27	27	28	28	28	28
Members outdegree	3	17	18	18	22	25	28	28	29	29	29	29
Organizers indegree	0	14	15	15	19	25	28	29	35	38	40	40
Organizers outdegree	3	16	19	19	19	26	27	28	34	37	39	39
Members % of total in	100%	58%	59%	59%	54%	51%	49%	48%	44%	42%	41%	41%
Members % of total out	50%	52%	49%	49%	54%	49%	51%	50%	46%	44%	43%	43%
Members % of ties	75%	55%	54%	54%	54%	50%	50%	49%	45%	43%	42%	42%
active population	5	11	11	11	11	12	12	12	13	13	13	13
members	23	32	37	37	37	48	48	49	49	55	56	57
network population	29	38	43	43	43	54	54	55	55	61	62	63
organizer only ties	0	5	6	6	6	9	9	10	15	18	20	20
member only ties	3	8	9	9	9	9	9	9	9	9	9	9
mixed ties org out	3	11	13	13	13	17	18	18	19	19	19	19
mixed ties mem out	0	9	9	9	13	16	19	19	20	20	20	20
network ties	6	33	37	37	41	51	55	56	63	66	68	68
density	0.7%	2.3%	2.0%	2.0%	2.3%	1.8%	1.9%	1.9%	2.1%	1.8%	1.8%	1.7%
active population density	30%	30%	34%	34%	37%	39%	42%	42%	40%	42%	44%	44%
active member density	24%	25%	28%	28%	32%	32%	35%	35%	31%	31%	31%	31%
active member-organizer density	12%	15%	16%	16%	20%	19%	21%	21%	19%	19%	19%	19%
ties per node	0.2	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.1	1.1	1.1	1.1
ties per active node	1.2	3.0	3.4	3.4	3.7	4.3	4.6	4.7	4.8	5.1	5.2	5.2
member ties per active node	1.2	2.5	2.8	2.8	3.2	3.5	3.8	3.8	3.7	3.7	3.7	3.7
member-organizer ties per active node	0.6	1.5	1.6	1.6	2.0	2.1	2.3	2.3	2.2	2.2	2.2	2.2
Average Daily Growth Rates												
active population	10.9%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%
members	3.6%	1.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.1%	0.0%	0.9%	0.1%	0.1%
network population	2.8%	0.8%	0.0%	0.0%	0.0%	1.6%	0.0%	0.1%	0.0%	0.8%	0.1%	0.1%
organizer only ties	-	1.3%	0.0%	0.0%	0.0%	3.1%	0.0%	0.8%	3.6%	1.5%	0.7%	0.0%
member only ties	15.2%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	24.2%	1.1%	0.0%	0.0%	0.0%	1.9%	0.5%	0.0%	0.4%	0.0%	0.0%	0.0%
mixed ties mem out	-	0.0%	0.0%	0.0%	3.4%	1.4%	1.4%	0.0%	0.4%	0.0%	0.0%	0.0%
network ties	40.9%	0.8%	0.0%	0.0%	0.8%	1.5%	0.6%	0.1%	0.9%	0.4%	0.2%	0.0%
density	19.8%	-0.8%	0.0%	0.0%	0.8%	-1.3%	0.6%	-0.1%	0.9%	-1.2%	0.0%	-0.2%
active population density	0.0%	0.8%	0.0%	0.0%	0.8%	0.2%	0.6%	0.1%	-0.3%	0.4%	0.2%	0.0%
active member density	0.6%	0.7%	0.0%	0.0%	1.0%	0.0%	0.7%	0.0%	-0.8%	0.0%	0.0%	0.0%
active member-organizer density	2.6%	0.4%	0.0%	0.0%	1.7%	-0.3%	0.9%	0.0%	-0.9%	0.0%	0.0%	0.0%
ties per node	29.1%	-0.1%	0.0%	0.0%	0.8%	-0.1%	0.6%	0.0%	0.9%	-0.4%	0.1%	-0.1%
ties per active node	13.6%	0.8%	0.0%	0.0%	0.8%	0.9%	0.6%	0.1%	0.3%	0.4%	0.2%	0.0%
member ties per active node	10.2%	0.7%	0.0%	0.0%	1.0%	0.6%	0.7%	0.0%	-0.3%	0.0%	0.0%	0.0%
member-organizer ties per active node	14.3%	0.4%	0.0%	0.0%	1.7%	0.3%	0.9%	0.0%	-0.3%	0.0%	0.0%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

Including Launch (Period 2 rates) Excluding Launch (Period 2 rates)

	Low	High	Average	Low	High	Average
--	-----	------	---------	-----	------	---------

active population	0.0%	10.9%	1.1%	0.0%	0.6%	0.1%
members	0.0%	3.6%	0.7%	0.0%	1.9%	0.4%
network population	0.0%	2.8%	0.6%	0.0%	1.6%	0.4%

organizer only ties	0.0%	3.6%	1.1%	0.0%	3.6%	1.1%
member only ties	0.0%	15.2%	1.4%	0.0%	0.8%	0.1%
mixed ties org out	0.0%	24.2%	2.6%	0.0%	1.9%	0.4%
mixed ties mem out	0.0%	3.4%	0.7%	0.0%	3.4%	0.7%
network ties	0.0%	40.9%	4.2%	0.0%	1.5%	0.5%

density	-1.3%	19.8%	1.7%	-1.3%	0.9%	-0.1%
active population density	-0.3%	0.8%	0.3%	-0.3%	0.8%	0.3%
active member density	-0.8%	1.0%	0.2%	-0.8%	1.0%	0.2%
active member-organizer density	-0.9%	2.6%	0.4%	-0.9%	1.7%	0.2%

ties per node	-0.4%	29.1%	2.8%	-0.4%	0.9%	0.2%
ties per active node	0.0%	13.6%	1.6%	0.0%	0.9%	0.4%
member ties per active node	-0.3%	10.2%	1.2%	-0.3%	1.0%	0.3%
member-organizer ties per active node	-0.3%	14.3%	1.6%	-0.3%	1.7%	0.3%

**Attracting and Retaining Talent (ART) Network
Summary Statistics**

	1	2	3	4	5	6	7	8	9	10	11	12
Period	1	30	37	57	77	77	77	77	80	82	85	86
Total indegree	1	30	37	57	77	77	77	77	80	82	85	86
Total outdegree	1	30	37	57	77	77	77	77	80	82	85	86
Members indegree	1	8	13	15	15	18	18	18	18	19	19	19
Members outdegree	0	9	12	15	15	18	18	18	18	19	19	19
Organizers indegree	0	22	24	42	42	59	59	59	62	63	66	67
Organizers outdegree	1	21	25	42	42	59	59	59	62	63	66	67
Members % of total in	100%	27%	35%	26%	26%	23%	23%	23%	23%	23%	22%	22%
Members % of total out	0%	30%	32%	26%	26%	23%	23%	23%	23%	23%	22%	22%
Members % of ties	50%	28%	34%	26%	26%	23%	23%	23%	23%	23%	22%	22%
active population	2	9	13	14	14	16	16	16	16	17	17	17
members	16	42	59	60	72	72	79	79	79	103	103	103
network population	22	48	65	66	78	78	85	85	85	109	109	109
organizer only ties	0	13	13	28	28	43	43	43	46	46	49	50
member only ties	0	0	1	1	1	2	2	2	2	2	2	2
mixed ties org out	1	8	12	14	14	16	16	16	16	17	17	17
mixed ties mem out	0	9	11	14	14	16	16	16	16	17	17	17
network ties	1	30	37	57	77	77	77	77	80	82	85	86
density	0.2%	1.3%	0.9%	1.3%	0.9%	1.3%	1.1%	1.1%	1.1%	0.7%	0.7%	0.7%
active population density	50%	42%	24%	31%	31%	32%	32%	32%	33%	30%	31%	32%
active member density	14%	24%	15%	16%	16%	14%	14%	14%	14%	13%	13%	13%
active member-organizer density	0%	13%	8%	8%	8%	8%	8%	8%	8%	7%	7%	7%
ties per node	0.0	0.6	0.6	0.9	0.7	1.0	0.9	0.9	0.9	0.8	0.8	0.8
ties per active node	0.5	3.3	2.8	4.1	4.1	4.8	4.8	4.8	5.0	4.8	5.0	5.1
member ties per active node	0.5	1.9	1.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
member-organizer ties per active node	-	1.0	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Average Daily Growth Rates												
active population	31.8%	2.8%	0.5%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%
members	14.8%	2.5%	0.1%	1.5%	0.0%	0.7%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%
network population	10.7%	2.2%	0.1%	1.4%	0.0%	0.7%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%
organizer only ties	-	0.0%	8.2%	0.0%	0.0%	3.3%	0.0%	0.0%	0.5%	0.0%	0.4%	0.1%
member only ties	-	-	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	63.6%	3.1%	1.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%
mixed ties mem out	-	1.4%	1.9%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%
network ties	264%	1.5%	3.9%	0.0%	2.2%	0.0%	0.0%	0.0%	0.3%	0.2%	0.2%	0.1%
density	46.8%	-2.1%	3.5%	-2.2%	2.2%	-1.2%	0.0%	0.0%	0.3%	-2.9%	0.2%	0.1%
active population density	-1.5%	-2.7%	2.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.3%	-0.7%	0.2%	0.1%
active member density	5.9%	-2.2%	0.3%	0.0%	-0.7%	0.0%	0.0%	0.0%	0.0%	-0.5%	0.0%	0.0%
active member-organizer density	-	-2.4%	0.5%	0.0%	-0.6%	0.0%	0.0%	0.0%	0.0%	-0.5%	0.0%	0.0%
ties per node	116%	-0.6%	3.7%	-1.2%	2.2%	-0.6%	0.0%	0.0%	0.3%	-1.5%	0.2%	0.1%
ties per active node	51.5%	-0.9%	3.1%	0.0%	1.1%	0.0%	0.0%	0.0%	0.3%	-0.3%	0.2%	0.1%
member ties per active node	25.3%	-0.1%	0.9%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member-organizer ties per active node	-	-0.5%	1.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

	Low	High	Average	Low	High	Average
active population	0.0%	31.8%	3.3%	0.0%	2.8%	0.5%
members	0.0%	14.8%	2.0%	0.0%	2.5%	0.7%
network population	0.0%	10.7%	1.6%	0.0%	2.2%	0.7%
organizer only ties	0.0%	8.2%	1.3%	0.0%	8.2%	1.3%
member only ties	0.0%	6.3%	0.7%	0.0%	6.3%	0.7%
mixed ties org out	0.0%	63.6%	6.3%	0.0%	3.1%	0.6%
mixed ties mem out	0.0%	1.9%	0.5%	0.0%	1.9%	0.5%
network ties	0.0%	263.6%	24.7%	0.0%	3.9%	0.8%
density	-2.9%	46.8%	4.1%	-2.9%	3.5%	-0.2%
active population density	-2.7%	2.3%	-0.2%	-2.7%	2.3%	0.0%
active member density	-2.2%	5.9%	0.3%	-2.2%	0.3%	-0.3%
active member-organizer density	-2.4%	0.5%	-0.3%	-2.4%	0.5%	-0.3%
ties per node	-1.5%	115.9%	10.8%	-1.5%	3.7%	0.3%
ties per active node	-0.9%	51.5%	5.0%	-0.9%	3.1%	0.4%
member ties per active node	-0.1%	25.3%	2.4%	-0.1%	0.9%	0.1%
member-organizer ties per active node	-0.5%	1.1%	0.1%	-0.5%	1.1%	0.1%

Corporate Philanthropy Network
Summary Statistics

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	4	19	26	27	32	52	58	58	58	59	59	59
Total outdegree	4	19	26	27	32	52	58	58	58	59	59	59
Members indegree	3	9	12	12	14	20	23	23	23	23	23	23
Members outdegree	1	6	10	12	13	19	21	21	21	22	22	22
Organizers indegree	1	10	14	15	18	32	35	35	35	36	36	36
Organizers outdegree	3	13	16	15	19	33	37	37	37	37	37	37
Members % of total in	75%	47%	46%	44%	44%	38%	40%	40%	40%	39%	39%	39%
Members % of total out	25%	32%	38%	44%	41%	37%	36%	36%	36%	37%	37%	37%
Members % of ties	50%	39%	42%	44%	42%	38%	38%	38%	38%	38%	38%	38%
active population members	6	11	17	18	18	24	26	26	26	26	26	26
network population	12	25	34	36	40	47	50	50	50	50	50	50
	18	31	40	42	46	53	56	56	56	56	56	56
organizer only ties member only ties	1	7	8	8	10	19	20	20	20	20	20	20
mixed ties org out	1	3	5	5	5	6	6	6	6	6	6	6
mixed ties mem out	2	6	7	7	9	14	17	17	17	17	17	17
network ties	0	3	6	7	8	13	15	15	15	16	16	16
	4	19	26	27	32	52	58	58	58	59	59	59
density	1.3%	2.0%	1.7%	1.6%	1.5%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
active population density	13%	17%	10%	9%	10%	9%	9%	9%	9%	9%	9%	9%
active member density	7%	11%	7%	6%	7%	6%	6%	6%	6%	6%	6%	6%
active member-organizer density	2%	5%	4%	4%	4%	3%	3%	3%	3%	3%	3%	3%
ties per node	0.2	0.6	0.7	0.6	0.7	1.0	1.0	1.0	1.0	1.1	1.1	1.1
ties per active node	0.7	1.7	1.5	1.5	1.8	2.2	2.2	2.2	2.2	2.3	2.3	2.3
member ties per active node	0.5	1.1	1.1	1.1	1.2	1.4	1.5	1.5	1.5	1.5	1.5	1.5
member-organizer ties per active node	0.2	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Average Daily Growth Rates												
active population members	7.6%	3.4%	0.4%	0.0%	0.0%	2.1%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
network population	9.8%	2.3%	0.4%	0.0%	0.9%	1.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
	6.6%	1.8%	0.4%	0.7%	1.0%	1.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
organizer only ties member only ties	54.5%	0.9%	0.0%	0.0%	1.9%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	18.2%	4.2%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	6.3%	1.2%	1.0%	2.2%	3.5%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
network ties	34.1%	2.3%	0.3%	1.4%	3.9%	3.9%	0.9%	0.0%	0.0%	0.1%	0.0%	0.0%
density	5.1%	-1.2%	-0.4%	-0.1%	-0.1%	1.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
active population density	2.7%	-2.8%	-0.5%	1.4%	-0.6%	-0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
active member density	5.8%	-2.5%	-0.4%	1.2%	-1.1%	-0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
active member-organizer density	13.2%	-1.6%	-0.2%	0.6%	-1.2%	-0.5%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%
ties per node	16.0%	0.4%	-0.1%	0.6%	0.6%	2.6%	0.4%	0.0%	0.0%	0.1%	0.0%	0.0%
ties per active node	14.5%	-0.7%	-0.1%	1.4%	1.4%	2.4%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%
member ties per active node	10.7%	-0.2%	0.0%	1.2%	0.8%	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
member-organizer ties per active node	20.7%	1.2%	0.2%	0.6%	0.6%	0.2%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%
Calculation Notes												
nodes with at least one tie												
network members only (excluding organizers)												
network members and organizers												
all ties / population												
all ties / active population												
ties involving members / active population *												
ties originated by members / active population *												
* less all possible organizer-only ties, maximum 30												
all ties / population												
all ties / active population												
ties involving members / active population												
ties originated by members / active population												
-- Excluding Launch (Period 2) --												
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average
active population	0.0%	7.6%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	0.7%
members	0.0%	9.8%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.5%
network population	0.0%	6.6%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.4%
organizer only ties	0.0%	54.5%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.9%
member only ties	0.0%	18.2%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	0.5%
mixed ties org out	0.0%	18.2%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	0.8%
mixed ties mem out	0.0%	6.3%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	1.4%
network ties	0.0%	34.1%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.9%
density	-1.2%	5.1%	0.4%	-1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.2%	1.4%	0.0%
active population density	-2.8%	2.7%	0.0%	-2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-2.8%	1.4%	-0.3%
active member density	-2.5%	5.8%	0.3%	-2.5%	0.3%	0.0%	0.0%	0.0%	0.0%	-2.5%	1.2%	-0.3%
active member-organizer density	-1.6%	13.2%	1.0%	-1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.6%	0.6%	-0.2%
ties per node	-0.1%	16.0%	1.8%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	2.6%	0.4%
ties per active node	-0.7%	14.5%	1.5%	-0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.7%	1.4%	0.2%
member ties per active node	-0.2%	10.7%	1.2%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.2%	1.2%	0.2%
member-organizer ties per active node	0.0%	20.7%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.3%

**Creativity Network
Summary Statistics**

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	3	17	34	36	36	39	41	43	43	44	44	45
Total outdegree	3	17	34	36	36	39	41	43	43	44	44	45
Members indegree	1	8	18	19	19	19	21	23	23	24	24	24
Members outdegree	1	7	16	17	17	19	20	22	22	22	22	23
Organizers indegree	2	9	16	17	17	20	20	20	20	20	20	21
Organizers outdegree	2	10	18	19	19	20	21	21	21	22	22	22
Members % of total in	33%	47%	53%	53%	53%	49%	51%	53%	53%	55%	55%	53%
Members % of total out	33%	41%	47%	47%	47%	49%	49%	51%	51%	50%	50%	51%
Members % of ties	33%	44%	50%	50%	50%	49%	50%	52%	52%	52%	52%	52%
active population	4	15	17	18	19	19	21	22	22	23	23	23
members	32	72	96	97	117	127	127	127	127	174	179	179
network population	38	78	102	103	123	133	133	133	133	180	185	185
organizer only ties	1	3	4	4	4	5	5	5	5	5	5	5
member only ties	0	1	4	4	4	4	5	7	7	7	7	7
mixed ties org out	1	7	14	15	15	16	16	16	16	17	17	17
mixed ties mem out	1	6	12	13	13	15	15	15	15	15	15	16
network ties	3	17	34	36	36	39	41	43	43	44	44	45
density	0.2%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%
active population density	25%	8%	13%	12%	11%	11%	10%	9%	9%	9%	9%	9%
active member density	7%	7%	11%	10%	9%	10%	9%	8%	8%	8%	8%	8%
active member-organizer density	4%	3%	6%	6%	5%	6%	5%	5%	5%	4%	4%	5%
ties per node	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
ties per active node	0.8	1.1	2.0	2.0	1.9	2.1	2.0	2.0	2.0	1.9	1.9	2.0
member ties per active node	0.5	0.9	1.8	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7
member-organizer ties per active node	0.3	0.5	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average Daily Growth Rates												
active population	25.0%	0.8%	0.8%	0.4%	0.4%	0.0%	0.8%	0.3%	0.0%	0.3%	0.0%	0.0%
members	11.4%	2.1%	0.1%	1.6%	1.6%	0.5%	0.0%	0.0%	0.0%	2.8%	0.2%	0.0%
network population	9.6%	1.9%	0.1%	1.5%	1.5%	0.5%	0.0%	0.0%	0.0%	2.7%	0.2%	0.0%
organizer only ties	18.2%	2.1%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member only ties	-	18.8%	0.0%	0.0%	0.0%	0.0%	1.9%	2.9%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	54.5%	6.3%	0.5%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%
mixed ties mem out	45.5%	6.3%	0.6%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
network ties	42.4%	6.3%	0.4%	0.0%	0.0%	0.5%	0.4%	0.3%	0.0%	0.2%	0.0%	0.2%
density	3.0%	1.0%	0.3%	-2.3%	-0.5%	0.4%	0.4%	0.3%	0.0%	-3.4%	-0.4%	0.2%
active population density	-6.1%	3.4%	-0.4%	-0.8%	0.5%	-1.1%	-1.1%	-0.3%	0.0%	-0.5%	0.0%	0.2%
active member density	-0.9%	4.1%	-0.4%	-0.8%	0.4%	-1.1%	-1.1%	-0.3%	0.0%	-0.5%	0.0%	0.2%
active member-organizer density	-0.9%	4.8%	-0.4%	-0.8%	0.7%	-1.1%	-1.1%	0.0%	0.0%	-0.7%	0.0%	0.3%
ties per node	16.0%	3.3%	0.3%	-1.3%	0.0%	0.4%	0.4%	0.3%	0.0%	-1.9%	-0.2%	0.2%
ties per active node	4.6%	4.8%	0.0%	-0.4%	0.5%	-0.4%	-0.4%	0.0%	0.0%	-0.2%	0.0%	0.2%
member ties per active node	7.9%	5.6%	0.1%	-0.4%	0.4%	-0.3%	0.1%	0.0%	0.0%	-0.1%	0.0%	0.2%
member-organizer ties per active node	7.9%	6.4%	0.0%	-0.4%	0.7%	-0.4%	0.4%	0.0%	0.0%	-0.3%	0.0%	0.3%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *
* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low High Average Low High Average

0.0% 25.0% 2.6% 0.0% 0.8% 0.3%

0.0% 11.4% 1.7% 0.0% 2.8% 0.7%

0.0% 9.6% 1.5% 0.0% 2.7% 0.7%

0.0% 18.2% 2.0% 0.0% 2.1% 0.4%

0.0% 18.8% 2.4% 0.0% 18.8% 2.4%

0.0% 54.5% 5.7% 0.0% 6.3% 0.8%

0.0% 45.5% 4.9% 0.0% 6.3% 0.8%

0.0% 42.4% 4.6% 0.0% 6.3% 0.8%

-3.4% 3.0% -0.1% -3.4% 1.0% -0.4%

-6.1% 3.4% -0.5% -1.1% 3.4% 0.1%

-1.1% 4.1% -1.1% -1.1% 4.1% 0.2%

-1.1% 4.8% 0.2% -1.1% 4.8% 0.3%

-1.9% 16.0% 1.6% -1.9% 3.3% 0.1%

-0.4% 4.8% 0.8% -0.4% 4.8% 0.5%

-0.4% 7.9% 1.2% -0.4% 5.6% 0.5%

-0.4% 7.9% 1.3% -0.4% 6.4% 0.7%

**Crisis Management Network
Summary Statistics**

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	6	17	21	23	24	41	54	61	62	67	88	92
Total outdegree	6	17	21	23	24	41	54	61	62	67	88	92
Members indegree	1	11	14	16	16	22	29	32	32	36	54	58
Members outdegree	0	8	10	11	11	16	21	25	26	28	43	44
Organizers indegree	5	6	7	7	8	19	25	29	30	31	34	34
Organizers outdegree	6	9	11	12	13	25	33	36	36	39	45	48
Members % of total in	17%	65%	67%	70%	67%	54%	54%	52%	52%	54%	61%	63%
Members % of total out	0%	47%	48%	48%	46%	39%	39%	41%	42%	42%	49%	48%
Members % of ties	8%	56%	57%	59%	56%	46%	46%	47%	47%	48%	55%	55%
active population	7	14	16	17	18	23	27	27	27	31	45	47
members	15	31	41	53	53	68	76	78	79	82	118	118
network population	21	37	47	59	59	74	82	84	85	88	124	124
organizer only ties	5	5	5	5	6	14	16	16	16	17	19	19
member only ties	0	7	9	9	9	11	12	12	12	14	28	29
mixed ties org out	1	4	6	7	7	11	17	20	20	22	26	29
mixed ties mem out	0	1	1	2	2	5	9	13	14	14	15	15
network ties	6	17	21	23	24	41	54	61	62	67	88	92
density	1.4%	1.3%	1.0%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	0.9%	0.6%	0.6%
active population density	14%	9%	9%	8%	8%	8%	8%	9%	9%	7%	4%	4%
active member density	1%	7%	7%	7%	6%	5%	5%	6%	7%	5%	3%	3%
active member-organizer density	0%	4%	4.2%	4.0%	3.6%	3.2%	3.0%	3.6%	3.7%	3.0%	2.2%	2.0%
ties per node	0.3	0.5	0.4	0.4	0.4	0.6	0.7	0.7	0.7	0.8	0.7	0.7
ties per active node	0.9	1.2	1.3	1.4	1.3	1.8	2.0	2.3	2.3	2.2	2.0	2.0
member ties per active node	0.1	0.9	1.0	1.1	1.0	1.2	1.4	1.7	1.7	1.6	1.5	1.6
member-organizer ties per active node	-	0.6	0.6	0.6	0.6	0.7	0.8	0.9	1.0	0.9	1.0	0.9
Average Daily Growth Rates												
active population	-- Excluding Launch (Period 2) --											
members	9%	0.9%	0.4%	0.5%	0.5%	1.7%	1.3%	0.0%	0.0%	1.1%	3.0%	0.3%
network population	10%	2.0%	2.1%	0.0%	1.8%	1.8%	0.9%	0.2%	0.1%	0.3%	2.9%	0.0%
organizer only ties	6.9%	1.7%	1.8%	0.0%	1.6%	1.6%	0.8%	0.2%	0.1%	0.3%	2.7%	0.0%
member only ties	0.0%	0.0%	0.0%	1.5%	8.3%	8.3%	1.1%	0.0%	0.0%	0.5%	0.8%	0.0%
mixed ties org out	-	1.8%	0.0%	0.0%	1.4%	1.4%	0.7%	0.0%	0.0%	1.3%	6.7%	0.3%
mixed ties mem out	27%	3.1%	1.2%	0.0%	3.6%	3.6%	4.2%	1.3%	0.0%	0.8%	1.2%	0.8%
network ties	-	0.0%	7.1%	0.0%	9.4%	9.4%	6.2%	3.2%	0.5%	0.0%	0.5%	0.0%
density	17%	1.5%	0.7%	0.3%	4.4%	4.4%	2.4%	0.9%	0.1%	0.6%	2.1%	0.3%
active population density	-1%	-1.5%	-2.2%	0.3%	0.5%	0.5%	0.5%	0.5%	-0.1%	0.1%	-2.3%	0.3%
active member density	-3.1%	-0.4%	-0.2%	-0.6%	0.2%	-0.4%	-0.4%	0.9%	0.1%	-1.4%	-2.6%	-0.3%
active member-organizer density	34%	0.1%	-0.1%	-0.9%	-0.6%	0.1%	1.3%	0.2%	-2.3%	-2.3%	1.3%	-0.4%
ties per node	-	-0.3%	-0.2%	-0.9%	-0.8%	-0.4%	1.4%	0.3%	-1.4%	-1.9%	-0.4%	-0.5%
ties per active node	5.5%	-0.2%	-0.9%	0.3%	2.3%	1.5%	0.7%	0.0%	0.3%	-0.5%	0.3%	0.3%
member ties per active node	3.8%	0.5%	0.2%	-0.1%	2.1%	0.9%	0.9%	0.1%	-0.5%	-0.6%	0.0%	0.0%
member-organizer ties per active node	45%	1.0%	0.4%	-0.4%	1.1%	1.5%	1.3%	0.2%	-0.4%	-0.3%	0.1%	0.1%
density	-	0.6%	0.3%	-0.4%	0.9%	0.9%	1.4%	0.3%	-0.5%	0.4%	-0.1%	-0.1%
active population density	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
active member density	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
active member-organizer density	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
ties per node	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
ties per active node	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
member ties per active node	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
member-organizer ties per active node	1.4%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%

**Emerging Markets Network
Summary Statistics**

	1	2	3	4	5	6	7	8	9	10	11	12
Period	0	10	12	13	13	39	45	46	56	59	60	60
Total indegree	0	10	12	13	13	39	45	46	56	59	60	60
Total outdegree	0	10	12	13	13	39	45	46	56	59	60	60
Members indegree	0	10	12	12	12	31	36	37	44	47	48	48
Members outdegree	0	4	6	7	7	24	28	28	36	39	40	40
Organizers indegree	0	0	0	1	1	8	9	9	12	12	12	12
Organizers outdegree	0	6	6	6	6	15	17	18	20	20	20	20
Members % of total in	-	100%	100%	92%	92%	79%	80%	80%	79%	80%	80%	80%
Members % of total out	-	40%	50%	54%	54%	62%	62%	61%	64%	66%	67%	67%
Members % of ties	-	70%	75%	73%	73%	71%	71%	71%	71%	73%	73%	73%
active population	0	9	11	12	13	27	28	28	32	33	34	34
members	41	95	126	129	140	458	463	465	478	480	480	486
network population	47	101	132	135	146	464	469	471	484	486	486	492
organizer only ties	0	0	0	0	0	0	1	1	1	1	1	1
member only ties	0	4	6	6	6	16	20	20	25	28	29	29
mixed ties org out	0	6	6	6	6	15	16	17	19	19	19	19
mixed ties mem out	0	0	0	1	1	8	8	8	11	11	11	11
network ties	0	10	12	13	13	39	45	46	56	59	60	60
density	0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
active population density	-	14%	11%	10%	8%	6%	6%	6%	6%	6%	5%	5%
active member density	-	12%	10%	9%	7%	5%	6%	6%	5%	5%	5%	5%
active member-organizer density	-	5%	5%	5%	4%	3%	4%	4%	3%	4%	3%	3%
ties per node	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ties per active node	-	1.1	1.1	1.1	1.0	1.4	1.6	1.6	1.8	1.8	1.8	1.8
member ties per active node	-	1.1	1.1	1.1	1.0	1.4	1.6	1.6	1.7	1.8	1.7	1.7
member-organizer ties per active node	-	0.4	0.5	0.6	0.5	0.9	1.0	1.0	1.1	1.2	1.2	1.2
Average Daily Growth Rates												
active population	-	1.4%	0.6%	0.6%	0.6%	6.7%	0.3%	0.0%	1.0%	0.2%	0.2%	0.0%
members	12.0%	2.0%	0.2%	0.7%	14.2%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%
network population	10.4%	1.9%	0.2%	0.6%	13.6%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%
organizer only ties	-	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member only ties	-	3.1%	0.0%	0.0%	10.4%	1.9%	0.0%	0.0%	1.8%	0.9%	0.2%	0.0%
mixed ties org out	-	0.0%	0.0%	0.0%	9.4%	0.5%	0.4%	0.8%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	-	-	-	0.0%	43.8%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%
network ties	-	1.3%	0.6%	0.6%	12.5%	1.2%	0.2%	0.2%	1.6%	0.4%	0.1%	0.0%
density	-	-1.9%	0.3%	-1.1%	-4.4%	1.0%	0.1%	0.1%	1.1%	0.3%	0.1%	-0.2%
active population density	-	-1.3%	-0.7%	-1.2%	-2.1%	0.5%	0.2%	0.2%	-0.5%	-0.1%	-0.3%	0.0%
active member density	-	-1.1%	-0.8%	-1.3%	-1.8%	0.4%	0.2%	0.2%	-0.5%	0.0%	-0.3%	0.0%
active member-organizer density	-	0.2%	-0.3%	-1.3%	-1.2%	0.7%	0.0%	0.0%	-0.1%	0.2%	-0.2%	0.0%
ties per node	-	-0.5%	0.4%	-0.6%	-0.4%	1.1%	0.1%	0.1%	1.3%	0.2%	0.1%	-0.1%
ties per active node	-	-0.1%	0.0%	-0.6%	2.8%	0.9%	0.2%	0.2%	0.5%	0.2%	-0.1%	0.0%
member ties per active node	-	-0.1%	0.0%	-0.6%	2.8%	0.7%	0.2%	0.2%	0.5%	0.2%	-0.1%	0.0%
member-organizer ties per active node	-	1.4%	0.5%	-0.6%	4.1%	1.0%	0.0%	0.0%	0.9%	0.4%	0.0%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low High Average Low High Average

0.0% 6.7% 1.1% 0.0% 6.7% 1.1%

0.0% 14.2% 2.7% 0.0% 14.2% 1.7%

0.0% 13.6% 2.5% 0.0% 13.6% 1.7%

0.0% 0.0% 0.0% 0.0% 0.0% 0.0%

0.0% 10.4% 1.8% 0.0% 10.4% 1.8%

0.0% 9.4% 1.1% 0.0% 9.4% 1.1%

0.0% 43.8% 5.8% 0.0% 43.8% 5.8%

0.0% 12.5% 1.8% 0.0% 12.5% 1.8%

-4.4% 1.1% -0.5% -4.4% 1.1% -0.5%

-2.1% 0.5% -0.5% -2.1% 0.5% -0.5%

-1.8% 0.4% -0.5% -1.8% 0.4% -0.5%

-1.3% 0.7% -0.2% -1.3% 0.7% -0.2%

-0.6% 1.3% 0.2% -0.6% 1.3% 0.2%

-0.6% 2.8% 0.4% -0.6% 2.8% 0.4%

-0.6% 2.8% 0.3% -0.6% 2.8% 0.3%

-0.6% 4.1% 0.8% -0.6% 4.1% 0.8%

Family Business Network
Summary Statistics

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	1	5	5	5	5	6	6	6	6	6	12	12
Total outdegree	1	5	5	5	5	6	6	6	6	6	12	12
Members indegree	0	3	3	3	3	3	3	3	3	3	6	6
Members outdegree	0	2	2	2	2	2	2	2	2	2	3	3
Organizers indegree	1	2	2	2	2	3	3	3	3	3	6	6
Organizers outdegree	1	3	3	3	3	4	4	4	4	4	9	9
Members % of total in	0%	60%	60%	60%	60%	50%	50%	50%	50%	50%	50%	50%
Members % of total out	0%	40%	40%	40%	40%	33%	33%	33%	33%	33%	25%	25%
Members % of ties	0%	50%	50%	50%	50%	42%	42%	42%	42%	42%	38%	38%
active population	2	6	6	6	6	7	7	7	7	7	11	11
members	52	66	74	76	79	82	82	82	82	82	87	89
network population	58	72	80	82	85	88	88	88	88	88	93	95
organizer only ties	1	1	1	1	1	2	2	2	2	2	4	4
member only ties	0	1	1	1	1	1	1	1	1	1	1	1
mixed ties org out	0	2	2	2	2	2	2	2	2	2	5	5
mixed ties mem out	0	1	1	1	1	1	1	1	1	1	2	2
network ties	1	5	5	5	5	6	6	6	6	6	12	12
density	0.03%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
active population density	50%	17%	17%	17%	17%	14%	14%	14%	14%	14%	11%	11%
active member density	0%	9%	9%	9%	9%	6%	6%	6%	6%	6%	6%	6%
active member-organizer density	0%	4%	4%	4%	4%	3%	3%	3%	3%	3%	2%	2%
ties per node	0.02	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ties per active node	0.5	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.1	1.1
member ties per active node	-	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7
member-organizer ties per active node	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Average Daily Growth Rates												
active population	18.2%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%
members	2.4%	0.8%	0.2%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%
network population	2.2%	0.7%	0.2%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%
organizer only ties	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%
member only ties	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%	1.0%
mixed ties mem out	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	6.7%	0.7%
network ties	36.4%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	36.4%	0.8%
density	20.3%	-1.2%	-0.3%	-0.5%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	-0.3%
active population density	-6.1%	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.6%	0.0%
active member density	-	0.0%	0.0%	0.0%	-1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.7%	0.0%
active member-organizer density	-	0.0%	0.0%	0.0%	-1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	-2.1%	0.0%
ties per node	27.5%	-0.6%	-0.2%	-0.3%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	-0.2%
ties per active node	6.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%
member ties per active node	-	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.1%
member-organizer ties per active node	-	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.9%	-0.1%
Calculation Notes												
nodes with at least one tie												
network members only (excluding organizers)												
network members and organizers												
all ties / population												
all ties / active population												
ties involving members / active population *												
ties originated by members / active population *												
* less all possible organizer-only ties, maximum 30												
all ties / population												
all ties / active population												
ties involving members / active population												
ties originated by members / active population												
-- Excluding Launch (Period 2) --												
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average
active population	0.0%	18.2%	2.1%	0.0%	3.8%	0.5%	0.0%	3.8%	0.5%	0.0%	3.8%	0.5%
members	0.0%	2.4%	0.4%	0.0%	0.8%	0.2%	0.0%	0.8%	0.2%	0.0%	0.8%	0.2%
network population	0.0%	2.2%	0.4%	0.0%	0.7%	0.2%	0.0%	0.7%	0.2%	0.0%	0.7%	0.2%
organizer only ties	0.0%	6.7%	1.2%	0.0%	6.7%	1.3%	0.0%	6.7%	1.3%	0.0%	6.7%	1.3%
member only ties	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	0.0%	10.0%	1.0%	0.0%	10.0%	1.0%	0.0%	10.0%	1.0%	0.0%	10.0%	1.0%
mixed ties mem out	0.0%	6.7%	0.7%	0.0%	6.7%	0.7%	0.0%	6.7%	0.7%	0.0%	6.7%	0.7%
network ties	0.0%	36.4%	4.0%	0.0%	36.4%	4.0%	0.0%	36.4%	4.0%	0.0%	36.4%	4.0%
density	-1.2%	20.3%	2.2%	-1.2%	5.3%	0.4%	-1.2%	5.3%	0.4%	-1.2%	5.3%	0.4%
active population density	-6.1%	0.0%	-0.8%	-6.1%	-0.8%	-0.2%	-6.1%	-0.8%	-0.2%	-6.1%	-0.8%	-0.2%
active member density	-1.7%	0.0%	-0.2%	-1.7%	-0.2%	-0.4%	-1.7%	-0.2%	-0.4%	-1.7%	-0.2%	-0.4%
active member-organizer density	-2.1%	0.0%	-0.4%	-2.1%	-0.4%	-0.9%	-2.1%	-0.4%	-0.9%	-2.1%	-0.4%	-0.9%
ties per node	-0.6%	27.5%	3.0%	-0.6%	5.9%	0.6%	-0.6%	5.9%	0.6%	-0.6%	5.9%	0.6%
ties per active node	6.1%	0.0%	6.1%	6.1%	1.8%	0.2%	6.1%	1.8%	0.2%	6.1%	1.8%	0.2%
member ties per active node	-	0.0%	1.8%	-	1.8%	0.1%	-	1.8%	0.1%	-	1.8%	0.1%
member-organizer ties per active node	-	0.0%	0.0%	-	0.0%	-0.9%	-	0.0%	-0.9%	-	0.0%	-0.1%

**Innovation Network
Summary Statistics**

	1	2	3	4	5	6	7	8	9	10	11	12
Period	0	7	9	11	13	37	39	43	48	57	67	71
Total indegree	0	7	9	11	13	37	39	43	48	57	67	71
Total outdegree	0	7	9	11	13	37	39	43	48	57	67	71
Members indegree	0	5	6	8	8	16	17	19	19	21	24	24
Members outdegree	0	5	6	7	9	15	16	19	20	23	26	26
Organizers indegree	0	2	3	3	5	21	22	24	29	36	43	47
Organizers outdegree	0	2	3	4	4	22	23	24	28	34	41	45
Members % of total in	-	71%	67%	73%	62%	43%	44%	44%	40%	37%	36%	34%
Members % of total out	-	71%	67%	64%	69%	41%	41%	44%	42%	40%	39%	37%
Members % of ties	-	71%	67%	68%	65%	42%	42%	44%	41%	39%	37%	35%
active population	0	8	9	10	11	16	17	18	18	20	22	22
members	21	48	62	68	76	87	92	96	98	122	141	141
network population	27	54	68	74	82	93	98	102	104	128	147	147
organizer only ties	0	0	0	0	0	10	10	11	15	20	24	28
member only ties	0	3	3	4	4	4	4	6	6	7	7	7
mixed ties org out	0	2	3	4	4	12	13	13	13	14	17	17
mixed ties mem out	0	2	3	3	5	11	12	13	14	16	19	19
network ties	0	7	9	11	13	37	39	43	48	57	67	71
density	0.0%	0.2%	0.2%	0.2%	0.2%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%
active population density	-	13%	13%	12%	12%	15%	14%	14%	16%	15%	15%	15%
active member density	-	10%	10%	10%	10%	10%	10%	10%	10%	9%	9%	9%
active member-organizer density	-	7%	7%	7%	7%	6%	5%	6%	6%	6%	5%	5%
ties per node	-	0.1	0.1	0.1	0.2	0.4	0.4	0.4	0.5	0.4	0.5	0.5
ties per active node	-	0.9	1.0	1.1	1.2	2.3	2.3	2.4	2.7	2.9	3.0	3.2
member ties per active node	-	0.9	1.0	1.1	1.2	1.7	1.7	1.8	1.8	1.9	2.0	2.0
member-organizer ties per active node	-	0.6	0.7	0.7	0.8	0.9	0.9	1.1	1.1	1.2	1.2	1.2
Average Daily Growth Rates												
active population	-	0.8%	0.8%	0.8%	0.8%	2.8%	0.5%	0.4%	0.0%	0.9%	0.7%	0.0%
members	11.7%	1.8%	1.8%	0.7%	0.9%	0.9%	0.4%	0.3%	0.1%	1.9%	1.0%	0.0%
network population	9.1%	1.6%	1.6%	0.6%	0.8%	0.8%	0.4%	0.3%	0.1%	1.8%	1.0%	0.0%
organizer only ties	-	-	-	-	-	-	0.0%	0.7%	2.6%	2.6%	1.3%	1.2%
member only ties	-	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	1.3%	0.0%	0.0%
mixed ties org out	-	3.1%	2.4%	0.0%	0.0%	12.5%	0.6%	0.0%	0.0%	0.6%	1.4%	0.0%
mixed ties mem out	-	3.1%	0.0%	0.0%	5.1%	7.5%	0.7%	0.6%	0.5%	1.1%	1.3%	0.0%
network ties	-	1.8%	1.6%	1.4%	1.4%	11.5%	0.4%	0.7%	0.8%	1.4%	1.2%	0.4%
density	-	-1.2%	0.2%	-0.3%	-0.3%	7.6%	-0.4%	0.1%	0.5%	-1.7%	-0.7%	0.4%
active population density	-	0.0%	-0.2%	-0.3%	1.9%	-0.5%	-0.5%	-0.1%	0.8%	-0.3%	-0.2%	0.4%
active member density	-	0.3%	0.1%	-0.3%	0.0%	-0.3%	-0.3%	-0.1%	0.2%	-0.6%	-0.2%	0.0%
active member-organizer density	-	-0.1%	-0.2%	0.3%	-1.2%	-0.4%	0.5%	0.5%	0.4%	-0.4%	-0.4%	0.0%
ties per node	-	0.1%	0.9%	0.5%	9.4%	0.0%	0.4%	0.4%	0.7%	-0.3%	0.2%	0.4%
ties per active node	-	0.9%	0.7%	0.6%	6.0%	-0.1%	0.3%	0.3%	0.8%	0.5%	0.5%	0.4%
member ties per active node	-	0.9%	0.7%	0.6%	2.7%	0.1%	0.3%	0.2%	0.2%	0.1%	0.4%	0.0%
member-organizer ties per active node	-	0.4%	0.4%	1.3%	0.9%	0.0%	0.0%	0.9%	0.4%	0.3%	0.2%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low High Average Low High Average

0.0% 2.8% 0.8% 0.0% 2.8% 0.8%

0.0% 11.7% 1.8% 0.0% 1.9% 0.8%

0.0% 9.1% 1.5% 0.0% 1.8% 0.8%

0.0% 2.6% 1.4% 0.0% 2.6% 1.4%

0.0% 3.6% 0.7% 0.0% 3.6% 0.7%

0.0% 12.5% 2.1% 0.0% 12.5% 2.1%

0.0% 7.5% 2.0% 0.0% 7.5% 2.0%

0.4% 11.5% 2.1% 0.4% 11.5% 2.1%

-1.7% 7.6% 0.5% -1.7% 7.6% 0.5%

-0.5% 1.9% 0.2% -0.5% 1.9% 0.2%

-0.6% 0.3% -0.1% -0.6% 0.3% -0.1%

-1.2% 0.5% -0.2% -1.2% 0.5% -0.2%

-0.3% 9.4% 1.2% -0.3% 9.4% 1.2%

-0.1% 6.0% 1.1% -0.1% 6.0% 1.1%

0.0% 2.7% 0.6% 0.0% 2.7% 0.6%

0.0% 1.3% 0.5% 0.0% 1.3% 0.5%

**Intrapreneurship Network
Summary Statistics**

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	0	12	21	22	23	30	36	39	40	42	46	46
Total outdegree	0	12	21	22	23	30	36	39	40	42	46	46
Members indegree	0	10	14	15	16	18	18	18	18	19	21	21
Members outdegree	0	7	10	11	11	15	15	17	17	17	18	18
Organizers indegree	0	2	7	7	7	12	18	21	22	23	25	25
Organizers outdegree	0	5	11	11	12	15	21	22	23	25	28	28
Members % of total in	-	83%	67%	68%	70%	60%	50%	46%	45%	45%	46%	46%
Members % of total out	-	58%	48%	50%	48%	50%	42%	44%	43%	40%	39%	39%
Members % of ties	-	71%	57%	59%	59%	55%	46%	45%	44%	43%	42%	42%
active population	0	7	10	11	11	13	13	13	13	14	14	14
members	7	10	12	13	62	63	72	73	73	73	94	101
network population	13	16	18	19	68	69	78	79	79	79	100	107
organizer only ties	0	0	2	2	2	5	11	12	13	14	16	16
member only ties	0	5	5	6	6	8	8	8	8	8	9	9
mixed ties org out	0	5	9	9	10	10	10	10	10	11	12	12
mixed ties mem out	0	2	5	5	5	7	7	9	9	9	9	9
network ties	0	12	21	22	23	30	36	39	40	42	46	46
density	0.0%	5.0%	6.9%	6.4%	0.5%	0.6%	0.6%	0.6%	0.6%	0.7%	0.5%	0.4%
active population density	-	29%	23%	20%	21%	19%	23%	25%	26%	23%	25%	25%
active member density	-	21%	17%	15%	16%	13%	13%	15%	15%	13%	14%	14%
active member-organizer density	-	12%	9%	8%	8%	8%	8%	9%	9%	8%	8%	8%
ties per node	-	0.8	1.2	1.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.4
ties per active node	-	1.7	2.1	2.0	2.1	2.3	2.8	3.0	3.1	3.0	3.3	3.3
member ties per active node	-	1.7	1.9	1.8	1.9	1.9	1.9	2.1	2.1	2.0	2.1	2.1
member-organizer ties per active node	-	1.0	1.0	1.0	1.2	1.2	1.2	1.3	1.3	1.2	1.3	1.3
Average Daily Growth Rates												
active population	-	2.7%	0.7%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%
members	3.9%	1.3%	0.6%	29.0%	0.1%	1.1%	1.1%	0.1%	0.0%	0.0%	1.9%	0.5%
network population	2.1%	0.8%	0.4%	19.8%	0.1%	1.0%	1.0%	0.1%	0.0%	0.0%	1.8%	0.5%
organizer only ties	-	-	0.0%	0.0%	9.4%	9.2%	0.6%	0.6%	0.6%	0.6%	1.0%	0.0%
member only ties	-	0.0%	1.4%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%
mixed ties org out	-	5.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.6%	0.0%
mixed ties mem out	-	9.4%	0.0%	0.0%	2.5%	0.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%
network ties	-	4.7%	0.3%	0.3%	1.9%	1.5%	0.6%	0.6%	0.2%	0.4%	0.6%	0.0%
density	-	2.3%	-0.4%	-7.1%	1.7%	-0.5%	0.4%	0.4%	0.2%	0.4%	-2.1%	-0.9%
active population density	-	-1.1%	-1.0%	0.3%	-0.5%	1.5%	0.6%	0.6%	0.2%	-0.8%	0.6%	0.0%
active member density	-	-1.3%	-0.7%	0.4%	-0.8%	0.0%	0.6%	0.6%	0.0%	-0.7%	0.5%	0.0%
active member-organizer density	-	-1.8%	-0.4%	0.0%	-0.1%	0.0%	1.0%	1.0%	0.0%	-0.9%	0.4%	0.0%
ties per node	-	3.5%	-0.1%	-5.4%	1.8%	0.5%	0.5%	0.5%	0.2%	0.4%	-0.9%	-0.5%
ties per active node	-	1.4%	-0.3%	0.3%	0.6%	1.5%	0.6%	0.6%	0.2%	-0.2%	0.6%	0.0%
member ties per active node	-	0.7%	-0.3%	0.4%	0.0%	0.0%	0.6%	0.6%	0.0%	-0.3%	0.5%	0.0%
member-organizer ties per active node	-	0.0%	0.0%	0.0%	1.0%	0.0%	1.0%	1.0%	0.0%	-0.5%	0.4%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *
* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low	High	Average	Low	High	Average
0.0%	2.7%	0.5%	0.0%	2.7%	0.5%
0.0%	29.0%	3.5%	0.0%	29.0%	3.5%
0.0%	19.8%	2.4%	0.0%	19.8%	2.4%
0.0%	9.4%	2.4%	0.0%	9.4%	2.4%
0.0%	2.1%	0.4%	0.0%	2.1%	0.4%
0.0%	5.0%	0.7%	0.0%	5.0%	0.7%
0.0%	9.4%	1.4%	0.0%	9.4%	1.4%
0.0%	4.7%	1.1%	0.0%	4.7%	1.1%
-7.1%	2.3%	-0.6%	-7.1%	2.3%	-0.6%
-1.1%	1.5%	0.0%	-1.1%	1.5%	0.0%
-1.3%	0.6%	-0.2%	-1.3%	0.6%	-0.2%
-1.8%	1.0%	-0.2%	-1.8%	1.0%	-0.2%
-5.4%	3.5%	0.0%	-5.4%	3.5%	0.0%
-0.3%	1.5%	0.5%	-0.3%	1.5%	0.5%
-0.3%	0.7%	0.2%	-0.3%	0.7%	0.2%
-0.5%	1.0%	0.2%	-0.5%	1.0%	0.2%

IT Network Summary Statistics

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	1	22	28	32	32	36	36	37	40	40	40	40
Total outdegree	1	22	28	32	32	36	36	37	40	40	40	40
Members indegree	1	13	15	17	17	21	21	21	21	21	21	21
Members outdegree	0	8	13	13	13	15	15	16	18	18	18	18
Organizers indegree	0	9	13	15	15	15	15	16	19	19	19	19
Organizers outdegree	1	14	15	19	19	21	21	21	22	22	22	22
Members % of total in	100%	59%	54%	53%	53%	58%	58%	57%	53%	53%	53%	53%
Members % of total out	0%	36%	46%	41%	41%	42%	42%	43%	45%	45%	45%	45%
Members % of ties	50%	48%	50%	47%	47%	50%	50%	50%	49%	49%	49%	49%
active population	2	13	14	15	15	18	18	18	18	18	18	18
members	24	44	54	56	66	70	70	70	70	70	70	105
network population	30	50	60	62	72	76	76	76	76	76	76	111
organizer only ties	0	3	3	5	5	5	5	5	6	6	6	6
member only ties	0	2	3	3	3	5	5	5	5	5	5	5
mixed ties org out	1	11	12	14	14	16	16	16	16	16	16	16
mixed ties mem out	0	6	10	10	10	10	10	11	13	13	13	13
network ties	1	22	28	32	32	36	36	37	40	40	40	40
density	0.1%	0.9%	0.8%	0.8%	0.6%	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%	0.3%
active population density	50%	14%	15%	15%	15%	12%	12%	12%	13%	13%	13%	13%
active member density	14%	10%	12%	11%	11%	9%	9%	10%	10%	10%	10%	10%
active member-organizer density	0%	4%	6%	5%	5%	4%	4%	5%	5%	5%	5%	5%
ties per node	0.0	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4
ties per active node	0.5	1.7	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.2	2.2	2.2
member ties per active node	0.5	1.5	1.8	1.8	1.8	1.7	1.7	1.8	1.9	1.9	1.9	1.9
member-organizer ties per active node	-	0.6	0.9	0.9	0.9	0.8	0.8	0.9	1.0	1.0	1.0	1.0
Average Daily Growth Rates												
active population	50.0%	0.5%	0.5%	0.5%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
members	7.6%	1.4%	0.3%	1.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%
network population	6.1%	1.3%	0.2%	1.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%
organizer only ties	-	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%
member only ties	-	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	90.9%	0.6%	1.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	0.0%	0.0%	0.0%
network ties	191%	1.7%	1.0%	0.0%	0.8%	0.0%	0.2%	0.6%	0.6%	0.0%	0.0%	0.0%
density	61.9%	-0.7%	0.5%	-2.0%	0.1%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	-3.8%
active population density	-6.5%	0.6%	-0.1%	0.0%	-1.4%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%
active member density	-2.6%	1.0%	-0.3%	0.0%	-1.1%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
active member-organizer density	-	2.7%	-0.8%	0.0%	-1.1%	0.0%	0.5%	0.9%	0.0%	0.0%	0.0%	0.0%
ties per node	111%	0.4%	0.8%	-1.1%	0.4%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	-2.3%
ties per active node	21.7%	1.1%	0.5%	0.0%	-0.4%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%
member ties per active node	17.5%	1.4%	0.1%	0.0%	-0.3%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
member-organizer ties per active node	-	3.2%	-0.5%	0.0%	-0.2%	0.0%	0.5%	0.9%	0.0%	0.0%	0.0%	0.0%
-- Excluding Launch (Period 2) --												
		Low	High	Average	Low	High	Average	Low	High	Average	Low	High
active population		0.0%	50.0%	4.7%	0.0%	1.3%	0.0%	0.0%	1.3%	0.0%	0.0%	0.2%
members		0.0%	7.6%	1.3%	0.0%	3.6%	0.0%	0.0%	3.6%	0.7%	0.0%	0.7%
network population		0.0%	6.1%	1.1%	0.0%	3.3%	0.0%	0.0%	3.3%	0.6%	0.0%	0.6%
organizer only ties		0.0%	4.8%	0.6%	0.0%	0.0%	0.0%	0.0%	4.8%	0.8%	0.0%	0.6%
member only ties		0.0%	4.2%	0.7%	0.0%	0.0%	0.0%	0.0%	4.2%	0.7%	0.0%	0.7%
mixed ties org out		0.0%	90.9%	8.5%	0.0%	0.0%	0.0%	0.0%	90.9%	1.2%	0.3%	0.3%
mixed ties mem out		0.0%	4.2%	0.6%	0.0%	0.0%	0.0%	0.0%	4.2%	0.6%	0.0%	0.6%
network ties		0.0%	191%	17.7%	0.0%	0.0%	0.0%	0.0%	191%	1.7%	0.4%	0.4%
density		-3.8%	61.9%	5.2%	-3.8%	0.6%	0.0%	0.0%	61.9%	0.6%	-0.5%	-0.5%
active population density		-6.5%	0.6%	-0.6%	-6.5%	0.0%	0.0%	0.0%	0.6%	0.6%	0.0%	0.0%
active member density		-2.6%	1.0%	-0.2%	-2.6%	0.0%	0.0%	0.0%	1.0%	-1.1%	1.0%	0.0%
active member-organizer density		-1.1%	2.7%	0.2%	-1.1%	0.0%	0.0%	0.0%	2.7%	0.2%	2.7%	0.2%
ties per node		-2.3%	111%	10.0%	-2.3%	0.0%	0.0%	0.0%	111%	0.8%	-0.1%	-0.1%
ties per active node		-0.4%	21.7%	2.2%	-0.4%	0.0%	0.0%	0.0%	21.7%	1.1%	0.2%	0.2%
member ties per active node		-0.3%	17.5%	1.8%	-0.3%	0.0%	0.0%	0.0%	17.5%	1.4%	0.2%	0.2%
member-organizer ties per active node		-0.5%	3.2%	0.4%	-0.5%	0.0%	0.0%	0.0%	3.2%	0.4%	3.2%	0.4%

Key Account Management Network
Summary Statistics

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	2	21	30	31	41	61	65	68	68	68	70	70
Total outdegree	2	21	30	31	41	61	65	68	68	68	70	70
Members indegree	0	8	12	13	19	34	34	36	36	36	36	36
Members outdegree	0	8	12	12	16	26	28	30	30	30	31	31
Organizers indegree	2	13	18	18	22	27	31	32	32	32	34	34
Organizers outdegree	2	13	18	19	25	35	37	38	38	38	39	39
Members % of total in	0%	38%	40%	42%	46%	56%	52%	53%	53%	53%	51%	51%
Members % of total out	0%	38%	40%	39%	39%	43%	43%	44%	44%	44%	44%	44%
Members % of ties	0%	38%	40%	40%	43%	49%	48%	49%	49%	49%	48%	48%
active population	2	14	15	16	18	22	22	22	22	22	22	22
members	33	50	60	60	61	66	66	66	66	66	66	67
network population	39	56	66	66	67	72	72	72	72	72	72	73
organizer only ties	2	9	10	10	13	15	17	17	17	17	18	18
member only ties	0	4	4	6	7	14	14	15	15	15	15	15
mixed ties org out	0	4	8	12	12	20	20	21	21	21	21	21
mixed ties mem out	0	4	8	9	9	12	14	15	15	15	15	15
network ties	2	21	30	37	41	61	65	68	68	68	69	69
density	0.1%	0.7%	0.7%	0.9%	0.9%	1.2%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
active population density	100%	12%	14%	15%	13%	13%	14%	15%	15%	15%	15%	15%
active member density	0%	6%	8%	10%	8%	9%	10%	10%	10%	10%	10%	10%
active member-organizer density	0%	4%	5%	6%	5%	5%	6%	6%	6%	6%	6%	6%
ties per node	0.1	0.4	0.5	0.6	0.6	0.8	0.9	0.9	0.9	0.9	1.0	0.9
ties per active node	1.0	1.5	2.0	2.3	2.3	2.8	3.0	3.1	3.1	3.1	3.1	3.1
member ties per active node	-	0.9	1.3	1.7	1.6	2.1	2.2	2.3	2.3	2.3	2.3	2.3
member-organizer ties per active node	-	0.6	0.8	0.9	0.9	1.2	1.3	1.4	1.4	1.4	1.4	1.4
Average Daily Growth Rates												
active population	54.5%	4.7%	0.4%	0.5%	1.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
members	4.0%	1.3%	0.0%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
network population		4.0%	1.1%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
organizer only ties	31.8%	0.7%	0.0%	0.0%	2.3%	1.0%	1.0%	0.0%	0.0%	0.0%	0.4%	0.0%
member only ties	-	0.0%	3.6%	1.3%	6.3%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	-	6.3%	3.6%	0.0%	4.2%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	6.3%	0.9%	0.0%	2.1%	1.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
network ties	86.4%	2.7%	1.7%	1.7%	0.8%	3.0%	0.5%	0.3%	0.0%	0.0%	0.1%	0.0%
density	36.8%	0.2%	1.7%	1.7%	0.6%	1.8%	0.5%	0.3%	0.0%	0.0%	0.1%	-0.2%
active population density	-8.0%	1.5%	0.6%	0.6%	-1.0%	-0.1%	0.5%	0.3%	0.0%	0.0%	0.1%	0.0%
active member density	-	3.0%	1.4%	1.4%	-1.3%	0.8%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%
active member-organizer density	-	2.0%	0.8%	-1.1%	0.7%	0.6%	0.6%	0.5%	0.0%	0.0%	0.0%	0.0%
ties per node	57.4%	1.3%	1.7%	1.7%	0.7%	2.4%	0.5%	0.3%	0.0%	0.0%	0.1%	-0.1%
ties per active node	4.5%	2.1%	1.1%	1.1%	-0.1%	1.4%	0.5%	0.3%	0.0%	0.0%	0.1%	0.0%
member ties per active node	-	3.5%	1.9%	1.9%	-0.6%	2.2%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%
member-organizer ties per active node	-	2.5%	1.2%	1.2%	-0.4%	2.1%	0.6%	0.5%	0.0%	0.0%	0.0%	0.0%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low	High	Average	Low	High	Average
0.0%	54.5%	5.3%	0.0%	1.4%	0.3%
0.0%	4.7%	0.6%	0.0%	1.3%	0.2%
0.0%	4.0%	0.5%	0.0%	1.1%	0.2%
0.0%	31.8%	3.4%	0.0%	2.3%	0.5%
0.0%	6.3%	1.2%	0.0%	6.3%	1.2%
0.0%	6.3%	1.4%	0.0%	6.3%	1.4%
0.0%	6.3%	1.1%	0.0%	6.3%	1.1%
0.0%	86.4%	8.7%	0.0%	3.0%	0.9%
-0.2%	36.8%	3.8%	-0.2%	1.8%	0.5%
-8.0%	1.5%	-0.6%	-1.0%	1.5%	0.2%
-1.3%	3.0%	0.5%	-1.3%	3.0%	0.5%
-1.1%	2.0%	0.4%	-1.1%	2.0%	0.4%
-0.1%	57.4%	5.8%	-0.1%	2.4%	0.7%
-0.1%	4.5%	0.9%	-0.1%	2.1%	0.5%
-0.6%	3.5%	0.8%	-0.6%	3.5%	0.8%
-0.4%	2.5%	0.6%	-0.4%	2.5%	0.6%

Leadership Network
Summary Statistics

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	0	14	24	24	28	46	51	56	56	59	59	61
Total outdegree	0	14	24	24	28	46	51	56	56	59	59	61
Members indegree	0	5	13	13	14	19	22	25	25	25	25	25
Members outdegree	0	4	9	9	12	19	21	24	24	24	24	24
Organizers indegree	0	9	11	11	14	27	29	31	31	34	34	36
Organizers outdegree	0	10	15	15	16	27	30	32	32	35	35	37
Members % of total in	-	36%	54%	54%	50%	41%	43%	45%	45%	42%	42%	41%
Members % of total out	-	29%	38%	38%	43%	41%	41%	43%	43%	41%	41%	39%
Members % of ties	-	32%	46%	46%	46%	41%	42%	44%	44%	42%	42%	40%
active population	0	12	14	14	15	21	22	23	23	23	23	23
members	116	151	172	174	192	207	207	218	219	247	254	257
network population	122	157	178	180	198	213	213	224	225	253	260	263
organizer only ties	0	7	7	7	8	16	17	17	17	20	20	22
member only ties	0	2	5	5	6	8	9	10	10	10	10	10
mixed ties org out	0	3	8	8	8	11	13	15	15	15	15	15
mixed ties mem out	0	2	4	4	6	11	12	14	14	14	14	14
network ties	0	14	24	24	28	46	51	56	56	59	59	61
density	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
active population density	-	10.6%	13.2%	13.3%	13.3%	11.0%	11.0%	11.1%	11.1%	11.7%	11.7%	12.1%
active member density	-	4.2%	7.8%	7.8%	8.2%	6.5%	6.8%	7.1%	7.1%	7.1%	7.1%	7.1%
active member-organizer density	-	2.4%	4.1%	4.1%	4.9%	4.1%	4.2%	4.4%	4.4%	4.4%	4.4%	4.4%
ties per node	-	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2
ties per active node	-	1.2	1.7	1.7	1.9	2.2	2.3	2.4	2.4	2.6	2.6	2.7
member ties per active node	-	0.6	1.2	1.2	1.3	1.4	1.5	1.7	1.7	1.7	1.7	1.7
member-organizer ties per active node	-	0.3	0.6	0.6	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Average Daily Growth Rates												
active population	-	1.0%	0.0%	0.0%	0.5%	2.5%	0.4%	0.3%	0.0%	0.0%	0.0%	0.0%
members	2.7%	0.9%	0.1%	0.8%	0.5%	0.0%	0.0%	0.4%	0.0%	1.0%	0.2%	0.1%
network population	2.6%	0.8%	0.1%	0.8%	0.5%	0.0%	0.0%	0.4%	0.0%	1.0%	0.2%	0.1%
organizer only ties	-	0.0%	0.0%	0.0%	1.1%	6.3%	0.5%	0.0%	0.0%	1.4%	0.0%	0.7%
member only ties	-	9.4%	0.0%	0.0%	1.5%	2.1%	1.0%	0.8%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	-	10.4%	0.0%	0.0%	0.0%	2.3%	1.4%	1.1%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	6.3%	0.0%	0.0%	3.8%	5.2%	0.7%	1.2%	0.0%	0.0%	0.0%	0.0%
network ties	-	4.5%	0.0%	0.0%	1.3%	4.0%	0.8%	0.7%	0.0%	0.4%	0.0%	0.2%
density	-	2.1%	-0.2%	-0.3%	2.6%	0.8%	0.8%	-0.1%	-1.3%	-0.4%	0.1%	0.1%
active population density	-	1.5%	0.0%	0.1%	-1.1%	0.1%	0.1%	0.0%	0.0%	0.4%	0.0%	0.2%
active member density	-	5.4%	0.0%	0.3%	-1.3%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
active member-organizer density	-	4.6%	0.0%	0.0%	1.4%	-1.0%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%
ties per node	-	3.2%	-0.1%	0.5%	3.3%	0.8%	0.8%	0.3%	0.0%	-0.5%	-0.2%	0.2%
ties per active node	-	2.9%	0.0%	0.7%	1.1%	0.4%	0.4%	0.4%	0.0%	0.4%	0.0%	0.2%
member ties per active node	-	6.8%	0.0%	0.8%	0.4%	0.6%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%
member-organizer ties per active node	-	5.8%	0.0%	1.9%	0.8%	0.4%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%
Calculation Notes												
nodes with at least one tie												
network members only (excluding organizers)												
network members and organizers												
all ties / population												
all ties / active population												
ties involving members / active population *												
ties originated by members / active population *												
* less all possible organizer-only ties, maximum 30												
all ties / population												
all ties / active population												
ties involving members / active population												
ties originated by members / active population												
-- Excluding Launch (Period 2) --												
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average
active population	0.0%	2.5%	0.5%	0.0%	2.5%	0.5%	0.0%	2.5%	0.5%	0.0%	2.5%	0.5%
members	0.0%	2.7%	0.6%	0.0%	2.7%	0.6%	0.0%	2.7%	0.6%	0.0%	2.7%	0.6%
network population	0.0%	2.6%	0.6%	0.0%	2.6%	0.6%	0.0%	2.6%	0.6%	0.0%	2.6%	0.6%
organizer only ties	0.0%	6.3%	1.0%	0.0%	6.3%	1.0%	0.0%	6.3%	1.0%	0.0%	6.3%	1.0%
member only ties	0.0%	9.4%	1.5%	0.0%	9.4%	1.5%	0.0%	9.4%	1.5%	0.0%	9.4%	1.5%
mixed ties org out	0.0%	10.4%	1.5%	0.0%	10.4%	1.5%	0.0%	10.4%	1.5%	0.0%	10.4%	1.5%
mixed ties mem out	0.0%	6.3%	1.7%	0.0%	6.3%	1.7%	0.0%	6.3%	1.7%	0.0%	6.3%	1.7%
network ties	0.0%	4.5%	1.2%	0.0%	4.5%	1.2%	0.0%	4.5%	1.2%	0.0%	4.5%	1.2%
density	-1.3%	2.6%	0.3%	-1.3%	2.6%	0.3%	-1.3%	2.6%	0.3%	-1.3%	2.6%	0.3%
active population density	-1.1%	1.5%	0.1%	-1.1%	1.5%	0.1%	-1.1%	1.5%	0.1%	-1.1%	1.5%	0.1%
active member density	-1.3%	5.4%	0.5%	-1.3%	5.4%	0.5%	-1.3%	5.4%	0.5%	-1.3%	5.4%	0.5%
active member-organizer density	-1.0%	4.6%	0.5%	-1.0%	4.6%	0.5%	-1.0%	4.6%	0.5%	-1.0%	4.6%	0.5%
ties per node	-0.5%	3.3%	0.7%	-0.5%	3.3%	0.7%	-0.5%	3.3%	0.7%	-0.5%	3.3%	0.7%
ties per active node	0.0%	2.9%	0.6%	0.0%	2.9%	0.6%	0.0%	2.9%	0.6%	0.0%	2.9%	0.6%
member ties per active node	0.0%	6.8%	0.9%	0.0%	6.8%	0.9%	0.0%	6.8%	0.9%	0.0%	6.8%	0.9%
member-organizer ties per active node	0.0%	5.8%	1.0%	0.0%	5.8%	1.0%	0.0%	5.8%	1.0%	0.0%	5.8%	1.0%

**Mergers and Acquisitions Network
Summary Statistics**

Period	1	2	3	4	5	6	7	8	9	10	11	12
Total indegree	3	7	9	10	12	12	12	12	13	16	20	26
Total outdegree	3	7	9	10	12	12	12	12	13	16	20	26
Members indegree	1	4	6	6	6	6	6	6	7	9	10	11
Members outdegree	0	2	3	4	4	5	5	5	6	8	9	11
Organizers indegree	2	3	3	4	4	6	6	6	6	7	10	15
Organizers outdegree	3	5	6	6	6	7	7	7	7	8	11	15
Members % of total in	33%	57%	67%	60%	60%	50%	50%	50%	54%	56%	50%	42%
Members % of total out	0%	29%	33%	40%	40%	42%	42%	42%	46%	50%	45%	42%
Members % of ties	17%	43%	50%	50%	50%	46%	46%	46%	50%	53%	48%	42%
active population	4	8	12	12	12	13	13	13	14	16	17	18
members	31	56	71	81	85	96	105	108	117	123	125	126
network population	37	62	77	87	91	102	111	114	123	129	131	132
organizer only ties	2	2	2	2	2	3	3	3	3	3	5	8
member only ties	0	1	2	2	2	2	2	2	3	4	4	4
mixed ties org out	1	3	4	4	4	4	4	4	4	5	6	7
mixed ties mem out	0	1	1	2	2	3	3	3	3	4	5	7
network ties	3	7	9	10	10	12	12	12	13	16	20	26
density	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%
active population density	25%	13%	7%	8%	8%	8%	8%	8%	7%	7%	7%	8%
active member density	4%	7%	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%
active member-organizer density	0%	3%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%
ties per node	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
ties per active node	0.8	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.2	1.4
member ties per active node	0.3	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.9	1.0
member-organizer ties per active node	-	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.6
Average Daily Growth Rates												
active population	9.1%	3.1%	3.1%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	1.1%	0.4%	0.4%
members	7.3%	1.7%	1.0%	1.0%	0.4%	0.8%	0.7%	0.2%	0.6%	0.4%	0.1%	0.1%
network population	6.1%	1.5%	0.9%	0.4%	0.8%	0.8%	0.7%	0.2%	0.6%	0.4%	0.1%	0.1%
organizer only ties	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	4.4%	4.3%
member only ties	-	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	2.6%	0.0%	0.0%
mixed ties org out	18.2%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	1.3%	1.2%
mixed ties mem out	-	0.0%	7.1%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	2.6%	1.7%	2.9%
network ties	12.1%	1.8%	0.8%	0.0%	1.3%	0.0%	0.0%	0.0%	0.6%	1.8%	1.7%	2.1%
density	-1.6%	-1.1%	-0.9%	-0.7%	-0.3%	-1.2%	-0.4%	-0.4%	-0.5%	0.9%	1.4%	2.0%
active population density	-4.5%	-2.8%	0.8%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.5%	-0.5%	0.7%	1.1%
active member density	7.1%	-2.1%	1.0%	0.0%	-0.3%	0.0%	0.0%	0.0%	-0.2%	0.2%	0.1%	0.6%
active member-organizer density	-	-1.9%	2.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.4%	0.4%	-0.1%	0.7%
ties per node	3.6%	0.2%	-0.1%	-0.3%	0.4%	-0.6%	-0.2%	-0.2%	0.0%	1.3%	1.5%	2.1%
ties per active node	1.5%	-0.9%	0.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.6%	1.2%	1.6%
member ties per active node	13.6%	-0.4%	1.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	1.1%	0.6%	1.0%
member-organizer ties per active node	-	0.0%	2.4%	0.0%	1.0%	0.0%	0.0%	0.0%	0.8%	1.3%	0.4%	1.1%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *
* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

**Supply Chain Management Network
Summary Statistics**

	1	2	3	4	5	6	7	8	9	10	11	12
Period	0	2	4	4	6	9	10	10	10	10	10	10
Total indegree	0	2	4	4	6	9	10	10	10	10	10	10
Total outdegree	0	2	4	4	6	9	10	10	10	10	10	10
Members indegree	0	0	1	1	2	4	4	4	4	4	4	4
Members outdegree	0	1	2	2	3	5	6	6	6	6	6	6
Organizers indegree	0	2	3	3	4	5	6	6	6	6	6	6
Organizers outdegree	0	1	2	2	3	4	4	4	4	4	4	4
Members % of total in	-	0%	25%	25%	33%	44%	40%	40%	40%	40%	40%	40%
Members % of total out	-	50%	50%	50%	50%	56%	60%	60%	60%	60%	60%	60%
Members % of ties	-	25%	38%	38%	42%	50%	50%	50%	50%	50%	50%	50%
active population	0	3	4	4	5	7	8	8	8	8	8	8
members	22	30	34	37	38	42	42	46	46	49	50	54
network population	28	36	40	43	44	48	48	52	52	55	56	60
organizer only ties	0	1	1	1	1	1	1	1	1	1	1	1
member only ties	0	0	0	0	0	1	1	1	1	1	1	1
mixed ties org out	0	0	1	1	2	3	3	3	3	3	3	3
mixed ties mem out	0	1	2	2	3	4	5	5	5	5	5	5
network ties	0	2	4	4	6	9	10	10	10	10	10	10
density	0.0%	0.2%	0.3%	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%
active population density	-	33%	33%	33%	30%	21%	18%	18%	18%	18%	18%	18%
active member density	-	5%	11%	11%	14%	12%	10%	10%	10%	10%	10%	10%
active member-organizer density	-	5%	7%	7%	9%	7%	7%	7%	7%	7%	7%	7%
ties per node	-	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ties per active node	-	0.7	1.0	1.0	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3
member ties per active node	-	0.3	0.8	0.8	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1
member-organizer ties per active node	-	0.3	0.5	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.8
Average Daily Growth Rates												
active population	-	2.1%	0.0%	1.9%	2.5%	1.1%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%
members	3.3%	0.8%	0.6%	0.2%	0.7%	0.0%	0.7%	0.0%	0.0%	0.5%	0.1%	0.6%
network population	2.6%	0.7%	0.5%	0.2%	0.6%	0.0%	0.6%	0.0%	0.0%	0.4%	0.1%	0.5%
organizer only ties	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member only ties	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties org out	-	-	0.0%	7.7%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
mixed ties mem out	-	6.3%	0.0%	3.8%	2.1%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
network ties	-	6.3%	0.0%	3.8%	3.1%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
density	-	3.8%	-1.0%	3.3%	1.6%	0.9%	-1.1%	0.0%	-0.8%	-0.2%	-0.9%	0.6%
active population density	-	0.0%	0.0%	-0.8%	-1.8%	-1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%
active member density	-	8.3%	0.0%	2.2%	-1.0%	-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
active member-organizer density	-	3.5%	0.0%	1.2%	-0.8%	-0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
ties per node	-	5.0%	-0.5%	3.6%	2.3%	0.9%	-0.5%	0.0%	-0.4%	-0.1%	-0.5%	1.0%
ties per active node	-	3.1%	0.0%	1.5%	0.4%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
member ties per active node	-	7.8%	0.0%	2.6%	0.9%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
member-organizer ties per active node	-	3.1%	0.0%	1.5%	1.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%

Calculation Notes

nodes with at least one tie
network members only (excluding organizers)
network members and organizers

all ties / population
all ties / active population
ties involving members / active population *
ties originated by members / active population *

* less all possible organizer-only ties, maximum 30

all ties / population
all ties / active population
ties involving members / active population
ties originated by members / active population

-- Excluding Launch (Period 2) --

Low High Average Low High Average

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Virtual Teamwork Network
Summary Statistics

	1	2	3	4	5	6	7	8	9	10	11	12
Period	0	18	39	40	41	58	64	67	73	76	76	76
Total indegree	0	18	39	40	41	58	64	67	73	76	76	76
Total outdegree	0	18	39	40	41	58	64	67	73	76	76	76
Members indegree	0	14	33	34	34	47	51	54	56	57	57	57
Members outdegree	0	12	28	29	30	43	47	49	55	57	57	57
Organizers indegree	0	4	6	6	7	11	13	13	17	19	19	19
Organizers outdegree	0	6	11	11	11	15	17	18	18	19	19	19
Members % of total in	-	78%	85%	85%	83%	81%	80%	81%	77%	75%	75%	75%
Members % of total out	-	67%	72%	73%	73%	74%	73%	73%	75%	75%	75%	75%
Members % of ties	-	72%	78%	79%	78%	78%	77%	77%	76%	75%	75%	75%
active population	0	7	11	12	13	17	17	17	18	19	19	19
members	28	63	77	81	89	104	105	111	115	128	128	134
network population	34	69	83	87	95	110	111	117	121	134	134	140
organizer only ties	0	0	0	0	0	1	1	1	1	1	1	1
member only ties	0	8	22	23	25	35	37	39	41	41	41	41
mixed ties org out	0	6	11	11	11	14	16	17	17	18	18	18
mixed ties mem out	0	4	6	6	7	10	12	12	16	18	18	18
network ties	0	18	39	40	43	60	66	69	75	78	78	78
density	0.0%	0.4%	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%
active population density	-	43%	35%	30%	28%	22%	24%	23%	25%	23%	23%	23%
active member density	-	32%	30%	26%	24%	20%	22%	20%	22%	21%	21%	21%
active member-organizer density	-	21%	22%	19%	18%	15%	16%	15%	17%	16%	16%	16%
ties per node	-	0.3	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ties per active node	-	2.6	3.5	3.3	3.3	3.5	3.9	3.8	4.2	4.1	4.1	4.1
member ties per active node	-	2.6	3.5	3.3	3.3	3.5	3.8	3.8	4.1	4.1	4.1	4.1
member-organizer ties per active node	-	1.7	2.5	2.4	2.5	2.6	2.9	2.8	3.2	3.1	3.1	3.1
Average Daily Growth Rates												
active population	-	3.6%	0.6%	0.6%	0.6%	1.9%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%
members	11.4%	1.4%	0.4%	0.8%	1.1%	1.1%	0.1%	0.4%	0.3%	0.9%	0.0%	0.3%
network population	9.4%	1.3%	0.3%	0.7%	1.0%	1.0%	0.1%	0.4%	0.2%	0.8%	0.0%	0.3%
organizer only ties	-	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member only ties	-	10.9%	0.3%	0.7%	0.7%	2.5%	0.4%	0.4%	0.4%	0.0%	0.0%	0.0%
mixed ties org out	-	5.2%	0.0%	0.0%	1.7%	1.7%	1.1%	0.4%	0.0%	0.5%	0.0%	0.0%
mixed ties mem out	-	3.1%	0.0%	1.3%	2.7%	1.5%	1.5%	0.0%	2.4%	1.0%	0.0%	0.0%
network ties	-	7.3%	0.2%	0.6%	2.5%	0.8%	0.8%	0.3%	0.6%	0.3%	0.0%	0.0%
density	-	3.1%	-0.5%	-0.8%	0.2%	0.6%	0.6%	-0.4%	0.1%	-1.2%	0.0%	-0.6%
active population density	-	-1.1%	-1.0%	-0.7%	-1.2%	0.8%	0.8%	-0.5%	0.6%	-0.5%	0.0%	0.0%
active member density	-	-0.3%	-0.9%	-0.7%	-1.1%	0.8%	0.8%	-0.4%	0.6%	-0.5%	0.0%	0.0%
active member-organizer density	-	0.1%	-0.8%	-0.6%	-1.0%	0.7%	0.7%	-0.5%	0.8%	-0.5%	0.0%	0.0%
ties per node	-	5.0%	-0.2%	-0.1%	1.3%	0.7%	0.7%	-0.1%	0.4%	-0.5%	0.0%	-0.3%
ties per active node	-	2.4%	-0.4%	-0.1%	0.4%	0.8%	0.8%	-0.1%	0.6%	-0.1%	0.0%	0.0%
member ties per active node	-	2.4%	-0.4%	-0.1%	0.3%	0.8%	0.8%	-0.1%	0.6%	-0.1%	0.0%	0.0%
member-organizer ties per active node	-	3.0%	-0.4%	0.1%	0.5%	0.7%	0.7%	-0.1%	0.8%	-0.1%	0.0%	0.0%
Calculation Notes												
nodes with at least one tie												
network members only (excluding organizers)												
network members and organizers												
all ties / population												
all ties / active population												
ties involving members / active population *												
ties originated by members / active population *												
* less all possible organizer-only ties, maximum 30												
all ties / population												
all ties / active population												
ties involving members / active population												
ties originated by members / active population												
-- Excluding Launch (Period 2) --												
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average
active population	0.0%	3.6%	0.8%	0.0%	3.6%	0.8%	0.0%	3.6%	0.8%	0.0%	3.6%	0.8%
members	0.0%	11.4%	1.5%	0.0%	11.4%	1.5%	0.0%	11.4%	1.5%	0.0%	11.4%	1.5%
network population	0.0%	9.4%	1.3%	0.0%	9.4%	1.3%	0.0%	9.4%	1.3%	0.0%	9.4%	1.3%
organizer only ties	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
member only ties	0.0%	10.9%	1.6%	0.0%	10.9%	1.6%	0.0%	10.9%	1.6%	0.0%	10.9%	1.6%
mixed ties org out	0.0%	5.2%	0.9%	0.0%	5.2%	0.9%	0.0%	5.2%	0.9%	0.0%	5.2%	0.9%
mixed ties mem out	0.0%	3.1%	1.2%	0.0%	3.1%	1.2%	0.0%	3.1%	1.2%	0.0%	3.1%	1.2%
network ties	0.0%	7.3%	1.3%	0.0%	7.3%	1.3%	0.0%	7.3%	1.3%	0.0%	7.3%	1.3%
density	-1.2%	3.1%	0.1%	-1.2%	3.1%	0.1%	-1.2%	3.1%	0.1%	-1.2%	3.1%	0.1%
active population density	-1.2%	0.8%	-0.4%	-1.2%	0.8%	-0.4%	-1.2%	0.8%	-0.4%	-1.2%	0.8%	-0.4%
active member density	-1.1%	0.8%	-0.3%	-1.1%	0.8%	-0.3%	-1.1%	0.8%	-0.3%	-1.1%	0.8%	-0.3%
active member-organizer density	-1.0%	0.8%	-0.2%	-1.0%	0.8%	-0.2%	-1.0%	0.8%	-0.2%	-1.0%	0.8%	-0.2%
ties per node	-0.5%	5.0%	0.6%	-0.5%	5.0%	0.6%	-0.5%	5.0%	0.6%	-0.5%	5.0%	0.6%
ties per active node	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%
member ties per active node	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%	-0.4%	2.4%	0.3%
member-organizer ties per active node	-0.4%	3.0%	0.5%	-0.4%	3.0%	0.5%	-0.4%	3.0%	0.5%	-0.4%	3.0%	0.5%

Appendix C Network Statistics - Individual Roles

**Alternative Employment Models (AEM) Network
Individual Roles**

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
A03												
A04												
A05												
B01												
C01												
C02												
C03												
C04												
C05												
C06												
C07												
D01		U	U	U	U	U	U	U	U	U	U	U
D02												
E01												
E02												
E03												
F01												
F02												
F03												
H01												
H02												
J01					U							
J02												
J03												
K01												
K02												
M01												
M02												
M03		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
M04		U	U	U	U	U	U	U	U	U	U	U
M05												
M06												
M07												
N01												
N02								U	U	U	U	
O01												
P01												
P02												
P03												
P04												
R01												
R02												
R03												
R04												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
S09												
S10												
T01												
W01												
O1									C/B/F	C/B/F	C/B/F	
O2												
O3		U	U	U		U	U	U	U			
O4									C/B/F	C/B/F	C/B/F	
O5						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	
O6												

**Attracting and Retaining Talent (ART) Network
Individual Roles**

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02												
A03			U	U	U	U	U	U	U	U	U	U
A04												
A05												
A06												
A07												
A08												
A09												
A10												
A11												
A12												
A13												
A14												
B01												
B02		U										
B03												
B04												
C01												
C02												
C03												
C04												
C05												
C06												
C07												
C08												
C09												
D01												
D02												
D03												
E01			U	U	U	U	U	U	U	U	U	U
E02												
E03												
E04												
E05												
F01												
F02												
G01												
G02												
H01												
H02												
H03												
H04												
H05												
H06												
I01												
I02												
I03												
J01						U	U	U	U	U	U	U
J02												
J03				U	U	U	U	U	U	U	U	U
J04												
J05		U	U	U	U	U	U	U	U	U	U	U
J06												
J07												
J08												
K01						U	U	U	U	U	U	U
K02												

Period	1	2	3	4	5	6	7	8	9	10	11	12
L01												
M01												
M02												
M03												
M04		U	U	U	U	U	U	U	U	U	U	U
M05												
M06		C/B/F										
M07												
M08												
M09												
M10												
M11												
M12												
M13												
M14												
M15												
M16												
M17												
N01												
N02												
N03												
O01												
P01												
P02												
P03												
P04												
R01												
R02			U	U	U	U	U	U	U	U	U	U
R03												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
T01												
T02												
T03												
T04												
V01									U	U	U	
W01												
W02												
W03												
X01												
O1												
O2				U	U							
O3		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O4						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O5		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O6												

Corporate Philanthropy Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01				C/B/F								
A02												
A03												
A04							U	U	U	U	U	U
A05							U	U	U	U	U	U
A06												
A07												
A08												
A09												
A10												
A11												
B01												
C01												
C02						U	U	U	U	U	U	U
D01												
E01						U	U	U	U	U	U	U
E02												
F01					U	U	U	U	U	U	U	U
G01					U	U	U	U	U	U	U	U
H01												
J01												
J02												
J03												
K01					U	U	U	U	U	U	U	U
K02												
K03												
K04												
L01							U	U	U	U	U	U
M01												
M02												
N01												
O01						U	U	U	U	U	U	U
P01					U	U	U	U	U	U	U	U
P02						U	U	U	U	U	U	U
P03					U	U	U	U	U	U	U	U
R01												
R02												
R03												
S01												
S02												
S03												
S04												
S05					U	U	U	U	U	U	U	U
S06												
S07												
T01						U	U	U	U	U	U	U
U01												
V01					U	U	U	U	U	U	U	U
V02												
W01												
O1						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3					C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O4		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O5		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O6												

Creativity Network
Individual Roles

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

Period	1	2	3	4	5	6	7	8	9	10	11	12
A01												
A02												
A03												
A04			U									
A05												
A06												
A07												
A08												
A09												
A10												
A11												
A12												
A13												
A14												
A15												
A16												
A17												
A18												
B01												
B02												
B03												
B04												
B05												
B06												
C01												
C02												
C03				U	U	U	U	U	U	U	U	U
C04												
C05			U	U	U	U	U	U	U	U	U	U
C06												
C07												
C08												
C09												
C10												
C11												
C12												
C13												
C14												
C15												
C16												
C17												
D01				U	U	U	U	U	U	U	U	U
D02												
D03												
D04												
D05												
D06												
D07												
E01												
E02												
E03												
E04												
E05												
E06												
E07												
E08												
E09												
F01												
F02												
F03							U	U	U	U	U	U
F04												
F05												
G01												
G02												
G03												
H01												
H02												
H03			U	U	U	U	U	U	U	U	U	U
H04												
H05												
H06												
H07												
I01												
I02								U	U	U	U	U
I03												
I04												
J01												
J02												
J03										U	U	U
J04												
J05												
J06												
J07												
J08												
J09												
J10							C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
J11												
J12												
J13												
J14												
J15												

Period	1	2	3	4	5	6	7	8	9	10	11	12
J16												
J17												
J18												
K01												
K02												
K03												
K04												
K05												
K06												
K07												
K08												
K09												
L01												
L02												
L03												
L04												
L05												
L06												
M01												
M02												
M03												
M04												
M05												
M06												
M07							U	U	U	U	U	U
M08												
M09												
M10												
M11												
M12												
M13												
M14												
M15												
M16												
M17												
N01												
N02												
N03												
N04		U	U	U	U	U	U	U	U	U	U	U
N05												
N06												
N07												
N08												
P01												
P02												
P03												
P04												
P05												
P06												
P07												
P08												
R01												
R02												
R03												
R04												
R05												
R06		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R07												
R08												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
S08												
S09												
S10												
S11												
S12												
S13												
T01												
T02												
T03												
T04												
T05												
T06												
T07												
V01												
V02												
W01												
W02												
W03												
W04												
W05												
W06												
X01												
O1												
O2												
O3												C/B/F
O4		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O5												
O6					U	U	U	U	U	U	U	U

Crisis Management Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02											U	U
A03											C/B/F	C/B/F
A04										U	U	U
A05												
A06												
A07												
A08												
A09												
A10												
A11							U	U	U	U	U	U
A12												
A13												
A14												
A15							U	U	U	U	U	U
A16												
B01												
B02		C/B/F										
B03												
B04												
B05												
C01											U	U
C02											U	U
C03												
C04												
C05							U	U	U	U	U	U
C06												
C07												
D01												
D02												
D03												
E01												
E02												
E03												
F01												
F02							U	U	U	U	U	U
F03							U	U	U	U	U	U
G01												
H01												
H02							U	U	U	U	U	U
I01												
J01												
J02												
J03												
J04												
J05												
J06											U	U
J07												
J08											U	U
J09												
K01												
K02		C/B/F										
K03												
K04												
K05												
K06												
K07							U	U	U	U	U	U
L01												
L02												
L03												U
L04												
M01												

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
M02												
M03												
M04												
M05												
M06												
M07												
M08							U	U	U	U	U	U
M09												
M10												
M11												
M12												
N01												
N02		C/B/F										
N03										U	U	U
N04											U	U
N05												
N06												
N07							U	U	U	U	U	U
N08												
N09												
N10											U	U
O01											U	U
P01											U	U
P02												
P03												
P04												
R01							U	U	U	U	U	U
R02												
R03								C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R04												
R05												
R06												
R07							U	U	U	U	U	U
R08												
R09											U	U
S01											U	U
S02												
S03												
S04												
S05											U	U
S06												
S07										U	U	U
S08							U	U	U	U	U	U
S09												
T01											U	U
T02												
T03												
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T05												
U01												
V01												
V02										U	U	U
W01												
W02												
W03												
W04												
O1							C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2		C/B/F				C/B/F		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3							C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O4						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O5							U	U	U	U		
O6						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F

Emerging Markets Network
Individual Roles

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

Period	1	2	3	4	5	6	7	8	9	10	11	12
A01												
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A41												
A42												
A43												
A44		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
A45												
A46												
A47												
A48												
A49												
A50												
A51								U	U	U	U	
A52												
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Period	1	2	3	4	5	6	7	8	9	10	11	12
D08												
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E03								U	U	U	U	
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E11												
E12												
E13						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	
E14												
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E22								U	U	U	U	
F01												
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J22								U	U	U	U	
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Period	1	2	3	4	5	6	7	8	9	10	11	12
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Period	1	2	3	4	5	6	7	8	9	10	11	12
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R14						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R15												
R16												
R17												
R18												
R19						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R20												
R21												
R22												
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R24												
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R26								U	U	U	U	
R27												
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R29								U	U	U	U	
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Period	1	2	3	4	5	6	7	8	9	10	11	12
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S34								U	U	U	U	
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W11								U	U	U	U	
W12												
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W17												
W18												
X01												
Y01												
Y02												
Y03												
Z01												
Z02												
Z03												
O1								U	U	U	U	
O2												
O3												
O4												
O5												
O6						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F

Family Business Network
Individual Roles

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

Period	1	2	3	4	5	6	7	8	9	10	11	12
A01												
A02												
A03												
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S02												
S03												
S04												
S05												
T01												
T02												
T03												
W01												
W02												
O1												
O2						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3												
O4												
O5												
O6												

**Innovation Network
Individual Roles**

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02												
A03												
A04						U	U	U	U	U	U	
A05												
A06						U	U	U	U	U	U	
A07												
A08						U	U	U	U	U		
A09												
A10												
A11												
A12												
A13												
A14												
A15												
A16												
A17												
B01												
B02												
B03												
B04												
B05										U	U	
C01												
C02												
C03												
C04												
C05											U	
C06				C/B/F	C/B/F							
C07												
C08												
C09												
C10												
C11												
C12												
D01												
D02												
D03												
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E01												
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E05												
F01												
F02												
F03												
F04										U	U	
G01												
G02												
G03												
G04												
H01												
H02												
H03											U	
H04												
H05												
H06												
I01												
I02												
J01						C/B/F	C/B/F	C/B/F				
J02												
J03												
J04												
J05												
J06												
J07												
J08												
J09												
K01												

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
K02												
K03												
K04												
K05						U	U	U	U	U	U	
K06												
M01												
M02												
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M04												
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M06							U					
M07												
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M12												
M13						U	U	U	U	U	U	
M14												
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O02												
P01												
P02												
P03												
P04												
P05												
P06												
P07												
P08												
R01												
R02						U	U	U	U	U	U	
R03								U	U	U	U	
R04												
R05												
S01												
S02												
S03												
S04												
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T06												
T07												
T08												
T09												
U01												
V01												
V02												
W01												
X01												
O1										C/B/F	C/B/F	
O2												
O3						U	U					
O4									C/B/F	C/B/F	C/B/F	
O5											C/B/F	
O6					C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	

Intrapreneurship Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02												
A03												
A04												
A05						U	U	U	U	U	U	U
A06												
A07												
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A13												
A14												
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E01												
E02												
E03												
F01												
F02												
F03												
F04												
G01												
H01												
H02												
H03												
H04												
H05												
I01		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
I02												
J01						C/B/F						
J02												
J03												
J04												
J05				U	U	U	U	U	U	U	U	U
J06												
J07												
J08												
K01												
K02												
K03												

Period	1	2	3	4	5	6	7	8	9	10	11	12
K04												
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N02												
N03												
N04												
O01		U	U	U	U	U	U	U	U	U	U	U
P01												
P02												
P03												
P04												
R01												
R02									U			
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T01												
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T03												
T04												
T05												
T06												
U01												
V01												
W01												
O1								C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3												
O4							C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O5					U	U	U	U	U	U	U	U
O6					U	U	U	U	U	U		

IT Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01			U	U	U	U	U	U	U	U	U	U
A02			U	U	U	U	U	U	U	U	U	U
A03												
A04			U	U	U	U	U	U	U	U	U	U
A05												
A06												
A07												
A08												
A09												
B01												
B02												
B03				U	U	U	U	U	U	U	U	U
B04												
B05												
B06												
B07												
B08												
C01												
C02			U	U	U	U	U	U	U	U	U	U
C03												
C04												
C05						U	U	U	U	U	U	U
C06												
C07												
C08												
C09												
D01												
D02												
D03												
D04												
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F01												
G01												
G02												
G03												
H01												
H02												
H03												
I01												
J01												
J02												
J03												
J04												
J05												
J06												
J07												
J08												
J09												
K01			U	U	U	U	U	U	U	U	U	U

Period	1	2	3	4	5	6	7	8	9	10	11	12
K02												
K03												
K04												
K05												
K06												
K07												
L01												
M01												
M02												
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P03												
P04												
P05												
P06												
P07												
P08												
R01												
R02												
R03												
R04												
R05				C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R06												
R07												
R08						U	U	U	U	U	U	U
S01												
S02												
S03												
S04												
S05												
S06												
T01												
T02												
T03												
T04			U	U	U	U	U	U	U	U	U	U
V01												
W01												
X01												
Y01		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O1								C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2			U	U	U	U	U	U	U	U	U	U
O3									C/B/F	C/B/F	C/B/F	C/B/F
O4												
O5												
O6												

Key Account Management Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	1	2	3	4	5	6	7	8	9	10	11	12
A01												
A02												
A03												
A04												
A05												
A06												
B01												
B02												
C01												
C02												
C03												
C04												
C05												
C06												
C07												
D01												
D02												
D03												
D04												
D05			U									
D06					C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
E01						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
E02												
F01				U	U	U	U	U	U	U	U	U
F02		U	U	U	U	U	U	U	U	U	U	U
G01												
H01												
H02												
H03												
H04												
J01												
J02												
J03												
J04												
J05												
K01												
K02												
K03												
K04												
L01												
M01												
M02		U	U	U	U	U						
M03		U	U	U	U	U	U	U	U	U	U	U
M04												
M05												
M06												
M07												
M08												
M09												
M10												
M11												
N01												
N02		U	U	U	U	U	U	U	U	U	U	U
O01												
P01												
P02		U	U	U	U	U	U	U	U	U	U	U
R01					U	U	U	U	U	U	U	U
R02				U	U	U	U	U	U	U	U	U
R03												
S01		U	U	U								
S02												
S03												
T01												
T02		U	U	U	U	U	U	U	U	U	U	U
T03												
U01												
W01												
O1		C/B/F	C/B/F	C/B/F	C/B/F		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3					U							
O4												
O5												
O6		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F

Leadership Network
Individual Roles

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

Period	1	2	3	4	5	6	7	8	9	10	11	12
A01												
A02												
A03												
A04												
A05						U	U	U	U	U	U	U
A06												
A07												
A08												
A09												
A10												
A11						U						
A12						U	U	U	U	U	U	U
A13						U	U	U	U	U	U	U
A14												
A15												
A16												
A17												
A18												
A19												
A20												
A21												
A22												
A23												
A24												
A25												
A26												
A27												
A28												
B01												
B02												
B03												
B04												
B05												
B06												
B07												
B08												
B09												
C01												
C02												
C03												
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C05												
C06												
C07												
C08												
C09												
C10												
C11												
C12												
C13												
C14												
C15												
C16												
C17												
D01						U	U	U	U	U	U	U
D02												
D03												
D04												
D05												
D06												
D07												
D08												
D09												
D10												
D11												
D12												
E01												
E02												
E03												
E04												
E05												
E06												
E07												
E08												
E09												
E10												
F01												
F02												
F03												
F04												
F05												
F06												
F07												
F08												
F09												
F10												

Period	1	2	3	4	5	6	7	8	9	10	11	12
G01												
G02												
H01												
H02												
H03												
H04												
H05						U	U	U	U	U	U	U
H06												
H07												
H08												
H09												
H10												
H11												
H12												
I01												
I02												
I03												
J01												
J02												
J03						U	U	U	U	U	U	U
J04												
J05												
J06												
J07						U						
J08												
J09												
J10												
J11						U	U	U	U	U	U	U
J12												
J13												
J14												
J15												
J16												
J17												
J18												
J19												
J20												
J21												
J22												
J23												
J24												
J25												
J26												
J27												
K01												
K02												
K03												
K04												
K05						U	U	U	U	U	U	U
K06												
K07												
K08												
L01												
L02												
L03												
L04												
M01												
M02												
M03												
M04												
M05						U	U	U	U	U	U	U
M06												
M07												
M08												
M09												
M10												
M11												
M12												
M13												
M14												
M15												
M16							U	U	U	U	U	U
M17												
M18												
M19												
M20												
M21												
M22												
M23												
M24												
M25												
M26												
M27												
M28												
M29												
M30												
M31												
M32												
M33												
M34												
M35												
M36												

Period	1	2	3	4	5	6	7	8	9	10	11	12
M37												
M38												
M39												
M40												
M41												
N01												
N02												
N03												
N04												
N05												
N06												
N07												
N08												
P01												
P02												
P03												
P04												
P05												
P06												
P07												
P08												
P09												
R01												
R02												
R03												
R04												
R05												
R06												
R07												
R08		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R09												
R10												
R11												
R12												
R13												
R14												
R15												
R16												
R17												
R18												
R19												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
S08												
S09												
S10												
S11												
S12												
S13												
S14												
S15												
S16												
S17												
S18												
S19												
T01												
T02												
T03												
T04												
T05												
T06												
T07												
U01												
U02												
V01												
W01												
W02												
W03												
W04												
W05												
W06												
X01												
Y01												
Y02												
O1												
O2		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O3		C/B/F				C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O4						C/B/F	C/B/F		C/B/F	C/B/F	C/B/F	C/B/F
O5						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O6												

Mergers and Acquisitions Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02												
A03												
A04												
A05												
A06												
A07												
A08												
A09												
A10												
A11												
A12												
A13												
B01												
B02												
B03												
B04												
B05												
B06												
C01												
C02												
C03												
C04												
C05												
C06												
C07												
D01												
D02												
D03												
D04												
D05												
D06												
D07												
E01												
E02												
E03												
E04												
E05												
E06												
F01												
F02												
F03												
H01												
H02												
H03												
H04												
H05												
H06												
I01												
J01												
J02												
J03												
J04												
J05												
J06												
J07												
J08												
J09												
J10												
J11												
J12												
J13												
J14												
J15												

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
J16												
J17												
J18												
J19												
J20												
J21												
K01												
K02												
K03												
K04												
K05												
K06												
L01												
L02												
L03												
M01												
M02												
M03												
M04												
M05												
M06												
M07												
M08												
M09												
M10												
M11												
N01												
N02												
N03												
N04												
N05												
O01												
P01												
P02												
P03												
P04												
P05												
P06												
R01												
R02												
R03												
R04												
R05												
R06												
R07												
R08												
R09												
R10												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
T01												
T02												
T03												
U01												
V01												
W01												
Y01												
O1						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O2												
O3												
O4												
O5						C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
O6												

Supply Chain Management Network
Individual Roles

<i>Legend</i>	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

<i>Period</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
A01												
A02												
A03												
B01												
B02												
B03												
C01												
C02												
C03												
D01												
D02												
D03												
D04												
D05												
D06												
E01												
F01												
F02												
F03												
G01												
G02												
H01												
H02												
H03												
I01												
I02												
J01												
J02												
J03												
J04												
K01												
K02												
M01												
M02												
M03												
M04												
M05												
M06												
N01												
N02												
P01												
R01												
R02												
R03												
R04						C/B/F						
R05												
S01												
S02												
S03												
S04												
T01												
U01												
V01												
W01												
O1												
O2												
O3												
O4												
O5												
O6					C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F

Virtual Teamwork Network
Individual Roles

Legend	B	Broadcaster	P/S	Peripheral specialist / Sink
	C/B/F	Connector / Bridge / Facilitator	U	Unengaged

Period	1	2	3	4	5	6	7	8	9	10	11	12
A01												
A02												
A03												
A04												
A05												
A06												
A07												
A08												
A09												
A10												
A11												
A12												
A13												
A14												
A15		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
A16						U	U	U	U	U	U	U
A17												
A18												
A19												
B01												
B02												
B03												
B04												
B05												
B06												
B07												
C01			U	U								
C02												
C03												
C04												
C05												
C06												
C07												
D01												
D02												
D03												
D04												
D05												
D06												
E01												
E02												
E03												
E04												
E05												
E06												
F01												
F02												
F03												
F04												
G01												
G02												
G03												
H01												
H02												
H03												
H04												
I01												
I02												
I03												
J01												
J02												
J03									U	U	U	
J04												
J05												
J06												
J07												
J08												
J09												

Period	1	2	3	4	5	6	7	8	9	10	11	12
K01												
K02												
K03						U	U	U	U	U	U	U
K04												
K05												
K06												
L01												
M01												
M02												
M03												
M04												
M05								U	U	U	U	U
M06												
M07												
M08												
M09												
M10												
M11												
M12												
M13												
M14												
M15												
M16												
M17												
M18												
N01												
N02												
N03												
N04												
N06												
O01												
P01												
P02												
P03												
P04												
P05												
R01												
R02												
R03												
R04												
R05		C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F	C/B/F
R06												
R07												
R08												
S01												
S02												
S03												
S04												
S05												
S06												
S07												
S08												
S09												
S10												
S11												
T01												
T02												
U01												
U02												
V01												
W01												
W02												
W03												
W04												
X01												
Z01												
O1												
O2		U	U	U					C/B/F	C/B/F	C/B/F	C/B/F
O3												
O4												
O5			U	U	U	U	U	U	U	U	U	U
O6												

Appendix D Network Statistics - Cross-Network Comparisons

Cross-Network Comparison

Members' Percentage of Ties

Ranking	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average
1	Virtual Teams	-	72%	78%	79%	78%	78%	77%	77%	76%	75%	75%	76%
2	Emerging Markets	-	70%	75%	73%	73%	71%	71%	71%	71%	73%	73%	72%
3	Crisis Management	8%	56%	57%	59%	56%	46%	46%	47%	47%	48%	55%	48%
4	Creativity	33%	44%	50%	50%	50%	49%	50%	52%	52%	52%	52%	49%
5	Supply Chain Management	-	25%	38%	38%	42%	50%	50%	50%	50%	50%	50%	45%
6	IT	50%	48%	50%	47%	47%	50%	50%	50%	49%	49%	49%	49%
7	Key Account Management	0%	38%	40%	40%	43%	49%	48%	49%	49%	49%	48%	42%
8	Intrapreneurship	-	71%	57%	59%	59%	55%	46%	45%	44%	43%	42%	51%
9	Mergers and Acquisitions	17%	43%	50%	50%	50%	46%	46%	46%	50%	53%	48%	45%
10	Alternative Employment Models	75%	55%	54%	54%	54%	50%	50%	49%	45%	43%	42%	51%
11	Leadership	-	32%	46%	46%	46%	41%	42%	44%	44%	42%	42%	42%
12	Corporate Philanthropy	50%	39%	42%	44%	42%	38%	38%	38%	38%	38%	38%	40%
13	Family Business	0%	50%	50%	50%	50%	42%	42%	42%	42%	42%	38%	40%
14	Innovation	-	71%	67%	68%	65%	42%	42%	44%	41%	39%	37%	50%
15	Attracting and Retaining Talent	50%	28%	34%	26%	26%	23%	23%	23%	23%	23%	22%	27%
	Average	31%	50%	53%	52%	52%	49%	48%	48%	48%	48%	47%	49%

*Ranking based on period 12 results

Cross-Network Comparison

Active Population

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Crisis Management	7	14	16	17	18	23	27	27	27	31	45	47	25
2	Emerging Markets	0	9	11	12	13	27	28	28	32	33	34	34	22
3	Corporate Philanthropy	6	11	17	18	18	24	26	26	26	26	26	26	21
4	Leadership	0	12	14	14	15	21	22	23	23	23	23	23	18
5	Creativity	4	15	17	18	19	19	21	22	22	23	23	23	19
6	Key Account Management	2	14	15	16	18	22	22	22	22	22	22	22	18
7	Innovation	0	8	9	10	11	16	17	18	18	20	22	22	14
8	Virtual Teams	0	7	11	12	13	17	17	18	18	19	19	19	14
9	IT	2	13	14	15	15	18	18	18	18	18	18	18	15
10	Mergers and Acquisitions	4	8	12	12	12	13	13	13	14	16	17	18	13
11	Attracting and Retaining Talent	2	9	13	14	14	16	16	16	16	17	17	17	14
12	Intrapreneurship	0	7	10	11	11	13	13	13	13	14	14	14	11
13	Alternative Employment Models	5	11	11	11	11	12	12	12	13	13	13	13	11
14	Family Business	2	6	6	6	6	7	7	7	7	7	11	11	7
15	Supply Chain Management	0	3	4	4	5	7	8	8	8	8	8	8	6
Average		2	10	12	13	13	17	18	18	18	19	21	21	15

*Ranking based on period 12 results

Cross-Network Comparison

Members

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average	
1	Emerging Markets	41	95	126	129	140	458	463	465	478	480	480	486	320
2	Leadership	116	151	172	174	192	207	207	218	219	247	254	257	201
3	Creativity	32	72	96	97	117	127	127	127	127	174	179	179	121
4	Innovation	21	48	62	68	76	87	92	96	98	122	141	141	88
5	Virtual Teams	28	63	77	81	89	104	105	111	115	128	128	134	97
6	Mergers and Acquisitions	31	56	71	81	85	96	105	108	117	123	125	126	94
7	Crisis Management	15	31	41	53	53	68	76	78	79	82	118	118	68
8	IT	24	44	54	56	66	70	70	70	70	70	70	105	64
9	Attracting and Retaining Talent	16	42	59	60	72	72	79	79	79	103	103	103	72
10	Intrapreneurship	7	10	12	13	62	63	72	73	73	73	94	101	54
11	Family Business	52	66	74	76	79	82	82	82	82	82	87	89	78
12	Key Account Management	33	50	60	60	61	66	66	66	66	66	66	67	61
13	Alternative Employment Models	23	32	37	37	37	48	48	49	49	55	56	57	44
14	Supply Chain Management	22	30	34	37	38	42	42	46	46	49	50	54	41
15	Corporate Philanthropy	12	25	34	36	40	47	50	50	50	50	50	50	41
	Average	32	54	67	71	80	109	112	115	117	127	133	138	96

*Ranking based on period 12 results

Cross-Network Comparison

Population

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average	
1	Emerging Markets	47	101	132	135	146	464	469	471	484	486	486	492	326
2	Leadership	122	157	178	180	198	213	213	224	225	253	260	263	207
3	Creativity	38	78	102	103	123	133	133	133	133	180	185	185	127
4	Innovation	27	54	68	74	82	93	98	102	104	128	147	147	94
5	Virtual Teams	34	69	83	87	95	110	111	117	121	134	134	140	103
6	Mergers and Acquisitions	37	62	77	87	91	102	111	114	123	129	131	132	100
7	Crisis Management	21	37	47	59	59	74	82	84	85	88	124	124	74
8	IT	30	50	60	62	72	76	76	76	76	76	76	111	70
9	Attracting and Retaining Talent	22	48	65	66	78	78	85	85	85	109	109	109	78
10	Intrapreneurship	13	16	18	19	68	69	78	79	79	79	100	107	60
11	Family Business	58	72	80	82	85	88	88	88	88	88	93	95	84
12	Key Account Management	39	56	66	66	67	72	72	72	72	72	72	73	67
13	Alternative Employment Models	29	38	43	43	43	54	54	55	55	61	62	63	50
14	Supply Chain Management	28	36	40	43	44	48	48	52	52	55	56	60	47
15	Corporate Philanthropy	18	31	40	42	46	53	56	56	56	56	56	56	47
	Average	38	60	73	77	86	115	118	121	123	133	139	144	102

*Ranking based on period 12 results

Cross-Network Comparison

Ties

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Crisis Management	6	17	21	23	24	41	54	61	62	67	88	92	46
2	Attracting and Retaining Talent	1	30	37	57	57	77	77	77	80	82	85	86	62
3	Virtual Teams	0	18	39	40	43	60	66	69	75	78	78	78	54
4	Innovation	0	7	9	11	13	37	39	43	48	57	67	71	34
5	Key Account Management	2	21	30	37	41	61	65	68	68	68	69	69	50
6	Alternative Employment Models	6	33	37	37	41	51	55	56	63	66	68	68	48
7	Leadership	0	14	24	24	28	46	51	56	56	59	59	61	40
8	Emerging Markets	0	10	12	13	13	39	45	46	56	59	60	60	34
9	Corporate Philanthropy	4	19	26	27	32	52	58	58	58	59	59	59	43
10	Intrapreneurship	0	12	21	22	23	30	36	39	40	42	46	46	30
11	Creativity	3	17	34	36	36	39	41	43	43	44	44	45	35
12	IT	1	22	28	32	32	36	36	37	40	40	40	40	32
13	Mergers and Acquisitions	3	7	9	10	10	12	12	12	13	16	20	26	13
14	Family Business	1	5	5	5	5	6	6	6	6	6	12	12	6
15	Supply Chain Management	0	2	4	4	6	9	10	10	10	10	10	10	7
	Average	2	16	22	25	27	40	43	45	48	50	54	55	36

*Ranking based on period 12 results

Cross-Network Comparison

Density

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Corporate Philanthropy	1.3%	2.0%	1.7%	1.6%	1.5%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.8%
2	Alternative Employment Models	0.7%	2.3%	2.0%	2.0%	2.3%	1.8%	1.9%	1.9%	2.1%	1.8%	1.8%	1.7%	1.9%
3	Key Account Management	0.1%	0.7%	0.7%	0.9%	0.9%	1.2%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.0%
4	Attracting and Retaining Talent	0.2%	1.3%	0.9%	1.3%	0.9%	1.3%	1.1%	1.1%	1.1%	0.7%	0.7%	0.7%	1.0%
5	Crisis Management	1.4%	1.3%	1.0%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	0.9%	0.6%	0.6%	0.9%
6	Intrapreneurship	0.0%	5.0%	6.9%	6.4%	0.5%	0.6%	0.6%	0.6%	0.6%	0.7%	0.5%	0.4%	1.9%
7	Virtual Teams	0.0%	0.4%	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%
8	IT	0.1%	0.9%	0.8%	0.8%	0.6%	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%	0.3%	0.6%
9	Innovation	0.0%	0.2%	0.2%	0.2%	0.2%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%
10	Supply Chain Management	0.0%	0.2%	0.3%	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%
11	Mergers and Acquisitions	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%
12	Creativity	0.2%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%
13	Family Business	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
14	Leadership	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
15	Emerging Markets	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Average	0.3%	1.0%	1.0%	1.0%	0.6%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.7%

*Ranking based on period 12 results

Cross-Network Comparison

Active Population Density

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average
1	Alternative Employment Models	30%	30%	34%	34%	37%	39%	42%	42%	40%	42%	44%	38%
2	Attracting and Retaining Talent	50%	42%	24%	31%	31%	32%	32%	32%	33%	30%	31%	33%
3	Intrapreneurship	-	29%	23%	20%	21%	19%	23%	25%	26%	23%	25%	24%
4	Virtual Teams	-	43%	35%	30%	28%	22%	24%	23%	25%	23%	23%	27%
5	Supply Chain Management	-	33%	33%	33%	30%	21%	18%	18%	18%	18%	18%	24%
6	Innovation	-	13%	13%	12%	12%	15%	14%	14%	16%	15%	15%	14%
7	Key Account Management	100%	12%	14%	15%	13%	13%	14%	15%	15%	15%	15%	21%
8	Family Business	50%	17%	17%	17%	17%	14%	14%	14%	14%	14%	11%	17%
9	IT	50%	14%	15%	15%	15%	12%	12%	12%	13%	13%	13%	16%
10	Leadership	-	11%	13%	13%	13%	11%	11%	11%	11%	12%	12%	12%
11	Creativity	25%	8%	13%	12%	11%	11%	10%	9%	9%	9%	9%	11%
12	Corporate Philanthropy	13%	17%	10%	9%	10%	9%	9%	9%	9%	9%	9%	10%
13	Mergers and Acquisitions	25%	13%	7%	8%	8%	8%	8%	8%	7%	7%	7%	9%
14	Emerging Markets	-	14%	11%	10%	8%	6%	6%	6%	6%	6%	5%	7%
15	Crisis Management	14%	9%	9%	8%	8%	8%	8%	9%	9%	7%	4%	8%
	Average	40%	20%	18%	18%	17%	16%	16%	16%	17%	16%	16%	18%

*Ranking based on period 12 results

Cross-Network Comparison

Active Member Density

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Alternative Employment Models	24%	25%	28%	28%	32%	32%	35%	35%	31%	31%	31%	31%	30%
2	Virtual Teams	-	32%	30%	26%	24%	20%	22%	20%	22%	21%	21%	21%	23%
3	Intrapreneurship	-	21%	17%	15%	16%	13%	13%	15%	15%	13%	14%	14%	15%
4	Attracting and Retaining Talent	14%	24%	15%	16%	16%	14%	14%	14%	14%	13%	13%	13%	15%
5	Supply Chain Management	-	5%	11%	11%	14%	12%	10%	10%	10%	10%	10%	10%	11%
6	Key Account Management	0%	6%	8%	10%	8%	9%	10%	10%	10%	10%	10%	10%	9%
7	IT	14%	10%	12%	11%	11%	9%	9%	10%	10%	10%	10%	10%	11%
8	Innovation	-	10%	10%	10%	10%	10%	10%	10%	10%	9%	9%	9%	10%
9	Family Business	0%	9%	9%	9%	9%	6%	6%	6%	6%	6%	6%	6%	7%
10	Creativity	7%	7%	11%	10%	9%	10%	9%	8%	8%	8%	8%	8%	9%
11	Leadership	-	4%	8%	8%	8%	7%	7%	7%	7%	7%	7%	7%	7%
12	Corporate Philanthropy	7%	11%	7%	6%	7%	6%	6%	6%	6%	6%	6%	6%	7%
13	Mergers and Acquisitions	4%	7%	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
14	Emerging Markets	-	12%	10%	9%	7%	5%	6%	6%	5%	5%	5%	5%	7%
15	Crisis Management	1%	7%	7%	7%	6%	5%	5%	6%	7%	5%	3%	3%	5%
	Average	8%	13%	12%	12%	12%	11%	11%	11%	11%	11%	11%	11%	11%

*Ranking based on period 12 results

Cross-Network Comparison

Active Member-Originator Density

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Alternative Employment Models	12%	15%	16%	16%	20%	19%	21%	21%	19%	19%	19%	19%	18%
2	Virtual Teams	-	21%	22%	19%	18%	15%	16%	15%	17%	16%	16%	16%	17%
3	Intrapreneurship	-	12%	9%	8%	8%	8%	8%	9%	9%	8%	8%	8%	9%
4	Attracting and Retaining Talent	0%	13%	8%	8%	8%	8%	8%	8%	8%	7%	7%	7%	7%
5	Supply Chain Management	-	5%	7%	7%	9%	7%	7%	7%	7%	7%	7%	7%	7%
6	Key Account Management	0%	4%	5%	6%	5%	5%	6%	6%	6%	6%	6%	6%	5%
7	IT	0%	4%	6%	5%	5%	4%	4%	5%	5%	5%	5%	5%	5%
8	Innovation	-	7%	7%	7%	7%	6%	5%	6%	6%	6%	5%	5%	6%
9	Creativity	4%	3%	6%	6%	5%	6%	5%	5%	5%	4%	4%	5%	5%
10	Leadership	-	2%	4%	4%	5%	4%	4%	4%	4%	4%	4%	4%	4%
11	Emerging Markets	-	5%	5%	5%	4%	3%	4%	4%	3%	4%	3%	3%	4%
12	Corporate Philanthropy	2%	5%	4%	4%	4%	3%	3%	3%	3%	3%	3%	3%	4%
13	Mergers and Acquisitions	0%	3%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%
14	Family Business	0%	4%	4%	4%	4%	3%	3%	3%	3%	3%	2%	2%	3%
15	Crisis Management	0%	4%	4%	4%	4%	3%	3%	4%	4%	3%	2%	2%	3%
	Average	2%	7%	7%	7%	7%	7%	7%	7%	7%	7%	6%	6%	7%

*Ranking based on period 12 results

Cross-Network Comparison

Ties per Node

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Alternative Employment Models	0.2	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.1	1.1	1.1	1.1	0.9
2	Corporate Philanthropy	0.2	0.6	0.7	0.6	0.7	1.0	1.0	1.0	1.0	1.1	1.1	1.1	0.8
3	Key Account Management	0.1	0.4	0.5	0.6	0.6	0.8	0.9	0.9	0.9	0.9	1.0	0.9	0.7
4	Attracting and Retaining Talent	0.0	0.6	0.6	0.9	0.7	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7
5	Crisis Management	0.3	0.5	0.4	0.4	0.4	0.6	0.7	0.7	0.7	0.8	0.7	0.7	0.6
6	Virtual Teams	0.0	0.3	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5
7	Innovation	0.0	0.1	0.1	0.1	0.2	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.3
8	IT	0.0	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
9	Intrapreneurship	0.0	0.8	1.2	1.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.4	0.6
10	Creativity	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3
11	Leadership	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
12	Supply Chain Management	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
13	Mergers and Acquisitions	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1
14	Family Business	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
15	Emerging Markets	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Average	0.1	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4

*Ranking based on period 12 results

Cross-Network Comparison

Ties per Active Node

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average
1	Alternative Employment Models	1.2	3.0	3.4	3.4	3.7	4.3	4.6	4.7	4.8	5.1	5.2	5.2	4.0
2	Attracting and Retaining Talent	0.5	3.3	2.8	4.1	4.1	4.8	4.8	4.8	5.0	4.8	5.0	5.1	4.1
3	Virtual Teams	-	2.6	3.5	3.3	3.3	3.5	3.9	3.8	4.2	4.1	4.1	4.1	3.7
4	Intrapreneurship	-	1.7	2.1	2.0	2.1	2.3	2.8	3.0	3.1	3.0	3.3	3.3	2.6
5	Innovation	-	0.9	1.0	1.1	1.2	2.3	2.3	2.4	2.7	2.9	3.0	3.2	2.1
6	Key Account Management	1.0	1.5	2.0	2.3	2.3	2.8	3.0	3.1	3.1	3.1	3.1	3.1	2.5
7	Leadership	-	1.2	1.7	1.7	1.9	2.2	2.3	2.4	2.4	2.6	2.6	2.7	2.1
8	Corporate Philanthropy	0.7	1.7	1.5	1.5	1.8	2.2	2.2	2.2	2.2	2.3	2.3	2.3	1.9
9	IT	0.5	1.7	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.0
10	Crisis Management	0.9	1.2	1.3	1.4	1.3	1.8	2.0	2.3	2.3	2.2	2.0	2.0	1.7
11	Creativity	0.8	1.1	2.0	2.0	1.9	2.1	2.0	2.0	2.0	1.9	1.9	2.0	1.8
12	Emerging Markets	-	1.1	1.1	1.1	1.0	1.4	1.6	1.6	1.8	1.8	1.8	1.8	1.5
13	Mergers and Acquisitions	0.8	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	1.2	1.4	0.9
14	Supply Chain Management	-	0.7	1.0	1.0	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2
15	Family Business	0.5	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.1	1.1	0.9
	Average	0.7	1.6	1.8	1.9	2.0	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.2

*Ranking based on period 12 results

Cross-Network Comparison

Member Ties per Active Node

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average
1	Virtual Teams	-	2.6	3.5	3.3	3.3	3.5	3.8	3.8	4.1	4.1	4.1	3.6
2	Alternative Employment Models	1.2	2.5	2.8	2.8	3.2	3.5	3.8	3.8	3.7	3.7	3.7	3.2
3	Key Account Management	0.0	0.9	1.3	1.7	1.6	2.1	2.2	2.3	2.3	2.3	2.3	1.8
4	Attracting and Retaining Talent	0.5	1.9	1.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.9
5	Intrapreneurship	-	1.7	1.9	1.8	1.9	1.9	1.9	2.1	2.1	2.0	2.1	2.0
6	Innovation	-	0.9	1.0	1.1	1.2	1.7	1.7	1.8	1.8	1.9	2.0	1.5
7	IT	0.5	1.5	1.8	1.8	1.8	1.7	1.7	1.8	1.9	1.9	1.9	1.7
8	Emerging Markets	-	1.1	1.1	1.1	1.0	1.4	1.6	1.6	1.7	1.8	1.7	1.4
9	Creativity	0.5	0.9	1.8	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.6
10	Leadership	-	0.6	1.2	1.2	1.3	1.4	1.5	1.7	1.7	1.7	1.7	1.4
11	Crisis Management	0.1	0.9	1.0	1.1	1.0	1.2	1.4	1.7	1.7	1.6	1.5	1.2
12	Corporate Philanthropy	0.5	1.1	1.1	1.1	1.2	1.4	1.5	1.5	1.5	1.5	1.5	1.3
13	Supply Chain Management	-	0.3	0.8	0.8	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0
14	Mergers and Acquisitions	0.3	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.9	0.7
15	Family Business	0.0	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.6
	Average	0.4	1.2	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	1.9	1.7

*Ranking based on period 12 results

Cross-Network Comparison

Member-Originator Ties per Active Node

Ranking*	Network	1	2	3	4	5	6	7	8	9	10	11	12 Average
1	Virtual Teams	-	1.7	2.5	2.4	2.5	2.6	2.9	2.8	3.2	3.1	3.1	2.7
2	Alternative Employment Models	0.6	1.5	1.6	1.6	2.0	2.1	2.3	2.3	2.2	2.2	2.2	1.9
3	Key Account Management	0.0	0.6	0.8	0.9	0.9	1.2	1.3	1.4	1.4	1.4	1.4	1.0
4	Intrapreneurship	-	1.0	1.0	1.0	1.0	1.2	1.2	1.3	1.3	1.2	1.3	1.2
5	Innovation	-	0.6	0.7	0.7	0.8	0.9	0.9	1.1	1.1	1.2	1.2	0.9
6	Emerging Markets	-	0.4	0.5	0.6	0.5	0.9	1.0	1.0	1.1	1.2	1.2	0.9
7	Attracting and Retaining Talent	0.0	1.0	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0
8	Creativity	0.3	0.5	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.9
9	Leadership	-	0.3	0.6	0.6	0.8	0.9	1.0	1.0	1.0	1.0	1.0	0.9
10	IT	0.0	0.6	0.9	0.9	0.9	0.8	0.8	0.9	1.0	1.0	1.0	0.8
11	Crisis Management	0.0	0.6	0.6	0.6	0.6	0.7	0.8	0.9	1.0	0.9	1.0	0.7
12	Corporate Philanthropy	0.2	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.7
13	Supply Chain Management	-	0.3	0.5	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.6
14	Mergers and Acquisitions	0.0	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.4
15	Family Business	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Average	0.1	0.7	0.9	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.2	1.0

*Ranking based on period 12 results

Cross-Network Comparison

Growth in Active Population

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Key Account Management	55%	0.4%	0.5%	1.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.3%
2	IT	50%	0.5%	0.5%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	0.2%
3	Attracting and Retaining Talent	32%	2.8%	0.5%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	3.3%	0.5%
4	Creativity	25%	0.8%	0.4%	0.4%	0.0%	0.8%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	2.6%	0.3%
5	Family Business	18%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.5%
6	Crisis Management	9.1%	0.9%	0.4%	0.5%	1.7%	1.3%	0.0%	0.0%	0.0%	1.1%	3.0%	0.3%	1.7%	0.9%
7	Mergers and Acquisitions	9.1%	3.1%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.5%	1.1%	0.4%	0.4%	1.4%	0.6%
8	Corporate Philanthropy	7.6%	3.4%	0.4%	0.0%	2.1%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.7%
9	Emerging Markets	-	1.4%	0.6%	0.6%	6.7%	0.3%	0.0%	0.0%	1.0%	0.2%	0.2%	0.0%	1.1%	1.1%
10	Alternative Employment Models	11%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	1.1%	0.1%
11	Virtual Teams	-	3.6%	0.6%	0.6%	1.9%	0.0%	0.4%	0.4%	0.0%	0.4%	0.0%	0.0%	0.8%	0.8%
12	Innovation	-	0.8%	0.8%	0.8%	2.8%	0.5%	0.4%	0.4%	0.0%	0.9%	0.7%	0.0%	0.8%	0.8%
13	Supply Chain Management	-	2.1%	0.0%	1.9%	2.5%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.8%
14	Intrapreneurship	-	2.7%	0.7%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.5%	0.5%
15	Leadership	-	1.0%	0.0%	0.5%	2.5%	0.4%	0.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%
Average		24%	1.6%	0.4%	0.4%	1.8%	0.3%	0.3%	0.1%	0.1%	0.3%	0.5%	0.0%	2.7%	0.6%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Members

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Intrapreneurship	3.9%	1.3%	0.6%	29%	0.1%	1.1%	1.1%	0.1%	0.0%	0.0%	1.9%	0.5%	3.5%	3.5%
2	Emerging Markets	12%	2.0%	0.2%	0.7%	14%	0.1%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	2.7%	1.7%
3	Attracting and Retaining Talent	15%	2.5%	0.1%	1.5%	0.0%	0.7%	0.7%	0.0%	0.0%	2.3%	0.0%	0.0%	2.0%	0.7%
4	Crisis Management	9.7%	2.0%	2.1%	0.0%	1.8%	0.9%	0.9%	0.2%	0.1%	0.3%	2.9%	0.0%	1.8%	1.0%
5	Innovation	12%	1.8%	0.7%	0.9%	0.9%	0.4%	0.4%	0.3%	0.1%	1.9%	1.0%	0.0%	1.8%	0.8%
6	Creativity	11%	2.1%	0.1%	1.6%	0.5%	0.0%	0.0%	0.0%	0.0%	2.8%	0.2%	0.0%	1.7%	0.7%
7	Virtual Teams	11%	1.4%	0.4%	0.8%	1.1%	0.1%	0.1%	0.4%	0.3%	0.9%	0.0%	0.3%	1.5%	0.6%
8	Corporate Philanthropy	9.8%	2.3%	0.4%	0.9%	1.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.5%
9	IT	7.6%	1.4%	0.3%	1.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	1.3%	0.7%
10	Mergers and Acquisitions	7.3%	1.7%	1.0%	0.4%	0.8%	0.7%	0.7%	0.2%	0.6%	0.4%	0.1%	0.1%	1.2%	0.6%
11	Alternative Employment Models	3.6%	1.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.1%	0.0%	0.9%	0.1%	0.1%	0.7%	0.4%
12	Supply Chain Management	3.3%	0.8%	0.6%	0.2%	0.7%	0.0%	0.0%	0.7%	0.0%	0.5%	0.1%	0.6%	0.7%	0.4%
13	Key Account Management	4.7%	1.3%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.6%	0.2%
14	Leadership	2.7%	0.9%	0.1%	0.8%	0.5%	0.0%	0.0%	0.4%	0.0%	1.0%	0.2%	0.1%	0.6%	0.4%
15	Family Business	2.4%	0.8%	0.2%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.4%	0.2%
	Average	7.7%	1.5%	0.4%	2.6%	1.6%	0.3%	0.3%	0.2%	0.1%	0.7%	0.5%	0.4%	1.5%	0.8%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Population

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Emerging Markets	10%	1.9%	0.2%	0.6%	14%	0.1%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	2.5%	1.7%
2	Intrapreneurship	2.1%	0.8%	0.4%	20%	0.1%	1.0%	1.0%	0.1%	0.0%	0.0%	1.8%	0.5%	2.4%	2.4%
3	Attracting and Retaining Talent	11%	2.2%	0.1%	1.4%	0.0%	0.7%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%	1.6%	0.7%
4	Innovation	9.1%	1.6%	0.6%	0.8%	0.8%	0.4%	0.4%	0.3%	0.1%	1.8%	1.0%	0.0%	1.5%	0.8%
5	Creativity	9.6%	1.9%	0.1%	1.5%	0.5%	0.0%	0.0%	0.0%	0.0%	2.7%	0.2%	0.0%	1.5%	0.7%
6	Crisis Management	6.9%	1.7%	1.8%	0.0%	1.6%	0.8%	0.8%	0.2%	0.1%	0.3%	2.7%	0.0%	1.5%	0.9%
7	Virtual Teams	9.4%	1.3%	0.3%	0.7%	1.0%	0.1%	0.4%	0.2%	0.4%	0.8%	0.0%	0.3%	1.3%	0.5%
8	IT	6.1%	1.3%	0.2%	1.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	1.1%	0.6%
9	Mergers and Acquisitions	6.1%	1.5%	0.9%	0.4%	0.8%	0.7%	0.2%	0.2%	0.6%	0.4%	0.1%	0.1%	1.1%	0.6%
10	Corporate Philanthropy	6.6%	1.8%	0.4%	0.7%	1.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.4%
11	Alternative Employment Models	2.8%	0.8%	0.0%	0.0%	1.6%	0.0%	0.0%	0.1%	0.0%	0.8%	0.1%	0.1%	0.6%	0.4%
12	Leadership	2.6%	0.8%	0.1%	0.8%	0.5%	0.0%	0.4%	0.4%	0.0%	1.0%	0.2%	0.1%	0.6%	0.4%
13	Supply Chain Management	2.6%	0.7%	0.5%	0.2%	0.6%	0.0%	0.0%	0.6%	0.0%	0.4%	0.1%	0.5%	0.6%	0.4%
14	Key Account Management	4.0%	1.1%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%	0.2%
15	Family Business	2.2%	0.7%	0.2%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.4%	0.2%
	Average	6.1%	1.3%	0.4%	1.9%	1.5%	0.3%	0.3%	0.2%	0.1%	0.7%	0.4%	0.3%	1.2%	0.7%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Organizer Only Ties

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Corporate Philanthropy	55%	0.9%	0.0%	0.0%	1.9%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.9%
2	Key Account Management	32%	0.7%	0.0%	0.0%	2.3%	1.0%	1.0%	0.0%	0.0%	0.0%	0.4%	0.0%	3.4%	0.5%
3	Intrapreneurship	-	-	0.0%	0.0%	0.0%	9.4%	9.2%	0.6%	0.6%	0.6%	1.0%	0.0%	2.4%	2.4%
4	Creativity	18%	2.1%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.4%
5	Innovation	-	-	-	-	-	-	0.0%	0.7%	2.6%	2.6%	1.3%	1.2%	1.4%	1.4%
6	Attracting and Retaining Talent	-	0.0%	8.2%	0.0%	0.0%	3.3%	0.0%	0.0%	0.5%	0.0%	0.4%	0.1%	1.3%	1.3%
7	Family Business	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	1.2%	1.3%
8	Crisis Management	0.0%	0.0%	0.0%	0.0%	1.5%	8.3%	1.1%	0.0%	0.0%	0.5%	0.8%	0.0%	1.1%	1.2%
9	Alternative Employment Models	-	1.3%	0.0%	0.0%	0.0%	3.1%	0.0%	0.8%	3.6%	1.5%	0.7%	0.0%	1.1%	1.1%
10	Mergers and Acquisitions	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	4.4%	4.3%	1.1%	1.2%
11	Leadership	-	0.0%	0.0%	0.0%	1.1%	6.3%	0.5%	0.0%	0.0%	1.4%	0.0%	0.7%	1.0%	1.0%
12	IT	-	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.6%	0.6%
13	Emerging Markets	-	-	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
14	Virtual Teams	-	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15	Supply Chain Management	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Average		17%	0.4%	1.1%	0.6%	4.0%	0.9%	0.9%	0.1%	0.6%	0.4%	1.0%	0.4%	2.5%	1.0%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Member Only Ties

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Creativity	-	19%	0.0%	0.0%	0.0%	0.0%	1.9%	2.9%	0.0%	0.0%	0.0%	0.0%	2.4%	2.4%
2	Corporate Philanthropy	18%	4.2%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.5%
3	Emerging Markets	-	3.1%	0.0%	0.0%	0.0%	10%	1.9%	0.0%	1.8%	0.9%	0.2%	0.0%	1.8%	1.8%
4	Virtual Teams	-	11%	0.3%	0.7%	2.5%	0.4%	0.4%	0.4%	0.4%	0.0%	0.0%	0.0%	1.6%	1.6%
5	Leadership	-	9.4%	0.0%	1.5%	2.1%	1.0%	1.0%	0.8%	0.0%	0.0%	0.0%	0.0%	1.5%	1.5%
6	Alternative Employment Models	15%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.1%
7	Mergers and Acquisitions	-	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	2.6%	0.0%	0.0%	1.2%	1.2%
8	Crisis Management	-	1.8%	0.0%	0.0%	1.4%	0.7%	0.0%	0.0%	0.0%	1.3%	6.7%	0.3%	1.2%	1.2%
9	Key Account Management	-	0.0%	3.6%	1.3%	6.3%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	1.2%	1.2%
10	IT	-	3.1%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.7%
11	Innovation	-	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	1.3%	0.0%	0.0%	0.7%	0.7%
12	Attracting and Retaining Talent	-	-	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.7%
13	Intrapreneurship	-	0.0%	1.4%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.4%	0.4%
14	Supply Chain Management	-	-	-	-	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15	Family Business	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Average		17%	4.5%	0.6%	0.2%	2.6%	0.4%	0.4%	0.5%	0.4%	0.4%	0.5%	0.0%	2.4%	1.0%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Mixed Ties Organizer Out

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	IT	91%	0.6%	1.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.5%	0.3%
2	Attracting and Retaining Talent	64%	3.1%	1.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	6.3%	0.6%
3	Creativity	55%	6.3%	0.5%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%	5.7%	0.8%
4	Crisis Management	27%	3.1%	1.2%	0.0%	3.6%	4.2%	1.3%	0.0%	0.0%	0.8%	1.2%	0.8%	3.9%	1.6%
5	Alternative Employment Models	24%	1.1%	0.0%	0.0%	1.9%	0.5%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	2.6%	0.4%
6	Corporate Philanthropy	18%	1.0%	0.0%	2.2%	3.5%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.8%
7	Mergers and Acquisitions	18%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	1.3%	1.2%	2.2%	0.7%
8	Innovation	-	3.1%	2.4%	0.0%	13%	0.6%	0.0%	0.0%	0.0%	0.6%	1.4%	0.0%	2.1%	2.1%
9	Leadership	-	10%	0.0%	0.0%	2.3%	1.4%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	1.5%
10	Key Account Management	-	6.3%	3.6%	0.0%	4.2%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.4%
11	Supply Chain Management	-	-	0.0%	7.7%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	1.2%
12	Emerging Markets	-	0.0%	0.0%	0.0%	9.4%	0.5%	0.4%	0.8%	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%
13	Family Business	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10%	0.0%	1.0%	1.0%
14	Virtual Teams	-	5.2%	0.0%	0.0%	1.7%	1.1%	0.4%	0.0%	0.0%	0.5%	0.0%	0.0%	0.9%	0.9%
15	Intrapreneurship	-	5.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.6%	0.0%	0.7%	0.7%
	Average	42%	3.4%	0.7%	0.7%	2.9%	0.7%	0.7%	0.2%	0.1%	0.4%	1.0%	0.1%	4.8%	1.0%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Mixed Ties Member Out

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Emerging Markets	-	-	-	0.0%	44%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	5.8%	5.8%
2	Creativity	45%	6.3%	0.6%	0.6%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	4.9%	0.8%
3	Crisis Management	-	0.0%	7.1%	0.0%	9.4%	6.2%	3.2%	3.2%	0.5%	0.0%	0.5%	0.0%	2.7%	2.7%
4	Innovation	-	3.1%	0.0%	5.1%	7.5%	0.7%	0.6%	0.6%	0.5%	1.1%	1.3%	0.0%	2.0%	2.0%
5	Mergers and Acquisitions	-	0.0%	7.1%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	2.6%	1.7%	2.9%	1.7%	1.7%
6	Leadership	-	6.3%	0.0%	3.8%	5.2%	0.7%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	1.7%
7	Corporate Philanthropy	-	6.3%	1.2%	1.1%	3.9%	1.2%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.4%	1.4%
8	Supply Chain Management	-	6.3%	0.0%	3.8%	2.1%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.4%
9	Intrapreneurship	-	9.4%	0.0%	0.0%	2.5%	0.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.4%
10	Virtual Teams	-	3.1%	0.0%	1.3%	2.7%	1.5%	0.0%	0.0%	2.4%	1.0%	0.0%	0.0%	1.2%	1.2%
11	Key Account Management	-	6.3%	0.9%	0.0%	2.1%	1.3%	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%
12	Alternative Employment Models	-	0.0%	0.0%	3.4%	1.4%	1.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.7%	0.7%
13	Family Business	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.7%	0.7%
14	IT	-	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.3%	0.0%	0.0%	0.0%	0.6%	0.6%
15	Attracting and Retaining Talent	-	1.4%	1.9%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	0.5%
	Average	45%	3.7%	1.4%	1.2%	5.7%	1.0%	0.5%	0.5%	0.4%	0.7%	0.2%	5.5%	1.5%	

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Network Ties

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Attracting and Retaining Talent	264%	1.5%	3.9%	0.0%	2.2%	0.0%	0.0%	0.0%	0.3%	0.2%	0.2%	0.1%	24.7%	0.8%
2	IT	191%	1.7%	1.0%	0.0%	0.8%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	17.7%	0.4%
3	Key Account Management	86%	2.7%	1.7%	0.8%	3.0%	0.5%	0.3%	0.3%	0.0%	0.0%	0.1%	0.0%	8.7%	0.9%
4	Creativity	42%	6.3%	0.4%	0.0%	0.5%	0.4%	0.3%	0.3%	0.0%	0.2%	0.0%	0.2%	4.6%	0.8%
5	Alternative Employment Models	41%	0.8%	0.0%	0.8%	1.5%	0.6%	0.1%	0.1%	0.9%	0.4%	0.2%	0.0%	4.2%	0.5%
6	Family Business	36%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	4.0%	0.8%
7	Corporate Philanthropy	34%	2.3%	0.3%	1.4%	3.9%	0.9%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	3.9%	0.9%
8	Crisis Management	17%	1.5%	0.7%	0.3%	4.4%	2.4%	0.9%	0.9%	0.1%	0.6%	2.1%	0.3%	2.7%	1.3%
9	Innovation	-	1.8%	1.6%	1.4%	12%	0.4%	0.4%	0.7%	0.8%	1.4%	1.2%	0.4%	2.1%	2.1%
10	Mergers and Acquisitions	12%	1.8%	0.8%	0.0%	1.3%	0.0%	0.0%	0.0%	0.6%	1.8%	1.7%	2.1%	2.0%	1.0%
11	Emerging Markets	-	1.3%	0.6%	0.0%	13%	1.2%	0.2%	0.2%	1.6%	0.4%	0.1%	0.0%	1.8%	1.8%
12	Supply Chain Management	-	6.3%	0.0%	3.8%	3.1%	0.9%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.4%
13	Virtual Teams	-	7.3%	0.2%	0.6%	2.5%	0.8%	0.8%	0.3%	0.6%	0.3%	0.0%	0.0%	1.3%	1.3%
14	Leadership	-	4.5%	0.0%	1.3%	4.0%	0.8%	0.8%	0.7%	0.0%	0.4%	0.0%	0.2%	1.2%	1.2%
15	Intrapreneurship	-	4.7%	0.3%	0.3%	1.9%	1.9%	1.5%	0.6%	0.2%	0.4%	0.6%	0.0%	1.1%	1.1%
	Average	80%	2.9%	0.8%	0.7%	3.6%	0.7%	0.7%	0.3%	0.4%	0.4%	0.9%	0.2%	8.3%	1.1%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Density

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	IT	62%	-0.7%	0.5%	-2.0%	0.1%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	-3.8%	5.2%	-0.5%
2	Attracting and Retaining Talent	47%	-2.1%	3.5%	-2.2%	2.2%	-1.2%	-1.2%	0.0%	0.3%	-2.9%	0.2%	0.1%	4.1%	-0.2%
3	Key Account Management	37%	0.2%	1.7%	0.6%	1.8%	0.5%	0.3%	0.3%	0.0%	0.0%	0.1%	-0.2%	3.8%	0.5%
4	Family Business	20%	-1.2%	-0.3%	-0.5%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	-0.3%	2.2%	0.4%
5	Alternative Employment Models	20%	-0.8%	0.0%	0.8%	-1.3%	0.6%	0.6%	-0.1%	0.9%	-1.2%	0.0%	-0.2%	1.7%	-0.1%
6	Supply Chain Management	-	3.8%	-1.0%	3.3%	1.6%	0.9%	-1.1%	0.0%	0.0%	-0.8%	-0.2%	-0.9%	0.6%	0.6%
7	Innovation	-	-1.2%	0.2%	-0.3%	7.6%	-0.4%	0.1%	0.5%	-1.7%	-0.7%	0.4%	0.5%	0.5%	0.5%
8	Corporate Philanthropy	5.1%	-1.2%	-0.4%	-0.1%	1.4%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.4%	0.0%
9	Leadership	-	2.1%	-0.2%	-0.3%	2.6%	0.8%	-0.1%	-0.1%	-0.1%	-1.3%	-0.4%	0.1%	0.3%	0.3%
10	Virtual Teams	-	3.1%	-0.5%	-0.8%	0.2%	0.6%	-0.4%	0.1%	-1.2%	-0.4%	0.0%	-0.6%	0.1%	0.1%
11	Creativity	3.0%	1.0%	0.3%	-2.3%	-0.5%	0.4%	0.3%	0.0%	0.0%	-3.4%	-0.4%	0.2%	-0.1%	-0.4%
12	Mergers and Acquisitions	-1.6%	-1.1%	-0.9%	-0.7%	-0.3%	-1.2%	-0.4%	-0.4%	-0.5%	0.9%	1.4%	2.0%	-0.2%	-0.1%
13	Crisis Management	-1.0%	-1.5%	-2.2%	0.3%	0.5%	0.5%	0.5%	0.5%	-0.1%	0.1%	-2.3%	0.3%	-0.4%	-0.4%
14	Emerging Markets	-	-1.9%	0.3%	-1.1%	-4.4%	1.0%	0.1%	1.1%	1.1%	0.3%	0.1%	-0.2%	-0.5%	-0.5%
15	Intrapreneurship	-	2.3%	-0.4%	-7.1%	1.7%	-0.5%	0.4%	0.4%	0.2%	0.4%	-2.1%	-0.9%	-0.6%	-0.6%
	Average	21%	0.1%	0.0%	-0.8%	0.9%	0.1%	0.1%	0.0%	0.2%	-0.7%	0.1%	-0.3%	1.9%	0.0%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Active Population Density

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Alternative Employment Models	0.0%	0.8%	0.0%	0.0%	0.8%	0.2%	0.6%	0.1%	-0.3%	0.4%	0.2%	0.0%	0.3%	0.3%
2	Innovation	-	0.0%	-0.2%	-0.3%	1.9%	-0.5%	-0.5%	-0.1%	0.8%	-0.3%	-0.2%	0.4%	0.2%	0.2%
3	Leadership	-	1.5%	0.0%	0.1%	-1.1%	0.1%	0.1%	0.0%	0.0%	0.4%	0.0%	0.2%	0.1%	0.1%
4	Corporate Philanthropy	2.7%	-2.8%	-0.5%	1.4%	-0.6%	-0.4%	-0.4%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.3%
5	Intrapreneurship	-	-1.1%	-1.0%	0.3%	-0.5%	1.5%	0.6%	0.2%	0.3%	-0.8%	0.6%	0.0%	0.0%	0.0%
6	Attracting and Retaining Talent	-1.5%	-2.7%	2.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.3%	-0.7%	0.2%	0.1%	-0.2%	0.0%
7	Virtual Teams	-	-1.1%	-1.0%	-0.7%	-1.2%	0.8%	0.8%	-0.5%	0.6%	-0.5%	0.0%	0.0%	-0.4%	-0.4%
8	Supply Chain Management	-	0.0%	0.0%	-0.8%	-1.8%	-1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	-0.4%
9	Creativity	-6.1%	3.4%	-0.4%	-0.8%	0.5%	-1.1%	-0.3%	0.0%	0.0%	-0.5%	0.0%	0.2%	-0.5%	0.1%
10	Mergers and Acquisitions	-4.5%	-2.8%	0.8%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.5%	-0.5%	0.7%	1.1%	-0.5%	-0.1%
11	Emerging Markets	-	-1.3%	-0.7%	-1.2%	-2.1%	0.5%	0.2%	0.2%	-0.5%	-0.1%	-0.3%	0.0%	-0.5%	-0.5%
12	Key Account Management	-8.0%	1.5%	0.6%	-1.0%	-0.1%	0.5%	0.3%	0.3%	0.0%	0.0%	0.1%	0.0%	-0.6%	0.2%
13	IT	-6.5%	0.6%	-0.1%	0.0%	-1.4%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	-0.6%	0.0%
14	Crisis Management	-3.1%	-0.4%	-0.2%	-0.6%	0.2%	-0.4%	0.9%	0.9%	0.1%	-1.4%	-2.6%	-0.3%	-0.7%	-0.5%
15	Family Business	-6.1%	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.6%	0.0%	-0.8%	-0.2%
	Average	-3.7%	-0.3%	0.0%	0.0%	-0.2%	-0.4%	0.0%	0.1%	0.1%	-0.3%	-0.2%	0.1%	-0.4%	-0.1%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Active Member Density

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Crisis Management	34%	0.1%	-0.1%	-0.9%	-0.6%	0.1%	1.3%	0.2%	-1.4%	-2.3%	-0.2%	2.8%	-0.4%	
2	Supply Chain Management	-	8.3%	0.0%	2.2%	-1.0%	-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%	
3	Mergers and Acquisitions	7.1%	-2.1%	1.0%	0.0%	-0.3%	0.0%	0.0%	-0.2%	0.2%	0.1%	0.6%	0.6%	-0.1%	
4	Leadership	-	5.4%	0.0%	0.3%	-1.3%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%	
5	Key Account Management	-	3.0%	1.4%	-1.3%	0.8%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%	
6	Corporate Philanthropy	5.8%	-2.5%	-0.4%	1.2%	-1.1%	-0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	-0.3%	
7	Attracting and Retaining Talent	5.9%	-2.2%	0.3%	0.0%	-0.7%	0.0%	0.0%	0.0%	-0.5%	0.0%	0.0%	0.3%	-0.3%	
8	Alternative Employment Models	0.6%	0.7%	0.0%	1.0%	0.0%	0.7%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.2%	0.2%	
9	Creativity	-0.9%	4.1%	-0.4%	-0.8%	0.4%	-1.1%	-0.3%	0.0%	-0.5%	0.0%	0.2%	0.1%	0.2%	
10	Innovation	-	0.3%	0.1%	-0.3%	0.0%	-0.3%	-0.1%	0.2%	-0.6%	-0.2%	0.0%	-0.1%	-0.1%	
11	IT	-2.6%	1.0%	-0.3%	0.0%	-1.1%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	-0.2%	0.0%	
12	Intrapreneurship	-	-1.3%	-0.7%	0.4%	-0.8%	0.0%	0.6%	0.0%	-0.7%	0.5%	0.0%	-0.2%	-0.2%	
13	Family Business	-	0.0%	0.0%	0.0%	-1.7%	0.0%	0.0%	0.0%	0.0%	-0.5%	0.0%	-0.2%	-0.2%	
14	Virtual Teams	-	-0.3%	-0.9%	-0.7%	-1.1%	0.8%	-0.4%	0.6%	-0.5%	0.0%	0.0%	-0.3%	-0.3%	
15	Emerging Markets	-	-1.1%	-0.8%	-1.3%	-1.8%	0.4%	0.2%	-0.5%	0.0%	-0.3%	0.0%	-0.5%	-0.5%	
	Average	7.1%	0.9%	-0.1%	0.0%	-0.7%	0.0%	0.2%	0.0%	-0.3%	-0.2%	0.0%	0.6%	0.0%	

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Active Member-Originator Density

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Corporate Philanthropy	13%	-1.6%	-0.2%	0.6%	-1.2%	-0.5%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	1.0%	-0.2%
2	Leadership	-	4.6%	0.0%	1.4%	-1.0%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%
3	Alternative Employment Models	2.6%	0.4%	0.0%	1.7%	-0.3%	0.9%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.4%	0.2%
4	Key Account Management	-	2.0%	0.8%	-1.1%	0.7%	0.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
5	Supply Chain Management	-	3.5%	0.0%	1.2%	-0.8%	-0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%
6	Mergers and Acquisitions	-	-1.9%	2.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.4%	0.4%	-0.1%	0.7%	0.2%	0.2%
7	IT	-	2.7%	-0.8%	0.0%	-1.1%	0.0%	0.5%	0.9%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%
8	Creativity	-0.9%	4.8%	-0.4%	-0.8%	0.7%	-1.1%	0.0%	0.0%	0.0%	-0.7%	0.0%	0.3%	0.2%	0.3%
9	Innovation	-	-0.1%	-0.2%	0.3%	-1.2%	-0.4%	0.5%	0.4%	0.0%	-0.4%	0.0%	0.0%	-0.2%	-0.2%
10	Virtual Teams	-	0.1%	-0.8%	-0.6%	-1.0%	0.7%	-0.5%	0.8%	0.0%	-0.5%	0.0%	0.0%	-0.2%	-0.2%
11	Intrapreneurship	-	-1.8%	-0.4%	0.0%	-0.1%	0.0%	1.0%	0.0%	0.0%	-0.9%	0.4%	0.0%	-0.2%	-0.2%
12	Emerging Markets	-	0.2%	-0.3%	-1.3%	-1.2%	0.7%	0.0%	0.0%	-0.1%	0.2%	-0.2%	0.0%	-0.2%	-0.2%
13	Attracting and Retaining Talent	-	-2.4%	0.5%	0.0%	-0.6%	0.0%	0.0%	0.0%	0.0%	-0.5%	0.0%	0.0%	-0.3%	-0.3%
14	Family Business	-	0.0%	0.0%	0.0%	-1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	-2.1%	0.0%	-0.4%	-0.4%
15	Crisis Management	-	-0.3%	-0.2%	-0.9%	-0.8%	-0.4%	1.4%	0.3%	0.3%	-1.4%	-1.9%	-0.4%	-0.5%	-0.5%
	Average	5.0%	0.7%	0.0%	0.0%	-0.6%	0.0%	0.0%	0.2%	0.1%	-0.2%	-0.3%	0.0%	0.5%	0.0%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Ties per Node

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Attracting and Retaining Talent	116%	-0.6%	3.7%	-1.2%	2.2%	-0.6%	0.0%	0.0%	0.3%	-1.5%	0.2%	0.1%	10.8%	0.3%
2	IT	111%	0.4%	0.8%	-1.1%	0.4%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	-2.3%	10.0%	-0.1%
3	Key Account Management	57%	1.3%	1.7%	0.7%	2.4%	0.5%	0.3%	0.3%	0.0%	0.0%	0.1%	-0.1%	5.8%	0.7%
4	Family Business	28%	-0.6%	-0.2%	-0.3%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	-0.2%	3.0%	0.6%
5	Alternative Employment Models	29%	-0.1%	0.0%	0.8%	-0.1%	0.6%	0.0%	0.0%	0.9%	-0.4%	0.1%	-0.1%	2.8%	0.2%
6	Corporate Philanthropy	16%	0.4%	-0.1%	0.6%	2.6%	0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	1.8%	0.4%
7	Creativity	16%	3.3%	0.3%	-1.3%	0.0%	0.4%	0.3%	0.0%	0.0%	-1.9%	-0.2%	0.2%	1.6%	0.1%
8	Innovation	-	0.1%	0.9%	0.5%	9.4%	0.0%	0.4%	0.7%	-0.3%	0.2%	0.2%	0.4%	1.2%	1.2%
9	Supply Chain Management	-	5.0%	-0.5%	3.6%	2.3%	0.9%	-0.5%	0.0%	0.0%	-0.4%	-0.1%	-0.5%	1.0%	1.0%
10	Crisis Management	5.5%	-0.2%	-0.9%	0.3%	2.3%	1.5%	0.7%	0.3%	0.0%	0.3%	-0.5%	0.3%	0.9%	0.4%
11	Leadership	-	3.2%	-0.1%	0.5%	3.3%	0.8%	0.3%	0.3%	0.0%	-0.5%	-0.2%	0.2%	0.7%	0.7%
12	Mergers and Acquisitions	3.6%	0.2%	-0.1%	-0.3%	0.4%	-0.6%	-0.2%	-0.2%	0.0%	1.3%	1.5%	2.1%	0.7%	0.4%
13	Virtual Teams	-	5.0%	-0.2%	-0.1%	1.3%	0.7%	-0.1%	0.4%	-0.5%	0.0%	0.0%	-0.3%	0.6%	0.6%
14	Emerging Markets	-	-0.5%	0.4%	-0.6%	-0.4%	1.1%	0.1%	1.3%	0.4%	0.1%	0.1%	-0.1%	0.2%	0.2%
15	Intrapreneurship	-	3.5%	-0.1%	-5.4%	1.8%	0.5%	0.5%	0.5%	0.2%	0.4%	-0.9%	-0.5%	0.0%	0.0%
	Average	42%	1.4%	0.4%	-0.2%	1.9%	0.4%	0.4%	0.1%	0.3%	-0.2%	0.4%	0.0%	4.3%	0.4%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Ties per Active Node

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Attracting and Retaining Talent	52%	-0.9%	3.1%	0.0%	1.1%	0.0%	0.0%	0.0%	0.3%	-0.3%	0.2%	0.1%	5.0%	0.4%
2	IT	22%	1.1%	0.5%	0.0%	-0.4%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	2.2%	0.2%
3	Alternative Employment Models	14%	0.8%	0.0%	0.8%	0.9%	0.6%	0.6%	0.1%	0.3%	0.4%	0.2%	0.0%	1.6%	0.4%
4	Corporate Philanthropy	14%	-0.7%	-0.1%	1.4%	1.4%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	1.5%	0.2%
5	Innovation	-	0.9%	0.7%	0.6%	6.0%	-0.1%	0.3%	0.8%	0.5%	0.5%	0.5%	0.4%	1.1%	1.1%
6	Key Account Management	4.5%	2.1%	1.1%	-0.1%	1.4%	0.5%	0.3%	0.3%	0.0%	0.0%	0.1%	0.0%	0.9%	0.5%
7	Creativity	4.6%	4.8%	0.0%	-0.4%	0.5%	-0.4%	0.0%	0.0%	0.0%	-0.2%	0.0%	0.2%	0.8%	0.5%
8	Family Business	6.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.7%	0.2%
9	Crisis Management	3.8%	0.5%	0.2%	-0.1%	2.1%	0.9%	0.9%	0.9%	0.1%	-0.5%	-0.6%	0.0%	0.7%	0.4%
10	Leadership	-	2.9%	0.0%	0.7%	1.1%	0.4%	0.4%	0.0%	0.0%	0.4%	0.0%	0.2%	0.6%	0.6%
11	Mergers and Acquisitions	1.5%	-0.9%	0.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.6%	1.2%	1.6%	0.5%	0.4%
12	Supply Chain Management	-	3.1%	0.0%	1.5%	0.4%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%
13	Intrapreneurship	-	1.4%	-0.3%	0.3%	0.6%	1.5%	0.6%	0.6%	0.2%	-0.2%	0.6%	0.0%	0.5%	0.5%
14	Emerging Markets	-	-0.1%	0.0%	-0.6%	2.8%	0.9%	0.9%	0.2%	0.5%	0.2%	-0.1%	0.0%	0.4%	0.4%
15	Virtual Teams	-	2.4%	-0.4%	-0.1%	0.4%	0.8%	0.8%	-0.1%	0.6%	-0.1%	0.0%	0.0%	0.3%	0.3%
	Average	14%	1.2%	0.4%	0.3%	1.3%	0.3%	0.3%	0.2%	0.2%	0.1%	0.3%	0.2%	1.6%	0.4%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Member Ties per Active Node

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Crisis Management	45%	1.0%	0.4%	-0.4%	1.1%	1.5%	1.3%	0.2%	0.2%	-0.4%	-0.3%	0.1%	4.5%	0.4%
2	Attracting and Retaining Talent	25%	-0.1%	0.9%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.1%
3	IT	17%	1.4%	0.1%	0.0%	-0.3%	0.0%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	1.8%	0.2%
4	Mergers and Acquisitions	14%	-0.4%	1.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	1.1%	0.6%	1.0%	1.6%	0.4%
5	Creativity	7.9%	5.6%	0.1%	-0.4%	0.4%	-0.3%	0.1%	0.0%	0.0%	-0.1%	0.0%	0.2%	1.2%	0.5%
6	Corporate Philanthropy	11%	-0.2%	0.0%	1.2%	0.8%	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	1.2%	0.2%
7	Alternative Employment Models	10%	0.7%	0.0%	1.0%	0.6%	0.7%	0.0%	0.0%	-0.3%	0.0%	0.0%	0.0%	1.2%	0.3%
8	Supply Chain Management	-	7.8%	0.0%	2.6%	0.9%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%
9	Leadership	-	6.8%	0.0%	0.8%	0.4%	0.6%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%
10	Key Account Management	-	3.5%	1.9%	-0.6%	2.2%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.8%
11	Innovation	-	0.9%	0.7%	0.6%	2.7%	0.1%	0.3%	0.2%	0.2%	0.1%	0.4%	0.0%	0.6%	0.6%
12	Emerging Markets	-	-0.1%	0.0%	-0.6%	2.8%	0.7%	0.2%	0.2%	0.5%	0.2%	-0.1%	0.0%	0.3%	0.3%
13	Virtual Teams	-	2.4%	-0.4%	-0.1%	0.3%	0.8%	-0.1%	0.1%	0.6%	-0.1%	0.0%	0.0%	0.3%	0.3%
14	Intrapreneurship	-	0.7%	-0.3%	0.4%	0.0%	0.0%	0.0%	0.6%	0.0%	-0.3%	0.5%	0.0%	0.2%	0.2%
15	Family Business	-	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.1%	0.1%
	Average	19%	2.0%	0.3%	0.3%	0.8%	0.3%	0.3%	0.2%	0.1%	0.0%	0.2%	0.1%	2.1%	0.4%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Cross-Network Comparison

Growth in Member-Originator Ties per Active Node

Ranking ¹	Network	1	2	3	4	5	6	7	8	9	10	11	12	Average ²	Average ³
1	Corporate Philanthropy	21%	1.2%	0.2%	0.2%	0.6%	0.6%	0.2%	0.0%	0.0%	0.4%	0.0%	0.0%	2.2%	0.3%
2	Alternative Employment Models	14%	0.4%	0.0%	0.0%	1.7%	0.3%	0.9%	0.0%	-0.3%	0.0%	0.0%	0.0%	1.6%	0.3%
3	Creativity	7.9%	6.4%	0.0%	0.0%	-0.4%	0.7%	-0.4%	0.4%	0.0%	-0.3%	0.0%	0.3%	1.3%	0.7%
4	Leadership	-	5.8%	0.0%	0.0%	1.9%	0.8%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%
5	Emerging Markets	-	1.4%	0.5%	-0.6%	4.1%	1.0%	1.0%	0.0%	0.9%	0.4%	0.0%	0.0%	0.8%	0.8%
6	Mergers and Acquisitions	-	0.0%	2.4%	0.0%	1.0%	0.0%	0.0%	0.0%	0.8%	1.3%	0.4%	1.1%	0.7%	0.7%
7	Key Account Management	-	2.5%	1.2%	-0.4%	2.1%	0.6%	0.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.6%	0.6%
8	Supply Chain Management	-	3.1%	0.0%	1.5%	1.2%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.6%
9	Innovation	-	0.4%	0.4%	1.3%	0.9%	0.0%	0.0%	0.9%	0.4%	0.3%	0.2%	0.0%	0.5%	0.5%
10	Virtual Teams	-	3.0%	-0.4%	0.1%	0.5%	0.7%	-0.1%	0.8%	-0.1%	0.0%	0.0%	0.0%	0.5%	0.5%
11	IT	-	3.2%	-0.5%	0.0%	-0.2%	0.0%	0.0%	0.5%	0.9%	0.0%	0.0%	0.0%	0.4%	0.4%
12	Crisis Management	-	0.6%	0.3%	-0.4%	0.9%	0.9%	0.9%	1.4%	0.3%	-0.5%	0.4%	-0.1%	0.4%	0.4%
13	Intrapreneurship	-	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	1.0%	0.0%	-0.5%	0.4%	0.0%	0.2%	0.2%
14	Attracting and Retaining Talent	-	-0.5%	1.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.1%	0.1%
15	Family Business	-	0.0%	0.0%	0.0%	-0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.3%	0.0%	-0.1%	-0.1%
Average		14%	1.8%	0.4%	0.4%	0.9%	0.9%	0.3%	0.3%	0.3%	0.0%	0.1%	0.1%	1.7%	0.5%

¹ Ranking based on average results (including launch period)

² Average including launch period (period 2)

³ Average excluding launch period (period 2)

Appendix E IMD Learning Network

Partners	Business Associates	
ABN Amro Bank N.V. Accenture A. P. Møller ABB Asea Brown Boveri Ltd. AstraZeneca Baxter International Inc. Bertelsmann AG British Telecommunications Plc Caterpillar Inc. CGNU Plc Citibank International Plc Credit Suisse Group DaimlerChrysler AG Deloitte Touche Tohmatsu Dentsu Inc. Dresdner Bank Du Pont de Nemours International EMC Corporation F. Hoffmann-La Roche Ltd. Henkel KGaA Holcim Ltd. IBM Europe ISS A/S LEGO Group Nestlé S.A. Nokia Corporation Norsk Hydro ASA Novartis PricewaterhouseCoopers Rabobank Group Royal KPN N.V. Royal Philips Electronics Shell International Petroleum Company Ltd. Skandia Insurance Company Sony International (Europe) GmbH Sulzer Ltd. Swiss Reinsurance Company Tetra Laval Group TXU Europe Group UBS AG Unilever N.V. Zurich Financial Services	Aegon N.V. Ajinomoto Co., Inc. Arthur D. Little AVL List GmbH Ballarpur Industries Ltd. Bank Julius Baer Barclays Capital Bekaert Group BG Plc Bobst SA Borealis Boston Consulting Group BP Amoco Plc British Airways Canon Ciba Specialty Chemicals Inc. Cisco Systems Clariant International Ltd. CNI-IEL Confederation of Danish Industries Corus Group CSC Ploenzke AG Danfoss AS Danisco Danske Bank Den Norske Bank Det Norske Veritas Deutsche Telekom AG DJOEF Dogus Group The Dow Chemical Company Dubai Aluminium Co. Ltd. Dubai Internet City Eastman Kodak Company Egon Zehnder International Elisa Communications E.ON AG Ericsson Mobile Communications AB ETISALAT – Emirates Telecom Euro RSCG Euronext Ezz Group Egypt Firmenich S.A. Goodyear Tire & Rubber Co. Grundfos Group Heineken NV Hewlett-Packard S.A. Hilti AG Hitachi Ltd Huhtamäki Van Leer	International Finance Corporation Itochu Corporation Jotun A/S KLM Royal Dutch Airlines Lafarge Lombard Odier & Cie* MasterCard International Inc. Matsushita Electric Industrial Co. Medtronic Inc. Metsaliitto Group Metso Corporation Monsanto MTN – Mobile Telephone Networks NCC – Nordic Construction Co. AB Pechiney Philip Morris Europe S.A. PubliGroupe Puig Corporation Rieter Holding AG RPG Enterprises Sara Lee DE Schindler Management AG Scottish & Newcastle Plc SEB-Skandinaviska Enskilda Banken SGS Société Générale de Surveillance SICPA Group SITA – Integrated Information and Telecommunications Services State Farm Insurance Statoil ASA Sun Microsystems Inc. Swissair Group Telenor Thames Water Plc TNO – Netherland Organization for Applied Scientific Research Toyota Motor Europe Tupperware Union Bancaire Privée Uponor Vodafone Group Services Ltd. Volvo Car Corporation Wärtsilä Corporation Wavin BV Wetzel GmbH Wild Group *

* Family Business Associates

November, 2001

There are two levels of membership in IMD's Learning Network, Partners and Business Associates.
Both levels allow participation in Dynamic Learning Networks (DLN's).

Alim KHAN

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telephone: mobile +41 76 412 63 62; email: alim@alimkhan.com
Canadian, U.S. Citizenship; birthdate 18.09.1967; Swiss C Permit

COMPETENCY PROFILE

10 years of experience acquired with leading organizations
in strategic consulting, professional services, and executive education

A proven track record in improving organizational processes, structures, and performance, focusing especially in the areas of knowledge, learning, and change management

Doctorate, MBA, Masters of International Management, with honours

Strong teamwork, leadership, analysis and communication skills; process and results-oriented

PROFESSIONAL EXPERIENCE

Project Manager, IMD Learning Lab

R&D Associate

IMD, Lausanne, Switzerland

1999-2003

One of the world's leading management development institutes with annual revenues of CHF 80 million, delivering programs for over 5000 executives annually

Responsible for managing and delivering projects to faculty and multinational company clients, developing and implementing elearning and new technology solutions, and creating materials used in organizational and management development programs

- Managed and actively developed face-to-face and elearning activities for Nokia program, achieving a rating of 4+ out of 5 by Nokia
- Built a network of startup companies, venture capitalists and business incubators in Silicon Valley that was visited by over 120 Nokia managers and used as a resource for a Nokia change management program internally
- Supported development of an ABB global IS team, a part of a larger business transformation – debriefed key managers and produced a case study and video featuring a cross-section of managers, to foster cross-business unit cooperation and to build organization-level capabilities
- Developed and delivered articles, briefings, case studies, and workshops on topics such as organizational development and change, ebusiness, knowledge management, networks and communities of practice, for several executive education programs including IMD's top program, Orchestrating Winning Performance
- Led projects developing innovative tools and techniques for creating and sharing knowledge

Experienced (Senior) Consultant

Arthur Andersen LLP, Milwaukee, USA

1998-99

Business Consulting division of formerly the largest professional services firm in the world, with 1998 Business Consulting revenues of \$1 billion and 5,500 consultants in 360 locations worldwide

Executed consulting projects for clients with annual revenues from \$50 million to \$1 billion: project planning, interviewing, conducting focus groups, performing analysis, developing and implementing performance management and technology solutions, in a team environment

- Implemented performance management solutions including balanced scorecards, that aligned strategies, initiatives, and measures at the corporate and business unit levels
- Applied state-of-the-art tools in benchmarking and best practices to create USD 1.5 million annual savings on a USD 5 million investment, through process improvement and reorganization
- Researched knowledge management and organizational learning, and applied this expertise to creating and delivering workshops and proposals
- Achieved SAP R/3 certification (ERP) and trained in Hyperion Essbase business intelligence (OLAP) software, serving as initial local practice expert for proposals and tracking projects in the region

Business Development Manager

BSD Bulgaria PLC, Sofia, Bulgaria

1995-96

Computer networking products distributor for the market leaders in enterprise networking, with annual revenues of USD 5 million and approximately 10% market share nationally

Assisted management team in transition from operating in a planned economy to a market economy, primarily focusing on strategic marketing and disseminating Western-style management practices

- Completed an MBA Enterprise Corps assignment – top business school graduates join management teams of East European companies, to help them adopt a free market orientation
- Produced marketing plan and promotional material, leading to a new partnership agreement and international trade fair sponsorship by Digital Equipment Corporation
- Presented seminars and workshops to local staff, engaging in knowledge transfer of leading management practices

Project Manager

SDS International Trade Strategists Inc., Montreal, Canada

1993

Startup firm offering consulting services to companies entering new, foreign markets

Entrepreneur: developed business plan and secured funding, proposed services to prospective clients and negotiated agreements, created company operating and financial infrastructure

- Co-authored successful seed financing proposal for \$15,000 from state venture capital fund
- Assisted in closing deals with agricultural services and environmental companies valued at \$40,000, to bring their organizations into new markets
- Alerted clients to product modifications required for new markets

Associate

Canada Consulting Cresap (now Boston Consulting Group), Toronto, Canada

1990-92

Leading strategic and organizational design management consulting firm, with a client roster including 20 of the top 50 Canadian industrial companies, public sector institutions, and regional and national governments

Consulting project team member: engaged in competitive, marketing and financial analysis, problem solving, and presentations to clients

- Delivered projects in organization design, financial services, value based management and shareholder value using EVA and MVA measures, service delivery improvement, and a joint venture review
- E.g. redesigned organization to deliver planning services, successfully integrating geographical and functional “silos” to improve service delivery while remaining within budget constraints

EDUCATION AND LANGUAGES

Doctor of Multicultural Management, 2004

University of St Gallen, Switzerland

Master of International Management, with Honors, 1994

Thunderbird, Glendale, Arizona, USA

MBA, with Honors, 1993,

Ivey Business School, University of Western Ontario, London, Canada

BA in Business Administration, with Honors, 1990

University of Western Ontario, London, Canada

Languages: working knowledge of French (DELF A4); basic knowledge of German, Bulgarian

French language study at Eurocentre, Paris, Summer 1994 and Eurocentre, Amboise, Summer 1999

German language study at the Goethe Institut, Staufien, Germany, Summer 1997

Bulgarian language study at the Centre for the Study of Democracy, Summer 1995

ACTIVITIES AND INTERESTS

Classical piano, literature, fencing, European travel