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Surmountable Chasms: Networks and Social Innovation for Resilient Systems

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ABSTRACT. Complex challenges demand complex solutions. By their very nature, these problems are difficult to define and are often the result of rigid social structures that effectively act as "traps". However, resilience theory and the adaptive cycle can serve as a useful framework for understanding how humans may move beyond these traps and towards the social innovation that is required to address many complex problems. This paper explores the critical question of whether networks help facilitate innovations to bridge the seemingly insurmountable chasms of complex problems to create change across scales, thereby increasing resilience. The argument is made that research has not yet adequately articulated the strategic agency that must be present within the network in order for cross scale interactions to occur. By examining institutional entrepreneurship through case studies and examples, this paper proposes that agency within networks requires specific skills from entrepreneurs, including ones that enable pattern generation, relationship building and brokering, knowledge and resource brokering, and network recharging. Ultimately, this begins to build a more complete understanding of how networks may improve human capacity to respond to complex problems and heighten overall resilience.

Key Words: *agency; complexity; cross scale; network theory; resilience; scale; skill sets; social entrepreneurship; social innovation; social networks*

INTRODUCTION

Urgent calls for "innovation" have become increasingly frequent as people begin to recognize both the need for fundamental change in human beings' relationships with each other and their environment, and the catastrophic ramifications of inaction or ill-informed decisions as to how such change might be effected. Yet, progress from recognition to action is often stalled by a lack of capacity to transfer innovations and knowledge between disciplines, "thought worlds", and contexts, and an inability to mobilize action across the boundaries and scales that define a social system. Social networks offer potential conduits for the quick mobilization and transfer of knowledge, and therefore can play a key role in the dissemination of social innovations and sustainable change, thus increasing the overall resilience of human-ecological systems.

The critical question is whether and how social networks can help facilitate innovations to bridge the seemingly insurmountable chasms that separate local solutions from broad system transformation; that is, how they help innovations to "cross scales". Using a complexity lens to understand the meta challenges confronting the world, and applying a social innovation framework to illuminate how local novelty spreads so as to have broad system impacts, this paper proposes that institutional entrepreneurship enhances the understanding of agency that is active within networks. Using examples to demonstrate how a network may be mobilized in order to create the conditions for broad and transformative change, we conclude that such entrepreneurs rely on a complex skill set in order for their network to leverage resources and maximize opportunities to effect change and address complex problems.

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COMPLEXITY, RESILIENCE, AND SOCIAL INNOVATION

Complex systems are often described as nonlinear, emergent, uncertain, and self-organizing (Berkes et al. 2003) without ever being specifically defined (Jennings 2001, Bar-Yam 2003). In the 1970s, ecologists began to apply the theory of complexity to discuss the structural dynamics of ecosystems and to develop the theory of resilience. The resilience of a system is defined by three important characteristics: the capacity of the system to experience a disturbance or change and still retain its basic function, structure, and identity; the ability to self-organize; and the ability to increase its capacity to learn and adapt (Gunderson and Holling 2002, Walker and Salt 2006, Jansen et al. 2007). While initial applications of the resilience theory focused on various aspects of ecosystems, efforts to apply the concepts to human systems followed, with significant advancements occurring in the last decade (Homer-Dixon 2000, 2006).

The overall resilience of a system may be examined through the lens of the adaptive cycle, which is graphically represented by an infinity loop (∞) encompassing four phases: release, reorganization, exploitation, and conservation. The exploitation and conservation phases in the "front" loop represent periods of growth and resource accumulation, where change is routine and almost always adaptive, while the release and reorganization phases in the "back" loop can represent the introduction of novelty, either transformative (radical) or adaptive change, and renewal of the system (Gunderson and Holling 2002). The back loop represents, therefore, a precarious moment from the point of view of whether the system remains in its current stability basin, adapting and learning but not transforming, or whether it is pushed close to a threshold that tips the system into a new stability domain. The new domain may share characteristics with the old stability domain but will have radically different feedback loops, and hence different relationships between the elements (Walker et al. 2004).

While much discussion has taken place about the difference between transformation, which is sometimes defined in resilience literature as moving to a "totally new system", and adaptation, which is incremental change, Arthur (2009) argues persuasively that the difference is one of degree of change, not of kind. All innovation is a recombination of older elements: novelty is never total, nor is system change. Nonetheless, transformative innovations, often termed disruptive "innovation" in the management theory leadership (Christensen 1997), may be distinguished from adaptive innovations in terms of their breadth of impact and the disturbance they create. Transformation is comparable to second-order change where some of the rules that govern the system change in response to the novelty (Watzlawick et al. 1974), hence spreading its impact. This transformation is a type of change that cascades across the panarchy, altering relationships at different scales.

Understanding the dynamics of such transformations, their relationship to agency and to structures can contribute to resilience theory. In the context of complex adaptive systems, we refer to such transformations as social innovations—that is, any initiatives, products, processes, or programs that change basic routines, resource and authority flows, or beliefs of any social system. The capacity of any society to create a steady flow of social innovations, therefore, has profound implications on the capacity of a linked social ecological system to both adapt and transform, and is an essential component of its "general" social and ecological resilience.

When seeking to understand the dynamics of social innovation, however, it is helpful to return to the heuristic of the adaptive cycle. The front loop of the adaptive cycle involves the development of skills, acquisition of resources, and institutionalization of norms. In business, this is represented as the classic "S curve", where an organization becomes increasingly efficient and hence profitable as it moves up a learning or performance curve (Christensen 1997). Eventually, however, the growth leads to a mature system and reduces diversity, making it vulnerable to major disturbances. In the event of a disturbance such as a natural disaster, a financial crisis, or major political change, the system may go through a period known as "creative destruction" (Schumpeter 1942) and move into the back loop, a much more diverse and unstructured environment, where the integration of different sources of knowledge is more likely to lead to the emergence of novel ideas. A balance between the capacity to learn and adapt in the front loop and the ability to self-organize in the back loop is crucial for building resilience (Gunderson and Holling 2002, Gilsing and Duysters 2008).

The adaptive cycle of any system will be linked across scales to other systems and adaptive cycles. Scale crossing may occur at any point in the adaptive cycle, and is the primary focus of this paper. Therefore, the arguments will not closely examine each of the adaptive cycle's four phases except insofar as they shed light on the concept of scale crossing. With regard to resilience theory, Cash et al. (2006) have defined "scale" as involving discrete, measurable units of analysis, such as time, of a specific phenomenon. While this definition is useful for considering quantitative aspects of a system, it remains limited in its consideration of qualitative or less tangible components, which are essential to innovation in a complex system.

For innovation, two aspects of crossing scales are important for consideration. "Scaling out" involves the replication and diffusion of an innovation across social boundaries that leads to saturation and conversion. "Scaling up" refers to moving an innovation into a broader system and creating transformation through the linking of opportunities and resources across scales. Quite often, to effect transformative change in a broader system, the innovation will be reconfigured into an entirely new form to suit that context. For instance, the PLAN Institute of British Columbia scaled out its original innovation of creating support networks for children with disabilities by setting up networks for different families in numerous locations around the world. However, when it wanted to scale up its innovative thinking about how society could provide long-term security for people with disabilities, the social innovation required different tools and involved new legislation and new economic instruments, including the Registered Disabilities Savings Fund. The initial local networks and then the national policies are all part of scaling up a single social innovation. The more boundaries and scales an innovation crosses, the wider and deeper will be the impact, and the more likely the innovation will result in totalizing and transformative change.

TRAPS AND BARRIERS TO CHANGE

Complex problems are exceedingly difficult to address since they can rarely be defined in a way that is consistent across the sectors and scales that they affect. Viewing the social factors that are part of the complexity as an adaptive cycle, it appears that at least two possible traps may act as barriers to innovation and transformational change. The first

is a "poverty trap", which occurs in the back loop when diversity and competition does not result in a dominant subset of the ideas, organizations, or initiatives that can secure enough resources to enter the "front loop" where growth and productivity are possible. While a significant amount of research has focused on the financial and social capital that may be related to poverty traps (e.g., Adato et al. 2006, Barrett and Swallow 2006), a poverty of other resources and investments critical to innovation may also exist. For example, the ideas or visions themselves, the efforts to build political will and public support, the search for early adopters of the innovation, and the creation of energy and momentum around the innovation all serve as resources and require investment (Moore and Westley, *in press*). Many innovations face this trap because even highly interesting ideas or products may not succeed in challenging people at the right time, raising awareness, or framing the innovation in a way that makes it appear as legitimate, desirable, and needed; as a result, sufficient resources are never devoted to the innovation and the system remains trapped.

However, if a system moves successfully up the "front loop" curve into the conservation phase, there is a chance that the system may become stuck in a "rigidity trap" where the need for continuous innovation is repressed (Scheffer and Westley 2007). In a social system, the dynamics and risks of this phase are such that, as any form of social order matures, the structures of legitimation (rules), domination (resource and authority allocation), and signification (interpretation and meaning) become more homogeneous and more resistant to change (Giddens 1979).

Perhaps one of the greatest challenges in any complex system is that people must be able to "see" the traps and be motivated to initiate and support change. This may be difficult for some individuals or groups that have not traditionally held the authority, power, or resources to effect change across a variety of sectors they have little experience with even though complex problems demand that these scales be crossed. Very high skill levels may be required of the actors in order to "shake loose" the constraints posed by the dominant pressures (DiMaggio 1988, Lounsbury and Crumley 2007, Yujuico 2008).

At this point in the adaptive cycle, a significant disturbance to the system is often the only means to

justify the change that is needed to adapt to the complex conditions that are posing challenges. Resilience theory indicates that after a disturbance has created the conditions for a system's tipping point, a breakdown can occur in previously existing structures, and the system enters a back loop; this leads to a period of seeming chaos but also a phase in which resources (social and intellectual as well as financial) are released or freed up. As a result, this phase provides the conditions for emergence—with different interactions taking place, new connections and knowledge may be formed and new ideas may arise. The risk is that the system, already vulnerable, may undergo continuous setbacks and become stuck in the poverty trap, unable to pool resources and ideas collectively in order to move forward.

It has been argued that networks, with their capacity to buffer, adapt to, and shape change, may be one way to organize socially to avoid traps and deal with complex problems (Hahn et al. 2006, Olsson et al. 2008, Bodin and Crona 2009). One reason for this is that certain network structures may be critical to humans' ability to innovate collectively the responses needed to initiate and support change across scales and create the social innovations that can address and resolve complex challenges (Newman and Dale 2005).

THE EXPLANATORY POWER OF NETWORK THEORY

The topic of social networks, which is receiving growing attention (Borgatti and Foster 2003, Watts 2004, Oerlemans et al. 2007), is hardly a new scholarly interest (e.g., Bavelas 1950, Milgram 1967, Granovetter 1973). The prevalence of social networks analysis in research today may be a consequence of the effects of globalization in the communication and technology sector, the increased affordability of different modes of travel, and the realization that the complexity of problems and their interdependence have created conditions that demand that the patterns of social organization be reconfigured. Whether there is a difference in the scale and scope of networks that exist today or whether new information technologies simply make it easier for us to perceive the existence of networks, there is no question that "Networks have become the intellectual centrepiece for our era. If the contest between markets and state hierarchies was an organizing feature of the 1980s, network has

emerged as the dominant social and economic metaphor for subsequent decades" (Kahler 2009: 2).

Social networks are a form of social organization defined by the patterns of vertical and horizontal relationships, or "ties." Social networks consist of strong ties, or "bonding" relationships and weak ties, known as "bridging" relationships (Granovetter 1973, Putnam 2000, Newman and Dale 2005). The ties can be undirectional or directional. Research on the structural patterns of these ties has shown that several different network topologies exist. They include star-shaped networks, which typically can be found in "ego-centered" networks in which a focal person (ego) has a tie to every member of the network, even though those members may not share ties to all the others (Burt 1992); "small-world" networks, where the number of network steps (known as path length) between actors is relatively low, with the most well known example referring to "Six Degrees of Separation" (Milgram 1967, Watts 2003); and "scale-free" networks, which are defined by power law degree distributions and have a few actors or hubs that are highly connected to other actors, while most are connected to only a few others (Yamagishi et al. 1988, Barabási and Bonabeau 2003, Schnettler 2009).

Although it is possible that social innovations could cross scales in any of the network structures described above, recent scholarship indicates that different structures may be critical for different phases of the adaptive cycle. For instance, weak links may be more likely to give rise to innovations than strong bonds since the heterogeneous conditions created when different forums of knowledge and capabilities intersect are more likely to lead to novel recombination (Burt 2004, Gilsing and Duysters 2008, Uzzi 2008). Research also shows, however, that people are more willing to share the risk of innovation if relationships are trusting, cohesive, and not guided by competitive self-interest but by cooperation, which is generally considered to be more characteristic of strong bonds rather than weak ties (Uzzi 1997, 2008). As well, too many weak ties in a network lead actors to receive numerous different signals and knowledge inputs, which can result in cognitive limits being reached and can eventually cause misunderstandings. For example, Mason et al. (2008) found that networks increase the rate of information transmission, which allows good ideas to be shared more rapidly. However, they also concluded that the network might result in too little diversity or the

rapid spread of suboptimal ideas if relationships were structured so as to ensure quick convergence on a solution. Therefore, one interpretation could be that the actual invention of the innovation may require lots of weak and diverse links, but the adoption of the innovation requires strong bonds and trust so the network structure must evolve throughout the process. Ultimately, the relationship between the phases of innovation and the network structures and ties still needs further study (Newman and Dale 2005, Gilsing and Duysters 2008, Bodin and Crona 2009).

Collectively, studies about the role of networks in innovation both strengthen and are complementary to the insights provided by resilience theory. However, networks are often equated, implicitly or explicitly, with the generation of social capital, as if social capital alone were a solution to insurmountable problems. Yet, if networks have the potential to create social capital, how and under what conditions does this result in innovative solutions? How is the social capital mobilized for change if, as research seems to indicate, the mere existence of social capital is not always sufficient to ensure broad system change (Bodin and Crona 2008)?

Networks are often commended for their effectiveness and efficiency in transmitting information, ideas, norms, or practices (Slaughter 2004, Milgram 1967). But the literature on the transmission of innovations via networks, a topic that has received considerable attention, tends to rely on the theory of diffusion for explanations (e.g., Valente 1996, Young 2006). Yet, diffusion theory provides only a limited understanding of how or why innovations are able to move from one individual to many. If the relationships in a network are dense, diffusion theory may provide an accurate description because sheer proximity makes it nearly impossible for network members not to receive information and news (Bathelt et al. 2004). However, complex problems demand that knowledge and ideas will need to cross scales. Whether the scales are spatial, temporal, hierarchical, or even cognitive, a distance arises from perceived barriers and boundaries. Therefore, intentional agency is needed in order to form a targeted "pipeline" and so create an interaction that might otherwise not have occurred (Bathelt et al. 2004). In network studies, then, it seems that discussions about the transmission of innovations would be strengthened by discussions about agency.

ENTER AGENCY

While scholars have developed a fairly sophisticated understanding of networks as structures with respect to innovation, much remains to be understood about how agency operates within networks. We use Emirbayer and Mische's (1998: 962) description of agency as a "temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented toward the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment)." Broader areas of inquiry that examine networks have acknowledged that not all actors are equal in a network, and that influence or power may come from specific "nodes" (Kahler 2009); but network research has generally explained this in structural terms. For instance, the "powerful" in a network may be defined using a degree centrality measure —how "central" an actor is to a network, as defined by the number of ties the actor has to all other nodes (e.g., Cook et al. 1983). There has been little discussion of the skill sets that a central actor needs in order to create so many ties and gain such influence, or of how the actor might maintain or leverage those ties as a capacity to achieve socially innovative goals in the present or the future.

The concept of institutional entrepreneurship (DiMaggio 1988, Fligstein 1997, Dorado 2005) may add to the explanatory power of network theory for social innovations that aim to respond to complex problems and improve resilience by better illuminating the agency within networks. Different types of entrepreneurship must be considered in understanding social innovations and their impact on resilience. One type of entrepreneurship may be the inventor of a novel norm, idea, or product (sometimes called the social entrepreneur). Considerable work has been done on the creative attributes of inventors, which will not be duplicated here. A second type is the institutional entrepreneur, whose job it is to manage the context, complex as it is, in such a way that the innovation has a chance to flourish, widening the circle of its impact.

The term "institutional entrepreneur" used here refers to actors or groups of actors who seek to change "particular institutional arrangements and who leverage resources to create new institutions or transform existing ones" (Maguire et al. 2004: 657). Institutions are normally defined as "rules, norms,

and beliefs that describe reality for . . . [an] organization (group or individual), explaining what is and is not, what can be acted upon and what cannot" (Hoffman 1999: 351). Institutions define our behavior in relation to the broad beliefs that represent our culture (signification), the rules and norms that define laws and practices (legitimation), and the financial, material, and authority resources that define our political and economic life (domination) (Giddens 1979). An institutional entrepreneur, therefore, not only introduces a certain innovation but also works to change the broader context so that the innovation has widespread appeal and impact.

The small body of work that focuses on the attributes of institutional entrepreneurs suggests that a complex set of skills is essential, including cultural and cognitive skills such as framing and persuading (Rao 1998), procedural and technical skills (Strang and Meyer 1993), and political or interactional competence (DiMaggio 1998, Baron and Markman 2003). Few studies, however, look at the intersection between the agency of the institutional entrepreneurs and their impact on, and relationship with, networks. Those studies that do so work with the concept of "distributed agency" or an "actor net" (Garud and Karnoe 2005), "collective institutionalized entrepreneurship" (Möllering 2007, Wijen and Ansari 2007), or "collective action models" (Hargrave and Van de Ven 2006), which emphasize a population level view and the distributive nature of entrepreneurship in organizational networks (Mason et al. 2008). These studies do not grapple directly with the breadth and depth of the impact of entrepreneurship, and they neglect questions about how social system boundaries may be crossed if social networks are skillfully mobilized.

While network theory provides critical insights about the types of relationships that are important to both continuity and change, system entrepreneurship serves to fill knowledge gaps about agency in network and social innovation research. We described earlier the problem that network studies have uncovered with regard to innovation: network relationships characterized by strong bonds and high levels of trust and reciprocity are crucial for concentrated levels of exchanges of information and for considering the risks associated with innovation. Yet, given the concentrated nature, this network may also limit diversity, reduce access to new opportunities and information, and thus act as a barrier to change. The solution we propose is that

entrepreneurs' complex skill set enables them to recognize which types of relationships within the network are crucial at specific times and to mobilize those relationships in order for innovations to cross scales. In some cases, this means skillfully establishing strong bonds and weak links, where appropriate, as well as understanding the content of those relationships and whether the connections provide specific resources (information, financial support, access to new ideas) and ways to leverage those resources. Although this paper focuses specifically on the skill sets, it builds on the ideas of Burt (2005), who examined the role of specific actors within networks.

In order to test this idea, we initially consulted data collected over previous years on various studies of social innovation. These provided insights from cases of networks that resulted in social innovation with broad social impact and profiled the relevant institutional entrepreneurs that have contributed to various projects (Westley and Miller 2003, Westley et al. 2006). Our findings indicate that some of the key entrepreneurial skills are pattern generation, relationship building and brokering, knowledge and resource brokering, and network recharging. Each of these skills is illustrated by a particular case below, though the skills are not mutually exclusive, and readers will see that in certain cases the entrepreneurs use two or more skills simultaneously.

INSTITUTIONAL ENTREPRENEURS IN NETWORKS

1. Pattern Recognition: An important step in the process of social innovation occurs when someone recognizes the patterns causing a rigidity trap. The Planned Lifetime Advocacy Network (PLAN) was established by Al Etmanski and Vicki Cammack to support families caring for children with disabilities in order to help in planning for the child's long-term security (see http://www.plan.ca/). With a belief that relationships are critical to quality of life, PLAN and Etmanski established vibrant and sustainable social networks between these families and nonfamily members who were willing to participate in caring for a child with disabilities (Westley et al. 2006). The innovation began to scale out when PLAN began receiving requests to establish replicate organizations in other parts of Canada. Despite the success, Etmanski and others felt that the critical mass that was being created through the replication projects was simply inadequate to

change the key social structures in which support for disabled children was lacking.

Etmanski (*unpublished manuscript*) recognized this pattern or trap and realized that unless it was changed, his innovation would remain local and short-lived. Deliberate efforts were therefore made to change cultural, economic, and policy institutions in the direction of support for the engagement of people with disabilities—seeking to generate new patterns of belief. This was accomplished by establishing strategic partnerships with innovative thought leaders in Canada; with the national news media, which would deliver the story to a wider audience; and with politicians at local, provincial, and federal levels, who would assist in legislating change (Westley et al. 2006). To do so, Etmanski and others relied on weak links to establish initial connections with different people and agencies, and then used their mission and story to foster strong bonds with those who were interested. Often the people who were interested also had their lives touched by a child with a disability, and therefore, due to their own experience, could more easily understand the pattern that was at the root of the problem (Etmanski 2008).

2. Relationship Builder and Broker: Social networks are often described as informal when compared to formal structures such as an organization (Rank 2008). An institutional entrepreneur may be working to ensure the purpose of a formal structure is replaced by the mission of an informal group, or at least be attempting to push the formal structures to reorganize. This effort requires strategic intent, guidance, and the capacity to embed the innovation at different scales.

In scale-free networks, a few nodes may have significantly more ties than the majority of nodes in the network. These few individuals will be more engaged in the collection of new information and knowledge as a consequence of the number of ties and thus may serve as a bridge. They then share that information across the core group of interconnected actors of the network. Core and periphery networks have also been found to work similarly (e.g., Bodin and Crona 2009, Isaac et al. 2007). A successful bridge-hub combination requires the skill set of a visionary and strategic thinker when initially building the network. In their study of non-profit organizations, Wei-Skillern and Marciano (2008) capture this notion of the entrepreneur employing strategic intent in the development of a networked

approach. Their study describes the deliberate process and principles that entrepreneurs followed to form an effective network. Most significantly, the entrepreneurs viewed the network as an end itself, not simply a means to advance self-interests, and they all carried a perception that drove them and their partners to focus on "their mission, not their organization; on trust, not control; and on being a node, not a hub" (Wei-Skillern and Marciano 2008: 40). Entrepreneurs have also conveyed the importance of cultivating strong bonds within the network to provide clear values for its members, and of deliberately seeking other bridging relationships to expand the network and alter its composition when necessary (Podolny 2007). In effect, entrepreneurs work strategically to establish the "right mix" for crossing scales, and do not solely rely on organic, ad-hoc, or voluntary relationships.

3. Knowledge and Resource Broker: Once relationships have been strategically built, the entrepreneur may want to share a social innovation across scales. A knowledge broker is someone who is able to understand specialized knowledge and reframe the discourse about the subject so as to make it comprehensible, accessible, and engaging for others, particularly decision-makers (Litfin 1994). Additionally, the entrepreneur acting as a broker is able to identify the windows of opportunity in policy development and must be able to judge the timing of any attempt to cascade an idea up to a broader scale. Quite often, the broker is not the same person as the inventor or entrepreneur due to the different skill sets involved.

A good example is the widely studied HIV/AIDS movement, which began as a classic social movement effort, within which affected HIV/AIDS activists mobilized public protests about the pharmaceutical industry and the government testing programs and the resulting delays in the release of helpful antiretroviral drugs. The initial HIV/AIDS protests served to solidify resistance to the established medical and regulatory system. The activists though then switched their strategy and leadership because they recognized that a gap, known in network research as a "structural hole" (Burt 1992), existed in which their shared ideas were never directly connected and able to influence the practices of the medical and legal establishment. New leaders were appointed, including professionals such as doctors and lawyers who were also HIV positive and could act as representatives of the movement and bridge the gap between the

movement and the formal medical and legal establishments. Research has shown that people who bridge the structural holes are better able to access diverse and often contradictory information and knowledge and may do so earlier than others. These brokers are therefore more likely to find good ideas and socially innovative solutions to address complex problems (Burt 1992, 2004). But as a knowledge broker, they are also able to translate the new ideas and information to both of the groups, creating an important communication and issue framing link.

The transformation of the HIV/AIDS movement also illustrated the importance of resource mobilization. At some point, if the broader institution is to change, financial and legal support needs to shift. The new leaders gained access to key individuals, who themselves later testified that they were relieved to find leaders among the activists with whom they could identify. This move better positioned the leaders to be perceived as having legitimate authority and therefore to influence how resources were mobilized for policy-making, which, in this case, was crucial for effecting broad system change (Maguire et al. 2001). These boundary spanning types of relationships were important because HIV/AIDS was an emerging issue and stakeholder positions were numerous and disparate (Maguire et al. 2004). Therefore, the entrepreneurs invested in a process of recombining knowledge and ideas to ensure they converged, and to leverage resources to support these new ideas (Gilsing and Duysters 2008). If this had been a more mature issue area, dominant actors, positions, and structures might already have existed, and any network mobilization would have needed to focus on reframing the issues and establishing trustworthy relationships with those specific dominant structures and agents. Ultimately, the most important work of the knowledge and resource broker is to lessen resistance to a new idea, and in doing so, resources that would otherwise have been deemed inaccessible suddenly become relevant (Yujuico 2008).

4. Network Recharger: The process of social innovation, particularly at the point of trying to cross scales, can take considerable time and be emotionally, mentally, and physically exhausting for all actors in the network involved (Westley et al. 2006). Networks that operate effectively to achieve change seem to have individuals who act as recharge points for others. These network rechargers are often the visionary leaders who give form and direction to the network and its mission. Ulysses Seal, who led a worldwide network of conservationists in a fight to protect endangered species, had a tremendous power to motivate and empower network members (Westley and Vredenburg 2003). Individuals involved in the network, all of whom were committed to the cause and most of whom were highly trained professionals, would speak of how, in times of exhaustion and discouragement, Seal continued to be an inspiration—a person who gave context and meaning to their efforts and gave them confidence in their own ability to succeed in the face of enormous obstacles (Westley and Vredenburg 2003, Westley et al. 2006).

Networks therefore are subversive. They draw resources of time and energy from organizational imperatives. The room for volunteer activities of the kind that kept Seal's network alive was limited, as was the energy. The return on investment in such network activity was not material; indeed, the investment was often a material and energy drain. The space for continued innovation was therefore carved out of a restricted opportunity context, and Seal's personal charisma and vision were a key resource for maintaining the network. Although not every network member might have an intensely strong bond with Seal, the empowerment and inspiration he provided indicates that the network membership was founded on a type of personal relationship. When individuals are empowered by this kind of vision of purpose and context, each can act in isolation to accomplish the whole.

IDEAS FOR THE FUTURE

We have argued that institutional entrepreneurs with specific skill sets are key agents in effective social networks that enable social innovations to cross scales; that is, these actors leverage their network to bridge seemingly insurmountable chasms differently, and possibly more successfully, than others. Examples demonstrate that entrepreneurs may achieve scale crossing through a complex skill set that enables them to pursue and establish specific types of relationships that nurture or expand the network at particular points in time. Although this paper emphasizes institutional entrepreneurship, we would caution against believing that agency represents the sole aspect of understanding change and resilience. A more complete discussion of the

cases and examples would reveal that the adaptive cycle and resilience theory require that contextual factors and structures should also be understood. Each element is critical to moving past traps and to crossing the boundaries of systems and scale.

Network theory helps to explain the types of relationships needed for social innovation to spread across boundaries and systems, which at times may lead to tipping points. However, the mere presence of a network does not ensure this, and it cannot be assumed that diffusion will be the most appropriate means to cross boundary barriers. In order for networks to do this effectively, they need to be animated by both inventors and institutional entrepreneurs. Once animated, the networks become a powerful force for connection and dissemination. Also important is the fact that although skilled individuals are needed in order to mobilize networks, networks are notoriously difficult for individuals to control. The skills of the institutional entrepreneur are not those of the "heroic" leader. Rather they often work in obscurity to manage the emergence that they cannot actually control. They connect; span boundaries; mobilize resources of knowledge, power, and resources; recognize and generate patterns; revitalize energy; and keep alive a strategic focus. But they are, nonetheless, leaders—for all their relative invisibility. The same power laws that keep networks scale-free also make them vulnerable— knock out a hub and the network may be disabled (Mitchell 2009). Similarly, if a social innovation network has too few institutional entrepreneurs, it may be deactivated if one entrepreneur is lost. Future research could and should explore the ratio of institutional entrepreneurs to other network members in high-, medium-, and low-functioning networks. Future research should also deepen the understanding of the skills and capabilities of effective system entrepreneurs so that training programs could be developed to expand their numbers, thereby increasing social capacity to address complex problems and improve resilience. Just as importantly, other research needs to more closely examine the relationship between institutional entrepreneurs and the structural aspects of a network, including where the entrepreneur is positioned, and whether specific structural conditions affect their ability to innovate or scale up innovations.

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