11. Fighting SARS with a Hastily Formed Network

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Abstract

Globalization and advanced Information and Communication Technologies have enhanced the role of networking between organizations in business and public sectors. Examples of public networking are disaster relief (Stephenson, 2004), disease control management, military (coalition-based) campaigns (Alberts, Garstka, & Stein, 2000), and law enforcement. We discuss the SARS (Severe Acute Respiratory Syndrome) case to learn how global interorganizational networks can be successfully instantiated. The purpose of this study is to improve our understanding of interorganizational network instantiation and to examine some mechanisms leading to successful interorganizational network performance. The paper is structured as follows. First, we present briefly the SARS case. Next, we discuss the concept of hastily formed networks and some concepts that have been introduced by Hagel and Brown (2005). Finally, we analyze the SARS case with these concepts and draw some lessons from the case study.

Introduction

Globalization and advanced Information and Communication Technologies have enhanced the role of networking between organizations in business and public sectors. Business examples include networks in clothing, aviation, car and electronics industry (for instance the battle of standards for new generation electronics). Examples of public networking are disaster relief (Stephenson, 2004), disease control management, military (coalition-based) campaigns (Alberts et al., 2000), and law enforcement. Interorganizational networking rallies competencies (Katzy & Crownston,

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2001–2007) and leads to coordinated performances. Potentially, networks out-perform organizations and dyads of organizations (Smith, Caroll, & Ashford, 1995) in terms of speed, flexibility, reliability, knowledge intensity, scale, and efficiency. Interorganizational networks have the potential to respond to urgent events or opportunities to create value.

At the same time, failures of interorganizational networking have become apparent. Those in the public sector tend to draw most attention in the media. The multi-agent US government response to the Katrina disaster was considered unsuccessful, as were many international relief efforts to a certain extent (Daly Hayes & Weatley, 1996). Other unexpected major disasters such as the Tsunami in the Indian Ocean in December 2004 and the devastating earthquake in Kashmir in October 2005 revealed the global need for a deeper understanding of network coordination in response to unexpected major disasters.

The purpose of this study is therefore to improve our understanding of interorganizational network instantiation and to examine some mechanisms leading to successful interorganizational network performance. By instantiation we mean an organized, concerted effort to configure re-sources into a means-end relationship within a short time span. In the process of instantiation interorganizational networks undergo a 'phase transition' from a defined state into another state in response to changing levels of urgency awareness (Johnson, 2004). Network performance refers to the collective achievements that could not be achieved by the network actors individually.

Network response to major disasters requires an enormous amount of coordinated activities at different levels and in different phases of the response. In this paper we confine ourselves to the instantiation of knowledge and information which, to a large extent, determines the quality of network response (Denning, 2006). We discuss the SARS (Severe Acute Respiratory Syndrome) case to learn how global interorganizational networks can be successfully instantiated. For analyzing the SARS network we use the recently coined concept Hastily Formed Networks (HFN) (Denning, 2006) and network dynamic as discussed by Hagel and Brown (2005). The SARS case is widely discussed in the academic and professional literature. However, few attempts have been made to understand the SARS response from an interorganizational network perspective. For the case material of SARS we rely mainly on abundantly available secondary data such reports and documents, academic papers and books, websites (especially of the World Health Organization, 2000).

The paper is structured as follows. First, we present briefly the SARS case. Next, we discuss the concepts of hastily formed networks and some concepts that have been introduced by Hagel and Brown's (2005). Finally, the SARS case is analyzed using these concepts and we draw some lessons from this case study.

The SARS Outbreak

The SARS outbreak commenced in Guangdong (China) on November 2002 and spread to other countries – such as Singapore, Hong Kong, Canada – following travel patterns of infected individuals. The SARS outbreak shocked health care systems worldwide. SARS was a new corona virus not previous identified in humans and animals. There was no knowledge about how to identify, diagnose and treat SARS. Once SARS reached Hong Kong it spreaded, within a few days internationally "with the speed of an airplane" (National Advisory Committee on SARS and Public Health, 2003). China (including Hong Kong) was severely attacked: more than 600 people died (Table 11.1). As of early June 2003, the World Health Organization (WHO) counted 8098 people that were infected, 774 died. Most countries in the western world were hardly hit by SARS. The exception was Canada (Toronto and Vancouver) where 251 people were infected and 43 of them died. In July 2003, WHO declared that SARS had been contained and was no longer viewed as a global threat. Considering the potentiality of the threat of SARS as a 'globalizing disease' the impact remained modest.

Table 11.1 SARS cases worldwide. November 1, 2002- July 31, 2003 – Source: adapted from Abraham, 2005

Areas	Female	Male	Total	Number of deaths	Case fatality ratio	Date onset first probable case	Date onset last probable cases
Australia	4	2	6	0	0	26-Feb-03	1-Apr-03
Canada	151	100	251	43	17	23-feb-03	12-Jun-03
China	2674	2607	5327	349	7	16-Nov-02	3-Jun-03
China, Hong Kong SAR	977	778	1755	299	17	15-Feb-03	31-May-03
China, Macao SAR	0	1	1	0	0	5-May-03	5-May-03
China, Taiwan	218	128	346	37	11	25-Feb-03	15-Jun-03
France	1	6	7	1	14	21-Mar-03	3-May-03
Germany	4	5	9	0	0	9-Mar-03	6-May-03
India	0	3	3	0	0	25-Apr-03	6-May-03
Indonesia	0	3	3	0	0	25-Apr-03	6-May-03
Italy	1	3	4	0	0	13-Mar-03	20-Apr-03
Kuwait	1	0	1	0	0	9-Apr-03	9-Apr-03
Malaysia	1	4	5	2	40	14-Mar-03	22-Apr-03
Mongolia	8	1	9	0	0	31-Mar-03	6-May-03
New Zealand	1	0	1	0	0	20-Apr-03	20-Apr-03
Philippines	8	6	14	2	14	25-Feb-03	5-May-03
Republic of Ireland	0	1	1	0	0	27-Feb-03	27-Feb-03
Republic of Korea	0	1	1	0	0	19-Mar-03	19-Mar-03
Russian federation	0	1	1	0	0	5-May-03	5-May-03

Singapore	161	77	238	33	14	25-Feb-03	5-May-03
South Africa	0	1	1	1	100	3-Apr-03	3-Apr-03
Spain	0	1	1	0	0	26-Mar-03	26-Mar-03
Sweden	3	2	5	0	0	28-Mar-03	23-Apr-03
Switzerland	0	1	1	0	0	9-Mar-03	9-Mar-03
Thailand	5	4	9	2	22	11-Mar-03	27-May-03
United Kingdom	2	2	4	0	0	1-Mar-03	1-Apr-03
United States	14	15	29	0	0	24-Feb-03	13-July-03
Vietnam	39	24	63	5	8	23-Feb-03	14-Apr-04
Total			8098	774	**9,6**		

Table 11.1 clearly shows that China (including Hong Kong and Taiwain) and Singapore were severely hit by SARS. In the western countries the spread of SARS remained limited to a few cases. A striking exception here is Canada where quite a number of SARS cases were identified. New was the fact that many (1707) health care workers were infected; 21 of them died.

GOARN: Spider in the Information Web

In March 2003, the WHO issued a global alert for the outbreak of SARS. With the advance of global traveling, disease outbreak has become a major concern for public health officials. The SARS alert was enabled by WHO's Global Outbreak Alert and Response (GOARN) system. Commenced in 2000, this system tracks outbreaks and spreading of SARS continually. GOARN consists of experts in various areas whose knowledge must be integrated to combat major diseases. Teams on the ground in relevant countries receive information from and provide information to WHO. These teams work together through video- and teleconferencing. In cooperation with other agencies, WHO orchestrates a global network for monitoring disease outbreaks and communicating about these, mainly through its website.

In March 2003, WHO commenced planning for addressing the risks of SARS in multiple areas. Their efforts included arranging for medical supplies, mobile teams of specialists traveling to sites with urgent situations, and organizing networks of experts trying to develop a better understanding of SARS diagnosis and treatment. WHO organized multiple networks: organizations involved in medical supply logistics; epidemiologists studying patterns of outbreaks; clinicians involved in specific SARS case were interconnected to share experiences; and laboratory staff across the world attempting to understand causes of the disease.

GOARN operates according to guiding principles to improve coordination. These principles include:

1. WHO ensures outbreaks of potential international importance are rapidly verified and information is quickly shared within the Network.

2. There is a rapid response coordinated by the Operational Support Team to requests for assistance from affected state(s).
3. The most appropriate experts reach the field in the least possible time to carry out coordinated and effective outbreak control activities.
4. The international team integrates and coordinates activities to support national efforts and existing public health infrastructure.
5. There is a fair and equitable process for the participation of Network partners in international responses.
6. There is strong technical leadership and coordination in the field.
7. Partners make every effort to ensure the effective coordination of their participation and support of outbreak response.
8. There is recognition of the unique role of national and international nongovernmental organizations (NGOs) in the area of health, including in the control of outbreaks. NGOs providing support that would not otherwise be available, particularly in reaching poor populations. While striving for effective collaboration and coordination, the Network will respect the independence and objectivity of all partners.
9. Responses will be used as a mechanism to build global capacity by the involvement of participants from field-based training programs in applied epidemiology and public health practice, e.g. Field Epidemiology Training Programs (FETPs).
10. There is commitment to national and regional capacity building as a follow up to international outbreak responses to improve preparedness and reduce future vulnerability to epidemic prone diseases.
11. All network responses will proceed with full respect for ethical standards, human rights, national and local laws, cultural sensitivities and traditions.

SARS showed the successful orchestration of globally distributed medical research laboratories in identifying the SARS virus by the WHO. This international scientific cooperation was unusual. International health treaties were dominated by state sovereignty; international intervention in another state's internal activity used to be unthinkable (Wallis, 2005). In 2000 the WHO launched a new vision on its role in coordinating global outbreak of infectious diseases. The WHO relied on its international mandate based on the International Health regulations, and unique country specific experiences and knowledge.

Code Orange

Apart from these successes, SARS revealed the failure of national health care systems (Canada) in fighting global infectious diseases. Underpinning this problem was the underinvestment in microbiological research and testing capacity at the laboratories in Canada. While researchers in Hong Kong were able to correlate clinical and laboratory features of SARS with epidemiological data, the Canadian researchers were not able to do so. The latter were too busy with patient care and did not find time to do the required research. From an operational perspective, the state of emergency (Code Orange) was declared in Canada in March 2003. This threatened the Canadian health care system. Code Orange is part of the Uniform Emergency Codes which has been adopted by the Ontario Hospital Association in 1993. It indicates an external disaster which alerts hospitals to prepare for a rapid influx of patients being brought to hospital by ambulances. The code is intended to be applied to a specific area and to be used for a limited period of time. However, it soon appeared that the Code Orange was not the appropriate response for an infectious disease outbreak such as SARS. The code paralyzed the health care system because there was in fact no extraordinary number of incoming patients, as would be the case during natural disasters. In fact, the challenge in controlling SARS was to significantly restrict access to healthcare facilities. Moreover, Code Orange was not meant for such a broad geographic area and for a sustained period of time. As a consequence, many hospitals unaffected by SARS were forced to reduce their service level significantly. They delayed current procedures and thereby put critical patients at risk. The SARS case illustrates that an organization (the Canadian health care system) might be well-prepared for responding quickly to risks that are induced by the external environment (calculated risks). But the same organization finds it difficult to respond adequately to the indirect and unintended consequences that threatened the system self. Furthermore, procedures and codes (such as Code Orange) may seem reasonable in the eyes of disaster planners. But their effectiveness remains unknown in case of a real disaster that may differ from the anticipated situation.

The purpose of this study is to improve understanding of interorganizational network coordination and to examine the drivers of successful inter-organizational network coordination. Before analyzing the SARS case with its mixture of successful and less successful operations, we introduce concepts for building a theory of interorganizational network instantiation.

Hastily Formed Networks

We define networks as exchange structures with their own governance structure and patterns of interaction in which flows of resources between independent units (or individuals) take place (Van Baalen, Bloemhof-Ruwward, & van Heck, 2005). Network governance refers to interorganizational coordination that differs from market- and hierarchical coordination because they employ a wider set of coordination mechanisms (Grandori, 1999). Most research focuses on existing networks with stable relationships, while we are interested in instantiating and emerging network relationships and coordination. In the case of emerging networks, social structure is conceived as an outcome and not as a starting point of repeated exchange relationships between participants of the network. For the SARS response network no existing social structure was available. Network structures had to be formed and instantiated in response to the threat of the highly infectious SARS virus.

Denning (2006) recently coined the concept of Hastily Formed Network (HFN) which refers to multiple network organizations that are instantiated in response to disasters like earthquakes, terrorist attacks, hurricanes, global infectious diseases. HFN's can be classified according to the kind of events to which they have to respond and for which and organization/country can be prepared. The categorization concerns the relationship between network capabilities and the type of event. Eventually, the type of response gravitates to the availability of information about the event that disrupts our social and economic worlds (Table 11.2).

Responding adequately to U-category events implies that a jump (ad hoc stretch) has to be made from an unprepared situation to tightly coordinated action in order to contain the rapid spreading of the SARS virus. Figure 11.1 shows that, in order to respond adequately, preparedness should be connected to the capability to act.

Table 11.2 Kinds of events requiring responses from HFN's – Source: adapted from Denning, 2006

Category of Events	Characteristics	Examples of Events
K-Events: *Situation and Network Factors Known*	Network is in control: – Network knows what to do, and uses existing network structures – Network may choose not to respond	Fast response team for time-critical business problem or opportunity (focused, contained task environment)
KU-Events: *Mixture of Known and* *Unknown Factors*	Normal response activation: – Network knows what to do, yet doesn't know time or place – Responding network structure known	Local fire, small earth quack, civil unrest, military campaigns (recurrent, small to medium scale events with limited disruption)
U-Events: *Situation and Network Factors* *Unknown*	Network overwhelmed or disrupted: – Network doesn't know what to do and doesn't know time or place – Responding network structure unknown	Terrorist attacks, large earth quacks, major natural disasters, SARS (unique, large-scale, disruptive task environment)

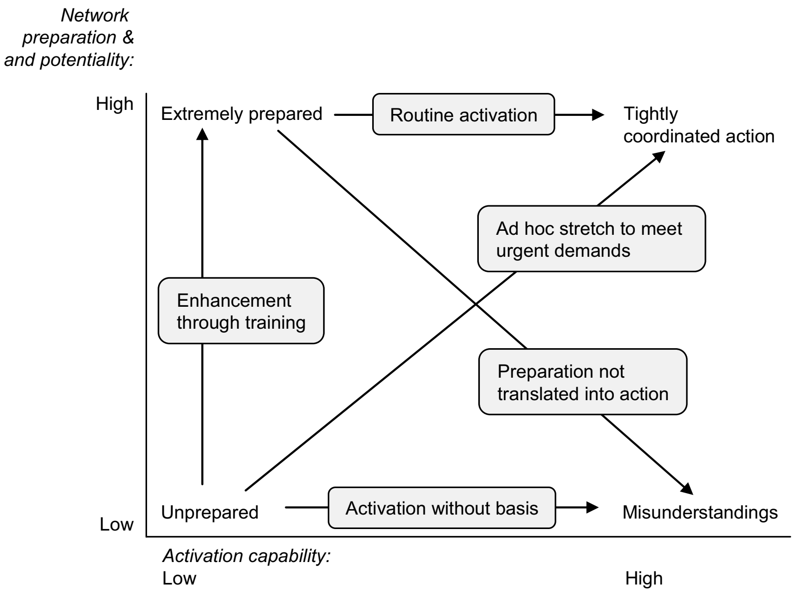

Fig. 11.1 Preparedness and activation

Relying on recent insights of Hagel and Brown (2005) about global process networks we argue that four elements are crucial for understanding SARS as an HFN's: dynamic specialization, connectivity and coordination, leveraged capability building, and network orchestration. In the next section we discuss these network elements, applied to the SARS case.

Dynamic Specialization

Hagel and Brown (2005) use the concept of dynamic specialization to refer to the commitment to eliminate resources and activities that do no differentiate firms and to concentrate on accelerating growth from capabilities that truly distinguish the firm in the marketplace. In the world of health care systems can mean something different. The SARS case has demonstrated the indisputable role of scientific research and the role of medical labs. The need to specialize in different activities like diagnoses of infections, characterization of micro-organisms, reference services, and support to epidemiological surveillance and epidemic investigation. Acquiring deep knowledge into these different most important knowledge domains requires large investments in basic and fundamental research. However at the beginning of the outbreak of the corona virus there was no knowledge how to identify, diagnose and treat SARS. David Heymann, a veteran epidemiologist at the WHO, stated that "we had no cause of the disease, we thought it was infectious, no vaccine, no drugs" (quoted in: Abraham, 2005: 84).

The urgency awareness put research labs under pressure and resulted in an unprecedented speed of scientific discovery and publication of research results (National Advisory Committee on SARS and Public Health, 2003). New knowledge had to be created and exchanged between globally distributed research labs in order to find proper diagnoses and treatments methods. The results of this global collaboration of the research labs were quite amazing. SARS was first identified in February 2003. The first scientific papers describing SARS were published already in March 2003 on the New England Journal of Medicine. They came from the research labs in Hong Kong and Canada. The following weeks, papers were published in high-ranked medical and scientific journals with traditionally long lead times like The Lancet, British Medical Journal, Science, New England Journal of Medicine, and JAMA – The Journal of the American Medical Association. In the period March – July 8 256 SARS papers were written by 38 countries (Chiu, Huang, & Ho, 2004). Interestingly, only 17% of SARS-related papers resulted from international collaboration. This indicates that specialization within research labs or research groups and fierce competition between those researchers still dominated but that through instant flexibilization of the publication system researchers were able to identify SARS cases and work on new treatments.

Connectivity and Coordination

Getting access and mobilizing resources of various specialized organizations appeared to be the most important success factor in the global attempt to control and contain the spreading of SARS. Perhaps more amazing than the speed of scientific discovery of the corona virus was 'the almost instantaneous communication and information exchange' about various aspects of the network response (Geberding, 2003). Hardly any modern communication tool was left unused to disseminate up to date information to health care workers, travelers, clinicians, health officials, researchers, etc. The first scientific papers were published online in order to get immediate access to the scientific findings about the corona virus. By setting up the Global Outbreak Alert and Response Network (GOARN) in March 2003, the WHO had a potent role as key coordinator and interpreter of epidemiological information. The WHO decided to set up a secure web-site where each research lab could post its findings. Daily teleconferences were organized to discuss the research results and to share information. Because of the firm competition between research labs, the WHO guaranteed that research data would be kept confidential and the labs and re-searchers were not allowed to use someone's finding without prior permission (Abraham, 2004). This "novel approach to science", as Abraham (2004) calls it required a lot of diplomacy and patience from the part of the WHO-coordinators. On one hand they had to ensure that knowledge and information sharing was optimized by connecting all relevant research labs to each other in order control and contain global epidemic as soon as possible. On the other hand they had to cherish the competitive environment in which international reputed researchers were used to work in. The WHO coordinators hoped to publish a single scientific article in the name of all participating laboratories. However it soon appeared that the research groups started to publish their research results individually Abrahams, 2004).

The central role of modern information and communication technology became apparent in the failure of the Canadian health care system to respond adequately to the SARS outbreak. Professor Johnson, responsible to set up a SARS surveillance system in Canada stated that Canada was un-able to provide optimal support for outbreak investigation and management. Because a sound database and new software tools to deal with tracking cases and contacts were missing at the moment of the breakout. This prevented researchers and health care workers tracking infectious disease and outbreaks because of “an archaic DOS platform used in the late eighties that could not be adapted for SARS” (quoted in: National Advisory Committee on SARS and Public Health, 2003: 29).

The website of GOARN provided up to date information, not only for scientists, public health officers, and policy makers but also started to communicate directly to citizens. This open information strategy was quite new for the WHO which was traditionally slow acting global organization in which decisions mostly took years of ponderous debate and in which individuals governments tend to obstruct decisions to defend their own interests (Abraham, 2004). SARS instantly transformed the WHO into rapid responding, and to a large extend independent, spider in the web of information processing.

Probably more important than connectivity provided by modern information and communication technologies was the social or political connectivity. While in November 2002 the first patient was identified with a mysterious respiratory disease in the Chinese Guangdong province, it was only in February 2003 that the Chinese government informed (still not complete) the world through a press conference about the disease outbreak. The SARS outbreak was no more under control. In April 2003 the Chinese press was allowed to publish about the SARS and only then a WHO team was allowed to visit the province of Guangdong. Until February 2003 the Chinese government was able to prevent scientists, healthcare workers, doctors, patients and media to disclose information about the mysterious disease to the outside world. In early February an anonymous SMS began circulating in Guangzhou about this new disease that in the end was caught up by people from the WHO global influenza surveillance network. From then on the WHO started to put the Chinese government under pressure to open up and to exchange information about SARS.

Leveraged Capability Building and Network Orchestration

Although the WHO orchestrated the network of scientific laboratories, no party dictated top down what different labs would do, what viruses or samples the researchers would work on, or how information would be exchanged (Surowiecki, 2004). The labs agreed that they would exchange research data, and figure out by themselves the most efficient way to divide up the work. The very fact that the labs were working independently appeared also a particular strength in their search for identifying the SARS virus.

However the success of the SARS-HFN cannot be fully explained by the international collaboration of research labs, facilitated by GOARN. The GOARN operated as what Hagel and Brown (2005) call a 'loosely coupled interface' between researchers, representatives of national health care systems, and the public. When the WHO, spurred on by the resolute leadership of director-general Gro Harlem Brundland, decided upon the open information strategy, rather independently from the continuously conflicting national governments, it invited scientists, public healthcare workers, policy makers, travelers, and citizens to collaboratively help to control and contain the spreading of SARS. This open information strategy helped to leverage untapped resources and allowed people to take responsibility. It sharply contrasts the closed information approach of the Chinese government during the first three months of the SARS outbreak.

The SARS case also illustrates the need for a high level of preparedness at country and organizational levels. Networks capabilities build on the availability of specialized knowledge and competencies to instantiate this knowledge way and to translate and use this knowledge in coordinated action. Canada, the country that was hardest hit by SARS outside Asia suffered from an outdated IT-infrastructure, unconnected information flows, unclear responsibilities, a failing alert system, a lack of coordination, a weak analytical capacity of the Ontario Public Health Branche, and a lack of involvement by the federal government (Zhan, 2004).

The quality of the response of HFN's therefore largely depends on the quality of information and information flow at the network and organizational/country level and within the network. Here it is important to distinguish between the network and the organizational (in this case country) level. In the end the alertness and response of the HFN depends on the quality of the information and information flow at the organization/country level. The SARS case included successful instances of coordinating specialized knowledge and translating this knowledge into swift, relevant, local action. Explaining the difference in performance requires attention for (the interplay between) two levels of analysis: organizations (hospitals, World Health Organization), and the network level. The SARS case suggests that individual organizations' research labs accumulate specialized knowledge. In addition, they participate in inter-organizational research networks in the area of disease control. We call the latter network transactive memory (NTM) (knowledge of who knows what at which organization), an extension of the traditional transactive memory concept (Moreland, 1999). NTM combined with specialized organization level knowledge drives a network's potential for coordination. This latent network capability must be activated at unexpected times. The actual SARS outbreak in 2003 made coordinated response urgent in order to contain the disease and avoid a global epidemic. The World Health Organization took on the role of network orchestrator. It coordinated specialized knowledge from globally distributed research labs, and it ensured translation of this knowledge into global and local response. Canada, the unsuccessful case, decided in the early 1990s to economize on research labs. This jeopardized long term development of local specialized knowledge and thereby participation in global knowledge networks. Resourcefulness of network nodes thus matters for network level performance.

Lessons from the SARS Case

As global cooperation between organizations will increase, it is important to understand the coordination dynamics of interorganizational networks. However, interorganizational networks are mostly understood in terms of rather stable network relationships. We think it is important to search for management and organizational concepts, like hastily formed networks, dynamic specialization, connectivity and coordination, network orchestration and leveraged capability building to understand new dynamics of inter-organizational globally operating and agile networks. In this paper we discussed the SARS case which can be viewed as a clear example of a non-stable, hastily formed network. We were primarily interested in the ways the SARS network was instantiated. The SARS case is interesting because contains very successful and very unsuccessful examples of network instantiation. Several interesting lessons can be drawn the SARS case.

1. The quality of the network response largely depends on the quality of the information and the information sharing within the network;
2. Providing a proper 'conversation space' (Denning, 2006), information rich and interactive websites and information systems, appears to be of crucial importance for publishing and sharing information;
3. Deep, specialized knowledge proves to be the core resource of interorganizational networks;
4. However the values of specialized knowledge only accrues only when it is dynamically connected to other specialized knowledge;
5. Open information strategies allow people with different acting roles to participate and to take responsible action.
6. Network performance depends to large extend on the level of preparedness of individual network contributors;
7. Independent network orchestration proves to be one of the main success factors for a high level network performance;

8. The SARS case showed that a high level of competition between knowledge providers can co-evolve with a high level of collaboration.

Future Research

The recent rise of globally Hastily Formed Networks like SARS, challenge our current understandings of networks as one of the dominant organizational forms. Networks, like any other organizational form, develop over time and can be instantiated towards coordinated actions. However in the case of SARS diagnosing and treatment expertise were lacking, (trust-) relationships at a global network level were often not yet established and network leadership was hardly developed. Although there is a vast network research literature, less attention has been paid to the consequences of the 'compression of time' for the emergence of networks in response to existential threats. Research into Hastily Formed Networks not only requires multilevel and multi-theory analyses like Monge and Contractor (2003) argue, but also reconsideration of our theoretical knowledge about networks. Of crucial importance here is to understand the impelling force of the urgency awareness that drives the 'phase transition'. Future research should address questions such as: Why did people start to collaborate without any antecedents? Why did the WHO receive legitimate leadership from national governments to orchestrate the SARS fighting campaign? How could the GOARN website play such a dominant role in the coordination of research activities and spreading of information about SARS to the wider public. And, how can global information systems play a role in the prevention and containment of unexpected major disasters?

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