DOES NETWORK DESIGN MATTER?

HOW INTERORGANIZATIONAL NETWORKS BALANCE MANDATED

STRUCTURES AND SITUATEDNESS IN CRISIS SITUATIONS

– First Draft –

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INTRODUCTION

To routinely develop and organize innovative responses to highly uncertain environments and complex problems, managers, career officials, policy makers and governments increasingly choose to rely on interorganizational networks as a form of governance (see e.g., Moynihan, 2009, on crisis management; Van Bueren, Klijn and Koppenjan, 2003, on policy-making in environmental debates; or Provan and Milward, 2001, on the local delivery of public services). Formal frameworks generally emerge for the productive governance of these unwieldy interorganizational networks (e.g., Roe et al., 2005, on standards in bandwidth performance for improvisation among energy providers; Berthod, Müller-Seitz and Sydow, 2014, on taskforces in foodborne disease outbreaks; Bigley and Roberts, 2001, and Moynihan, 2009, on Incident Command System), and in some cases mandated charters are employed (Raelin, 1980). Against this background however we know surprisingly little about how these interorganizational networks balance standardized frameworks against the drive to adapt collective work to the specific contexts and particular relational settings of the problems they confront.

In this paper, we raise the following research question: *How do interorganizational networks reconcile mandated structures and relational situatedness to face highly uncertain situations?* We address this question with a comparative case study of networked crisis management in the Cities of Düsseldorf, Germany, and New York in the United States. Crisis management is an interesting setting because it necessitates constant innovations in collective work and detailed procedures to face new incidents (Hutter and Power 2005). In the North American context, the Incident Command System (ICS for short) provides a formal structure that guides or even mandates collaboration of organizations from diverse sectors. ICS represents the attempt to hierarchically coordinate heterarchical networks of organizations and individuals (Moynihan, 2009). In Germany the equivalent to the ICS is the "Command and

Control System" (also called DV 100). In case of large-scale incidents, coordination is prescribed to take place via two different modules instead of one centralized command: an "Administrative-Organizational-Group" (taskforce made up of all relevant local administrations) and an "Operative-Tactical-Group" led by the local fire and emergency department.

In the remainder of the paper, we first outline the state of research on designing interorganizational networks. We then turn to a detailed description of the two institutional contexts at stake in our analysis. In the findings section, we report on observations made in the course of our fieldwork in Düsseldorf and New York City. We illustrate these observations with the description of the application of ICS and DV 100 in two major incidents and show how the professionals involved managed the balancing act aforementioned. Specifically, our results shed light on how lead organizations balance the enactment of formally mandated interorganizational frameworks with their informal relational context by protecting the operative work of their constellation. Hereby we highlight the relevance of a notion that was introduced only recently in the literature: the idea of the structural fold (Vedres and Stark 2010) and show how three specific practices contribute to managing networks at the fold.

THEORETICAL BACKGROUND

Designing Interorganizational Networks?

Research has a long history of studies on the formation of interorganizational relations and networks. Reviewing this wealth of insights and evidence, Brass et al. (2004) highlight organizational motives (from access to resources to legitimacy, uncertainty or opportunism reduction), learning, trust, norms of reciprocity and monitoring, and context. Similarly, Ebers (1997) boils down the formation of such relations to the actors' strategies and motives (mostly

related to costs and revenue issues), relational contingencies (such as interdependencies, industry positions, or preexisting social relationships), and their institutional embeddedness. Many more classical reviews and studies could be mentioned (e.g., Van de Ven, 1976; Whetten and Leung, 1979; Oliver, 1990; Gulati and Gargiulo, 1999), as well as theoretical perspectives, from new institutional economics to resource dependence or neo-institutionalism. Yet amid this diversity of research on the formation of interorganizational relations and networks, it is striking to notice how little we know about interorganizational network design as such.

The study of organizational and institutional design has experienced a steady decline since the early 1980s, despite "a growing demand for robust theorizing and empirical research on new forms for organizing ever-more-complex and dynamic situations (Van de Ven, Ganco and Hinings, 2013: 392). Research on design in interorganizational settings is fragmented and has remained on a very general level. For example, Provan and Kenis (2008) recently addressed networks as a form of governance and highlighted three different modes of network governance: participant-based, lead-organization, or network administration organization (see also Park, 1996). Similarly, Bryson, Crosby and Stone (2006) develop a theory of network formation that explains different choices in network processes, structures and governance depending on the type of collaboration, power distribution, and the amount of competing institutional logics at hand. Looking at issues of cooperation more generally, Gulati, Puranam and Tushman (2012) chose to distinguish interorganizational forms based on two variables: hierarchical/heterarchical decision-making and closed/open boundaries, to predict four prototypes of cooperation design: extended firm, closed community, open community, and managed ecosystem. Going further, Williams (2005) displays a list of structural factors to take into account while designing cooperation: formalization, density, investment intensity, centrality and stability, depending on the goals of the cooperation.

This line of thinking, however, brings along two main problems. First, it relies heavily on contingency arguments (Van de Van et al., 2013). This way of theorizing unpacks organizational features and designs that have already been introduced instead of looking at the way people use designs to solve specific problems in specific situations (Romme, 2003). For example, Provan and Kenis (2008) predict a dominant mode of governance depending on specific conditions such as trust, goal consensus or the amount of participants to the network. The problem with such arguments is typically that networks and organizations are depicted as homogeneous entities, easily maneuvered via design, provided one finds the right configuration for the given situation. The vast diversity in organizational designs and features, however, suggests equifinality – i.e. the existence of several options to reach a same result (Sydow and Windeler, 1998; Van de Ven et al., 2013).

A second problem is that, interorganizational design (like organizational design) is not immune to the unintended consequences of its process of structuration. Most research on design implies wide scopes of strategic agency and omnipotent actors. Contrasting that thinking, Doz, Olk and Ring (2000) chose to differentiate "emergent" from "engineered" networks, and Sydow and Windeler (1998) show that network evolution does not follow a linear process, it contested and that much takes place in the back of the actors. Similarly, de Rond and Bouchikhi (2004) demonstrate how much the process of developing an alliance relies not only on planning and strategizing but also on opportunism and emergence. From this perspective, network design is a structuration process that is not mechanical but rather dialectical by nature, as it needs to embrace tensions, such as trust and vigilance or competition and cooperation. Against this background, it seems that the notion of network design does not quite capture the continuous process of designing and adapting organizational forms, frameworks, or scripted interactions. However, the way organizations and their members *practice* interorganizational design has remained by and large unexplored (see

Provan et al., 2007, and Berthod, Grothe-Hammer and Sydow, in press, for pleas to study social practices in interorganizational settings). To better address these questions, we will now turn to practice-based theorizing.

Towards a Practice-Based View on Network Design

Organizational theorists have rooted their recent and widespread interest in social practices in numerous social theories, ranging from Foucault, Giddens, Bourdieu, Heidegger, Wittgenstein, to Mead (Simpson, 2009, Nicolini, 2013). From this point of view, practices bridge structures and agency and account for how social systems are produced and reproduced, from single organizations to whole fields (Schatzki 2001, 2007; Simpson, 2009; Feldman and Orikowski, 2011), including, unsurpringly, interorganizational networks (Sydow and Windeler, 1998).

The study of practices has found broad acceptance in organization and management research (see Vaara and Whittington, 2012, for a review). It contributed to redirect research on strategy (Whittington, 2006), technology (Orlikowski and Yates, 1994), but also knowledge, learning, or institutionalism (Feldman and Orlikowski, 2011). A growing body of literature suggests the relevance of practice-based ontology in interorganizational networks research as well (Pratt, 2000; Sydow and Windeler, 1998; Sydow, 2004; Provan et al., 2007). Nevertheless, such research remains rare. Hence, avenues for explorative research of what might be called "network design practices" are left wide open. In particular, we propose that the practice-based perspective of interorganizational networks addresses quite naturally the theoretical shortcomings of research on design in networks. Specifically, it enables us to transpose the focus on design as a process of continuous adaptation.

A practice-based approach to network design is not completely at odds with original work on organizational design and contingency theory. Van de Ven and colleagues (2013) point out

that the pioneers in this field (i.e. names such as Trist, Selznick, Blau or Etzioni) would have argued against the idea that it was possible to articulate universal design principles. More precisely, a practice-based perspective on design is at odds with the stream of research that has emerged around Simon's work (1999) on design science. As Garud, Jain and Tuertscher (2008) point out, organizational design refers to the process of developing a plan for a structure. However, "in contemporary settings (…) designs are more appropriately viewed as being simultaneously noun and verb" (ibid: 352). This approach, they propose, highlights design as always incomplete, which triggers action. Dunbar and Starbuck (2006) go in a similar direction when they speak about 'emerging fits'. From this perspective, organizational design is a relational issue, both intra- and interorganizationally. For example, Madsen et al. (2006) report on the constant need for redesign in a pediatric intensive care unit to produce a buffer between the unit and other organizations in ordered to safeguard its own reliability. In a more inclusive tone, Yoo, Boland and Lyytinen (2006) report on cases in the field of architecture and show how project network design is a constant process driven by three components: architectural vision, representation technologies and collaborative work processes.

In this paper, we, too, argue that managers and scholars need to think beyond static inter-organizational frameworks. Building on Garud et al. (2008), we propose that such designs operate as structures that both constrain and enable agency, in the form of situated adaptations, to support collective work. This distinction is important because, considering interorganizational networks, a large part of the designing work will relate to the search for partners, managing their relations during work, and their inclusion, or not, in the group thus formed (see again Madsen et al., 2006; Yoo et al., 2006). This line of thinking takes us back to a fundamental question in network research: what network structure enables creative recombination of resources and collective action that fits with the group's task and

environment? Answers to this general question are dichotomous. Arguments in favor of network closure highlight better coordination and trust in dense, cohesive networks (Coleman 1988; Uzzi 1997). Arguments in favor of network brokerage, in return, highlight the relevance of loose ties, diversity and structural holes, especially when it comes to creativity and change (Burt 1992; Granovetter 1973). In this paper, we rely on a recent, additional approach introduced to network theory, the notion of *structural folds* (Vedres and Stark 2010). Structural folding, from a practice-based perspective on network design, is the attempt at bypassing the classical dichotomy between closure and brokerage in the analysis of networks (see also Burt 2005). With folding, Vedres and Stark (2010) show that agents often belong to more than one cohesive group. Innovativeness and creativity, then, are made possible by folding these groups by those agents who work at the intersection. With that structural topology in mind, folding is superior to brokering. Vedres and Stark compare this superiority to chemical reactions. Instead of mere information passing, intercohesive groups provoke more important changes towards new solutions and innovative responses to problems. In this case intercohesion could be crucial to resilience, the ability to productively recombine practices and innovate new uses for existing resources in uncertain and rapidly changing environments (Stark 2014)

In the next sections, we turn to our fieldwork in the field of emergency response. In highly critical situations, response networks must coalesce, and often do so via mandated, highly standardized frameworks for interorganizational collaboration. Each critical incident, however, calls for a situated, adapted response, provoking challenges that must be dealt with *in situ* innovatively. Echoing this theoretical discussion, our findings report on what central organizations managing at the fold do with their designs to organize an effective response.

RESEARCH SETTING AND METHODOLOGY

We report on a comparative in-depth case study between the networked disaster management of the Cities of Düsseldorf, organized around the semiformal leadership of the local Fire and Emergency Department (FED for short), and New York, formally organized around the City's Emergency Management agency (NYCEM for short). Both NYCEM and FED rely on specific formal frameworks to design and coordinate large-scale crisis responses: ICS and DV 100 respectively. With a focus on social practices informed by structuration theory (Giddens, 1984; Berends et al., 2011), we investigate how organizational agents enact these frameworks in crises and how this enactment process has repercussions on how the focal organizations, FED and NYCEM respectively, manage the operations of the network.

In both settings, we relied on ethnographic fieldwork. In Düsseldorf, we have accumulated 565 hours of direct observations, including interorganizational planning meetings, large-scale events (concerts, carnival festivities, soccer games), a large-scale storm in the summer of 2014 (shadowing the incident commanders for three days), unexploded ordnance in the harbor, management of the call and coordination center, and participant observation in everyday emergency and rescue operations. We combined this direct observation with 108 (55 structured and 53 unstructured, increasingly focused) interviews, conducted with 92 professionals involved in 30 different organizations, all linked with the FED. Finally, we complement this qualitative dataset with over 5,500 pages of internal documents.

In New York City, we conducted 624 hours of direct observations, including interagency exercises and trainings, planning meetings, network administrative meetings, event monitoring, daily response operations, and community engagement. Observations also included the handling of several medium-scale events, including the explosion of a building in the City's East Village, a potential outbreak of Ebola Viral Disease, a snowstorm, a potential transit strike, and widespread protests related with alleged police brutality. Direct observation

was combined with formal interviews with 54 professionals in again 30 different organizations linked with NYCEM. This qualitative data is also complemented by review of internal documents including incident reports and comprehensive quantitative data on daily response operations.

Cross-analysis and coding of multiple ethnographies collide with the very notion of fieldwork reporting as a personal and subjective rendering of organizational experiences. In our case, we chose to make sense of our data by rewriting major narratives on incidents and comparing our analyses between the two cases repeatedly. In joint meetings we debated the differences between ICS and DV 100 and between NYCEM and FED. We relied extensively on literature to make sense of the intuitions we gathered in the field. First, we relied on Provan and Kenis (2008) typology of network governance modes to differentiate between the role of NYCEM, a coordinative agency with no operative responsibility, with the FED, an operative agency with not only coordinative but also operative duties with large autonomy in decisions during incidents. We then looked at how this difference in terms of governance mode (hereby relying on previous research we did on the subject) influenced the handling of incidents by both organizations. We realized that the ties on which they relied were far more developed than what Granovetter (1973) and many others may call "weak ties", and that the work of these two organizations, despite diverging policies and designs, relied on more than just brokerage and closure, even for the coordination-centric NYCEM. Readings in topologies of networks led us to the conclusion that what we were observing was in fact, two organizations managing at the fold, as detailed above. Digging deeper into this notion, we engaged openly with our respective fieldworks to unearth the main practices that seemed to be at play when FED and NYCEM engaged in structural folding.

ADOPTING INTERORGANIZATIONAL NETWORK DESIGNS

DV 100 and Düsseldorf's FED

The DV 100 outlines the design of the command and control system in emergency response operations and is the German equivalent to ICS. Originally designed as a fire service regulation, DV 100 is a remnant from a disestablished federal agency for emergency management. This policy is still in use in practice and is officially recommended by Federal Office of Civil Protection and Disaster Assistance. Every FED in Germany applies DV 100. Similarly, several major emergency medical services (EMS for short) and disaster assistance agencies – like the Red Cross – as well as the Federal Agency for Technical Relief (THW for short) have developed a policy that is almost identical to DV 100 to structure their command and control systems. Hereby, DV 100 has become a norm with national diffusion.

DV 100 regulates leadership and command in emergency operations. It outlines the principles of command organization and command process in every kind of incident. On the one hand, it prescribes processes of situation assessment, decision-making and order formulation. Orders formulation (and related goals) grants a large autonomy to the commanders and assigned units in the choice of means. On the other hand, it determines the design of the command structure for crisis management, including levels of command, tactical organization of the incident area and response units, and the organization of the command unit. DV 100, however, remains explicitly "open for interpretation and modification" (DV 100: 4), leaving room for specific interpretations and implementations by the organizations and incident commanders.

In the State of North-Rhine Westphalia, where our fieldwork took place, overall political responsibility lies with the mayor during large-scale incidents. There is no operational authority above this level. Even in case when state or federal agencies are involved, these

agencies are under the command of each city's authority. Specifically, DV 100 prescribes two organizational components: an *administrative-organizational group* and an *operative-tactical group*. The *administrative-organizational group* is an emergency taskforce consisting of career officials from all the agencies and organizations that are, or might be, involved in the disaster. The *operative-tactical group* is the incident command. It consists of the incident commander, six staff sections (S1 – S6), and liaison officers and experts of every agency operatively involved in the disaster response operation (see Figure 1 below for a schematic representation, including New York City).

Local FEDs play a crucial role in thisct system. The responsibilities of FEDs are broad and include major rescue operations in the case of accidents (e.g. train derailments, car or plane crashes), technical assistance during power shortages, containing leaking chemicals, safety management in large-scale events (e.g. soccer games), firefighting, or emergency medical service. For example, with a staff of about 1,000 employees and 300 volunteers, the Düsseldorf FED conducts about 140,000 operations each year, of which only 2% relate to fire. This polyvalence fuels the FED's omnipresence in the management of crisis in general. The FED is in charge of virtually every incident that is not an acute criminal one – e.g. a shooting. In the latter case the police would have the overall command.

Despite wide scope for interpretation and local adaptation, crisis management in Düsseldorf resonates with the formal rules of the DV 100. In case of large-scale disasters, the official management responsibility shifts from the FED towards political actors (the mayor or department head). The operative-tactical group takes charge of the actual incident management, led by the FED. The administrative-organizational group acts as the administrative council, integrating all agencies and institutions concerned and chaired by the political actor in charge of the incident. In Düsseldorf, we observed that the FED retained an administrative-organizational role nonetheless, hosting and facilitating the work of this group.

In fact, while both groups are kept separately, they are housed in the same building – the FED's joint operations center – next-door to one another.

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ICS and New York City's Emergency Management Agency

Similarly to DV 100, ICS has its roots in the fire services. It was developed originally in the 1970s by FIRESCOPE (FIrefighting REsources of Southern California Organized for Potential Emergencies), a California-based taskforce of federal, state, and local firefighting agencies assembled to address the problem of interagency, cross-jurisdiction response to wildfires and other emergencies. It prescribes an organizational hierarchy with direct lines of command and short spans of control to allow for decision-making and operational control in a chaotic, multi-jurisdictional environment. One crucial difference with DV 100 is that ICS does not call for an organizational separation of administrative-organizational and operative-tactical tasks. There is no equivalent in ICS to the interagency emergency task force operating under DV 100. Rather, the ICS-mandated structure consists of the command element and four major sections: operations, planning, logistics, and finance/administration, each of which report directly to the command element.

Originally designed as a template for national deployment, its use became mandated from the federal level in 2003. In February of that year, President George W. Bush issued Homeland Security Presidential Directive 5 (HSPD-5), which called for the development and deployment of a National Incident Management System (NIMS), of which the major operational framework would be ICS. The Presidential Directive further specified that adoption of NIMS by state and local governments would be required as a precondition for

receiving grant funds from the federal Department of Homeland Security. While public service agency officials in New York had long opposed the adoption of ICS, this opposition was overcome under pressure to conform with the new federal requirements, and in April 2005 New York adopted its version of NIMS, the Citywide Incident Management System (CIMS), along with ICS.

New York's implementation of ICS included several modifications from the standard prescribed in NIMS. Three significant changes were introduced. First, the designation of a "coordinating agency" (then called the Office of Emergency Management; its name was changed in 2015 to New York City Emergency Management, or NYCEM), which would continue in its existing role of coordinating multi-agency emergency response. The city's Office of Emergency Management had been created in 1996 as a division of the Mayor's Office. It was elevated to the status of independent agency in 2001, with a commissioner appointed by the mayor, and its responsibilities formally specified in the city charter. These responsibilities include: the coordination of all multi-agency responses to emergencies; continual monitoring of "all potential emergency conditions" both man-made and natural, and including labor unrest; coordination and implementation of training programs for emergency response; creation of plans for emergency response; consulting for the Mayor's office on the city's capacity for emergency response; conducting public awareness campaigns for citizen preparedness; and coordinating with other city agencies to ensure that they have proper emergency plans (such as Continuity of Operations plans) in place. That is to say that in between crises, NYCEM undertakes network coordination activities on an ongoing basis. These include: (1) inter-agency trainings and exercises; (2) plan design and maintenance; (3) condition monitoring and field response through its 24/7 Watch Command; (4) public communications including public-service announcements; and (5) an interagency liaison program. Second, the designation of "core competencies" among city agencies and a "primary

agency matrix" to determine which agency will take charge of which kinds of incidents. These core competencies (e.g. "accident investigation" for NYPD, "fire suppression" for FDNY, "disease surveillance and epidemiology" for the Department of Health and Mental Hygiene) are activities for which each agency is held accountable and expected to be given the authority to execute in an emergency incident. The "Primary Agency Matrix" is meant to determine in advance which agency should be in charge in a given incident type, and which agencies will be expected to provide support. The matrix designates 11 types of incident that necessitate a unified command (two or more agencies acting jointly as the "command element") and 18 incident types in which a single agency is to be in command. A third requirement is that interagency joint trainings and exercises be conducted. In its role as coordinating agency, NYCEM hosts these interagency trainings and exercises. The purpose of these exercises is to familiarize personnel across organizational boundaries, as well as to test emergency response plans.

With a total full-time staff of approximately 150, New York's Emergency Management agency is the most fully developed municipal emergency management agency in the United States. Unlike Düsseldorf's FED, NYCEM does not provide emergency response services directly, which explains it significantly smaller size. Rather, NYCEM serves as a Network Administrative Organization (NAO). Routine emergency services are provided almost exclusively by the Police Department (NYPD) and Fire Department (FDNY), along with its Bureau of Emergency Medical Services (EMS). The operational orientation of the two major response agencies, as opposed to the coordinating role of NYCEM, are reflected in their respective staffing levels: NYPD employs approximately 34,500 uniformed police officers, while the FDNY has 10,700 uniformed firefighting personnel and EMS 3,700 personnel. A common expression among NYPD staff (as well as a recruiting slogan) holds that its officers "have front row seats to the greatest show on Earth," referring to their deep engagement with

city life. Staff at NYCEM instead routinely talk in terms of the backstage, of seeing the city behind the scenes, referring to their work monitoring routine operations and conditions in the city, as well as their high degree of centrality in the response network during emergencies. For incidents exceeding the competence or capacity of any one agency, the NYCEM coordinates the multi-agency response, including oversight of ICS implementation (e.g. during large-scale public events, aviation or railway incidents, or natural disasters). In an average year NYCEM coordinates response to roughly 3,700 multi-agency incidents, sending field staff to 800 incidents, and monitoring more than 2,800 incidents from a 24-hour watch station, which continually tracks emergency communications in the city and information from around the country.

Hence, NYCEM is almost never designated as a primary agency, except in the case of natural disasters or weather emergencies, and therefore has limited authority. Even in events where NYCEM is designated a primary agency, it never holds this responsibility alone, but shares a Unified Command with the NYPD or FDNY or both, depending on the event type. To the extent that NYCEM is involved in decision-making, it is primarily in logistics, its ability to gather and deliver resources across organizational boundaries. Interagency resource requests formally are required to be channeled through NYCEM. For example if the Department of Buildings needs additional portable light towers, NYCEM can requisition them from the Police Department. But a form of influence comes in structuring these requests. NYCEM staff routinely tells network participants not to "say what they need, but what their problem is." For example, a request from the Parks Department for NYPD officers might be denied, if no officers are available. But a request for assistance with a crowd control problem could be filled through NYCEM by dispatching Transit Police or National Guard personnel. Finally, as the coordinating agency, NYCEM is often in charge of "deconflicting" competing orders or requests issued by multiple city agencies. While NYCEM has no formal authority to

enforce its solutions to these problems, difficult problems can be escalated up the chain of command of the competing agencies or ultimately to the Mayor's office until a solution is reached.

PRACTICING INTERORGANIZATIONAL DESIGNS: TWO VIGNETTES

In this section, we briefly review two embedded cases: the management of an unexpected and destructive thunderstorm in Düsseldorf (over 8,008 operations in 11 days; 4 casualties; 33 persons injured; over 40,000 trees destroyed; 300 cars alone crushed by trees), and of the natural gas explosion of a mixed-use residential building in a densely-populated Manhattan neighborhood (operations lasting 45 days; 2 casualties; 25 persons injured; 4 buildings destroyed; 144 apartments in 11 buildings evacuated and their residents temporarily resettled; more than 4,000 tons of debris searched and removed). These cases will show how the two "network orchestrators" (Paquin & Howard-Grenville, 2013), the FED and the NYCEM, organized an interorganizational response using their respective framework, and balanced these structures with informal, relational issues to protect the network's operations.

Thunderstorm over Düsseldorf

On June 9, 2014, several thunderstorms unified and formed a severe complex (a phenomenon called mesoscale convective system, see Sävert & Laps, 2014). Within a few hours, the system developed the strength of a hurricane and hit the city at 8:40 pm without major warning. At 8:51 pm, the FED received the first storm-related emergency call, reporting falling trees. From then on, the FED received up to thousand calls per hour, together with hundreds of alarms triggered by automated fire-alarm systems. The storm escalated severely, overturning trees in the thousands and damaging even more of them. Several buildings were damaged, 300 cars crushed, and people got missing, buried under trees and debris. At 9:20 pm, the FED activated "Echelon D", the last echelon in emergency management evoking

large-scale disasters, and established the operative-tactical group as defined by DV 100 (i.e. the incident command group with all six staff sections described above). A city-wide state of emergency was immediately declared. Operations focused on immediate, human-related emergencies: containing gas leaks, restoring safety in hospitals and retirement homes, and search and rescue operations amid debris, under trees, and in crushed cars. During the night, the FED rescued several people and cleared the roads for the EMS units to reach the incident sites. Eventually, response work revolved around the road network and critical infrastructures to respond to the consequences of the storm. The high number of fallen trees on streets and sidewalks were a threat for traffic, the trees could catch fire, or block water drains and provoke floods. Damaged branches hanging loose in the trees could fall on cars or people and hit train lines. All participants spoke of it as a massive response operation.

Despite application of the design mandated by DV 100, three main sources of problems challenged the conduct of the operations. A first source of problem concerned *resources scarcity*. Right from the beginning, the FED has been in need for additional staff and equipment to deploy its response. The staff, including the volunteers, had to work around the clock. In the days that follow, the FED had to find, again, additional staff and resources to secure broken trees, clear one lane of each major road, the train lines, and secure and stabilize critical infrastructures such as gas, electricity and water distribution. On June 11, the state district refused the sending of additional relief forces to Düsseldorf. What is more, volunteers of the FED, the THW, and the EMS agencies began showing signs of exhaustion.

A second source of problem emerged from the *polity*. As the organizations involved in crisis response proceeded with their operation, several organizations involved in the administrative-organizational group also asked for assistance to cope with the situation. The Mayor chairs the administrative-organizational group, so the agencies involved leveraged his presence to plea for their cause. In the days that followed the storm, the requests took a

decidedly political turn. The education authority began asking for prioritization for the clearing of specific schools (exams were approaching). Similarly, the office for public order asked the FED and other organizations for their opinion about the cancelling of upcoming events. On June 12, the state district decreed that acute danger for citizens was over, a decision that coincided with the district's refusal to send in more units from other cities to Düsseldorf. As we will see later, the FED pleaded for requesting assistance from the Federal Armed Forces to bridge resource scarcity. This decision, too, prompted reactions among politicians and citizens, who criticized the idea (and, eventually, the arrival of the Federal Armed Forces) — military in internal affairs is a highly delicate issue in Germany.

Finally, the operations also stumbled upon minor *jurisdictional and mandates issues* that were partly related to the political dimension highlighted above. For example, the state district's assessment prompted the FED to communicate a counter-assessment of its own to proceed with its operations. Similarly, specific requests seemed to be under the influence of the political leadership. Later, as the Federal Armed Forces reached the city, their integration into the operations provoked new needs for cooperation, as soldiers were not allowed to cordon areas. Finally, some agencies tried to leverage the soldiers' presence to accelerate their own response and went hereby beyond their own mandate, trying to bypass the one of the FED.

A Building Collapses in Manhattan

In New York City's central borough of Manhattan, shortly after 3:00 pm on March 26, 2015, a natural gas leak in the basement of a mixed-use five-story building ignited, triggering an explosion and fire that led to the collapse of the entire structure and two adjoining buildings of the same type and height. These buildings contained commercial space on the first floor, with four floors of residential apartments on top. They were located on a heavily traveled

avenue in Manhattan's East Village, a densely-populated neighborhood popular with tourists and with significant cultural value. The first emergency call was placed at 3:17 pm, and the FDNY issued a call for a seven-alarm fire, which eventually drew 250 firefighters to the response. Shortly after the explosion was reported, NYCEM's Emergency Operations Center was activated, and an ICS structure was established. As stated earlier, New York has developed a Primary Agency Matrix in order to make the composition of response networks more predictable. The matrix codifies in advance which agencies will take command of incidents falling into predefined categories, as well as which additional agencies or organizations will likely be called in for support. In accordance with the matrix a unified command was established, with NYPD and FDNY sharing command responsibilities, supported by NYCEM, the city's Department of Buildings, Department of Housing Preservation & Development, and Con Edison (the utility company responsible for the natural gas lines running into the building). NYPD became responsible for establishing a perimeter and managing access to the site, as well as assessing whether the incident had been triggered by criminal activity (e.g. arson or terrorism). FDNY meanwhile combatted the fires resulting from the explosion and conducted search and rescue operations. NYCEM's responsibility was to support interagency operations at the city's Emergency Operations Center, at which staff from all participating city agencies were stationed, to up and operate, along with the American Red Cross, a Resident Assistance Center for receiving and giving aid to displaced residents, provide logistical assistance in the operations where necessary – particularly where operational tasks crossed agency boundaries – and to coordinate public information about street closures related to the explosion and response. Unexpected complications arose from the size and scope of the evacuation and relocation of nearby residents: receiving and processing evacuated residents; coordinating between the NYPD, landlords, and other relevant agents; making sure vacate orders remained in place and were ultimately rescinded in

an orderly manner; incorporating volunteers into the response; managing distraught residents' requests to retrieve or locate their pets, etc. Finally, jurisdiction issues emerged as the operations moved between search and rescue towards a potential criminal investigation.

Managing at the Fold in Düsseldorf

Echoing the theoretical developments towards a practice-based understanding of interorganizational network design, we identified three main practices that we summarize under the heading "managing at the fold": channeling in, funneling through, and synthesizing.

Channeling in. The resource problems we identified above were dealt with by requesting assistance from other FEDs and organizations with the adequate skills or equipment. During the first day of operations, the FED requested assistance and included units into their own organization from three neighboring FEDs, from the THW, from a private firm fire department, and from the police. This requesting process unfolded based on an interpretation and assessment of potential partners' skills. For example, the police had no skills to offer in terms of response to damages, but it could assist in the search for missing persons and in rescue operations. Introducing these organizations into the emerging response group was made possible via the good relations the FED had with them and the FED's familiarity with these organizations' skills and limits. Similarly, as the response work proceeded, the FED began arranging assistance from organizations that are involved in the operative-tactical group and that could provide help with less urgent matters: traffic management authority, office for public order, agency for forestry, the cemeteries and gardening administration, the waste management agency. Channeling resources into the operations was made possible via the FED's capacity to not only pass on relevant information and contacts, but also assess exactly the potential usage of specific resources and integrate them into the response network. The FED's participation in virtually all safety-related issues during the year makes this

familiarity with others' resources and skills possible. Similarly, beyond external organizations, the FED arranged assistance with several other agencies involved in the administrative-organizational group: traffic management authority, office for public order, agency for forestry, cemetery & gardening administration, waste management agency, or with the public transport enterprise to restore tramways and subway lines. Finally, and most importantly, access to the Federal Armed Forces was made possible via the standard participation of a liaison officer of the Forces in the administrative-organizational group. Here also, although the Federal Armed Forces had not joined operations in Düsseldorf for more than a decade, the quality of the relation between FED and the military's liaison officer made the channeling of (unarmed) soldiers in the city possible, as we will see later.

Funneling through. An important aspect of managing at the fold during crises concern, in opposite to the channeling in of new actors and resources, is the art of refusing, even to agencies and actors with whom the FED is familiar. The FED hosts and coordinates the administrative-organizational group, but the political leadership chairs this group. This design provides the opportunity for agencies to leverage single organizational concerns. This group meets in other, less critical incidents during the year. With funneling through, we aim at showing how the FED retains organizations close to the response network because of their potential influence over the operations by paying attention to their requests, albeit a minor attention. For example, as the education authority asked for inspecting schools to know which one it could open for the summer term exams, the FED granted this request. It created, in the operative-tactical group, a small module dedicated to this task based on a list of choices sent by the education authority and promised a regular update on the situation. Hereby, the FED retained control over the mass of queries and requests from all sides and could work on it when it has capacity to do so. Similarly, when requests came up to clear the lakeshores (a popular recreational area), the FED decided that this task was not part of disaster response and

passed on a list with contact information of private firms to do the job. Concentrating forces upon specific tasks and preventing from dispersion became crucial upon the arrival of the soldiers. The incident commanders made repeatedly mention, during briefings, that the Federal Armed Forces were present solely for response purpose (e.g., eliminate dangers for citizens) and not for recovery operations (e.g., tidy up the woods). The incident commander issued a memo in the operation protocol to inform the whole FED about that and to document this, not least in case of future cooperation. The incident commander also clarified their position in face of the Federal Armed Forces state command. The work with the Forces went well, not least due to the extensive care that the FED spent in clarifying the work relationship. Eventually an expansion of the support of the Federal Armed Forces support was granted for a few more days.

Synthesizing. Finally, while channeling in and funneling through were helpful in compensating for resource scarcity and balancing political and cross-administrative pressures, the FED focused considerable attention on the integration of the additional units and organizations involved in operative work. First of all, most of the agencies and organizations whose resources were needed were included into the incident command. What is more, units of organizations closest to the FED in terms of processes and skills, such as the THW and other neighboring FEDs, were simply integrated into the FED's teams like additional staff. All organizations involved reported to the FED, hereby enacting its command role and centralizing forces, pretty much like in a hierarchy. This process of synthesizing the network of responders and observers into a unified network is also made observable by the decision of the Mayor to let go on attending most meetings of the administrative-organizational group. This is a recurring pattern that we observed in the course of other incidents and for which we could not identify any origin. The absence of the Mayor, however, speeds up discussions, as there is no hierarchical support in the room on which to rely to ask for prioritization. The

other than incidental absence of the Mayor, here, pushes the FED to the fore as the sole expert agency in emergency management. The FED, therefore, relied on this advantage to design the cooperation with the Federal Armed Forces in such a way that the soldiers' presence would fit entirely in the response network. The FED organized, using its relation to the local concert hall, a large accommodation amid the city for the soldiers, including cots, multi-outlet power strips provided by the hall operator, and a cooling vehicle for cold drinks. The tanks and bigger army vehicles had to stay out of the city. Eventually, the FED staged a press conference showing military and FED vehicles and staff working together, and the FED dedicated a less populated area for the battalion to work on, isolating the soldiers from the citizens and their critics about the military and its presence in communal affairs. Beyond that aspect of synthesizing, the FED also had to organize the cooperation and lines of work across agencies when it came to integrating the Federal Armed Forces into the operations. For example, as the soldiers had no mandate to cordon streets, the FED coordinated the interplay between the office for public order and the Federal Armed Forces to make sure that the response effort could proceed without interruptions.

Managing at the Fold in New York City

Similar practices of channeling in, funneling through, and synthesizing were at work in New York City's response to the building explosion and collapse, though the interorganizational configuration of the response differed significantly, considering the relative coequality of the FDNY and NYPD, and the coordinating or network administrative role of NYCEM. While FDNY took the lead in fire suppression and initial search and rescue efforts, NYPD took an active role in perimeter management, and NYPD moved into more of a leadership role as immediate life-safety operations ceased and pivoted to a criminal arson investigation. Ultimately the incident was reclassified as a homicide, and NYPD in February of 2016

arrested and indicted the building owner and four others on manslaughter charges once it was determined that the gas explosion was caused by illegal tampering with the building's gas main.

Channeling in. While the FDNY was in charge of channeling in resources related to fire suppression, NYCEM coordinated support resources. A major need for this was in providing comfort and temporary housing to displaced residents of 144 residential apartments that had to be evacuated. NYCEM, following existing protocols and directing the American Red Cross of Greater New York (ARCGNY), established a Resident Assistance Center (RAC, or sometimes referred to as a "reception center") at a nearby public school building. The purpose of the RAC is to receive displaced residents, provide them with food and water, and connect them to services provided by other city agencies or nonprofit entities. For example, residents waited at the RAC while ARCGNY procured hotel rooms for temporary housing, and while the American Society for the Prevention of Cruelty to Animals (ASCPA) searched for or retrieved missing pets and reunited them with their owners. As another example, while NYCEM staffs are trained in psychological first aid, they used the RAC as a central point from which to connect traumatized residents with counseling services. Ultimately the RACs also serve as community gathering places where information is centrally distributed. In this case, it was also where residents reported when they wished to be escorted to their homes inside the police cordon, and was a central point for the collection of information related to NYCEM's efforts to secure disaster relief funds through the federal Small Business Administration's Disaster Loan program. NYCEM also channeled in trained response personnel through its Community Emergency Response Team (CERT) program. CERT volunteers serve as a kind of emergency response reserve corps, trained by NYCEM with light emergency response skills in peace time to be deployed in crisis situations. In this case, CERT volunteers were crucial in staffing the RAC and in escorting residents through the

police cordon to and from their apartments. In all of these cases, NYCEM managed existing relationships to engage and integrate new resources and new actors that would not have been integral parts of the response otherwise.

Funneling through. During the response NYCEM worked to assert itself visibly as the response coordinator, attempting to appear as a peer agency with the NYPD and FDNY, subsuming the visibility and presence of other supporting agencies. To this end, for example, the OEM commissioner appeared at all mayoral press conferences alongside the NYPD and FDNY commissioners, gave reports on the agency's efforts, and answered questions from reporters. Furthermore, while in the past the ARCGNY would have been visibly in charge of tending to and relocating displaced residents, in this case NYCEM became the face of resident assistance and public information and directed its provision. NYCEM also exerted its power through its Emergency Operations Center (EOC). While incident operations were directed from the scene, they were coordinated from the EOC, located in NYCEM's headquarters building. This meant that liaison staffs from all participating agencies were present and working alongside NYCEM staff, exchanging information, issuing and resolving requests. During the recovery, NYCEM was the channel through which the city was able to petition and secure financial assistance from the federal Small Business Administration Disaster Assistance Loan program, the most prominent source of federal disaster aid aside from Federal Emergency Management Agency grants, which require a presidential disaster declaration to unlock.

Synthesizing. Most appropriately to its role as a coordinator, NYCEM played a central role in the practice of synthesis. Interagency meetings on the progress of the response were held both at the scene of the incident (with NYCEM officials present) and in the EOC at NYCEM headquarters. The EOC was the central coordinating space for information gathered from the response agencies: fire suppression, debris removal, building safety, and search and rescue

information from FDNY, street closures and criminal investigation information from NYPD, power restoration and natural gas infrastructure information from Con-Ed, environmental monitoring (for asbestos and other pollutants) from the Department of Environmental Protection, building inspection damage assessment information from the Department of Buildings, and of course all of the information from NYCEM's Resident Assistance Center. Information, centralized here, was dispatched back into the field. For example: Which buildings were still considered unsafe for habitation or entry? Where was debris being deposited? What was the health status of the injured? Had any of the persons reported missing been found? What were the dimensions of the police cordon – which is to say, which streets were still closed and which were open? The overall status of the site, synthesizing information from all responding agencies with a running tally of open tasks, was maintained by NYCEM's Watch Command. The geographic data were synthesized into maps by NYCEM's Geographic Information Systems (GIS) unit and circulated back into the field. Photos of damage at the scene from field personnel streamed in and were also recirculated. This information was shared with elected officials through teleconferences hosted by NYCEM. Information for public dissemination was broadcast through NYCEM's social media channels and subscribers to its emergency alert email system.

DISCUSSION

We know surprisingly little about how interorganizational networks balance mandated, formal frameworks (and herewith the advantages of intelligible structures understandable to all participants) with the urge to create a collective response that is adapted to the very specific context and particular relational setting of the problem they are tackling. We addressed this issue with a comparative case study of networked crisis management in Düsseldorf, Germany, and New York City. Crisis management is an interesting setting because it necessitates

constant adaptation of routine work and procedures to novel incidents and unpredictably disorganized environments effectively. We argued that managers and scholars need to think beyond static interorganizational frameworks and proposed that interorganizational designs operate as structures that both constrain and enable agency, in the form of situated adaptations, to support collective work. To conceptualize this approach, we relied on a concept recently introduced to network theory, the notion of structural folds (Vedres and Stark 2010).

In line with Vedres and Stark (2010), we have seen that FED as well as NYCEM belonged to more than one cohesive group and that their roles, typically, asked for more than mere brokering. Innovativeness and creativity, according to Vedres and Stark (2010), are made possible by folding groups at their intersection. In the two cases we report on in this paper, the continuous design and change of response groups or networks was linked with immediate resource transfers towards new solutions and innovative responses to problems instead of mere information exchange. This strategy is explicitly pursued by NYCEM through its staffing patterns: the agency recruits full-time staff from other emergency response agencies based on their competence and social ties. Symmetrically, when full-time staff trained at NYCEM depart the agency, their destinations are often emergency response-related positions in other city agencies, which further strengthens ties between NYCEM and the destination agencies. Furthermore the agency operates an interagency liaison program, in which staff members employed by other city departments are posted at NYCEM headquarters several days a month to pursue their normal duties alongside NYCEM staff. The FED, due to its far more operational role in the emergency management in Düsseldorf, does not need to rely on staffing patterns to nurture its relations to other agencies. Crucially, however, it achieves equivalent network effects by building on its omnipotence in emergency-related issues to channel the appropriate actors into the response group and integrate each organization into a

temporary constellation. These practices constitute unambiguous and intentional structural folding.

We identified three general practices that contribute to managing at the fold. (1) *Channeling in* is the process by which actors operating at the fold between two or more groups request contributions from participants across groups. These generative dynamics create additional resources (in this case, for the management of urgent responses to disasters) that are combined into new constellations. These performances enact and reinforce relationships between actor(s) at the fold and the participants by producing new cooperation, hereby creating a deeper mutual understanding than would brokering alone. Channeling in explains how, despite mandated designs, the organization coordinating the operations manages situated adaptations of the design of the interorganizational response effort. Therefore, to perform this practice, the network needs an organization at the fold with the necessary expertise to assess situations and select, from the environment, potentially relevant partners. This process implies more than simple requesting. It requires an ongoing process of intercohesion that is rehearsed in times of stability and leveraged in times of crisis. Channeling in represents an important contribution to a practice-based theory of interorganizational network design because it orients our attention towards what organizations and their members do to fill the void in their collective operations, hereby provoking the necessity to create new functions, processes, or communication paths.

(2) *Funneling through* provides a counterpart to the channeling in of new partners. A large number of organizations stood in the way of the response operations either because they would push forward their own problems and request help, or because they would compete for leadership, sometimes even trying to forge a passage across the fold, as we saw in Düsseldorf. Performances relating to funneling through prompts us to pay more attention at defense and maintenance work in networks and how these performances are embedded in design issues. In

particular, funneling through does not correspond to blunt refusal, although in some instances it does, but to the capacity to retain the organizations in the group, or its proximity, by satisfying their needs while retaining control over the overall operation. This can be done by actual actions taken, albeit peripheral, or by means of brokering, e.g. by forwarding a task to other organizations not yet involved. Funneling through represents an important contribution to a practice-based theory of interorganizational network design because it orients our attention towards what organizations and their members do to maintain organizations at the fringe of the network without discarding them altogether, hereby explaining how specific functions or parts of the designed constellation are being downscaled processually and situatively.

(3) *Synthesizing*, finally, contains instances of establishing tighter coordination between participants once they have been channeled in. Introducing resources into the response group often meant the creation of functional links among the organizations participating in the response effort. This involved significant work at the boundaries of the participating organizations. For example designing on the spot new cooperation structures to make sure that each organization channeled in would be able to work properly (Düsseldorf), or via intensive communication coordination (New York). Synthesizing represents an important component for a practice-based theory of interorganizational network design because it orients our attention towards what participants in networks do to create functional links among operating organizations. Hereby, this third practice, together with the other two, explains how the many functions and elements that are parts of the designed constellation are being integrated into a coherent and coordinated whole.

These observations prompt three main contributions to the literature on emergency management, interorganizational networks and design respectively. New York City and Düsseldorf rely on two very different designs to support the emergence of interorganizational

response to crises. These designs, despite their differences, yield similar results. Managing at the fold, we proposed, is what NYCEM and FED do to balance the enactment of these mandated networks with the necessity to adapt the design of the response group to its situation and relational context and protect the operative work. Puzzling, however, is not just the equifinality implied in this analysis (i.e. that despite different structures, both cities produce effective interorganizational crisis management) but that both Düsseldorf and New York City arrive at the same solution – the "folding" of organizations in the network.

We propose two responses to that finding. First, the task of emergency management is fundamentally similar in both cities (and in many others). Routine patterns of urban life are continually reproduced through a densely interconnected network of interdependent organizations and systems. Urban emergencies constitute ruptures in this complex network, breakdowns in the reproduction of social order. It should then perhaps be no surprise that urban emergency management requires the careful coordination of multiple organizations to contain these ruptures and restore order. Both Abbott (1988) and Eyal (2013) ask us to think about how the nature of tasks shapes the development of professions and networks of expertise. Our findings prompt us to think that the strategy of producing folds has proven to be, in practical terms, the most effective way of executing the task of managing interorganizational crisis response, whatever the mandated design. Most research on crisis management highlight the temporary nature of interorganizational responses and cooperation in crises (Moynihan, 2009; Vollmer, 2013). Against this background, paying attention at structural folds is especially effective to compensate for the long periods of latency that might endanger the ties and hinder quick reactivation. In other words, managing at the fold produces stronger interorganizational connections than does mere brokering.

A second point concerns the role of structural folds as such. First, we provide one of the first studies exploring structural folds qualitatively. The three practices that we introduced

contribute to a sharper understanding of what happens at the fold. This exploration, in addition, yields an interesting insight. Contrary to Vedres and Stark (2010), who concentrate on creativity and the necessity to go beyond closure and brokering at the same time towards richer interactions, we report on two cases where folding does not only support innovation and creativity; instead it seems to play also an important role in the protecting of groups from the influences of others in the broader organizational field. As we have seen in Düsseldorf, the FED used its position to protect operations. This necessity implied coping with refusal without harming the ties. Funneling through, in this case, was an instrumental practice that allowed the retaining of the organization by providing a controlled and well-dosed response so as to concentrate the bunk of the resources on what was more urgent. Similarly, in New York City, NYCEM would invest considerable amounts of energy in defending its position amid the overwhelming influence of NYPD and FDNY. Network research tends to be more interested in the growth and evolution of networks than in network maintenance, failure, or even entropy. Design issues imply a search for fit and the search for the combination that will foster effective task completion. A consequence of this situated search for fit with task and environment must entail interorganizational work at the boundary, including the protection of existing networks.

Finally, our paper contributes to the literature on interorganizational design and design more generally. We address recent developments in the literature that proposes to look at organizational design as a process that is never complete towards emerging fits (Dunbar and Starbuck, 2006; Garud et al. 2008). From this perspective, we proposed that organizational design is in practice a relational issue, both intra- and interorganizationally. For some time, scholars of organizations have looked at design as the search for a solution. Our findings contribute to showing how interorganizational constellations are designed processurally as the task evolves. Thanks to our comparative case design, this paper shows that, despite two very

different policies and institutional settings at the outset, the same practices have emerged, which provides a basis for generalization of our findings. The practices we unearthed provide a theoretical basis for more research on how to design interorganizational instances of cooperation, from networks to projects, towards a deeper and nuanced understanding of how organizing takes place in complex and heterogeneous systems.

These developments push opportunities for more research to the fore. More systematic studies of organizations working at the fold shall yield important insights into their role in organizing complex assemblages of organizations. We unpacked the role of two organizations orchestrating two different networks that are involved in managing the same kind of tasks and problems. Elaborating on our findings with research in other settings might yield important insights about networks, their structure and their design as they are being practiced into existence.

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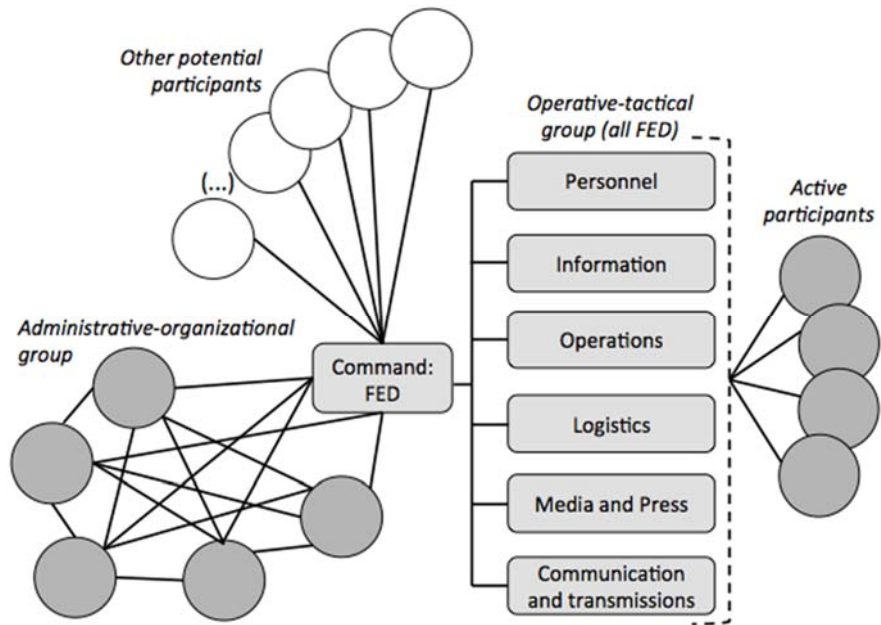
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Figure 1. Schematic representations of DV 100 and ICS

1.a. DV 100 in Düsseldorf

1.b. ICS in New York City