**The Structuring Activities of Boundary Objects**

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**Introduction**

Boundary objects (Star and Griesemer, 1989) are non-human actors or artefacts that can coordinate collaborative activity across social worlds. Unlike human actors, who have intentionality, this coordinating role occurs as the object is embedded in the network of actors and they influence or shape interactions and meanings between human actors. While existing research has investigated, and demonstrated, the success of objects facilitating collaboration within (epistemic objects, Knorr Cetina, 1999) and across (boundary objects, Star and Griesemer, 1989) groups, it has hitherto been unable to explain how such objects come into being (Nicolini et al, 2012); the focus has been on the role of objects in assembling networks of actors, rather than the roles of networks of actors in assembling specific objects (Knights and McCabe, 2016). Moreover, primarily research on such boundary objects has been in stable environments, where day-today activity is predictable and ordered. This article makes use of Actor-Network Theory (ANT) as a means of understanding boundary object formation, ontology and transience. Specifically, this paper addresses how boundary objects come into being, how they hold together the actor network, and how they are affected by changes in context.

Existing literature on boundary objects has several common limitations. First, the boundary objects are often discovered in stable predictable contexts with little consideration of how they may be changed in turbulent environments. Second, boundary objects are discovered in settings, there is presently a very limited and oversimplified understanding of their construction; that is, that boundary objects are constructed by the actors who use them (Thomas et al., 2007; Thomas et al., 2008). Finally, boundary objects are typically observed in simple dyadic relationships or chains of such relationships. However, boundary objects in more complex dynamic collaborations are yet to be observed.

In this case study, we follow an object as it is constructed and used to co-ordinate activity amongst a network of actors from organizations. The organizations work together as part of an emergency management partnership. This forms the context for observing the construction and disappearance of an object of collaboration (the emergency plan) in a turbulent actor-network. The article asserts that boundary objects are created through closer aligning understanding, and inscription. We define these as structuring activities, which include: *rehearsal, inscription, validation* and *empowerment*. We also note that, the strength of the object as a means of collaboration is determined by connections to strong actors. The moving of a boundary object between contexts is identified as re-contextualisation, a period in which the ontological strength of an object diminishes as connections to other actors are eroded. The ability of the object to facilitate collaboration is weakened and the object temporarily disappears into the background.

**Literature: Boundary Objects and Actor Network Theory**

Using the case of a bioreactor, Nicolini et al. (2012) describe a typology of objects to highlight that objects perform a variety of functions. These functions, they argue are: a) a primary function to motivate or drive collaboration (epistemic objects); b) a secondary function to allow translation across boundaries (boundary objects); and c) they are the infrastructure against which activity takes place (infrastructure objects). They argue that this typology allows a better understanding of how objects are implicated in collaboration and its breakdown. They also suggest that objects have a career trajectory, in which they can rise to a state of social prominence, perform a certain function within and/or across groups and then disappear into surrounding material infrastructure, but we do not know how or why these transitions occurs, and under what conditions. However, what is clear from their discussion is that they consider that objects become “boundary” or “epistemic” objects ‘because of the position they occupy in the process of collaboration and because of the nature of the issue at hand’ (Nicolini et al. 2012: 626). Their career can thus be a messy, clumsy and iterative journey. For this collaboration to occur, there is a need for engagement between actors, and a challenge is for meanings to be reconciled as organizational actors operate across epistemic boundaries (Knorr Cetina, 1982; Star and Greisemer, 1989).

This study focusses on boundary objects since they are non-human actors that enable groups without shared knowledge or goals to work together towards a specific goal or purpose, enabled by differences and similarities in actors’ understandings of the object (Star and Griesemer, 1989). The original example provided by Star and Griesemer (1989) is that of the Berkeley Museum of Vertebrate Zoology. Objects, such as specimens and classification forms, were seen to be plastic in common use (interpretively flexible, Lainer-Vos, 2013) and concrete (interpretively rigid) within the domains of specific groups of actors. Across a range of settings, such as machine manufacture (Carlile, 2002; 2004), computer games design (Scarborough, Panourgias and Nandhakumar, 2014), new product development (Bechky, 2003a; 2003b), and the understanding of financial products (Lainer-Vos, 2013), boundary objects have been used to explain how work is coordinated across boundaries. When objects are instantiated between communities of actors, and they interact with and through the object, actors are engaged in collaborative achievements in pursuit of understanding (Miettinen and Virkkunen, 2005).

ANT is primarily a study of how scientific knowledge becomes realized in networks of actors (Latour, 2005). It highlights the how objects are important in helping us understand how knowledge and meaning are translated and moved between sites of social activity (Latour, 1999; Callon, 2002). In ANT, the nature of objects, artefacts or devices (as they are variously called) is not just representational. Objects are intimately involved in defining the possibilities and scope of understanding and of practice, both now and in the future, as they unfold over time. As such, objects have an active role in either sustaining or overcoming boundaries (Knorr Cetina, 2001; Schatzki, 2005). They translate meaning from one domain to another (Callon, 1999; Latour, 1999) and are embedded in, and part of, the network of associations that constitutes the social arena (Law and Hassard, 1999). Knorr Cetina (2001), for example, argues that objects have the most potential when their properties allow them to signify gaps in understanding, or provide several perspectives or views to be considered. When objects or artefacts create opportunities to invoke differences between communities, or are pliable enough to be used in a variety of contexts, the potential exists for translation and connections across different domains of practice (Star and Greisemer, 1989). This translation potentially enables the reorientation and co-ordination of social practice across boundaries. It also suggests that there is potential for the objects themselves to evolve as the actor-network emerges. Further, ANT suggests that the objects will be particularly sensitive to context and that, if they are moved to another place, they have the potential to be disruptive to an existing network or become irrelevant if they cannot gain traction amongst a new cohort of actors.

Actor-Network Theory (ANT) offers an ontological lens with which to examine the creation of networks and actors intended to overcome uncertain or controversial viewpoints (such as in observed crises and the processes of emergency management planning), while privileging neither human nor non-human actors (Knights and McCabe, 2016). From an ANT perspective, boundary objects are able to operate as black boxes (Latour and Woolgar, 1979) used by involved parties even if not fully understood. As such, the boundary object is granted significance (power or ontological strength) through its connections when it is in use or being developed. In our case an Emergency Plan is an object that is constructed in an actor network, it is a *matter of concern* (Latour, 2004) for those involved. What Latour is suggesting when urging us to focus on such matters of concern is to consider the politics and power relations that are inherent in day-today musings and interactions. As a socio-material artefact through which actors in the network engage in negotiating meaning, responsibilities and authority, the plan and its development is a matter of concern, an object through which interests are scripted, made real and thus over time becomes more important for maintaining the network. It gains ontological strength as it emerges. The plan itself is formed from the performance of calculations, from negotiations of goals, from drawing lines of responsibility, from allocating resources and from deciding courses of action. It is what Callon and Muniesa (2005) describe as a performative outcome of the actor network, both dependent on the actor network for its significance, but without which the actor network itself would not exist in its current form.

Objects in an actor network are thus implicated in practical activity. They are artefacts through, and against which, different communities can represent, interpret and contribute to the understanding of ongoing and unfolding activities (Ewenstein and Whyte, 2005). This work occurs in a trading zone, what Kellogg et al. (2006: 38) describe as the ‘provision and emerging collage of loosely coupled contributions’ that temporarily coordinate actions. In this regard, objects will have different integrating capacities, and participants will ultimately have different abilities (or motivations), to work on, or through, them (Carlile, 2004) with others in the network. ANT therefore argues that:

‘objects do not exist ‘in themselves’, but are the effects of a performative stabilization of relational networks. Material objects are enactments of strategies, and actively participate in the making and holding together of social relations’ (Pels, Hetherington and Vandenberghe, 2002: 11)

In this way, boundary objects are created through *structuring activities.* By this we mean the establishing and inscription of connections between actors through the creation of the object, while the object still remains interpretively flexible between social worlds of the many actors involved in its production. An ANT perspective, as Law (1999: 7) argues, asserts and brings to the fore ‘the performative character of relations and the objects constituted in those relations’. Thus, through the integration of Actor-Network Theory, this paper addresses how boundary objects come into being, how they hold together the actor network, and also how they are affected by changes in context.

**Methodology**

The boundary objects in this study are emergency plans that can be understood in terms of ‘interessment’ (Callon, 1986), since their tentative creation enrols and thus interposes actors who together engage in its production. In this way, objects are central to the unfolding of new processes and new activities (Knorr Cetina, 2001), since they disrupt existing relations, encourage actors to interact across boundaries, and help to establish new relationships and understandings (Carlile, 2002). The empirical basis for this work is derived from an ethnographic investigation of a Local Resilience Forum (LRF) in the United Kingdom. LRFs are statutory non-hierarchical assemblies of organizational actors who are legally required under the Civil Contingencies Act (2004) to collaborate in preparing for and responding to crisis events, such as terrorism, floods, pandemic flu, and other emergencies. Data from 14 months of ethnographic research carried out by the first author, incorporating participant observation, interviews and document analysis is synthesised by means of a narrative analysis to produce rich descriptive accounts of activity across several stages (van Mannen, 2011). Such means of observing and presenting accounts of objects is commonly accepted in several strands of object-centred research (e.g. Bechky, 2003a; Carlile, 2002, Knorr Cetina, 1999; Nicolini et al., 2012). The case was selected on the basis of access availability in a traditionally hard to access area of activity. As such it is presented as a revelatory case (Yin, 2009) offering unprecedented insight at the cost of generalizability.

Our approach presents a narrative with analytical properties, uncovering and organizing observed practice, but it is necessarily subjective and brief given the large quantity and depth of data collected. Thick descriptive exploratory and analytical methodologies (such as ethnography and ecological historical analysis) have a tradition in both boundary object and ANT literatures. As Carlile (2002, p.447) notes, “a challenge that every ethnographer faces is how to represent and make understandable a large collection of observations of day-to-day work or practice”. Thus resulting narratives are less abstracted than alternative presentations of data. These stories aboutsocial worlds preserve something of the context of the field in which they were captured, it is this context that is important to understand the reality and functioning of boundary objects and actor networks. ANT has strong associations with such ethnographic accounts. Law (2009, p.144) argues that “knowledge lies in exemplars and words are never enough” Latour (2004b in Law 2009) and that although deconstructive analysis is trivial, through reconstruction a deeper understanding can be obtained.

Langley (1999) describes the process of the generation of theory from fine-grained and messy qualitative data, finding that there is ways a “creative leap” (p.691) in the transition. The resulting narratives provide a vicarious experience (Lincoln and Guba, 1985) from which learning can take place, as well as a platform from which theory can be developed. The specific investigation of the construction and persistence of boundary objects in this study has been aided by at least two contextual factors. First, the multi-agency context observed involved in large number of organizations and individual actors (LRF meeting minutes list representatives from around 25 different organizations). This allowed us to examine the construction of the object through several distinct stages each involving specific processes inscription, alignment of understandings by discussion, and re-inscription. The development of the object from these practices was made simpler to chart as a result of its reduced speed through each of the steps. In addition to the complexity of collaboration in designing emergency plans, the LRF also provided the opportunity to observe many plans under construction over the 14-month period. The LRF had a total of 20 plans addressing the 10 highest risks (floods, pandemic flu, acts of terrorism), and 10 elements of response (such as rest centers, communication, etc.). Over the observation period the majority of the LRF’s 20 plans were reviewed, this enabled the observation of multiple concurrent processes of emergency plan (boundary object) construction. Secondly, observing emergency plans through a process of slow and deliberate construction interrupted by acute crises demonstrated these boundary objects’ dependence on context for ontological strength. While contexts change within and around all organizations, in emergency management (moving through stages of planning, response, recovery and evaluation) this dynamism is more obvious. As we will see, these contextual changes have a dramatic effect on boundary objects’ strength across situations as links to the object are disrupted in crisis. The majority of activity within the observed Local Resilience Forum and its observed partnership focused on planning for emergencies in multi-agency meetings with key respondents (category one responders as designated by the Civil Contingencies Act 2004). It is through this process of planning that the construction of the boundary object begins.

**Empirical Account**

The narrative account of the case will be laid out in a format that follows the construction and disappearance of a boundary object. Following an overview of the observed emergency planning context the first stage of *rehearsal* is identified in a meeting, office observations of discussions and physical acts of writing and rewriting then constitute *inscription*. *Validation* is then presented as processes by which the object is linked to other powerful actors, enabling the object to gain social significance. Finally, in *re-contextualisation*  we see the object move across contexts, in this case between planning and crisis, which disrupts the network of connections and in which the object’s significance fades.

**Research setting**

As noted above, data collection took place within a Local Resilience Partnership office for a period of 14 months. The Partnership was established as a means of fulfilling the statutory duties of the local police, fire and rescue, local authorities, and other parties, to assess risk and plan for response and recovery (the Civil Contingencies Act, 2004). The governance structure of the partnership was formed of an Executive Group (Chief Executives, Chief Constable, Chief Fire Officer, etc.) who set the strategic priorities and assign resources to the partnership from their organisations. Below them, a group of middle management who decided on priorities and projects (what would be planned for, based on a risk assessment), and finally a general group of organisational representatives who met monthly to discuss progress on work streams, but also informed work on a day-to-day basis. The real work of the partnership (mostly planning) was carried out by working groups established by the mid-level of governance.

One such working group meeting took place with reference to the site clearance and recovery plan. The group were tasked with rewriting one of the 20 so plans the program group had decided to be a priority for the partnership (and the population it represents). At this point the plan had been written and required review and an update after a two-year period. This time the recovery plan will be divided into a site clearance plan (this group) and a humanitarian relief plan. The meeting was held in a local resilience partnership office, the meeting room that could hold about 15 people on an industrial estate roughly equidistantly between City Council, County Council and Police Force headquarters. The building itself was leased by the County Council, the partnership was managed by police, with remaining partner is contributing funding or staff resources.Meeting attendees arrive and sign the visitors book before filing into the office. There is a familiarity between some while others are meeting for the first time. The meeting is called to order by one of the Partnership Emergency Management Officers (EMOs) who asks the people to introduce themselves. Around the table introductions are made, the seniority and experience of attendees is wide. Some functional specialists (e.g. a trainee Health and Safety advisor from one local authority) some are representatives with an organizational role which involves specific responsibility for partnership working (from the NHS) while others are senior staff with a broad remit (the representative from Fire and Rescue). The Partnership is represented by two EMOs, these are members of staff funded by the local district, borough, county and unitary authorities who have a full-time role preparing emergency plans and responding to emergencies. The EMOs are authorised to speak on behalf of all of the local authorities in the Partnership.The EMO begins the meeting by stating where the plan is in terms of development. The plan is being rewritten and divided and this group considers the site clearance plan. The plan is coming to the stage of the drafting process in which the group been assembled to discuss and refine. The multi-agency plans for approved for a period of two years, after which they required revision and re-authorising. The Emergency Management Officer chairing the meeting asks who has read the draft plan (which is the intended focus of discussion). None of the participants beyond the two Emergency Management Officers appear to have read it. The meeting then reverts to the basic principles of the plan, responsibilities of organising in the event of recovery. This is explored through discussion of hypothetical scenarios and precedents.

*Rehearsal*As it becomes apparent that many of those present are unfamiliar with the plan (or that the plan was the focus of the meeting), discussion turns to the knowledge and experience of actors around recovery and site clearance. They verbally recite tales of recovery from other cases (e.g. where areas were contaminated with toxic debris or disposal of contaminated sandbags). In each case who is responsible, who would cover costs, and how each of the actors work in terms of practices capabilities. These sorts of activities share actors’ understandings of practice with other organisational representatives, knowledge begins to permeate across organisational boundaries. Conversations take place in cycles often with an active questioning what if or could/would you, testing assumptions of other groups’ repertoires of practice. Sometimes incompatibilities in understanding are discovered by chance and resolved through discussion. When misunderstandings are detected the owner of the relevant practice rehearses once more to share and create understanding, thus clarifying and enriching actors’ understandings of the emerging tapestry of shared practice (in this instance, site clearance that is the intended focus of the plan). Discussions at the meeting about building collapse response, collection and disposal of sandbags, and funding for wide area clean-up illustrate the verbal recitations that are considered here to represent rehearsal.

Explaining his understanding from an account of practice shared by contact in another area, during the meeting one EMO asks the Fire and Rescue representative if they can prop up buildings that are at risk of collapse. The Fire and Rescue representative explains that while crews do have this ability, it places firefighters and equipment at a high degree of risk, and potentially they might be caught in a building collapse. He explains the practice would not be attempted in recovery phase when no lives are at risk. Both the EMO and Fire and Rescue representative shared a rehearsal of their understanding of practice, through the comparison of the shared rehearsals their understanding has become more closely aligned and misunderstanding eliminated. Because they will been have trained in, and observed and carried out the practice, the Fire and Rescue representative has a substantially deeper understanding of the practice in operation than the EMO, yet the communication of the practice is sufficient to resolve the conflict in understandings.

In a discussion of the collection of used sandbags (following a major flooding incident), one representative asks who is responsible, where previously uncollected bags been reported to the Police. He asked if the issuing local authority could collect them as a part of recovery. A Health and Safety Officer representing one local authority responds on behalf of other local authorities, explaining that while all floodwater is assumed to be contaminated with unknown substances, local authorities could not collect and dispose of them. Instead it was the duty of the (national) Environment Agency (EA). This is a satisfactory explanation to those present, none of whom is from the Environment Agency (which has not sent representative nor notified the meeting of their intended absence). If the Environment Agency had a representative present they might have been able to confirm or contest the understanding of the Health and Safety Officer. Without this representation, however, the understanding of those present is regarded as sufficient[[1]](#footnote-1).

A final example of rehearsal is the funding of wide area clean-up. An Environmental Health Officer asks who would be responsible for paying for the clean-up of a contaminated area. The EMO says there is precedent for a local authority to pay immediate costs and that they would seek reimbursement from the site owners (which he says should be insured) or the central government through the Bellwin scheme. The Environmental Health Officer (who is employed by a local authority) says he cannot agree to that; he does not have the necessary authority and potential cost is beyond estimation. Here the rehearsal of events is leads to understanding which is undesirable to some participants present at the meeting, his objection ultimately means that no mention of the funding of recovery is included in the draft recovery plan. Here what would become an omission from the plan is intentional, signifying unresolved conflicting understandings of actors around a specific responsibility or practice

*Inscription*

Understandings of practice can be better aligned though actors’ verbal rehearsing, but these rehearsals are fleeting, personal to those involved, and difficult to communicate beyond their immediate audience or subject to close scrutiny. Inscription (Latour and Woolgar, 1979) provides a means of making them more permanent – in emergency management this is often in the form of inscribing understandings in emergency plans. Following meetings, such as the one observed above, emergency planers would inscribe their understandings in textual form.

Inscribing understanding serves at least two purposes; firstly, an inscribed object reflects a stabilized understanding which can be shared both within and beyond the actors present at the meeting for further consultation - to further compare and rehearse against other understandings. The stabilized understanding can be further refined through moving between phases of rehearsal and inscription until it eventually becomes a material inscription of the shared understanding of recovery, or any other tapestry of practice. Second, the creation of an inscribed plan allows for a process of validating an agreed upon understanding to commence (this is addressed in a following section).

Initially an EMO would produce a plan based on their understanding (and personal written ephemera) which has been shaped through verbal rehearsals with other actors. This initial inscription is the actor’s subjective understanding of the roles, responsibilities and repertoires of practice belonging to organisational actors. These cycles of the inscription and rehearsal work reflexively. As understandings are inscribed, other actors are better able to scrutinise them and this facilitates rehearsal of the practice(s) once more to understand how they fit with the expanding multi-agency repertoire (the existing set of practices owned by organizations that can be enacted as and when needed, Duymedjian and Rüling, 2010). The existing inscription is revised in light of the evolved understanding. After several rehearsals and revisions of the inscription at working group meetings, the resulting inscription is the subject of a wider consultation process. This consultation process enables specialists (e.g. housing officers from a local authority, health and safety officers from the local fire and rescue service) who are not regularly engaged with the plan’s construction to modify it, thereby incorporating their more nuanced knowledge in the planned response.

Inscription has two distinct phases: *shaping*, which involves actors discussing and agreeing the contents of the plan in broad terms; and *detailing*, where individual organisations have more control over what was said in particular sections – setting out what their organization can and cannot (or will not) do in the context of the planned event. Between the stages of shaping and detailing the plan is sculpted, from a mass of course understandings of roles and practices through rehearsal and gradually refined inscription, a more closely aligned understanding of practice is arrived at and transformed into material. The inscribed plan is it crystallised understanding which has been scrutinised by actors from many organisations, it possesses an important quality of being uncontentious, while actors may debate the level of simplification of the plan they do not disagree with what it says.

*Validation*Once the plan begins to be inscribed, links with actors, communication and endorsement empower it with authority. The notional plan accumulates links with other actors as it develops from initial discussions about the scope of the plan and importance references to other human and non-human actors (e.g. the crisis and its recovery, organisations and individuals involved). Stocks of sandbags in a depot become more significant because of their explicit reference within in the plan, just as the plan is more significant as a result of their mention in it. As an object of collaboration, the plan draws power (ontological strength) from some actors to marshal the activities of others. The more powerful force a particular event (a crisis) might be, the greater the power and importance of the associated plan. Similarly, the more powerful the actors that endow the plan with support, the greater the power of the plan to will other actors to action (ultimately the plan is physically signed by the most senior actor from each organisation in the Local Resilience Forum).

Through the *structuring activities* of *rehearsal*, *inscription* and *validation* boundary objects can be observed through processes of construction. Links to powerful actors are made through which the boundary object is able to marshal the force of other actors, it is this channeled force that comprises the object’s ontological strength. The network of actors to which the object is connected make it significant. In this example the emergency plan is connected to responders, executives and resources making it a powerful coordinating tool. This is similar to how the usefulness of a boundary object is derived from its connections across epistemic groups (Bechky, 2003a; 2003b; Carlile, 2002; 2004).

*Re-contextualisation*

In re-contextualisation a boundary object that has been constructed as the focus of collaboration through *rehearsal*, *inscription* and *validation* becomes a powerful object and then moves from a structured and stable context of planning to the uncertain and turbulent context of a crisis. Connections across the network change while the object (an accumulation of inscribed links to actors) remains the same. The force of connected actors which the object was able to channel, from which its own strength was derived is either diminished or becomes unclear. For the emergency plan the disruption which characterize crisis cause the plan to lose its significance. In the following account of re-contextualisation, the planned activities set out in a multi-agency flood plan are compared with what takes place in a real flooding response.

**From a stable to turbulent context**

The morning had been unusually dark and showed few signs of improvement as the day progressed. A meeting was being held for an NHS training operation in the larger of the partnership’s two meeting rooms. The researcher’s discussions that morning were around organizational membership within this collaborative space. One of the Emergency Management Officers (EMOs) was recounting the animosity he felt from members of his own employer (a local authority who saw him as an outsider in his headquarters).

At 11:30am the police superintendent left the meeting room as the event ended and other participants left the office and returning to their usual workplaces. The superintendent asked all those remaining if there had been any news about the weather. One EMO replies that he has received an email from the Environment Agency to say that they will be upgrading to an amber warning – “a low chance of thunderstorms” and that “where they hit they will be significant.” It’s darker outside, even more so than at the start of the day. At 11:37am the same EMO receives an amber alert email from the Environment Agency, and given that such warnings are commonplace, the reaction is mechanical. He forwards the alert to partner organizations and work carries on as normal. Most of the partnership team were working on matters related to the Olympic torch relay, coordinated through LRFs as a result of their interagency composition and links.

At 12:37pm a series of telephone calls break the calm in the partnership office. Four calls are received with fragments of information – each a part of the situation being constructed by actors. The first call is about a town 15 minutes from the office. There is heavy rain and water “shooting out of a drain” at the bottom of a hill with enough force to displace the drain cover. The second call is from an Emergency Manager who works at the partnership but is presently at the county council headquarters. He reports that there are problems with electricity and there is no indication of what is causing it. The third call is from an EMO’s wife to say that her workplace (a nearby university) is in the process of being flooded. The final call is from a police sergeant to say that a Tactical Coordinating Group (TCG) meeting has been called, will take place at police headquarters, and that he will call back with details shortly. At this point the calm context of planning gives way to a turbulent environment of crisis. The multi-agency flood plan, on individual’s desks, the duty officer’s laptop, and an official original signed copy in a safe, feet away, transitions to this new context and is recontexualised.

**Transition into the new context – loss of contextual flexibility and recontextualization**

The actions of actors that now follow vary considerably from the planned responses (that are inscribed and agreed in the multi-agency flood plan). According to the plan, the partnership duty officer (on call) should carry out a risk assessment on receiving the alert. This was not carried nor the process (formally specified in the plan) to contact other agencies to collaboratively complete a full flood risk matrix. As the situation develops there are further discontinuities between the planned response and that which is enacted. The TCG meeting does not take place in the designated suite, the police loggist (responsible for logging the discussions of the TCG) cannot be located, the call center for coordinating the highways department road closures and a district council depot (containing its entire stock of sandbags) are both flooded. Several actors cannot be reached, either because they are en-route to the TCG or because they are involved in other calls in response to the flood.

It is significant to highlight the differences in this example to those found in Carlile (2002) example of the semantic, syntactic and pragmatic differences that exist across contexts which are known to prevent boundary objects from functioning. Bechky (2003b) provides an example where in a static context a boundary object functions between groups A and B, but does not function between groups A and C although there is been no change in the broader context. Here an object that has previously coordinated the activity of groups A to G (three emergency services, three district councils, and a county council who were present in the response control room) in planning for crises ceases to function as a result of the object’s diminished connections to other actors in the new dynamic context of the observed crisis. Many of the same actors involved in the process of the plan’s construction (those engaged in *structuring activities*) were present during the crisis response, so little decontextualisation had occurred from one setting to another. Despite this, the plan seemed to have no role in coordinating the involved actors or transforming knowledge.

As a boundary object constructed from the inscriptions of actors (mis)understandings, the plan is detailed and highly inscribed while interpretively flexible and strong as a result of its connections across groups during planning phase. Duringre-contextualisation, the plan becomes delicate or brittle because of the disappearance or disruption of these same connections. Each detailed and carefully considered connection inscribed in the plan granted it strength but limited its *contextual flexibility*. As the planning becomes the background rather than the foreground of the emergency response, the relevance, ontological power, and appropriateness of the plan are lost. The gap between the plan and the developing situation (the emerging reality) grows, the chance of reverting to the plans inscribed order of events (at least in the short duration observed) diminishes. The plan has diminished ontological strength through the disappearance of actors from which it once drew its power.

The following day, the plan is been re-contextualised once again to the calmer context of planning. A small informal debriefing is held by the partnership (some but not all of the other agencies held their own). There was some frustration that the plan was not followed by other agencies but little recognition that the partnership’s own actors did not attempt to implement the plan either. In interviews with some of the actors involved in the days and weeks following, they indicate that work continues on the same multi-agency flood plan, but that it would not be changed in light of the observed flooding and non-implementation. The plan remains unaltered and restores its position at the center of collaborative activity with connections now re-established and ontological strength regained.

**Discussion**

The construction of objects requires that a network of actors, negotiate and resolve their different perspectives to transform, rather than simply transfer, their understanding (Bechky, 2003). In doing so, they can create and author a shared future (Shotter, 1993; Holman and Thorpe, 2002). This creation involves authoring practices (that broach boundaries and mediate social interactions), and objects, tools, devices or artefacts can help to mediate this social and situated activity (Schatzki, 2001; Bechky, 2003). In this case, it is the emergency plans that are the source of discussion and matter of concern (Latour, 2004) for those involved. This starts with a national risk register provided to all LRFs, but discussions then take place around which are the risks that are specifically relevant to this LRF. Once the significance of a risk to the area is agreed, a group of actors starts to establish a plan for that risk. It is the development of the plan that is used to enrol actors into the network, and the object emerges slowly through stages as it becomes more concrete. As it becomes more detailed, its presence in the network becomes more influential until finally, the object acts as a device to empower network members to act. The plan establishes meaning, shapes interactions, defines norms and expectations and allocates authority. Without the plan, the actor-network is only a loose coalition, rather than a substantive organization. The object (the plan) is shifted to the foreground during its production. However, once a crisis emerges, a different group of actors, and a different context subvert its usefulness and the object temporarily disappears. It cannot survive the re-contextualisation and the actor network is reformed around a new matter for concern: the crisis (Table 1).

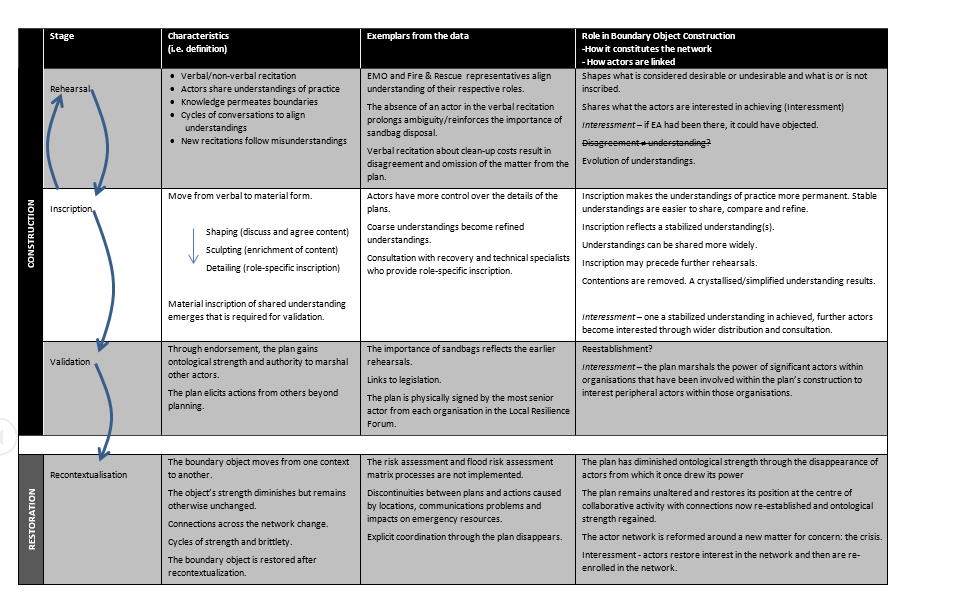


Table 1: Characteristics of Structuring Activities for Bounded Object Construction about here>>

The construction of the plan takes place most actively within planning meetings. Actors from the agencies involved, who are from, or familiar with, their organization’s operations in crisis are present. Throughout the meeting, understandings of each other’s practices are presented and discussed. In this space, the actors are articulating their role and responsibilities: *rehearsing* their commitment to collaboration and negotiating participation and commitment to the plan. Actors work to share information, but there is inevitable misunderstanding about roles and abilities, to various degrees, and negotiation about the scope and boundaries of the plan. Through *rehearsals*, each actor’s understanding (of practices, roles, responsibilities) is shaped through cycles of discussion.

Between the meetings, processes of *shaping, sculpting* and *detailing* (together processes of *inscription*) the plan take place. These are primarily the duty of emergency management officers, full-time dedicated planning staff (joint funded by several organizations). They inscribe their understandings of agreements in roles, responsibilities and repertoires of practices, which different organizational groups are able to perform. Often this would take several rounds of negotiation, with the Emergency Management Officer drafting and sharing several versions as they create, or sculpt, a version of the plan, continually refining and inscribing understanding with members of organizations involved. This process is naturally more gradual and formal than the uninscribed communication in meetings. Through sculpting, the plan is made real, taking a social form that allows connections and collaboration to be articulated and shared. For example, it defines the structure of a tactical coordinating groups and networks that will be engaged in the case of a crisis response.

The process of *validation* is the embedding of the plan as a powerful social object. The plan’s initial constructors have been from as close to an operational an organisational level as possible where they are most familiar with organizational repertoires of practice. To validate the object, it must be associated with other actors at higher organizational levels; in this case it is linked to national legislation (CCA, 2004) and chief executives in each of the organizations who agree to the plan’s adoption. In this way, by adopting the plan, they validate its use. By doing so, they empower others to use it and it to direct the activities of others, such as in operational exercises, or in real crises. *Empowerment* activities include the use of practices associated with objects, and using the social ties between actors demonstrates and perpetuates the objects collaborative function. Its significance/power is determined by the links to other actors, and their engagement with the object. As such, should a context shift to make these links unclear (such as a real crisis) it is doubtful that the object with little material power (e.g. a document) will remain socially significant or visible. After re-contextualisation the ability of the boundary object to create the networks necessary for collaboration may fade. As such, the object’s ontological strength is dependent on its ability to engage actors, to establish a network, and to shape their practices.

**Conclusion**

This paper has a number of contributions. First, by recreating the steps of collaborative object construction, such objects can be synthesised where they not expected to occur naturally. Collaboration might be significantly enhanced by the introduction of boundary objects when none emerge naturally. Secondly, we reinforce significant insight into how objects of collaboration are forged through objects in social and communicative spaces. Third, the finished plan partly seeks to identify where roles necessitate collaboration, and where groups have clear responsibility to facilitate ‘working alone together’ (Bruns, 2012). Finally, the paper has also demonstrated the significance of context on a boundary object’s continued existence. The emergency plan is presented here is an example which is unable to persist through the movement between contexts (re-contextualisation). Where the object moves from one context to another, the object’s connections may be disrupted. The object loses its ability to coordinate activity as those connections are disrupted and it ceases to be an object of collaboration, and temporarily disappears.

**References**

Bechky, B. (2003a). Object lessons: Workplace artefacts as representations of occupational jurisdiction. *American Journal of Sociology, 109*(3), 720-752.

Bechky, B. (2003b). Sharing meaning across occupational communities: The transformation of understanding on a production floor. *Organization Science, 14*(3), 312-330.

Bruns, H. (2012) Working Alone Together: Coordination in Collaboration across Domains of Expertise, Academy of Management Journal, 56 (1), 62-83.

Callon, M. (1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fisherman of St. Brieuc Bay. In Law, J. (1986) Power, Action and Belief: A New Sociology of Knowledge? *Sociological Review Monograph,* 32.

Callon, M. (2002). Writing and (Re)writing Devices as Tools for Managing Complexity. In J. Law & A. Mol (Eds.),*Complexities: Social Studies of Knowledge Practices* (pp. 191-217). Durham, NC: Duke University Press.

Callon, M., & Muniesa, F. (2005). Peripheral Vision. *Organization Studies, 26*(8), 1229-1250.

Carlile, P., R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science, 13*(4), 442-455.

Carlile, P., R. (2004). Transferring, translating and transforming: An integrative framework for managing knowledge across boundaries. *Organization Science, 15*(5), 555-568.

Civil Contingencies Act 2004 (UK), Chapter 36. Available from [http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga\_20040036\_en.pdf Last accessed 23/11/15](http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf%20Last%20accessed%2023/11/15).

Duymedjian, R. and Rüling, C. (2010) Towards a Foundation of Bricolage in Organization and Management Theory, *Organization Studies,* 31, 133.

Ewenstein, B., & Whyte, J. (2005). *Knowledge practices in design: The role of visual representations as 'epistemic objects'.* Paper presented at the Colloquim of Euro

Holman, D., & Thorpe, R. (Eds.). (2002). The Manager as Practical Author. London: Sage.

Kellogg, K., Orlikowski, W., Yates, J. (2006) Life in the Trading Zone: Structuring Coordination Across Boundaries in Postbureaucratic Organizations, 17 (1), 22-44.

Knights, D. and McCabe, D. (2016) The ‘Missing Masses’ of Resistance: An Ethnographic understanding of a Workplace Dispute, *British Journal of Management,* 27, p.534-549.

Knorr Cetina, K. (1982). Scientific communities or transepistemic arenas of research? A critique of quasi-economic models of science. *Studies of Social Science, 12*, 101-130.

Knorr Cetina, K. (1999). *Epistemic cultures: How the sciences make sense of knowledge*. London: Harvard University Press.

Knorr Cetina, K. (2001). Objectual Practice. In T. Schatzki, K. Knorr-Cetina, & E. Von Savigny (Eds.), The Practice Turn in Contemporary Theory (pp. 175-188). London: Routledge.

Law, J., & Hassard, J. (Eds.). (1999). Actor Network Theory and After. Oxford: Blackwell.

Lainer-Vos, D. (2013). Boundary objects, zones of indeterminacy, and the formation of Irish and Jewish transnational socio-financial networks. *Organizational Studies, 34*(4), 515-532.

Langley, A. (1999). Strategies for Theorising from Process Data, *Academy of Management Review,* 24(4), 691-710.

Latour, B., and Woolgar, S. (1976). *Laboratory life: The construction of scientific facts*. Chichester: Princeton University Press.

Latour, B. (1999). On recalling ANT. In J. Law, and J. Hassard (Eds.), *Actor network theory and after* (pp. 15-25). Oxford: Blackwell Publishing.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory* (1st ed.). Oxford: Oxford University Press.

Law, J. (1999). After ANT: Complexity, naming and topology. In J. Law, and J. Hassard (Eds.), *Actor network theory and after* (1st ed., pp. 1-14). Oxford: Blackwell Publishing.

Lincoln, Y. and Guba, E. (1985). *Naturalistic Enquiry,* California, Sage.

Miettinen, R. and Virkkunen, J. (2005) Epistemic Objects, Artefacts and Organizational Change, Organization 12(3): 437-456.

Nicolini, D., Mengis, J., and Swan, J. (2012). Understanding the role of objects in cross-disciplinary collaboration. *Organization Science,* 23(3), 612-629.

Nicolini, D., Mengis, J., and Swan, J. (2012). Understanding the role of objects in cross-disciplinary collaboration. *Organization Science, 23*(3), 612-629.

Pels, D., Hetgerubgtib, K. and Vandenberghe, F. (2002) Tge Status of the Object: Performance, Mediations, and Techniques, *Theory, Culture and Society,* 19 (5/6), 1-21.

Scarbrough, H., Panourgias, N., and Nandhakumar, J. (2014). Developing a relational view of the organizing role of objects: A study of the innovation process of computer games. *Organizational Studies, Online First: 26th November 2014*, 1-24.

Shotter, J. (1993). Conversational Realities: Constructing Life through Language. London: Sage.

Star, S., and Griesemer, J. (1989). Institutional ecology, "translations" and boundary objects: Amateurs and professionals in Berkeley's museum of vertebrate zoology. *Social Studies in Science, 16*, 387-420.

Thomas, R., Hardy, C., and Sargent, L. (2007). Artefacts in interaction: The production and politics of boundary objects. *AIM Research Working Paper Series, 052,* 1-52.

Thomas, R., Sargent, L. and Hardy, C. (2008). Power and participation in the production of boundary objects. Retrieved 12/22, 2013, from Http://www.sapin.org/system/files/conferences/Thomas%20et%20al%20-%20power%20and%20participation%20in%20the%20production%20of%20boundary%20objects.doc

van Mannen, J. (2011). *Tales of the field: On writing ethnography* (Second ed.). London: University of Chicago Press.

Yin, R. K. (2009). *Case study research: Design and methods* (Fourth ed.). London: Sage Publications.

1. At a later stage the plan would be circulated to the general group of organizational representatives which includes the EA. At this point their mention of the plan should be picked up and they would have the opportunity to refute or adapt mention of their responsibility in regard to used sandbags. The mention itself might be an intentional attempt at ‘intressment’ – the drawing of an actor into engagement with the network. [↑](#footnote-ref-1)