

Organizing Processes and the Construction of Risk:

A Discursive Approach*

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Abstract

This study examines the organizing processes through which products “become” risky. Drawing on a case study of chemical risk assessment and management processes in Canada and comparing two chemicals, it identifies a series of enacted practices that bundle into two forms of social ordering – normalizing and problematizing. By bringing the past to bear differently on organizing processes, these two forms of social ordering structure the discursive work of actors in their attempts to stabilize, as well as to destabilize and change, meanings of risk objects. As a result, objects “become” risky or safe in different ways.

This study examines organizing processes through which products “become” risky – or, for that matter, safe. The processes whereby products and technologies are deemed to pose risks are important in our global “risk society” (Beck, 1992). Although risk can be viewed positively, increasingly, it is associated less with opportunities for gain and more with possibilities of loss (Gephart, Van Maanen & Oberlechner, 2009). Accordingly, risk is typically defined as “the potential for realization of unwanted, adverse consequences to human life, health, property, or the environment” (SRA, 2003). Organizations have to manage risk (Smallman, 1996; Power, 2007) and deal with the consequences when their products and technologies are found to pose risks to external stakeholders (Maguire, 2004; Scheytt, Soin, Sahlin-Anderson & Power, 2006). Organizations are also places where risks are conceptualized, measured and assessed: they are “centres for processing and handling risk” (Hutter & Power, 2005: 1). It is important, therefore, that we learn more about the organizing processes whereby products become associated with risks and steps are taken to manage them.

Our study examines chemical risk assessment and management processes in Canada. In 2006, the Canadian government completed the task of categorizing over 23,000 existing substances and launched a follow-up process to assess whether 200 “high priority” chemicals were toxic i.e., posed risks to human health and the environment. Some chemicals which had long been considered safe became risky, requiring government action to reduce or eliminate – i.e. manage – the risks they posed; while others remained safe. We compare the fate of two chemicals during these processes – vinyl acetate monomer (VAM) and bisphenol A (BPA). VAM is used to make a variety of industrial and consumer products. It was found to be toxic in an initial assessment; but this finding was subsequently reversed and the Government declared that VAM was safe. BPA is used in a range of consumer products including baby and water

bottles. It was found to be toxic, as a result of which Canada became the first country in the world to implement a ban on baby bottles containing this chemical. The meaning of these products – risky or safe – is thus temporally and spatially contingent: it changes over time and from place to place. VAM has been considered safe in the past; appeared to be on course for being considered risky in Canada; but then was again declared safe. BPA has also been considered safe in the past; is still considered safe in most countries; but is considered an unacceptable risk in Canada for use in baby bottles. These chemicals are, accordingly, in an ongoing state of becoming – and unbecoming – risky.

We use a “performative” process perspective that assumes that social phenomena are in a perpetual state of “becoming” (Tsoukas & Chia, 2002) to understand how the meanings of VAM and BPA as “risk objects” (Hilgartner, 1992) were constructed. We combine it with a discursive approach to examine the discursive work – producing, distributing and consuming texts – that occurred around these meanings. Our findings differentiate two “forms of social ordering” (Chia, 2002) – normalizing and problematizing – relevant to contemporary risk assessment and management organizing processes and show how they structured the discursive work of actors in shaping the meanings of these chemicals. Our study makes the following contributions. First, it illustrates empirically how risks emerge from the very organizing processes through which they are assessed and managed: objects “become” risky or safe in different ways as a result of the practices to which they are subjected. Second, it shows how these practices bundle into different forms of social ordering, which structure the discursive work of actors in their attempts to stabilize, as well as to destabilize and change, meanings of risk objects. Third, it shows how meanings are constructed at the intersection of practices *and* discursive work, and how both are required to hold them in place.

The rest of this paper is organized as follows. We first discuss the literature on risk, performative process approaches to organizing, and discourse. We then outline our methods. Third, we present the findings. Finally, we discuss the contributions of our study.

Risk, Organizing Processes and Discourse

Risk is a prominent feature of contemporary organizations and their environments: the production of risk has become as important as that of wealth (Tsoukas, 1999); and managers are increasingly having to engage in risk management (Smallman, 1996; Power, 2007). Despite some positive associations, such as taking advantage of opportunities, risk is increasingly likely to refer to “negative and undesirable consequences” (Gephart, et al, 2009: 141), the “anticipation of catastrophe” (Beck 2006: 332) or “the chance of mishap” (Cranor, 2007: 38). In what has been termed the “risk society” (Beck, 1992), risks have become “more global, less readily identifiable, more problematic, less easily managed, and more anxiety-provoking” (Gephart et al., 2009: 142) – social institutions are increasingly preoccupied with risks but, paradoxically, less able to manage them (Tsoukas, 1999; Mythen, 2008). Discussions of “organizational side-effects” (Scheytt et al., 2006) emphasize that risks are unavoidable consequences of organizing; are often borne by a wide range of actors outside risk-producing organizations; and, therefore, lead to greater scrutiny and regulation of organizations’ activities (Power, 2005; 2007; Eccles, Newquist & Schatz, 2007). Consequently, the processes whereby products and technologies are assessed as posing risks – and how those risks are subsequently managed – are of considerable significance to organizational scholars, practitioners and the public alike.

Theorizing by natural scientists has given rise to a well developed scientific discipline – “risk analysis” – from which has emerged an established set of practices for assessing, managing and communicating risks (SRA, 2003). Much of the research on risk is, as a result, dominated by

perspectives from the natural sciences, engineering and medicine (Miller, 2009), which adopt a “realist” approach (Jasanoff, 1998). It assumes that risks are “objectively quantifiable” phenomena (Miller, 2009: 30) that can be identified and measured by scientific experts as “the expected value of the conditional probability of the event occurring times the consequence of the event given that it has occurred” (SRA, 2003). The “realist” approach is integral to understanding risk. Its assumptions form the basis of the vast majority of formal risk assessment and management processes, which help decision makers to estimate harms associated with possible courses of action (Renn, 1992; 2008). Technical risk analysis “is vital for making risk decisions better informed, more consistent, and more accountable” (Kunreuther and Slovic, 1996: 123). Moreover, managers tend to act as if risks are – or at least should be – measurable and assessable (e.g., Sullivan-Taylor & Wilson, 2009).

The realist approach has, however, been criticized. First, critics argue that it privileges scientific knowledge at a time when, instead of creating more certainty as once “triumphantly presumed,” science increasingly “generates even more uncertainty” (Tsoukas, 1999: 505). Second, not all risks can be quantified and, for those that can, different measurements may result in quite different assessments of risk (Kunreuther & Slovic, 1996). Third, critics maintain that value judgments are inherent in risk assessments (Pidgeon, Hood, Jones, Turner & Gibson, 1992) and therefore need to be acknowledged (Renn, 2008; Miller, 2009). Fourth, the realist approach tends to dismiss lay understandings of risk as a distortion of “actual” risk as defined by experts (Gephart, et al., 2009; Jasanoff, 1998). Yet public perceptions are frequently incorporated into risk assessment and management (Kunreuther & Slovic, 1996), and scholars argue that such “extrascientific” knowledge (Wynne, 1992: 294) should be “considered not as error but as an essential datum” (Pidgeon et al., 1992: 91).

As a result, an alternative approach, involving “constructionist” accounts of risk, has emerged to explore risk as a social phenomenon (Lupton 1999; Renn, 2008; Zinn, 2008). It argues that risks are never “fully objective or knowable outside of belief systems and moral positions” (Gephart et al., 2009: 144). They do not exist “out there”, “waiting to be measured” but are, instead, subjective (Kunreuther & Slovic, 1996: 119). This approach advances the idea that “the fundamental doctrines of risk management are inherently plural, disputable and disputed” (Hood & Jones, 1996: xi-xii). Multiple interpretations of what poses a danger are possible because of the inherent ambiguity of social phenomena (Tansey & O’Riordan, 1999), with the “worldviews” of different actors serving as lenses, “magnifying one danger, obscuring another threat, selecting others for minimal attention” (Dake, 1992: 33). In other words, risks are not “discovered”, they are “defined, perceived and managed according to principles that inhere in particular forms of social organization” (Raynor, 1992: 849).

We build on this constructionist approach to examine the way in which risk and organizing processes implicate each other (cf. Malefant, 2009; Miller, 2009; Winch & Maytorena, 2009). We are interested in how risk is “socially constructed through varied processes of negotiation and conflict resolution in settings ranging from the relatively closed quarters of a research laboratory to the public debate of a regulatory hearing” (Jasanoff, 1998: 94). According to Hilgartner (1992: 40), this process involves the construction of “at least three conceptual elements: an object deemed to ‘pose’ the risk, a putative harm, and a linkage alleging some form of causation between the object and the harm”. This is not to deny that individuals face potential harms from some objects; that technical analyses can illuminate these harms; or that these analyses involve scientific practices that are based on a realist understanding of risk. Rather, it focuses attention on the specific ways in which particular *meanings* are attached to

objects through organizing processes that construct risks, as well as on how risks are shaped by the very processes used to assess and manage them.

Organizing Processes and Risk

To explore how risks and the meaning of risk objects are constructed in organizational settings, we draw on a process approach to organizing (Van de Ven & Poole, 2005). Also known as “organizational becoming” (Chia; 1995; Tsoukas & Chia, 2002; Nayak, 2008), these performative accounts of organizing processes collapse traditional ontological distinctions between process and object. According to this view, objects are not pre-existing or fixed but, rather, temporary patterns “constituted by and shaped from micro-interactions as actors perform their everyday work” (Thomas, Sargent & Hardy, 2011: 22). They are “*products* of processes rather than existing prior to them” (Bakken & Hernes, 2006: 1600, emphasis added). Certain objects may appear to be stable and immutable (Carlsen, 2006), but this is only because their meaning is held in place through countless communicative interactions among actors (Tsoukas & Chia, 2002).

The objects that humans think they perceive are, then, abstractions which emerge from organizing processes through which particular meanings are attributed. The forms that these abstractions take – the objects we think we see – are not completely open-ended or random; they are informed by and structured through practices which are enacted at a given moment in time but also emanate from the past. Distinct practices are “bundled” insofar as they become “coordinated or linked with one another and also exhibit temporal features such as rhythm and patterning” as they unfold over time (Schatzki, 2006: 1866). Accordingly, disparate practices can attain a degree of coherence together as possible courses of action present themselves, and some combinations are selected over others (Bakken & Hernes, 2006).

Chia (2002) refers to persistent patterns among practices as “forms of social ordering” which emerge as organizations establish rhythms that become frameworks for regulating interactions and modes of thought.

Such forms of social ordering inevitably influence, amongst other things, how the flux and flow of our life-worlds are structured and conceptualized into events, things and situations; how identity is established and social entities created; how taxonomies and systems of classifications are produced and with what effects; how reification takes place, how causal relations are imputed, and with what consequences (Chia, 2002: 867).

A form of social ordering can thus be defined as a bundle of interrelated practices that persists over time. This “temporalizing” (Hodges, 2008: 409) brings the past to bear on the present by connecting objects to wider social structures, and on the future by enabling and constraining outcomes. Without such a “pre-structured field of possibilities,” it would not be possible “to establish the identity of an object of analysis” (Chia, 1999: 219).

In sum, objects are both “momentary outcomes” of localized, situated practices *and* “effects of historical processes” (Chia, 2002: 866) that emerge from the patterned enactment of practices as actors engage in organizing processes over time. In applying this approach, we must therefore examine how “bundled activities interweave with ordered constellations of non-human entities” or objects (Schatzki, 2001: 3). According to this perspective, then, a risk object is a “physically stabilized, congealed embodiment” of past social assumptions and conventions (Jasanoff, 1998: 97), rather than a preexisting object with essentially harmful characteristics. Anything can be a risk – “it all depends upon how one analyzes the danger, considers the event” (Ewald, 1991: 199). Precisely how dangers are analyzed and events are considered depend upon

the particular practices in the organizing processes through which risk is assessed and managed. Accordingly, our first research question is: how are the meanings of risk objects constructed through organizing processes?

Discursive Work and Risk

While organizing processes play a role in constructing the meaning of risk objects so, too, does discourse (Tsoukas, 2005). Practices are performed within the context of discourses – structured collections of texts (Phillips, Lawrence & Hardy, 2004) that define “who and what is ‘normal’, standard and acceptable” (Meriläinen, Tienari, Thomas & Davies, 2004: 544) and position actors such that not all “warrant voice” (Hardy & Phillips, 1999). Discourse constrains “the strategies and rules by which we can speak about and act on a domain of objects ... in such a way that certain possibilities and outcomes are realized rather than others” (Reed 1998: 196). Accordingly, when organizing processes occur within the context of a dominant discourse, meanings tend to be stabilized in ways that have become taken-for-granted (e.g., Phillips et al., 2004; Robichaud, Giroux & Taylor, 2004). In the case of risk, the pervasiveness of realist approaches has led to a dominance of a discourse that privileges formal, scientific knowledge, empowering some people as “experts” and dismissing others as inexperienced.

The discursive model [of risk] also views knowledge about risk as socially constructed, but it emphasizes the role of professional languages (such as quantitative risk assessment) and analytic practices (such as cost-benefit analysis) in shaping public perceptions of risk. Authoritative knowledge is created in this framework by people or institutions that master the relevant formal discourses, which, however, importantly constrain even the experts’ perceptions of risk (Jasanoff, 1998: 94).

Discourses are, however, never completely cohesive: they are always partial, inconsistent and contested to some degree and, therefore, never able to determine social reality fully (Hardy & Phillips, 2004). As a result, actors can also draw on them to challenge what was once taken-for-granted in order to destabilize meanings, thereby forming the basis of change (e.g., Heracleous & Barrett, 2001; Tsoukas, 2005) through their discursive work i.e., producing, distributing and consuming texts (Hardy & Phillips. 2004; Phillips et al., 2004).

In the context of risk, “the process of constructing a risk object” is a “rhetorical process performed in texts” (Hilgartner, 1992: 46). A discursive perspective on organizing processes can therefore “highlight the ways in which dominant meanings emerge” as well as shed light on “the discursive practices and rhetorical devices that are deployed” in “struggles around meaning” (Grant & Hardy, 2004: 5). Accordingly, our second research question is: what is the role of discursive work in stabilizing (and destabilizing) meanings of risk objects?

Methods

Site Selection

Our study examines processes of assessing and managing the risks of chemicals in Canada. We selected Canada because it is “the first country in the world to categorize the thousands of chemical substances in use before comprehensive environmental protection laws were created” (Government of Canada, 2007a). There is, therefore, much to learn that may be relevant for other countries. Second, these processes take place over a number of years, making it possible to examine how meanings changed over time. Third, Canada publishes a great number of publicly available texts that we could analyze. Fourth, one of the authors has a formal role in

the process and is familiar with the context.¹ We compare the fate of two chemicals –Vinyl Acetate Monomer (VAM) and Bisphenol A (BPA) – because their meanings clearly changed over time.

Case Study

The 1999 Canadian Environmental Protection Act (CEPA) put in place a formal process (see Figure 1) for the systematic categorization of 23,000 chemicals already in use according to the risks they could pose to human health and the environment. The Government identified 200 products as “high priorities for action” (Government of Canada, 2010a), and listed them as part of what is called the “Challenge”, which meant that it was “predisposed to treat” them as “CEPA-toxic” – toxic according to the criteria stated in the 1999 Act.² Industry and other stakeholders were then “challenged” to submit specific information within certain timelines to inform the risk assessment and management processes. In the Challenge, assessing whether a substance is CEPA-toxic is guided by a weight of evidence approach and the precautionary principle (Environment Canada, 2005). The former involves integrating multiple measures or bodies of evidence from prior studies, taking into consideration their strengths and weaknesses. The latter affirms that “lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to protect the environment and human health” (Government of Canada, 2009a).

— Figure 1 near here —

The Challenge is managed by two Government departments – Health Canada and

¹ One of the authors is a member of the Challenge Advisory Panel (see below). Please note that the opinions expressed here reflect those of the authors and not the Challenge Advisory Panel.

² According to Article 64 of CEPA (1999) “a substance is toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that (a) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; (b) constitute or may constitute a danger to the environment on which life depends; or (c) constitute or may constitute a danger in Canada to human life or health”.
http://www.ec.gc.ca/lcpe-cepa/documents/archives/loi-act/CEPA_full-eng.pdf retrieved July 2010.

Environment Canada – working together to assess twelve batches of 12-20 chemicals according to strict timelines over a period covering several years. For each chemical in a batch, stakeholders are invited to provide information, following which a draft Screening Assessment Report (SAR) is produced. Stakeholders are then invited to comment on the draft SAR. If a draft SAR proposes that a chemical is toxic, then a Risk Management Scope (RMS) document is produced which summarizes the issues and invites stakeholders to submit more information. Stakeholders' comments are summarized in the Summary of Public Comments (SPC) and factored into the final SAR, which may or may not confirm the original conclusion. If the final SAR concludes that a chemical is not CEPA-toxic, no further action is taken. If a chemical is found to be toxic, it may be added to the Priority Substances List for further assessment of its risks, or to the Toxic Substances List, in which case the Government must prepare a Proposed Risk Management Approach (PRMA) to address the risks. Stakeholders are provided with opportunities to comment on these proposals, following which a range of measures, such as regulations, guidelines or codes of practice can be implemented “to control a chemical’s research and development, manufacture, use, storage, transport and/or ultimate disposal” (Government of Canada, 2010b).

During these processes, information on a chemical’s properties, hazards, uses, releases to the environment and routes of exposure to humans is collected and analyzed. This work is undertaken by staff at Health Canada and Environment Canada; and peer-reviewed by external scientists. The Government also solicits and receives advice on specific questions from the “Challenge Advisory Panel” (CAP), which has 12 members selected for their knowledge and expertise (not as organizational or professional representatives).

Vinyl Acetate Monomer (VAM)

VAM is an industrial chemical used to manufacture a wide variety of polymers, and is found in paints, adhesives and personal care products in the form of residue from the manufacturing process. Scientific findings had suggested that long-term exposure to vinyl acetate can cause a carcinogenic response (Vinyl Acetate Council, 2009). VAM was therefore included in the Challenge. The draft SAR, released in May 2008, stated that VAM was toxic to humans based on an assumption that it was a “non-threshold” carcinogen (Environment Canada & Health Canada, 2008: 2). This was followed by a 60-day public comment period during which 28 submissions were received from industry organizations, individual companies and NGOs, many of which commented on VAM’s mode of action i.e., whether it was “non-threshold” or “threshold”. The former means that there is a possibility of harm to human health at any level of exposure; whereas the latter means that only exposure above a threshold level is considered to be potentially harmful.

The Government subsequently accepted that VAM had a threshold mode of action and, drawing on data on exposure scenarios, concluded that it did not meet the criteria for toxicity. In doing so, it consulted the Panel in October 2008 on whether it agreed “that the weight of evidence and application of precaution” supported this conclusion (Government of Canada, 2008). The Panel agreed. Accordingly, the final SAR reversed the finding of the draft SAR and, instead, concluded that VAM was not toxic. As a result, a PRMA document was not required and the Challenge file on VAM was closed with a summary of these processes posted on the website.

Bisphenol A (BPA)

BPA is used in baby and water bottles, sports equipment, lenses, CDs and DVDs. Indications of possible health risks emerged in the 1990s, as scientific findings suggested it was

an endocrine disruptor i.e. a chemical that interferes with hormones to cause reproductive, developmental, neural or other problems. In 2006, it became part of the Challenge and underwent assessment. In March 2008, the Panel was asked by the Government to comment on the Government's approach to BPA. The Panel agreed that "the weight of evidence and the application of precaution support the conclusion reached by Health Canada" i.e., that BPA was toxic (Government of Canada, 2008b). In April 2008, the draft SAR was published, concluding that BPA was toxic to both humans and the environment, and proposing that it be added to the Toxic Substances List. It was followed by a 60-day public comment period during which 21 submissions were received from industry organizations, NGOs, public health organizations and individuals (Government of Canada, 2009b). In October, the final SAR confirmed that BPA constituted a potential danger in the form of neurological effects in early stages of a child's development (Government of Canada, 2009b). The PRMA, published the same month, outlined a proposed ban on baby bottles, initiating another 60-day public comment period, which saw the receipt of 15 submissions (Government of Canada, 2009b). In June 2009, it was announced that BPA would be added to Schedule I of the Hazardous Products Act (Government of Canada, 2009b) to allow for the prohibition of the advertisement, sale and importation of baby bottles containing BPA. In March 2010, this ban was implemented.

The ban on baby bottles did not close the file on BPA since the Government continues to carry out activities related to its potential risks. As of August 2010, Environment Canada was monitoring BPA and studying landfills to examine the life cycle of products containing BPA (Government of Canada, 2010c); while Health Canada was working with the food packaging industry on the implementation of voluntary measures to reduce levels of BPA in infant formula products (Government of Canada, 2009c).

Data Collection

We collected publicly available texts that described the practices of chemical risk assessment and management processes, starting with the 1999 Canadian Environmental Protection Act (CEPA). We then searched the Government's web portal on chemical substances to identify and download texts on the overall processes (www.chemicalsubstanceschimiques.gc.ca); as well as all documents pertaining to VAM and BPA. We searched the websites of Environment Canada and Health Canada to find texts related to risk assessment and management processes and to the two chemicals. We also collected publicly available documents produced by NGOs and industry relating to the assessment of VAM and BPA by searching the internet.

Data Analysis

In the first stage of analysis, we constructed an "event history database" (Van de Ven & Poole, 1990) that captured what happened when. We also created a "discursive event history database" (Maguire, 2004) by ordering texts chronologically, identifying authorship, and classifying content in relation to VAM and BPA. From these databases, we developed an overall timeline of the risk assessment and management process and, in particular, what happened with VAM and BPA. This timeline was used as the basis of the case study description above.

In the second stage of analysis, we identified texts in our database that described chemical risk assessment and management processes in Canada. Using an inductive, interpretive approach, we systematically coded these descriptions, from which we inferred eight distinct practices related to risk assessment and management. We refer to these practices as: referencing, anchoring, categorizing, sequencing, particularizing, innovating, questioning, and pluralizing (see Table 1). We also noted patterns among these practices, i.e., whether certain practices tended to co-occur and could be linked conceptually. On the basis of this interpretive analysis we

clustered the practices into two distinct “bundles” of four interrelated practices. We refer to these bundles as *normalizing* and *problematizing* and discuss them in more detail in the first set of findings.

— Table 1 near here —

In the third stage of analysis, we examined the sets of texts that were produced as part of the risk assessment and management of VAM and BPA (see Table 2) for traces of the eight practices. We systematically coded the two sets of texts for evidence of the two bundles of practices and compared the results. We found considerable evidence of normalizing practices in the case of VAM i.e., the texts produced in the assessment of VAM contained numerous traces of the four practices associated with normalizing and very few traces of the four practices associated with problematizing. The texts produced in the assessment of BPA also contained traces of normalizing practices, but there was also extensive evidence of the practices associated with problematizing. The results of this stage of the analysis are discussed in the second set of findings.

— Table 2 near here —

Finally, we analyzed the discursive work carried out around VAM and BPA. We began by comparing the texts produced for VAM with those produced for BPA to note similarities and differences in their number, types, length and general contents. We then explored specific attempts to stabilize, as well as to destabilize and change, the meanings of the chemicals by examining the Summary of Public Comments (SPC) for each chemical. This document summarized stakeholders’ disagreements with, and criticisms of, the conclusion of the draft SAR and provides the Government’s response. Focusing on the producing, distributing and consuming of texts, we identified three ways in which the conclusions of the draft assessments were

contested: stakeholders produced and submitted texts in which (a) criticisms were made that important texts had been ignored and recommendations were made for these texts to be included in the final assessment; (b) criticisms were made of particular texts that had been referenced in the draft report and recommendations were made that these texts should be excluded from the final assessment; and (c) criticisms were made of the way in which the Government had (mis)interpreted particular texts. We noted two forms of response: (a) rebuffing criticisms; and (b) accommodating criticisms (see Table 3). We then compared the two SPC's to ascertain any differences in the patterns of criticisms and responses and to see whether and how these patterns related to the discursive work carried out around each chemical, as well as to normalizing and problematizing practices, as we discuss in the third set of findings.

— Table 3 near here —

Findings

We present three sets of findings: practices relevant to Canadian chemical risk assessment and management processes; the particular practices enacted in the construction of VAM and BPA as risk objects; and the discursive work carried out in struggles over the meanings of these two these chemicals.

Practices Relevant to Chemical Risk Assessment and Management Processes in Canada

In this section, we describe two bundles of interrelated practices, which we refer to as normalizing and problematizing.

Normalizing

Normalizing is the term that we use to refer to an interrelated set of practices which emphasized “normal” science. It involved the mindful application of accepted knowledge, the continuity of organizational activities, and the use of codified norms as a basis for action. The

specific practices, identified from texts describing how risks are assessed and managed in Canada, included: referencing an accepted body of scientific or regulatory knowledge; anchoring actions in organizational precedents or taken-for-granted routines; and categorizing chemicals in ways that subsequently led to a predetermined sequence of clearly delineated actions.

First, *referencing* refers to instances where the systematic application of accepted scientific knowledge and techniques is emphasized with acknowledgements of extant research, scientific experts and the work of other jurisdictions. For example, the Government website on chemical substances noted: “The law says that chemical substances must be examined in a scientific and thorough way” (Government of Canada, 2007b). A “systematic”, “rigorous” and “comprehensive” application of science was necessary “to make sure that every substance that could potentially affect human health or our environment” was identified for further attention (Government of Canada, 2007c). Descriptions of risk assessment and management processes also emphasized the importance of carrying out activities in ways that were consistent with those of international peers. Accordingly, the Government was “mindful of international standards” (Environment Canada, 1995) and reviewed those decisions of other countries which were “based on scientific considerations” (CEPA, 1999: 45). The incorporation of extant scientific findings was, therefore, a key part of risk assessment and management insofar as descriptions emphasized extensive referencing to published research and conclusions reached in other jurisdictions.

Second, *anchoring* refers to instances where risk assessment and management processes were explicitly linked to past activities, decisions and precedents, thus emphasizing continuity. For example, descriptions stressed that processes derived from longstanding laws, including CEPA (Government of Canada, 2007a); and that the current initiative was informed by prior risk assessment activities:

The Government of Canada has been doing risk assessment and management for many years ... There are some 60 different tools in place ... (Government of Canada, 2010d).

In texts describing the Challenge, risk assessment and management processes were thus situated among and represented as a continuation of prior routines and experience.

Third, *categorizing* – assigning chemicals to pre-existing categories with clear rules of inclusion and from which certain actions followed – was also an integral part of risk assessment and management processes described in Government texts. “Categorization” was the official term used to describe the initial screening of the 23,000 substances (Government of Canada, 2007b). If a chemical was categorized as persistent, bioaccumulative and inherently toxic, further evaluation was then required. If chemicals were then categorized as “CEPA-toxic”, particular actions were mandated. Thus categorizing was central to risk assessment and management processes by establishing a series of “if/then” protocols: if a chemical met specific rules of inclusion to be categorized in a particular way, then clearly delineated actions followed.

Finally, different forms of temporal *sequencing* were also described in texts describing the Challenge. The various steps of the formal process were associated with strict timelines and often represented in a linear, flowchart-like way. For example, CEPA (p. 42) stated that the Government “shall, within seven years from the giving of Royal Assent to this Act, categorize the substances that are on the Domestic Substances List”. In 2005, it was “on track to meet its legislated deadline of September 2006 for completing this categorization exercise” (Government of Canada, 2005). In the Challenge, each batch had specific timelines presented in a range of visual formats. A web page entitled: “Deadlines associated with the Challenge” specified the “key milestones for each released Batch” (Government of Canada, 2010e).

In sum, normalizing describes a bundle of interrelated practices which collectively emphasized the mindful application of accepted knowledge, the continuity of organizational activities, and the use of codified norms as a basis for action. An accepted body of scientific knowledge and precedents from other jurisdictions or prior organizing activities informed risk assessment and management processes, which meant that taken-for-granted categories were invoked and predetermined sequences of activities followed.

Problematizing

Our analysis also identified a second interrelated set of practices, which we refer to as problematizing, that was in tension with normalizing. It emphasized the reflexive acknowledgement of potential inadequacies in knowledge, discontinuity in organizational activities, and the use of open-ended deliberations as a basis for action. In contrast to the clear “roadmap” (Government of Canada, 2007a) provided by the application of practices associated with normal science and precedent, descriptions of the Challenge underlined that assessing and managing risks could also involve other practices. These practices included recognizing particular situations as unique or novel and innovating accordingly in conjunction with questioning the adequacy of existing scientific knowledge and acknowledging the plurality of multiple stakeholders involved in and affected by risk assessment and management processes.

First, we found evidence of *particularizing*, where mention was made of the need to single out individual chemicals as unique despite the systematic application of an accepted body of knowledge and use of generalized categories. Texts describing the Challenge noted that “risk depends on what the chemical substance is, the quantity required to cause effects, the amount and length of time of exposure, and how that exposure takes place (in food or air or water, for example)” (Government of Canada, 2007d), suggesting idiosyncratic analyses for each

individual chemical.

Second, texts about the Challenge stressed that risk assessment and management also involved *innovating* and hence the possibility of clear breaks with the organization's prior activities or those of other jurisdictions. Such descriptions stood in contrast to those emphasizing the anchoring of current processes in routine activities and stressing continuity, experience and familiarity. Canada's risk assessment and management processes were not simply an extrapolation of the past or an imitation of other countries – they were described as novel and different.

Canada, like the United States and European countries, has been evaluating and managing chemical substances for decades. However, Canada is the first country in the world to categorize the thousands of chemical substances in use before comprehensive environmental protection laws were created (Government of Canada, 2007a).

Thus claims of innovating were often juxtaposed and in tension with anchoring and referencing.

Third, we noted extensive *questioning* in texts describing the risk assessment and management processes. Sometimes, questions appeared as a rhetorical device to impose order i.e., many of the questions posed on the website were directly answered, thus helping to construct certainty. However, we found numerous other instances where questions were asked but not answered, thereby helping to construct uncertainty.

How and where are chemical substances getting into our air, water and food, and at what levels are they found? How much exposure might we have to a given chemical substance? What happens after its use and disposal? What might short or long term exposure mean? What do advancements in research tell us we did not

know before? These and other questions guide Government of Canada scientists in researching and assessing chemical substances (Government of Canada, 2007a).

There were, consequently, many instances where it was recognized that uncertainty existed and information was incomplete or contradictory. Actions had to be taken “in a precautionary manner (i.e., decision making will not wait for scientific certainty in all instances)” (Government of Canada, 2007e) and “the absence of information from industry and stakeholders will not preclude measures being taken to safeguard human health and the environment” (Government of Canada, 2009d). Thus we identified tensions between open-ended questioning, with its foregrounding of uncertainty, and the referencing of extant scientific knowledge and unproblematic categorizing of chemicals based on that knowledge.

Finally, we noted tensions between referencing, anchoring and categorizing, which imply a process dominated by scientists, and *pluralizing*, which acknowledged that other stakeholders also had important roles. For example, the Government brochure on assessing chemicals (Government of Canada, 2005) named industry and the environmental community as important participants in risk assessment and management processes. Other documents emphasized plurality by using the terminology of “working together” and “partnerships”. A major objective of the Challenge was “transparency, to involve all stakeholders, including members of the public in the process” (Keller & Heckman, 2007: 2-3).

In sum, problematizing describes a bundle of interrelated practices which includes questioning the adequacy of a body of knowledge as well as drawing attention to unique circumstances requiring innovation and consideration of plural perspectives in open-ended deliberations. In emphasizing a break from prior risk assessment and management processes, it is

in tension with normalizing.

Constructing the Meaning of Specific Chemicals

We examined our data on VAM and BPA for evidence of normalizing and problematizing practices and found differences in the prominence of these practices in the construction of meaning of the two chemicals. The meaning of VAM emerged primarily from practices associated with normalizing. BPA texts also showed evidence of normalizing practices, but, in addition, there was far greater evidence of problematizing practices compared to VAM.

VAM

Our analysis indicated that VAM was initially particularized, by being “identified as a high priority” (VAM-DSAR, 2008: 1). Following this, traces of normalizing practices became much more apparent. For example, the conclusion of the draft assessment was explicitly anchored in a longstanding policy of the Government which was reaffirmed on the advice of the Challenge Advisory Panel in relation to the first batch of chemicals considered under the Challenge. This policy established a general precedent: chemicals categorized as non-threshold carcinogens were automatically deemed to be toxic to humans because any level of exposure can result in harms to human health. Hence, the categorizing of VAM as having a non-threshold mode of action led directly, in turn, to the subsequent conclusion that it was toxic to humans.

For substances for which the critical health effect is assumed to have no threshold of exposure for induction, e.g., a genotoxic carcinogen, it is assumed that there is a probability of harm to human health at any level of exposure (VAM-RMS: 1).

This document (p. 2) did acknowledge the existence of uncertainty regarding a “full evaluation of the mode of action” but, otherwise, there was relatively little mention of uncertainty or precaution. The draft SAR mentioned uncertainty only six times, precaution was only mentioned

twice, and far greater emphasis was placed on weight of evidence.

The texts related to VAM contained extensive referencing to other scientific texts. For example, the draft SAR referenced an unpublished draft risk assessment report produced by the European Union (EU, 2007). However, it was concluded that the unofficial and “uncertain status” (Government of Canada, 2008a) of this text was insufficient to overturn the assumption of a non-threshold mode of action. Submissions to the public consultation subsequently referenced a revised version of this text published in 2008 (EU, 2008), as well as additional scientific studies. The Government acknowledged in the SPC that new information had come to light regarding VAM’s mode of action, including this EU text, which was referenced more than 50 times in the final SAR.

Prior to issuing the final SAR, the Government appeared to particularize VAM once again when it asked the Panel whether it agreed that the weight of evidence and application of precaution now supported a conclusion that VAM was *not* toxic. The Panel agreed that it did. In the final SAR, VAM was re-categorized as having a threshold mode of action and, since studies indicated that anticipated exposure levels did not approach the threshold, VAM was not considered to be toxic. Accordingly, there was no requirement for the Government to prepare risk management measures and, as far as the Challenge was concerned, the file was closed (see Table 4).

— Table 4 near here —

BPA

Our analysis indicated that BPA was also initially particularized as “a high priority for assessment with respect to risks to human health” (BPA-DSAR, 2008: 4). Subsequent texts addressing BPA provide evidence that particularizing continued insofar as BPA, as of August

2010, was the only chemical in the Challenge to warrant its own link from the Government's chemicals management portal (Government of Canada, 2010f) and its own "fact sheet" and "frequently asked questions" (Government of Canada, 2009e).

There was also significant evidence of questioning. For example, the draft SAR for BPA mentioned the term "uncertainty" or "uncertainties" 28 times in 106 pages (in the draft SAR for VAM, uncertainty was mentioned only 7 times in 44 pages). In the sections on effects on human health, where both chemicals were found to be toxic, these terms were used 21 times in 39 pages for BPA as opposed to 5 times in 4 pages for VAM. Similar patterns were noted in the SPC – 17 times in 26 pages for BPA and only once in 9 pages for VAM. In the final SAR, uncertainty was mentioned 28 times in 107 pages in the case of BPA and only 4 times in 47 pages in the case of VAM. Uncertainty was not only mentioned more often, greater attention was drawn to it. For example, in the draft SAR for BPA, the heading "Uncertainties in Evaluation of Risk to Human Health and Identification of Research Needs" (BPA-DSAR: 72) was followed by the statement: "There are a number of uncertainties related to evaluation of risk to human health" which, in turn, was followed by 7 bullet points in each of which the term uncertainty/uncertainties appeared at least once. This structure was retained in the final SAR. In other words, uncertainty as to BPA's toxicity was foregrounded. (The final VAM document had only 1 heading mentioning uncertainties, which was followed by 2 paragraphs with no bullet points, and in which the word uncertainties was mentioned only once.)

In the case of BPA, uncertainty was consistently linked to precaution, which was also mentioned more often than with VAM: 10 times in the draft SAR, 15 times in the SPC and 9 times in the final SAR (compared to twice, 4 times and once for VAM). The SPC on BPA stated:

It is important to note that precaution may be invoked when there is uncertainty

about the extent to which the available evidence actually indicates that the substance is causing such harm (p. 17).

It was, therefore, “considered appropriate to apply a precautionary approach when characterizing risk” (BPA-DSAR: 2; 3). Uncertainty about BPA’s toxicity to both humans and the environment “warranted” the use of a precautionary approach in evaluating risk (BPA-FSAR: 32; 33).

Precaution was foregrounded in a number of ways. First, the Panel was consulted prior to issuing the draft SAR on whether the weight of evidence and application of precaution supported the Government’s conclusion of toxicity; and the Panel agreed. Second, a series of authoritative texts, authored by the Government and supporting its interpretation of precaution, were referenced in the SPC. Third, the Government emphatically invoked its right – and duty – to exercise judgment: it was “incumbent on the government to judge whether a substance has the potential to cause serious or irreversible damage to the environment and/or human health (BPA-SPC: 18). Even when the Government concluded that exposure levels for newborns and infants were “below those that could cause health effects”, it stated that it would still act: “to further limit exposure” because of the “uncertainty raised in some studies” (Government of Canada, 2009f). In other words, BPA was portrayed as a very particular case inasmuch as the Government had an obligation to act independently of other regulatory agencies and to take the lead in restricting BPA. In doing so, it engaged in pluralizing by recognizing that the public had an important stake in this outcome as did other stakeholders, most notably industry (Government of Canada, 2008c). For example, the Government stated it would “support manufacturers in the evaluation of replacement options” (BPA-RMS: 7) and “continue to work with the food packaging industry and infant formula manufacturers” (Health Canada, 2008a).

Fourth, precaution was linked to actions (i.e. risk management measures) required to deal

with BPA's threat to human health and the environment. The 8-page Risk Management Scope document (RMS) also provided an extensive discussion of risk management measures to be considered in the event that BPA was found to pose risks – 6 paragraphs amounting to nearly a page of text (compared to a single paragraph for the 6-page VAM document, even though the draft SAR found VAM to be toxic to human health). In linking precaution to action, texts indicated that specific sub-populations of Canadians were at risk – “the pregnant woman/fetus and infant” (p. 3). This distinction was further emphasized in the SPC, which referred to “vulnerable populations” (p. 2) while underlining that most products containing BPA posed “little risk to Canadians” (p. 3). A press release stressed that “the general public need not be concerned” (Health Canada, 2008b). However, attempts to construct boundaries between sub-populations at risk and those not at risk appear to have been problematic. The web-based summary (Government of Canada, 2008c) stated that BPA “did not pose a risk to the general population” but then went on to list a series of “precautionary measures” that all Canadians could take to avoid risk.

BPA's meaning – as toxic – resulted from greater use of problematizing practices compared to VAM. In addition to containing traces of the practices associated with normalizing, BPA texts also constructed BPA as an exceptional case: uncertainty regarding its toxicity for a particularly vulnerable subpopulation warranted a precautionary approach and hence actions to manage risks; and the Government asserted its right to take the lead in making innovative, independent judgments about BPA where necessary (Table 5).

— Table 5 near here —

Discursive Work: Stabilizing, Destabilizing and Re-stabilizing Meanings

We examined how the various meanings of VAM and BPA were held in place. The

meaning of both chemicals was initially stabilized in the draft SARs as toxic. In each case, some stakeholders attempted to destabilize this meaning with a view to subsequently re-stabilizing the chemical's meaning as safe. In the case of VAM, destabilizing attempts were successful and VAM's meaning as toxic was destabilized, then changed and subsequently re-stabilized as safe. In the case of BPA, destabilizing attempts failed and BPA's initial meaning as toxic remained stabilized. In this section, we show how the amount and nature of discursive work carried out by stakeholders and the Government differed according to the prevalence of normalizing or problematizing practices.

VAM

The initial assessment of VAM, which was associated primarily with normalizing practices, served to stabilize its meaning – momentarily at least – as toxic; VAM was categorized as a non-threshold carcinogen which, according to precedent, led automatically to a conclusion of toxic. Stakeholders responded to that conclusion by attempting to destabilize it and re-stabilize the meaning of VAM as safe. They did so by submitting texts recommending that additional texts should be referenced in the final SAR – most notably the 2008 version of the EU's risk assessment report (EU, 2008), which proposed that VAM had a threshold mode of action.

[Submitters] argued that the draft screening assessment conclusion had been overly precautionary and did not consider the weight of evidence of new toxicology data. In particular, the submitters recommended that Health Canada consider a threshold mode of action for the carcinogenicity of vinyl acetate which has been recently proposed in the scientific literature and in risk assessments from Europe [i.e., EU, 2008] (VAM-SPC: 1).

The Government accommodated this criticism and referenced this text in the final SAR,

concluding that there *was* a threshold mode of action, even if VAM was one of few “exceptional cases where genotoxic action is thought to be thresholded” (SCHER, 2008: 5). Accordingly, VAM was allocated to a different category – it was now considered to be a threshold carcinogen. The original sequencing that followed from the non-threshold categorization no longer applied and VAM could no longer automatically be categorized as toxic. This change of categorization also meant that, in accordance with normal scientific practice and prior assessments, additional information was required to ascertain whether the exposure of Canadians was likely to be above or below the threshold at which harm was caused. Critics therefore recommended the referencing of additional texts that addressed exposure. The Government also accommodated these recommendations, referencing 21 additional texts in the final SAR, and concluding that exposure to VAM was expected to be low and was not considered to be harmful to human health.

Our analysis illustrates how normalizing practices structured attempts to destabilize VAM’s meaning, which was dictated primarily by whether or not it was categorized as a threshold or non-threshold carcinogen, as well as the Government’s response. Normalizing meant that there was a relatively clear target for those wishing to destabilize VAM’s meaning as toxic i.e., by referencing additional scientific texts that could lead to a re-categorization of VAM. Once re-categorized, the new meaning of VAM then emerged from the new sequencing that followed from this new categorization, methods anchored in prior assessments, and referencing additional texts that developed exposure scenarios. So, although there were many instances where the Government rebuffed criticisms, those instances where it accommodated them – by referencing additional texts – led to the destabilizing of VAM’s meaning as toxic and the re-stabilization of a new meaning – VAM as safe.

BPA

The initial assessment of BPA was associated with normalizing practices but it also showed far greater evidence of problematizing practices compared to VAM. These practices served to stabilize BPA's meaning as toxic not because it belonged to a specific category, but because its effects were uncertain, and this uncertainty was linked, through the precautionary principle, to the need for action to manage potential risks. Attempts to destabilize the meaning of BPA as toxic involved primarily challenges to the Government's interpretation of certain texts and demands to exclude certain texts that had been cited in the draft SAR.

First, stakeholders refuted the Government's interpretation of texts describing the precautionary principle and equating it with the need for action.

The application of the precautionary principle is excessive and without an appropriate scientific basis. Application of the weight-of-the evidence approach and precautionary principle does not mean that any uncertainty requires action as a precaution. The precautionary principle should be applied when the weight of the evidence suggests that a potential threat to the environment and human health exists and when that threat is of serious or irreversible damage. Until both of these conditions are met, application of the precautionary principle to justify actions limiting trade is inappropriate (BPA-SPC: 18).

The Government rebuffed this criticism by invoking a series of extant texts that it had previously authored to argue that its interpretation – involving the need for action – was entirely appropriate in the light of ongoing questioning and uncertainty regarding BPA's risk to human health.

A precautionary approach to decision making, as defined in *A Framework for the Application of Precaution in Science-Based Decision Making About Risk*

(Government of Canada), emphasizes the need to take appropriate action, even in the absence of full scientific demonstration of cause and effect (BPA-SPC: 18).

It also asserted its right to act in the face of scientific uncertainty, and linked this to innovating.

The Government of Canada is leading the development of risk assessment methodology ... For substances where no other regulatory bodies have conducted a rigorous assessment, the Government of Canada will develop methodology to efficiently address the issues surrounding the substance (for example, developing models to determine the exposure of Canadians to a particular substance) (BPA-SPC: 14-15).

The Government thus justified acting differently from other jurisdictions because it was a leader; because of questions surrounding BPA's health effects; and because of the need to adopt a precautionary approach in protecting Canadians.

Additional criticisms that the Government's interpretations of texts were value-driven were also rebuffed – not by denying that they were value-driven, but on grounds that they were – and *ought to be* – value-driven. For example, a repeated accusation that the Government was “too” conservative in its interpretation of texts on exposure estimates was met with responses that it was appropriate to be conservative.

... the screening assessment must adopt a conservative approach when representing the potential for risk from wastewater treatment plant effluents in Canada (BPA-SPC: 10).

It is also the practice to utilize conservative approaches to estimate exposures to ensure that the environment is protected (BPA-SPC: 11).

Canadian studies presented in the screening assessment are considered

appropriate to represent Canadian conditions and to enable conservative-level assessment (BPA-SPC: 17)

Thus, the Government's interpretations of particular texts were defended.

Second, attempts to destabilize the meaning of BPA as toxic also took the form of recommendations to exclude texts referenced in the draft SAR on grounds that they were not scientifically valid or appropriate. The Government rebuffed such criticism.

The limitations and inconsistencies associated with the mentioned datasets were recognized and acknowledged in the draft screening assessment; however, the key studies identified in the developmental neurotoxicity dataset were conducted by the National Toxicology Program – Center for the Evaluation of Risks to Human Reproduction (NTP-CERHR) expert panel (a science-based interagency program in the United States). These studies were rigorously designed, relevant and considered of high utility by the expert panel; therefore, they were included in hazard identification and risk characterization. Scientists within and external to the Government of Canada having the required expertise were consulted for peer review and had significant input on the validation of the scientific evidence included in the draft screening assessment (BPA-SPC: 15).

In this case, the Government used normalizing practices to defend its inclusion and referencing of certain texts by anchoring its activities in accepted scientific protocols and peer review; and by referencing other jurisdictions.

Our analysis shows how problematizing practices structured attempts to destabilize the meaning of BPA as toxic insofar as critics attacked the link between uncertainty, precaution and action by questioning Government interpretations. This was difficult, however, because the

Government could use value-based inferences to justify its selection and interpretation of texts, as well as its right to act. The particular nature of BPA, the questions surrounding its effects, the inadequacy of existing research, and the need to consider a plurality of interests were all grounds for Government action. In addition, whereas additional texts could resolve the uncertainty concerning the categorization of VAM as a non-threshold carcinogen, additional texts could only *increase* the uncertainty in the case of BPA. Additional texts referring to new evidence could not “undo” the existing evidence that indicated BPA might not be safe; they merely added to the controversy. So, even though 26 additional texts were referenced in the final SAR, BPA’s meaning as toxic was not destabilized – uncertainty still remained and action was still required.

Discussion and Conclusion

In combining a performative process approach (Tsoukas & Chia, 2002) – where much of the work to date has been theoretical and empirical studies are rare (Van de Ven & Poole, 2005) – with a discursive perspective, our study contributes important, empirically grounded insights into the relationship between organizing and risk.

A Performative Process Perspective on Risk: The Role of Practices and Discursive Work

Our research questions asked how organizing processes construct the meaning of risk objects and, within these processes, what is the role of discursive work in stabilizing (and destabilizing) meanings? Our study illustrates how two different forms of social ordering emerge in risk assessment and management processes, depending on how practices are collectively enacted and unfold over time, and, in so doing, bring the past to bear on the present in specific ways. These forms of social ordering – normalizing and problematizing – structure the discursive work of actors in their attempts to stabilize, as well as to destabilize and change, meanings. Objects therefore “become” risky or safe in different ways. Note that while our analysis

distinguishes these two forms of social ordering, we do not wish to imply that they are mutually exclusive: normalizing practices were found in relation to both VAM and BPA, but in the case of BPA problematizing practices were also prominent. Nor do we wish to imply that problematizing necessarily leads to findings of toxicity: in using this term, we are not referring to the problematization of the status of a given chemical as safe but, rather, to the problematization of the codified norms on which such categorizations are usually made. Similarly, normalizing does not simply refer to practices that have come to be routine or habitual, but to specific practices which include the application of normal science.

When normalizing practices dominate, the meaning of an object is constructed through discursive work – producing, distributing and consuming texts – much of which has taken place in the past. Earlier discursive work creates shared understandings as to accepted “facts”, causal models, categories and their consequences, as well as methods for generating and validating knowledge. In this way, the meaning of a material object – in our case, the meaning of VAM as *both* toxic and safe (but at different points in time) – is held in place by a nexus of pre-existing texts, such as scientific articles, policy documents, and risk assessments from other jurisdictions, that reflect the outcomes of discursive work carried out in the past. By referencing scientific research, anchoring in past organizational practice, categorizing with accepted rules of inclusion and exclusion, and sequencing according to predetermined steps, the authority and applicability of a body of risk knowledge is reproduced; and the credibility of scientific experts is reaffirmed. In other words, the rules of the “the risk game” (Slovic, 1998) are understood and shared.

The weight of the past that is brought to bear through normalizing practices means there is relatively little need for contemporaneous discursive work to explain or justify what is occurring, even when meanings are destabilized and changed. In our case, VAM’s meaning

changed from safe to toxic then back to safe again. It was one of only two chemicals in over 120 assessed as of August, 2010 that, following an initial conclusion of toxicity in the draft assessment, subsequently became safe. Yet this reversal was not controversial – and required little contemporaneous discursive work – since the destabilization of the initial meaning of VAM and its re-stabilization as safe were both achieved through normal science and organizational precedent: an additional text produced in another jurisdiction was referenced; and the subsequent re-categorizing of VAM as a threshold carcinogen then led to a different set of consequences involving the referencing of other additional texts addressing human exposures. Normalizing thus not only helps to stabilize meanings, but also establishes a relatively clear target for discursive work required in attempts to destabilize and change them.

Our approach draws attention to how apparently stabilized meanings of risk objects are, in fact, precarious, even when supported by normalizing practices. VAM's re-stabilized meaning as safe – while it may appear to have been fixed as a result of the EU document – is not immutable. The Scientific Committee on Health and Environmental Risks (SCHER), which provides the EU with independent scientific advice, noted concerns with VAM's categorization in the EU text.

[VAM] is a very special compound in that it is genotoxic, induces tumours in 2 animal species at localizations relevant to man. This would require classification as a Category 2 carcinogen ... Instead, the RAR [EU, 2008] proposes classification as a category 3 carcinogen ... [which] is not in accordance with the criteria for classification of carcinogens (SCHER, 2008: 5).

Consequently, some organizations continue to maintain that VAM is toxic. For example, the environmental NGO called Reach for Unbleached! has claimed that VAM “is a carcinogen and

genotoxin with no known safe threshold”, and “its use in food packaging is inappropriate and should be disallowed” (Reach for Unbleached!, 2008). So further discursive work may be required to maintain VAM’s meaning as safe if other stakeholders continue in their attempts to destabilize and change it.

Our study also illustrates how problematizing practices can be used to stabilize the meaning of risk objects. In the case of BPA, where normalizing practices were evident but eclipsed by considerable problematizing, this chemical “became” risky and remained so, despite discursive struggle and even though no other country had, at that time, found BPA to pose significant risks. When problematizing practices dominate, the past weighs less heavily and, as a result, considerably more contemporaneous discursive work is required. The authority and applicability of a body of risk knowledge is called into question, thereby constructing a particular problem requiring innovative action. In the case of BPA, a great many texts were produced, distributed and consumed to elaborate a link between uncertainty, precaution and action to avoid potential risks. Compared to VAM, texts were longer, there were more of them, and they involved far more questioning of authors’ legitimacy, basic “facts”, causal models and methods for generating and validating knowledge. In other words, with problematizing, what constitutes relevant knowledge, how to produce it and what to do with it are up for grabs – the rules of the “the risk game” (Slovic, 1998) are more fluid.

Our study highlights how problematizing practices are associated with actors engaging in more discursive work and for longer periods of time. Instead of struggle occurring *within* a paradigm where issues of epistemology, valid evidence and appropriate value judgments are settled, as with normalizing, problematizing involves struggle occurring *over* a paradigm. Problematizing thus obliges actors to engage in considerable discursive work whether their

intention is to stabilize and defend or to destabilize and change meanings because of the many fronts that are opened up in the discursive struggle. In the case of BPA, the Government continued to produce and distribute texts following the release of the final SAR, including a webpage, press releases, and updates on the ongoing research of BPA's effects. This is because problematizing practices open up possibilities: if an object is particularized, then it is always possible to afford it further special treatment; if innovating is constructed as necessary, then it is always possible to invent novel ways of dealing with risk; if questioning challenges the applicability of a body of knowledge, then it is always possible to expand the scope of this questioning; and if interests are pluralized, then it is always possible to find alternative ways to balance stakeholder concerns. This generates notable discursive work as risk assessors and managers explain their actions and attempt to set bounds on problematizing.

Stabilizing Meanings of Risk Objects through Normalizing *and* Problematizing

The coalescing of practices into particular forms of social ordering is not random insofar as practices are interrelated in ways that are meaningful and familiar to actors engaged in organizing processes because these bundles emanate from the past. In other words, only a delimited number of forms of social ordering will “make sense” in a particular setting. Our study indicates the importance of normalizing and problematizing in the context of risk assessment and management processes. That normalizing practices are used in stabilizing meaning is, perhaps, not surprising, given the way in which risk is conceived of in late modernity, with a dominance of realist approaches, the pervasiveness of scientific rationality, and the taken-for-grantedness of the scientific method (Gephart et al., 2009; Malenfant, 2009; Miller, 2009; Topal, 2009). That normalizing practices can be used to *destabilize* and change meanings is less obvious. Our study highlights how meanings must first be destabilized before they can be changed and re-stabilized:

objects are always “becoming” even when they are constructed primarily through taken for granted scientific practices and texts.

Problematizing practices can also be harnessed in attempts to stabilize and destabilize meanings. Our study indicates how practices and discourse combine to make this form of ordering relevant to contemporary risk assessment and management processes through the way in which the dominant discourse that emphasizes “sound science” has been recently challenged by the discourse of precaution (Andrée, 2005). The latter creates different “conditions of possibility” (Maguire & Hardy, 2006). Specifically, it allows for the stabilizing of meaning *because of and despite* uncertainty. Before the emergence of this discourse, uncertainty was largely understood to arise from “data unavailability” which rendered impossible “the assignment of probabilities to a defined set of negative outcomes and thus the calculation of ‘risk’, formally defined”; and it was assumed that uncertainty could be eliminated by gathering more data (Maguire & Ellis, 2009: 121). The discourse of precaution advocates a broader understanding of uncertainty as “incertitude” i.e., “the general inability to make reliable predictions of damages” which includes formal notions of uncertainty but also ambiguity and ignorance (Klinke & Renn, 2001: 161). In so doing, it fills “the vacuum created by a science that continually searches for certainty but which continually fails to deliver” (Adams, 2002: 311) by providing a “strategic resource” (Hardy, Palmer & Phillips, 2000) for actors to use in their discursive work to stabilize meanings and construct risk objects in situations of ambiguity.

In summary, our study’s findings illustrate how, in the context of contemporary risk assessment and management processes, the meanings of risk objects can be stabilized in (at least) two ways: by invoking “certainties” that are known and accepted, including scientific findings, precedents and routines, through normalizing practices; or by invoking “uncertainties” and the

need to manage risks in a precautionary manner, through problematizing practices.

Organizing Processes in Other Contexts

Normalizing and problematizing are forms of social ordering that are highly relevant to the *prospective* assessment and management of chemical risks – a highly mediated process in which “risk is localized in the sphere of physical and chemical formulas” (Beck, 1992: 21). Different forms of social ordering may apply when risks are assessed and managed through organizing processes with a different temporal orientation, and our study suggests interesting areas for future study. One possibility for research concerns situations where risk is assessed and managed *in situ* – without mediation and in real time – as, for example, in “high reliability organizations” such as aircraft carriers, oil rigs, nuclear submarines, etc. (e.g., Leveson, Dulac, Marais & Carroll, 2009; Sullivan-Taylor & Wilson, 2009). Here, risks are often immediate and borne by the very same actors who are assessing and managing them. In such contexts, a systematic, top-down approach to risk is often advocated (Leveson et al., 2009), including continuous monitoring of devices measuring physical parameters, regular inspecting and record-keeping, auditing previous failures, and authorizing activities through successive levels of hierarchy. Such practices appear to bundle into a form of social ordering that might be termed “controlling”. At the same time, a very different form of social ordering, perhaps termed “sensing”, might also be important inasmuch as actors rely on practices such as intuiting – where individuals’ experience and tacit knowledge is used to process “weak” signals to conclude that something is wrong (Weick & Sutcliffe, 2001) – or actively looking for unusual situations and listening for strange sounds.

Risk is also assessed and managed *retrospectively*, such as in hearings and inquiries (e.g., Topal, 2009; Winch & Maytorena, 2009). Here, organizing practices involve a forensic

component to determine causality, involving interviewing, cross-examining and reconstructing event timelines. These practices could bundle into a form of social ordering that might be termed “investigating.” Additionally, because inquiries are often intended to reassure the public, they may also feature a form of social ordering that could be termed “narrating” and consisting of such practices as dramatizing, plotting and moralizing. There is, then, considerable scope for future research to explore whether and how practices bundle into different forms of social ordering in other risk assessment and management contexts and, if so, what the implications are for the nature and extent of discursive work needed to stabilize or destabilize meanings.

In addition to illustrating and theorizing how practices and discourse intersect in the organizing processes through which risks are assessed and managed, our study also makes contributions to the growing body of work adopting a performative process approach to organizing more generally. First, it shows how organizing processes bring objects into being and construct meanings for them through the interplay of practices *and* discursive work; and how, depending upon the specific bundle of practices that is enacted, there may be more or less contemporaneous discursive work involved. When extensive discursive work is carried out in the present, it is more easily observable, as a result of which the precarious and contestable status of meanings is more apparent. When the discursive work has taken place in the past, the contingent status of meanings and the body of texts holding them in place may be less evident. Our study thus illustrates how a performative process approach combined with a discursive perspective can be used to subject all meanings to interrogation – to shed light on how they come about and how they are held in place.

Second, our study provides insights into how specific forms of social ordering bring the past to bear on the present differently through “temporalizing” (Hodges, 2008). Practices and the

ways in which they bundle together emanate from past organizing processes in ways that are not random, but in particular forms of social ordering that are familiar and relevant to actors. In addition, discursive work is carried out within the context of – and by drawing on – broader discourses which are historically situated. In some cases, this discursive work has taken place in the past; in other cases, it takes place in the present. Third, the study provides practical insights into how researchers can carry out empirical performative process studies. As Cooper (2005: 1689) argues, individuals, including researchers, tend to see the world as an immutable system of categories and things – “objects of attention appear as bounded entities which exist against a background.” This tendency towards reification makes it easier for actors and scholars alike to grasp reality but it also hides the underlying complexities whereby reality is *made*. Our study illustrates how it is possible to examine the ways in which objects are in a perpetual state of “becoming”.

This study does, however, have limitations. First, it is a single, qualitative case study of prospective chemical risk assessment and management processes in one country; and it compares only two chemicals within those processes. Such a focus has, however, allowed us to unpack complex processes and to subject them to a finely grained analysis. Second, our main source of data has been texts containing traces of practices rather than direct observations of practices. Our focus on naturally occurring texts makes sense given that the specific risk assessment and management processes we studied are highly mediated and, to a significant extent, *textual* affairs (cf. Hilgartner, 1992): decisions are made and actions are taken on the basis of texts that actors have accessed, read, interpreted, cited, critiqued, etc. In other words, producing, distributing and consuming texts are an important aspect of risk assessment and management. On the other hand, our evidence rests on what actors have chosen to express in these texts. It is possible that

observations of actors as they produced the texts or access to draft versions could indicate different patterns in practices to those we inferred from the final, public versions of the texts. In addition, the norms associated with scientific text production (Knorr-Cetina, 1981) and the telling of coherent narratives in texts designed for public consumption (Kohler Reissman, 1993) may have produced a degree of convergence not experienced by the actors carrying out the practices. Ethnographic studies (e.g., Feldman, 2004) of organizing processes would yield further and complementary insights in relation to these issues. Finally, our study does not consider *why* problematizing was more prominent in the case of BPA and much less so in the case of VAM. Further research could explore this question, as well as the relevance and role of these bundles of practices in assessing and managing other types of risks (e.g. from nuclear power generation, offshore oil drilling, emerging diseases, etc.).

These limitations notwithstanding, our study adds to a better understanding of the processes through which risks are organized into existence, which is important in our risk society (Beck, 1992; Tsoukas, 1999). In theorizing how products “become” risk objects through organizing processes, our study contributes to orienting organization theory towards questions of significant relevance to the private, public and non-governmental organizations that are increasingly brought together around contemporary societal concerns about risk.

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Table 1:
Practices Identified in Canadian Chemical Risk Assessment and Management Organizing Processes

Description of data coded	Practices	Bundles of interrelated practices
Instances where the systematic application of accepted scientific knowledge and methods is emphasized with reference to extant research, scientific experts and other jurisdictions	Referencing	Normalizing
Instances where current activities are related to past activities, decisions, experience, and/or precedents, and continuity is emphasized	Anchoring	
Instances where clearly bounded categories are used, from which certain actions follow i.e., if X then Y	Categorizing	
Instances where actions are temporally sequenced through pre-established timelines, charts, flow diagrams, etc.	Sequencing	
Instances where a case is made for unique considerations or special treatment	Particularizing	Problematizing
Instances where activities are distinguished from those carried out in the past and novelty is emphasized	Innovating	
Instances where uncertainty and incompleteness of information are emphasized	Questioning	
Instances where the involvement of stakeholders other than scientists and government officials in risk assessment and management processes is emphasized	Pluralizing	

Table 2: Timeline and Relevant Documents for BPA and VAM

Document	VAM	BPA
Summary of Consultation of Challenge Advisory Panel (CAP)	<i>Panel was consulted in October 2008 (see below)</i>	March 2008: Panel asked to consider two questions related to application of weight of evidence and precaution for BPA
Draft Screening Assessment Report (draft SAR)	May 2008 (41 pages): indicated that the Government was considering designating VAM as toxic under CEPA	April 2008 (106 pages): indicated that the Government was considering designating BPA as toxic under CEPA
Risk Management Scope (RMS)	May 2008 (6 pages): summarizes draft screening assessment and invites stakeholders to submit comments	April 2008 (8 pages): summarizes draft screening assessment and invites stakeholders to submit comments
Summary of Consultation of Challenge Advisory Panel (CAP)	October 2008: Panel asked to consider two questions related to application of weight of evidence and precaution for VAM	<i>Panel was consulted in March 2008 (see above)</i>
Summary of Public Comments (SPC)	November 2008 (9 pages): summarized comments from 28 industry organizations and 3 NGOs	October 2008 (26 pages): summarized comments from 8 industry organizations, 16 NGOs, 4 public health organizations and 4 individuals.
Final Screening Assessment Report (final SAR)	November 2008 (47 pages): VAM does not meet any of the CEPA criteria for toxicity	October 2008 (107 pages): BPA meets one or more of the CEPA criteria for toxicity
Proposed Risk Management Approach (PRMA)	<i>Not applicable</i>	October 2008 (19 pages): proposes ban on the importation, sale and advertising of polycarbonate baby bottles made with BPA October-December 2008: During consultation on PRMA, 15 submissions were received from 4 industry associations, 8 NGOs, 1 government department and 2 individuals
Order Adding a Toxic Substance to the List	<i>Not applicable</i> (January 2009: notice is given that Government intends to take no further action)	May, 2009: Notice of intention to add BPA to the list of toxic substances on grounds that the assessment has found it to be toxic
Notice of amendment to Schedule 1 of Hazardous Products Act	<i>Not applicable</i>	June 2009: Government announces that it proposes to add polycarbonate baby bottles that contain BPA to Schedule 1 to allow for the prohibiting of the advertisement, sale and importation of these products
Final Notice	<i>Not applicable</i>	October 2009: BPA is added to the list of toxic substances
Web-based summary	Reports that exposure levels are not considered to be harmful to human health	Reports that BPA has been determined to be toxic; and Government is proposing measures
Web-based Fact Sheet	None found	Provides further information on risk management and advice for consumers
Other documents	None found	Various additional documents found on the website, e.g. Government press releases on BPA

Table 3: Coding Categories for Struggles over Meaning

Illustration of Data Coded	Description	Coding Category
<i>Criticisms of the Draft SAR</i>		
“The public comments cited several limitations for this study and recommended an alternative chronic LO(A)EC [Lowest observed adverse effect concentration] of 704 mg/m ³ (200 ppm) based on a study in mice and rats (Bogdanffy et al. 1994a).” (VAM-SPC: 3)	Instances where stakeholders proposed or submitted additional texts – not referenced in the draft SAR – for consideration and inclusion in the final SAR	Recommendation to include additional texts
“The studies used in the screening assessment to estimate fetal or neonate plasma levels of free bisphenol A had methodological problems.” (BPA-SPC: 4)	Instances where stakeholders criticized texts referenced in the draft SAR and proposed that they not be considered or included in the final SAR	Recommendation to exclude texts
“Releases of bisphenol A to the environment have been overstated. The assessment does not correctly represent industrial processes and makes unvalidated assumptions.” (BPA-SPC: 9)	Instances where stakeholders criticized the way in which texts referenced in the draft SAR had been interpreted	Criticism of an interpretation of texts
<i>Government Response</i>		
“The Government of Canada acknowledges the receipt of information regarding additional scientific studies on bisphenol A. As screening assessments do not represent exhaustive or critical reviews of all available data, only those studies deemed to influence the ultimate conclusions of the assessment have been added to the assessment report.” (BPA-SPC: 11)	Instances where a proposed/submitted additional text is not included	Rebuffing a recommendation to include additional texts
“... the key studies ... were rigorously designed, relevant and considered of high utility by the expert panel; therefore, they were included in hazard identification and risk characterization.” (BPA-SPC: 15-16)	Instances where a recommendation to exclude a referenced text is not accepted	Rebuffing a recommendation to exclude texts
“We acknowledge that there are differences between the EU draft RAR [EU, 2007] and the Canadian draft screening assessment ... With respect to exposure, the differences are greater in the final screening assessment because data from a contemporary consumer products survey were used for determining Canadian exposures.” (VAM-SPC: 2)	Instances where a criticism of an interpretation is rejected	Rebuffing a criticism of an interpretation of texts
“Modeling of exposures was modified based on the new residue data provided.” (VAM-SPC: 7)	Instances where a proposed/submitted additional text is included	Accommodating a recommendation to include additional texts
“However, as an evaluation by SCOEL (2005) discounted the Czajkowska et al. study due to poor documentation, and since the study has not been cited in more recent assessments of vinyl acetate (EU RAR 2008 [EU, 2008], US EPA 2006b), this study is no longer considered in final screening assessment.” (VAM-SPC: 3)	Instances where a recommendation to exclude a text is accepted	Accommodating a recommendation to exclude texts
“The Government was in agreement with this comment [<i>Reliance on Section 71 submissions does not accurately portray residues of vinyl acetate monomer in Canadian consumer products</i>] and solicited industry to test consumer products in the North American marketplace for residues of vinyl acetate monomer. ...” (VAM-SPC: 8)	Instances where a criticism of an interpretation is acknowledged	Accommodating a criticism of an interpretation of texts

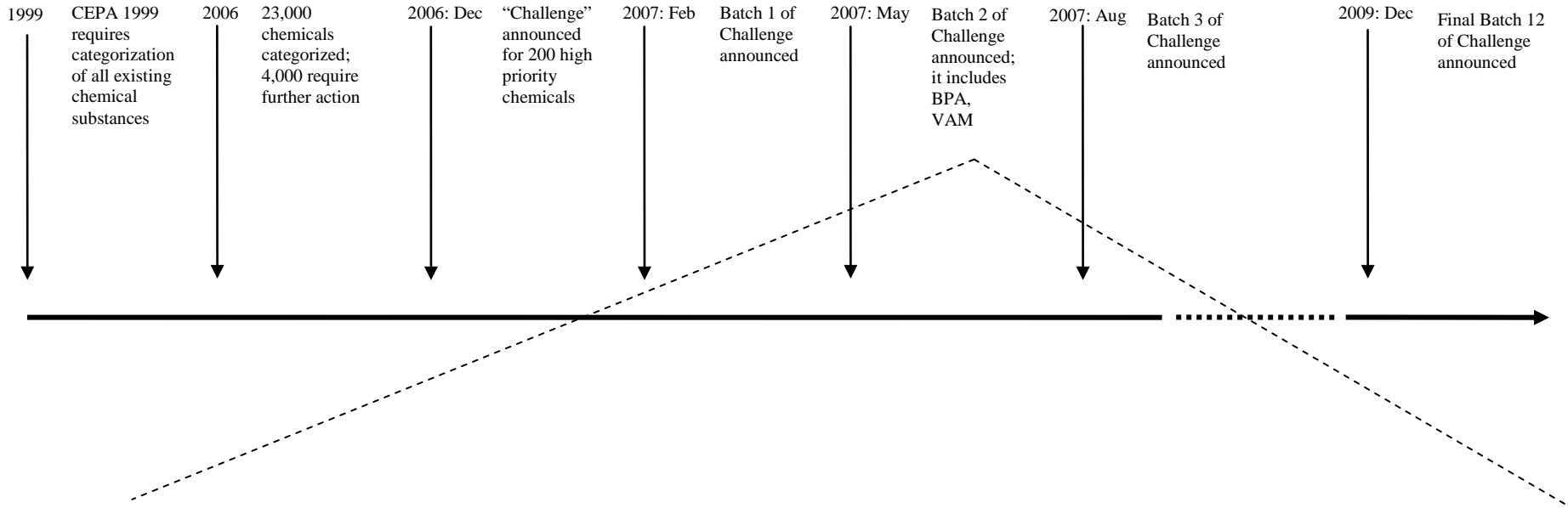
Table 4: Practices Most Prominent in the Construction of Meaning for VAM, Over Time

Draft SAR May 2008	RMS May 2008	CAP October 2008	SPC November 2008	Final SAR November 2008	WEB SUMMARY
<p>- “Based principally on the weight of evidence evaluation of IARC (1995)”, critical effect is carcinogenicity</p> <p>- Focus on non-threshold mode of action, which is constructed as the appropriate categorization based on available information</p> <p>- Little mention of uncertainty or precaution</p>	<p>- Some mention of risk management measures to be taken if VAM is found to pose risks, but few details given</p> <p>- Focus on non-threshold mode of action although incomplete information acknowledged</p>	<p>- Panel is asked specific question in relation to VAM: <i>Does the Panel agree with the approach to application of weight of evidence and precaution?</i></p>	<p>- Government invokes texts by outside actors, especially published draft risk assessment report (EU, 2008)</p> <p>- Government acknowledges previous “incompleteness” of information and references “new data”</p> <p>- Little mention of uncertainty</p>	<p>- Reverses draft SAR conclusion</p> <p>- “Based principally on the weight of evidence evaluation of IARC (1995) and taking into consideration more recent data including [EU, 2008]”, critical effect is carcinogenicity .</p> <p>- Focus on threshold mode of action, which is constructed as the appropriate categorization based on new information</p>	<p>- VAM “is not considered to be harmful to human health.”</p> <p>- “This decision was based on new information received during the public comment period, as well as more recent information from the risk assessment conducted by the European Union.”</p>
<p><i>Problematizing:</i> particularizing (VAM is a priority meriting its own assessment); some questioning (information about mode of action incomplete)</p> <p><i>Normalizing:</i> referencing (weight of evidence of IARC; citation of EU (2007) risk assessment report); anchoring and categorizing (as a longstanding policy, and in line with Panel advice for Batch 1, non-threshold carcinogens are categorized as toxic)</p>	<p><i>Normalizing:</i> referencing (weight of evidence assessment of IARC; anchoring and categorizing: (non-threshold mode of action results in toxicity conclusion)</p> <p><i>Some problematizing:</i> questioning (non-threshold mode of action “cannot be precluded”)</p>	<p><i>Problematizing:</i> particularizing (VAM singled out in a specific question relating to its assessment only, not a more general policy issue)</p>	<p><i>Normalizing:</i> extensive referencing (invoking new scientific texts); extensive anchoring and categorizing (draft finding was appropriate given longstanding policy and earlier Panel advice re chemicals categorized as non-threshold carcinogens; reversal of draft finding is also appropriate due to re-categorization)</p>	<p><i>Normalizing:</i> extensive referencing (new data now available); categorizing (a different mode of action as compared to draft SAR); anchoring (in accepted practice for assessing threshold carcinogens, i.e. via exposure scenarios)</p>	<p><i>Normalizing:</i> extensive referencing (new information received and EU assessment)</p>

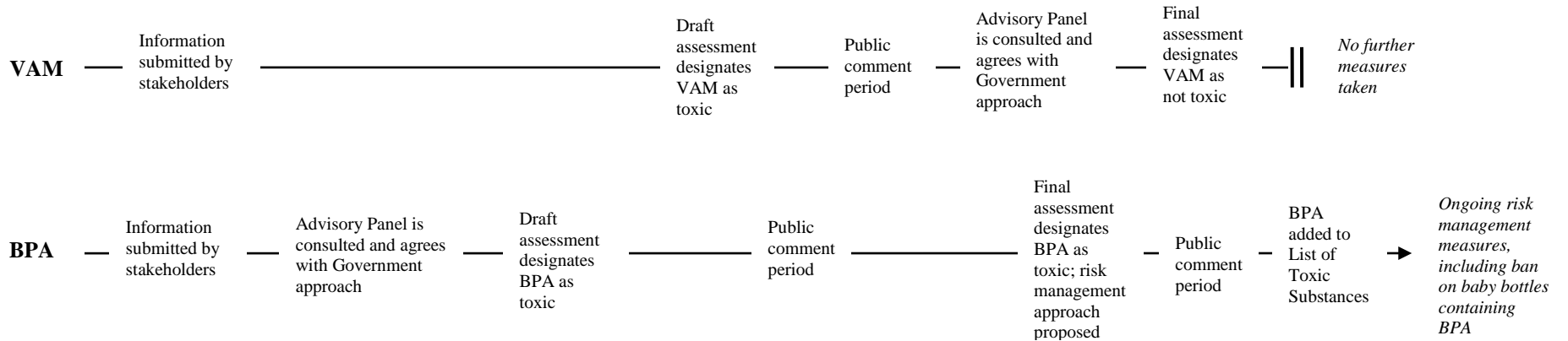
Table 5: Practices Most Prominent in the Construction of Meaning for BPA, Over Time

CAP March 2008	Draft SAR April 2008	RMS April 2008	SPC October 2008	Final SAR October 2008	WEB SUMMARY
<p>- Panel is asked specific question in relation to BPA: <i>Does the Panel agree with the approach to application of weight of evidence and precaution?</i></p>	<p>- Critical effect is “reproductive and developmental toxicity”; and dataset “though highly uncertain, is suggestive of potential effects at doses” similar to exposures. - Uncertainty is prominent and linked to precaution, which is constructed as the appropriate response so that action can be taken in relation to sensitive sub-populations, i.e., “the pregnant woman/fetus and infant”</p>	<p>- Explicit and repeated mention of precautionary approach, which is linked to action in relation to “sensitive subpopulations” - Action outlined in quite detailed manner: “support manufacturers in the evaluation of replacement options” for infant formula food packaging; and ban baby bottles</p>	<p>- Government invokes its own texts in support of precautionary action; and its right to make judgments in light of uncertainty and vulnerable subpopulations - Government “is leading the development of risk assessment methodology for succinct and focused assessments to better address public and scientific concerns in more efficient manner”</p>	<p>- Affirms draft SAR conclusion - Critical effect is “reproductive and developmental toxicity”; and dataset “though highly uncertain, is suggestive of potential effects at doses” similar to exposures. - Uncertainty is prominent and linked to precaution, which is constructed as the appropriate response so that action can be taken in relation to sensitive sub-populations, i.e., “the pregnant woman/fetus and infant”</p>	<p>- BPA is toxic - “Children, including newborns and infants” are at risk - BPA “does not pose a risk to the general population”, however “if Canadians have concerns” a series of precautionary measures is provided - New risk management measures are to be taken - Government working with industry</p>
<p><i>Problematizing</i>: particularizing (BPA singled out in a specific question relating to its assessment only, not a more general policy issue)</p>	<p><i>Problematizing</i>: particularizing (BPA is priority meriting its own assessment; vulnerable subpopulations affected); extensive questioning (uncertainty)</p>	<p><i>Problematizing</i>: extensive questioning (uncertainty); innovating (new risk management actions); pluralizing (working with industry)</p>	<p><i>Problematizing</i>: extensive questioning (uncertainty), innovating (government is the leader in assessment methods and precautionary action); particularizing (vulnerable subpopulations affected) <i>Some normalizing</i>: anchoring (referencing of Government texts on precaution)</p>	<p><i>Problematizing</i>: particularizing (vulnerable subpopulations affected); extensive questioning (uncertainty)</p>	<p><i>Problematizing</i>: innovating (new risk management measures); pluralizing (working with industry; acknowledging concerns of Canadians) <i>Some normalizing</i>: categorizing (boundaries narrowly drawn around risk bearers, i.e. infants, not general population)</p>

Figure 1: Chemical Risk Assessment and Management Processes in Canada



Sequence of Events for VAM and BPA



Biographies

Steve Maguire (steve.maguire@mcgill.ca) is Founding Director and Chair of the Marcel Desautels Institute for Integrated Management, as well as Associate Professor of Strategy and Organization, in the Desautels Faculty of Management at McGill University. His research focuses on institutional and technological change, seeking to understand the processes through which technologies enter and exit the economy and how these processes are influenced by the strategic behaviors of non-market actors (e.g. NGOs, scientists, and government organizations) in addition to market ones (e.g. firms and their customers). Empirically, he has studied controversial products at the intersection of commercial, scientific and political struggles around social and environmental issues, such as pharmaceutical chemicals for the treatment of HIV/AIDS as well as industrial and agricultural chemicals. His current research focuses on green chemistry and efforts to build a global political economy around “cleaner stuff”.

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