'Trust the experts!' Risk definitions in Dutch online forums about the 'swine flu'

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Abstract: Citizens are becoming increasingly likely to challenge the knowledge bases underlying policy programmes that deal with risks. This paper investigates how participants in online discussions engage in interactions between expert knowledge, 'commons knowledge' and policy assumptions. The concept of 'boundary objects', arrangements that allow different groups to work together without consensus, is used to analyse the role of online discussions in these interactions. Discussions on three Dutch online forums about the swine flu are investigated according to a framework for policy argumentation. Interaction between knowledge domains was limited, and it varied in focus and nature across the three forums. Each discussion functioned as a partial approximation of a boundary object. Government organizations should be more aware of the variety of online forums in which discussions about societal risks take place. Several practical options are presented for policymaking with regard to risks.

Keywords: boundary objects, commons knowledge, expert knowledge, online forums, risk communication

1.   Introduction

In the course of 2009, a global concern emerged regarding the spread of the 'swine flu' (officially, H1N1 influenza). The World Health Organization (WHO) issued a pandemic influenza alert, and health authorities in the Netherlands launched a

vaccination campaign. Many discussions about the vaccination were held in virtual social networks and online forums. Many citizens contested the trustworthiness of the information provided by the health authorities (RIVM, 2009).

Scientific knowledge has traditionally played an important role in the development of public policy. Although knowledge might contribute to the legitimacy of public policies, this role becomes problematic in the context of 'wicked problems' (Rittel, 1972), which are characterized by the absence of any clear relationship between causes and effects, by controversies regarding the validity of scientific knowledge and by disagreements about relevant values and the acceptability of policies aimed at managing them. The new types of risks emerging within the 'risk society' (Beck, 1992) are typical examples of wicked problems. As noted by Beck, the monopoly that the sciences have traditionally held on rationality is broken in the definition of these types of risks (Beck, 1992, p. 29). Discussions about such risks are characterized by cleavages between 'scientific' and 'social' rationality, with the scientific determination of 'acceptable' risks (which necessarily relies on value judgments) being challenged by the risk perceptions of laypeople. In addition to the debates between academic experts, laypeople use the information-sharing possibilities offered by the internet and social media to direct challenges against the knowledge bases underlying policy programmes that deal with risks. Citizens are developing their own internet-supported knowledge bases ('commons knowledge'; Lievrouw, 2011) as an alternative to authoritative, institutional forms of knowledge (Burrows et al., 2000). Policymakers are therefore being increasingly confronted with conflicting knowledge claims.

The domains of scientific knowledge, policymaking and commons knowledge have never functioned independently of each other. The internet provides opportunities for linking these domains in online social networks. The literature on virtual policy

communities calls for attention to 'communities of practice', which can be defined as groups of people organizing themselves according to some shared professional background or common challenge (Wenger, 2000; Bekkers, 2004). By sharing this common frame of reference, participants develop a set of shared meanings, thus fostering mutual understanding. In these communities, 'a permanent process of learning and innovation is organized' (Bekkers, 2004, p. 197).

In this paper, we analyse the interaction between the three domains of knowledge by investigating the role of online discussions in which experts, citizens and policymakers participate. Our central research question concerns (1) how participants in online discussions about the swine flu engage in argumentative discussions about risks and (2) how interactions between expert knowledge, commons knowledge and policy assumptions are elicited in these discussions. We develop suggestions for ways in which online discussions might contribute to learning effects of public policies dealing with risks. In Section 2, we provide a theoretical exploration of the nature of knowledge underlying risk definitions and the role of online social networks, followed by a presentation of our conceptual framework and research strategy in Section 3. We present the results of our analysis of three online discussions in Section 4, formulating our conclusions in Section 5.

2. Theoretical framework

2.1 Wicked problems and the role of knowledge

In the standard view, scientific knowledge is perceived as an accurate and objective representation of reality, which can inform 'evidence-based policymaking' (Sanderson, 2002). With regard to wicked problems, this view can be relativized from several other

angles. First, knowledge is produced through a process of social construction (Weick, 1995). Reality is ambiguous, and it allows multiple interpretations. Conflicts about 'facts' are thus inevitable. Moreover, normative disagreements result in conflicts about knowledge based on a plurality of value systems (Funtowicz & Ravetz, 1993). Knowledge is also embedded in experiences and intertwined with action and practical learning at both the individual and the collective level. In coping with wicked problems, knowledge is adapted to constantly changing conditions (e.g. Blosch, 2001). Finally, actors can use knowledge strategically. It can be used as a tool in ongoing policy struggles between actors with conflicting interests and views. This type of struggle involves the exercise of power (Lindblom, 1959). We thus conclude that knowledge is inherently questionable in situations involving wicked policy problems.

2.2 Knowledge in online social networks and processes of risk definition

Online social networks are playing an increasing role in the sharing of various forms of knowledge in our society (Bekkers, 2004). Online social networks have several important characteristics. First, potential participants in these networks are able to organize themselves into groups and to share and create new experiences. This could potentially lead to co-production, in which participants are not restricted to consuming knowledge and information, instead also assembling, creating, organizing and sharing content to meet their own needs or those of fellow participants (Boulos & Wheeler, 2007). A second characteristic of social networks is that participants are nearly always online in these networks through laptop computers, mobile phones or desktop computers. Third, social networks are open and flexible, building upon what Granovetter (1973) refers to as weak ties: networks of people who barely know each other, but who wish to share certain content. Given that every user can add knowledge

and perform the role of a potential expert, these characteristics place online forums at the centre of debates regarding the reliability of knowledge and the trustworthiness of sources (Lievrouw, 2011). Knowledge shared in social networks can be considered 'commons knowledge'. According to Lievrouw (2011, p. 178), commons knowledge 'provides an alternative and complement to the expert-driven, disciplinary, institutionalized and authoritative process of knowledge creation, distribution, and gatekeeping' in modern societies. One important aspect of commons knowledge is that the boundaries between ordinary knowledge and scientific knowledge are becoming blurred. Knowledge sources with a somewhat ambiguous academic status or dubious background are referred to as 'alternative sources' with expert status. As a consequence, the emergence of commons knowledge raises new issues of trustworthiness: 'When we are all authors, and some of us are writing fiction, whom can we trust?' (Keen, 2007, p. 65).

In the risk society, specifically, 'a politics of knowledge' emerges, in which 'people themselves become small, private alternative experts in risks of modernization' (Beck, 1992, p. 61). Each individual is able to add relevant knowledge about risks, including other-based knowledge or knowledge that is contradictory to the dominant risk definition. People can also exchange experiences (e.g. about harmful side effects of a vaccine), which could be used to influence the definition of risks. Not only is the knowledge about risks open for debate, but the assessment of particular events, developments or issues might pose risks as well. Douglas and Wildavsky (1982, p. 23) argue that cultural processes influence the risk definitions of certain trends and issues, due to fundamental disagreements about values and norms. Different perspectives are used to determine whether particular risks are perceived as serious enough, which justify taking countermeasures and at what cost these countermeasures would be

acceptable (Douglas & Wildavsky, 1982, pp. 7-9). This further underlines Beck's observation that risk definitions are inherently political, as they involve conflicting claims, viewpoints and interests.

2.3 Online discussions as boundary objects

The assumed boundary delineating policymakers as exclusively concerned with policy and scientists as exclusively producing knowledge is clearly out of date. Policymakers also produce knowledge (including scientific knowledge), and scientists also design policy (Jasanoff, 1990; Hoppe, 2010). Given that the boundaries between knowledge and policy are vague, the notion of 'boundary work' has been proposed for investigating the interactions between these two domains (Gieryn, 1995; Hoppe, 2009; 2010). Boundary work involves meaningful and targeted activities within each domain, aimed at creating a collective product. Policymakers and experts should therefore communicate about interpretations in order to achieve a collective product. In the context of controversial wicked problems, however, the politicisation of science may cause instability in the relationship between science and non-science. As suggested by Guston (2001), the concept of 'boundary objects' offers a strategy for linking science and non-science, thereby stabilising boundary work. We propose using this concept to analyse the role of online discussions as bridges between different knowledge domains.

The concept of boundary objects was introduced by Star and Griesemer (1989). The original concept refers to scientific objects that inhabit several intersecting social worlds simultaneously and satisfy the informational needs of each of these worlds (Star & Griesemer, 1989, p. 23). Boundary objects bridge social worlds or domains. On the one hand, the objects have different meanings in different social worlds. On the other hand, their structure is strong and common enough to make them recognizable as a

means of translation to more than one world. They are thus capable of adopting individual meanings, and they are robust enough to abstract meanings to a common product, thereby creating a common identity. Moreover, they are able to confront different meanings with each other. Interaction is a fundamental characteristic of boundary objects, as interaction stimulates cooperation, even for situations with no previous consensus or shared language (Star, 2010).

Star (2010, p. 602) emphasizes that boundary objects are arrangements that 'allow different groups to work together *without consensus*'. This makes the concept especially useful for communicative practices about controversial issues. The concept of boundary object exhibits a certain element of ambiguity, which actually helps us to tie it to our empirical object. On one the hand, Star (2010) characterizes boundary objects as 'arrangements' or 'shared spaces'. In this way, they are conceived of as rule-governed platforms for interaction. On the other hand, Star and Griesemer (1989) and Star (2010) see boundary objects as material or symbolic objects. Following on this view, Wenger (2000) mentions tools, documents, models and discourses as forms of boundary objects. In our investigation, we take these two meanings together as dimensions or qualities, such that a boundary object is to be understood as a specific discussion on an online forum, along with its specific discussion rules and other provisions facilitating or governing interaction. In a similar vein, when Shanahan (2011, p. 905) proposes applying the concept to science blogs, a boundary object should be understood as the blog post of an editor, along with any ensuing lines of discussion, as they are embedded within the specific online platform ('blog') designed by the editor. In its dimension of a symbolic artefact, an online discussion about societal risks can be taken as a boundary object when it exhibits sufficient 'interpretive flexibility' (Star, 2010) for cooperation between actors, each having specific information needs.

The objective is not to arrive at a common risk definition, but to achieve sustained cooperation in view of more transparency, negotiation and coordination (Wenger, 2000) between different risk definitions. This view aligns with the extensive literature on online and other argumentation within a collaborative learning perspective (e.g., Schwarz, 2003). Because 'a boundary object "sits in the middle" of a group of actors with divergent viewpoints' (Star, 1989, p. 49), however, any conceptualization of online forums as boundary objects in a learning perspective would be viable only for online forums that avoid the tendency to develop into 'echo chambers', in which only like-minded people participate (Sunstein, 2001). This issue must be addressed in our research design.

2.4 Conceptual model

We present our conceptual model in Figure 1. The model is based on the assumption that the societal acceptance of policies dealing with risks is dependent upon the input and interaction between various sorts of knowledge in public deliberation about risks. General theory about policy acceptance specifies two mechanisms that can account for policy acceptance based on deliberation. First (with regard to outputs), policy acceptance can be generated through informed conviction (Lucke, 1995). This mechanism of consensus-seeking is not very realistic in the modern risk society. The assessment of risks has become much more contentious: 'Polarized views, controversy, and overt conflict have become pervasive' (Slovic, 1993, p. 675). Slovic elaborates the important role of trust in risk perceptions amongst the public, which is characterized by pervasive distrust in many institutions, individual experts and industries responsible for risk management. Slovic also refers to the asymmetry between the difficulty of creating trust and the ease of destroying it. The second mechanism works by enhancing the

throughput legitimacy of decision-making (Risse & Kleine, 2007). Under certain conditions, deliberation may enhance the participants' readiness to accept a policy, even if they do not agree with its underlying premises. This mechanism relies on social learning and reframing. The notion of boundary objects can suggest new ways of conceiving policy acceptance in controversial issues, in which procedural arrangements and shared frames with interpretive flexibility take prominence. Favourable conditions can be created by arrangements that have the effect of increasing trust. Slovic mentions one example involving a nuclear power plant: 'An advisory board of local citizens and environmentalists is established to monitor the plant and is given legal authority to shut the plant down if they believe it to be unsafe' (p. 678). In the concluding section, we apply this suggestion to our assessment of online forums in risk management.

Figure 1: Conceptual model

(about here)

The input of and interaction between expert knowledge, commons knowledge and policy assumptions in online discussions can be accomplished in three ways: (1) the participation of experts, laypeople and policy officials, (2) the arguments advanced and (3) references and links to sources of knowledge. Although policy acceptance is not a subject of empirical investigation in this paper, we have presented a line of reasoning based on the function of boundary objects in the context of controversial issues. We assess the results of our investigation according to this reasoning.

3. Research design

Our research objective is to investigate the extent to which online discussions can be expected to function as 'bridges' between at least two of the three domains of knowledge. Our initial design involved a comparative case study, for which we sought cases from four types of online forums:

(1)   a discussion forum focused on scientific knowledge about the swine flu and the swine flu vaccination, with the aim of making this knowledge accessible to a broad public;

(2)   a discussion forum focused on practical expert knowledge, with the aim of informing a lay public about the significance of risks for their own lives (including the risks associated with vaccination) and about ways in which to counter these risks;

(3)   a discussion forum focused on the policy assumptions underlying the vaccination campaign, with the aim of providing information about the campaign and discussing this policy with lay people;

(4)   a discussion forum providing a platform where laypeople could share and discuss their commons knowledge about risks, possibly in relation to expert knowledge and policy assumptions.

We were unable to find an online forum that was established specifically to bridge the domains of policy assumptions and commons knowledge (Type 3). The government agency responsible for the vaccination campaign would seem the most likely candidate to establish such a forum. However, the idea of government agencies hosting online forums on controversial issues entails various political risks, which the government must first consider. We settled for cases from the other three types. The bridging function between commons knowledge and policy assumptions can still be performed by participants providing arguments based on government information.

We conducted a comparative case study of discussions about the swine flu on the three Dutch online forums described below. We add details concerning such aspects as ownership and moderation policy, as they determine the 'arrangement-dimension' of online discussions as boundary objects.

(1)   *Wetenschapsforum.nl* ('Science forum'): This online forum was established in 2003 as an initiative of two individuals. The forum aims to provide a discussion platform about scientific topics and to make scientific knowledge applicable for Dutch-speaking participants. The main target group consists of young adults 'sceptics' who are interested in good discussions about scientific issues. This forum can be regarded as a Type 1 forum. The forum is dependent on donor contributions, and it is maintained by several groups of volunteers performing a range of tasks, including moderation, technical support and news provision. In many cases, lines of discussion are started by editorials written by moderators or participants of high-ranking status. This forum's extensive moderation policy is specified in a 'Rules' section. It includes a number of rules pertaining to general forum etiquette, along with specific rules regarding scientific communication. Posts are screened after they have appeared online, and they can be removed in case of infringement of rules.

(2)   *Forum Mens en Gezondheid* ('Humans and Health') on infonu.nl ('information now'): Infonu.nl is a highly popular online forum in the Netherlands, which aims to become the most extensive source of Dutch-language information on the internet. The website is owned by Interate AB, an international web-publishing company established in Malmö. Infonu.nl is arranged as a structure of sub-forums on specific subjects. The *Forum Mens en Gezondheid* is intended for laypeople who are seeking support and advice from peers and experts. It can be regarded as a Type 2 forum. The editorials are written by a number of 'infoteurs', acting as information intermediaries. The

moderation policy is formulated in a number of 'house rules'. In addition to rules regarding legal provisions, they include various behavioural rules and an on-topic rule about 'meaningless' posts. Posts are screened before they are placed online.

(3)   *HiFi Forum*: This forum was initiated in 2004 as an independent platform for aficionados of Hi-Fi technology. It also provides a 'habitués table' for discussions on a wide range of subjects, including discussions about political issues, which are not allowed on the main forum. This forum can be regarded as belonging to Type 4. The moderation policy is limited to a general rule of etiquette, with regard to the principle of mutual respect and the prohibition of expletives, obscene language and other offensive behaviour. Moderators can remove or adapt posts after they have been placed online.

Although some discussions about the swine flu continued until 2012, our study focuses on the discussions that took place in autumn 2009, as this was the period during which the vaccination campaign was implemented. Each of the three selected forums addresses a different category of participants. Only the second forum (*Mens en Gezondheid*) specifically addresses the most involved category (i.e. people considering vaccination, including parents). An extensive literature exists about online communities for people with social and health problems (Tanis, 2008; Veen et al., 2010). Recent articles in the medical literature also investigate online discussions about vaccination (Penţa & Băban, 2014; Nicholson & Leask, 2012). Our study differs from this strand of literature, as it includes a wider range of online discussions. This is necessary in order to investigate their function as boundary objects in different contexts.

Following our conceptual model, we formulated four sets of specific research questions pertaining to the following aspects: (1) participants, (2) arguments about

risks, (3) communication about knowledge and (4) interaction between the domains of policy, expert knowledge and commons knowledge. This analytical framework is depicted in Table 1.

Table 1: Analytical framework

(about here)

Our research approach is discursive, thereby aligning with a vast body of literature in communication studies, conversation analysis and discursive psychology about online communities (e.g., Preece & Maloney-Krichmar, 2005). Specifically, and in line with our research aim, we adopt an argumentative perspective, focusing on the viewpoints and arguments brought forward by participants. In this respect, our research differs from studies that focus on identities, expressive and relational factors. We therefore sought a thematic coding scheme that would enable us to capture the advantages and disadvantages of the vaccination, as well as the risks of the swine flu. Fischer's argumentation framework for evaluating policies (Fischer, 1995) is well suited to this purpose. In addition to arguments directly related to the vaccination and the swine flu, this framework can also capture broader societal and ideological considerations. The framework includes the following thematic codes:

(1)   Situational validation: This theme addresses the problem definition upon which the vaccination is based. It focuses on the issue of whether the swine flu (and its effects) constitutes a health problem or risk that warrants vaccination. Argumentation about the causes of the disease also belongs to this category.

(2)   Instrumental programme verification: This theme addresses the advantages and disadvantages of the vaccination. Specific issues include the effectiveness, efficiency

and possible side effects of the vaccination, as well as argumentation about the merits of other cures. Comments on specific medical details of the vaccination are also coded in this category, as they might pertain to its effectiveness and side effects.

(3)   Societal vindication: This theme addresses the societal costs and benefits of the disease and vaccination programme, including the distribution of these effects across various groups and sectors in society.

(4)   Ethical and ideological evaluation: This theme focuses on basic normative assumptions about how society should address issues involving health risks, disease and medical treatment.

We also distinguish specific codes for comments addressing the sufficiency, validity and trustworthiness of the underlying information and knowledge. These can be seen as embedded within Fischer's categories (an example involves urging the availability of additional sources about a specific side effect of the vaccination). However, we coded them in a separate category (informational assessment) as an indication of the degree of controversy about the sufficiency and validity of the knowledge provided.

Qualitative researchers must shape the entire research process in view of the validity and reliability of their research findings. We follow the strategy of 'audit trail', suggested by Guba and Lincoln (1981), which involves describing how data were collected, how categories were derived and how operational decisions were made in the analysis of the data. Peer examination provides an additional check to ensure that the investigator has interpreted the data consistently and plausibly (Merriam, 1995). Research reports should provide information on how disagreements between coders were resolved. In the preceding section, we specified how the online discussions were

selected and how the coding categories were derived. Here, we provide additional details about the coding process.

Posts constituting a unity in terms of specific codes were coded in their entirety. Multiple codes were assigned to posts in which different arguments are combined. In such cases, we coded fragments of posts. Some comments were coded as 'not classifiable'. Examples include comments with merely interactive functions (e.g. good wishes, 'thanks'). We also coded the classifiable comments according to their orientation towards the vaccination (positive, negative or neutral). A positive orientation can ensue from the argument that the swine flu constitutes a risk that warrants a vaccination campaign (situational validation) or from a positive assessment of the effects of the vaccination (instrumental programme verification). This classification provides a straightforward overview of the relative homogeneity of the messages. Comments containing viewpoints in favour of the vaccination were coded as 'positive', while those expressing opposition were coded as 'negative'. Substantive contributions that did not express any viewpoint on the vaccination were coded as 'neutral'. Two authors performed the coding task independently. They started by coding the discussion on the *Wetenschapsforum*, which seemed to be the most straightforward one of the three. The two researchers discussed the codings on which they initially disagreed.

We assessed the intercoder reliability with Scott's Pi. This method is appropriate for nominal level variables and two coders (Lombard et al., 2002). The index was calculated for the coding results in the stage before the two coders had their final discussion about codings on which they disagreed. In this way, the calculated coefficients represent the degree to which the final results were dependent on consensus building. The coefficients are presented in Table 2. The results for *Mens en Gezondheid*,

in particular with regard to the argumentation, are 'moderate'.[1] The main coding problem involved the interpretation in terms of information assessment (in combination with instrumental verification). This reflects the many expressions of incertitude on this forum about the vaccination.

Table 2: Results Intercoder Reliability Test (Scott's Pi)

(about here)

4.   Empirical findings

4.1 Participants

The number of comments, the number of participants, the period investigated and other details of the discussions on the three online forums are displayed in Table 3.

Table 3: Participants

(about here)

4.1.1 Wetenschapsforum

According to the profiles of the 26 participants, 14 had completed at least some university education. The five most active participants had academic backgrounds as well, some in specific medical fields. This suggests that the discussion was carried on predominantly by participants who were oriented towards expert knowledge.

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[1] We use the 'benchmarks' proposed by Landis & Koch (1977), which can be applied to Scott's Pi as well as Cohen's Kappa (Craig, 1981). Both indices are considered as rather conservative (Lombard et al., 2002).

4.1.2 Forum Mens en Gezondheid

As the highest number of comments (113) appeared in November 2009, we analysed the discussion in November. The vast majority of participants posted only one comment. We identified only one expert among the participants ('I am a paediatrician'). He posted four comments (all in November 2009), including his full name, reacting to specific questions from other participants. Several participants mentioned that they were employed in the nursing profession. Most participants, however, seemed to be laypeople seeking to share their experiences and questions.

4.1.3 HiFi Forum

We designated 54 comments as non-classifiable, given that they served merely interactive functions (e.g. jokes and good wishes). The high frequency of non-classifiable comments is probably due to the fact that participants know each other as members of this community of Hi-Fi aficionados. None of the participants mentioned having a position in healthcare.

4.2 Arguments about risks

Table 4 presents the distribution of arguments concerning risk definitions on the three online forums.

Table 4: Distribution of arguments regarding risk definitions about the swine flu and the vaccination programme

(about here)

As shown in Table 4, the risks associated with the vaccination constituted the dominant topic of discussion. On the *Wetenschapsforum*, however, assessments of the risks of the vaccination (instrumental programme verification) and the risks of the swine flu (situational validation) were almost in equilibrium. The two other forums also contained frequent arguments on risk assessment concerning the Mexican flu, along with critical remarks about the sufficiency, validity and trustworthiness of the available information. The distribution of comments in terms of orientation towards the vaccination is displayed in Table 5.

Table 5: Distribution of comments in terms of orientation towards the vaccination (about here)

As shown in this table, the number of negative comments regarding the vaccination exceeded the number of positive comments only on the *Forum Mens en Gezondheid*. In the following sections, we provide further reflection on the results presented in Tables 4 and 5.

4.2.1 Wetenschapsforum

Three dominant risk definitions emerged on the *Wetenschapsforum*. Two somewhat opposite risk definitions related to the possible dangers of the swine flu. Some participants argued that a 'worst-case scenario' involving high percentages of infections amongst the population and serious consequences was still possible. In general, however, the belief prevailed that the risks of the swine flu were not so great, or that they were far less than those associated with the ordinary 'seasonal flu'. For

example, one participant noted that the mortality rate due to the 'normal flu' reaches 500 000 each year:

[…] *With the actual mortality rate of the swine flu [about 0.5 %], this would imply that 100 million people would have to be infected. With all due respect for this microbe, I don't see that the swine flu will attain this before the normal influenza strikes again.* […] (25-07-2009)

A third risk definition addressed possible harmful side effects of the swine-flu vaccine. For example, a discussion arose with regard to the risks of the vaccination for pregnant women.

Participants mentioned several sources of risks related to the swine flu and the vaccination. Some argued that the swine flu had originated in a 'combination virus' that infects humans and animals at the same time. According to these arguments, this combination had produced a dangerous and risky virus, characterized by a high chance of mutation. In some posts, the risks were linked to specific seasons. Cold weather in the autumn and the winter would result in a more dangerous virus. One participant mentioned that the money-driven pharmaceutical industry had been responsible for bringing an untested and dangerous vaccine to the market. The ways in which participants estimated the potential consequences of infection depended upon their stance (i.e. pessimistic or optimistic) towards the seriousness of the swine flu. Various solutions for countering the risks of the swine flu were discussed. The first solution to be discussed was obviously the vaccination. The general assumption in this forum was that the vaccination was a good option for countering the risks. Other solutions mentioned included additional hygienic measures and, if necessary, the possibility of

quarantine. Some participants argued that the swine flu was more or less a normal flu, which would make patients ill for only a short time. Vaccination or special hygienic measures would therefore not be necessary. The relatively high number of neutral comments underlines the scientific, fact-based character of the discussion. Furthermore, in quite a few comments, participants referred to the role of the media in spreading unwarranted risk perceptions throughout the population. In this respect, these 'neutral' comments carried a negative undertone with regard to the necessity of the vaccination campaign, although they did not explicitly call the campaign into question.

4.2.2 Forum Mens en Gezondheid

The discussion line ('Possible serious side effects of the Mexican flu vaccine') was opened by an article written on 18 July 2009 by Henbro, one of the 'infoteurs' of the forum infonu.nl. This short article mentioned five points:

(1) The WHO has issued a 'warning' about possible serious side effects of the vaccine.

(2) The vaccine contains a new generation of adjuvants.

(3) The relative safety of this combination is not yet known.

(4) The test results will be available in December 2009.

(5) In many countries, including the Netherlands, the vaccination campaign will start in the autumn of 2009.

Many comments referred to these claims, which might be taken to suggest that people were being subjected to an insufficiently tested vaccine.

Unlike the *Wetenschapsforum*, many comments in this forum were based on the personal experiences of participants with the vaccination or the swine flu. In many cases, they reported symptoms that had occurred after the vaccination. These comments were often accompanied by expressions of regret, anger and/or lost faith in the health

authorities. The difference between the numbers of negative and positive comments on the *Forum Mens en Gezondheid* is not as great as we expected. However, the coding decisions made created a grey area between 'negative' and 'neutral' comments in this regard. The negative orientations towards the vaccination in this discussion might therefore be somewhat underestimated.

Various comments tended to downplay the risks of the swine flu: 'This entire issue has been blown out of proportion by the government'. Brief discussions between proponents and opponents of the vaccination ensued. Several comments expressed trust in the authorities or advanced counterarguments to the arguments made by vaccination opponents.

4.2.3 HiFi Forum

Participants in this forum mentioned risks associated with the side effects of the vaccination as well as the effects of the swine flu itself. Because relatively few comments pertained to personal experiences with the vaccination, opponents of the vaccination tended to emphasise long-term side effects (e.g. the alleged risk of the Gulf War Illness and the risk of autism for children). Several comments mentioned the difficulty of assessing and weighing the risks of the swine flu (situational validation) against the risks of the vaccination (instrumental programme verification). The following comment provides an illustration:

[…] *I think that it* [the vaccination] *is the least of all possible evils. Everyone's a bit scared of it, but they are getting the shot anyway, just to be sure. To do nothing would be to let the virus take its own course. We don't know what the consequences of that would be*. (13-11-2009)

Positive and neutral comments towards vaccination predominated on the *HiFi Forum*. Proponents of the vaccination referred to the risks encountered in ordinary life (e.g. driving a car or food safety): 'There's more mercury in a herring than there is in a vaccination'. On the other hand, some opponents argued that the risks of the swine flu were perfectly comparable to those associated with ordinary seasonal flu. The neutral comments were less emotional expressions of incertitude and doubt than they were factual considerations about the swine flu and the vaccination.

4.3 Communication about knowledge

Based on our analytical framework, the kinds of knowledge advanced, dominant kinds of knowledge, and the status attributed to knowledge on each of the forums are presented in Table 6.

Table 6: Communication about knowledge

(about here)

The following sections provide further reflection on the results presented in Table 6.

4.3.1 Wetenschapsforum

A substantial number of the 76 comments (17) were categorized as 'informational assessment'. For example, participants asked for specific sources. The argumentation in most comments was based on expert knowledge and knowledge obtained from policy institutions. Specific sources that were provided, whether requested or unsolicited, included the European Medicines Agency (EMA), the World Health Organization

(WHO) and the National Institute for Public Health and the Environment (RIVM). One participant launched a fierce attack against the pharmaceutical industry, experts, media and government. He provided references to alternative knowledge sources, including Mercola, Horowitz and Jane Bürgermeister.2 This was the only instance of a completely dissident voice on this forum. In general, participants seemed to accept the trustworthiness of expert knowledge and the information provided by policy institutions. The moderator reacted negatively towards this intervention arguing that the 'doctors' mentioned by the dissident had 'dual interests' themselves. He proceeded:

[…] *The RIVM and WHO sites don't have ads for any kind of medications – they contain only purely objective information* […]. (16-11-2009)

This statement is consistent with the forum's mission, and it appears to suit the culture of argumentation maintained by the experienced participants and moderators, who had obtained their status largely by making strong comments based on expert knowledge. Alternative commons knowledge had no legitimate place in the discussion.

4.3.2 Forum Mens en Gezondheid

The quality of information was assessed in 26 comments (N=113). References to insufficient information provision about the side effects of the vaccination were frequent. Other comments referred to publicity in the media or attacked the validity of information provided by health authorities as well as 'pseudo-experts' on the internet.

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2 Joseph Mercola is an osteopathic physician, and a proponent of alternative medicine. He criticizes various aspects of standard medical practice, and he operates the natural health website mercola.com. Leonard Horowitz is a dentist who authored the theory that HIV was designed by the US Army as a biological weapon. Jane Bürgermeister is a science journalist. In 2009, she filed a criminal complaint against Baxter and WHO in connection with 'bioterrorism'. She operates the blog birdflu666.wordpress.com (source: Wikipedia).

Many participants indicated that they had been vaccinated on the advice of their family physicians. We could identify only one medical expert in the discussion. This paediatrician answered questions from three participants, thereby providing links to two expert sources (Erasmus MC and NIVEL). These references received positive reactions ('The sites I got from doctor [name of the paediatrician] were very objective', 14-11-2009). In various comments, however, the reliability of expert knowledge was heavily contested:

According to the Health Council, the vaccine is safe. [...] [However] *the council is not so independent as many people believe. Most of their members have connections with or commercial interests in the vaccine industry.* (16-11-2009)

That commons knowledge played a prominent role in this forum can be inferred from the frequent comments asking about similar experiences and requesting advice regarding what to do. Fierce discussions sometimes ensued between proponents and opponents of the vaccination concerning the status of the knowledge trusted by common people. The following comments illustrate the different views expressed with regard to the quality of sources on the internet:

[…] *Perhaps you should do some homework using the internet or uncensored alternative media, instead of simply believing everything you hear on the television and radio or read in the newspapers. In particular, you should try to find out who's in charge and what ties they might have with the pharmaceutical industry etc., etc. You'd be surprised*. (13-11-2009)

In any case I would not ask anonymous internet users for advice.[…] *if you have any doubts, ask for a second or third opinion. Just don't let your decisions be influenced by responses posted in a forum full of people with no expertise.* (13-11-2009)

References to expert knowledge were relatively scarce. Such references were provided by participants in positive or neutral comments regarding the vaccination. One participant provided a link to the EMA website, along with the rejoinder to 'have some faith in the experts' (12-11-2009). References to health authorities, especially the WHO and the Dutch RIVM, were somewhat more frequent, expressing an almost equal division between positive and negative views regarding the vaccination. References to alternative knowledge, including 'German Medicine', Teuni Kuiper (a Dutch author about the dangers of vaccinations) and (again) Jane Bürgermeister were provided as well, all within the context of negative viewpoints on the vaccination.

4.3.3 HiFi Forum

In this forum, 24 posts (among the 96 classifiable posts) assessed the quality of information. These assessments either expressed distrust in experts and health authorities, or distrust in or contempt of 'anti-vaccination' sources, as they are particularly likely to be found on the internet ('I trust the government more than I do weird doom scenarios'). References to sources of expert knowledge and information of health authorities were relatively scarce. References to commons knowledge were more frequent. In contrast to the *Forum Mens en Gezondheid*, however, these references were made by opponents of the vaccination, as well as by participants criticising these sources (at times, fiercely). The following example provides an illustration:

[…] *Let me add that I can understand why some people might be scared to have an injection of dead (or nearly dead) virus material.* […] *Nevertheless, the nonsense that's being reported on the Internet* [reference to world-evangelisation network] *isn't helping anyone.* (14-11-2009)

4.4 Interaction between knowledge domains

In line with our analytical framework, information on whether the discussions facilitated the linking of various individual meanings, and interaction between the three sorts of knowledge is presented in Table 7.

Table 7: Interaction between domains

(about here)

As shown in Table 7, interaction between the three different knowledge domains was limited on each forum.

4.4.1 Wetenschapsforum

In some instances, interactions developed around different interpretations and knowledge domains. One example of such an interaction occurred in a discussion about the two variants of the vaccine that were being used in the Netherlands. One participant raised the issue that family physicians were using Focretia to vaccinate high-risk patients, older people and pregnant women, while the local health agencies were using Pandremix for healthy children and the families of babies:

What is the reason for that? Is one considered safer than the other? […] Should we be surprised that people are no longer able to understand it and that they are resorting to all sorts of conspiracy theories instead? […] (18-11-2009)

This comment was followed by a relatively extensive discussion between five participants, in which various assumptions about the reasons for this difference in the vaccination policy were exchanged. Participants referred to information from the European Medicines Agency. Another example involves a discussion about the vaccination policy for pregnant women. One discussant raised the issue that, in contrast to the Netherlands, the United Kingdom was offering the vaccine to women as early as the first three months of pregnancy. Another participant referred to the situation in Belgium, where an indication applied only to the second and third trimesters of pregnancy. These two participants engaged in some discussion regarding the appropriate interpretation of these differing recommendations. In this case, the participants referred to texts on government websites, which also contained references to expert knowledge. These two examples reveal some extent of co-production that generates new (practical) knowledge. On one other occasion, an interaction with a more confrontational character occurred. A clearly dissident voice was expressed in a comment that contained a fierce attack on health authorities, experts, the media and the pharmaceutical industry:

This flu pandemic is a direct attack on humanity, disguised in a whole lot of hocus-pocus (jargon) that is usually used and understood only by microbiologists, geneticists and virologists. […] Given that the media are simply an extension of the government

and the corporate world, it's just the same highly slanted, one-sided view of what's actually going on. […] (12-09-2009)

The most active participant on this forum posted an extensive reaction, and a moderator announced that 'messages that propagate conspiracy theories would be deleted immediately'. In this case, the moderator fulfilled the role of gatekeeper by excluding one typical form of commons knowledge. In conclusion, this forum included interaction only between and within the domains of expert knowledge and policy knowledge.

4.4.2 Forum Mens en Gezondheid

This forum facilitated the linking of individual meanings, largely because the participants shared personal experiences and incertitude regarding the side effects of the vaccination. Some of the discussions involved the interaction of expert knowledge and government information with commons knowledge, usually in a relatively confrontational context. When one discussant suggested that the vaccination would make the immune system 'lazy', the paediatrician responded with the following post, in which he interjected his own status as an expert:

Why would your immune system become 'lazy' because of the vaccination? I have never heard about that. […] *A vaccination helps an immune system to react in time, before the disease can result in (sometimes) fatal effects.* (10-11-2009)

In a few reactions, participants responded to the assertion that the WHO had issued a warning about possible serious side effects of the vaccination. They had been unable to find such information on the WHO website. We therefore conclude that some

interaction between the three knowledge domains took place within this forum. In contrast to the *Wetenschapsforum*, these interactions were brief, taking place in a relatively confrontational context.

4.4.3 HiFi Forum

In this forum, there was more interaction between participants than was the case in the *Forum Mens en Gezondheid*. This might have been because the participants were already part of a community of Hi-Fi aficionados who share a critical attitude with regard to assessing technology. The high degree of interaction was reflected in the large number of citations from earlier comments posted by other participants that are embedded in participants' own comments. Information from commons knowledge (often with an oppositional character) was shared and critically discussed. In a few cases, participants engaged in critical discussion regarding information provided by health authorities and expert views on the vaccination. In these cases, however, the participants did not specify the sources upon which they had based their arguments, and the comments appeared to be a mixture of 'hearsay' expert knowledge and commons knowledge. The following comment provides an illustration:

[…] *We're not allowed to be sick anymore, even though being sick is essential in order to build up effective and well-functioning resistance.* […] *Some experts even argue that our natural resistance is deteriorating because of all of these vaccinations. There is also abundant evidence to underscore this argument* […]. (14-11-2009)

We conclude that participants were attempting to engage in an informed discussion but could be more critical in terms of providing sources. This also suggests that the

participation of experts would have been particularly welcome in this discussion. Such participation might have improved the quality of the discussion according to the participants' own standards.

5.   Conclusions

Our research objective was to gain insight into (1) how participants in online discussions engage in discussions about risks and (2) how interactions between expert knowledge, policy assumptions and commons knowledge are elicited in these discussions.

How did participants engage in discussions about risks? The communication on the *Wetenschapsforum* appears to have been aimed at generating deeper insight into both the seriousness of the swine flu (situational validation) and the risks of the vaccination (instrumental programme verification). The communication on the *Forum Mens en Gezondheid* focused on the exchange of personal experiences and interpretations of the possible risks of the vaccination (instrumental programme verification). On the *HiFi Forum*, differing ideas about the risks of both the swine flu and the vaccination were exchanged (situational validation and instrumental programme verification).

Our second conclusion is that the discussions were more balanced in terms of opponents and proponents of the vaccination than might be expected, based on the literature concerning polarization in online forums, especially in the case of the *Mens en Gezondheid* forum. This result corresponds to research findings on an online debate about the vaccination against the Human Papilloma Virus (HPV) (Penţa & Băban, 2014), and about the Measles-Mumps-Rubella (MMR) vaccination (Nicholson &

Leask, 2012). In this respect, one important condition for collaborative learning seems to be present.

Our third conclusion is that the interaction between knowledge domains was limited, and the communication exhibited different types of interaction. On the *Wetenschapsforum*, participants exchanged expert knowledge and policy knowledge. Commons knowledge had no legitimate status. The communication in this discussion was relatively collaborative, as reflected in two ways. First, participants shared the common norm that arguments should be backed by references or links. Second, interaction occurred through the exploration and testing of various interpretations, at times taking on the character of knowledge co-production. On the *Forum Mens en Gezondheid*, there was limited explicit interaction (supported by references and links) between the various knowledge domains. The interaction in this discussion was more adversarial. Participants relatively frequently advanced alternative commons knowledge, thereby attacking the expertise of health authorities, although there was also a significant undercurrent of attacks against this oppositional commons knowledge. On the *HiFi Forum* there was also limited interaction between different knowledge domains. However, policy assumptions, expert knowledge (in some cases, hearsay) and commons knowledge were advanced and critically discussed by both proponents and opponents of the vaccination. The interaction between knowledge domains was also reflected in the characteristics of the participants. Although the Wetenschapsforum is not specifically intended for physicians, the participants do share an orientation towards expert knowledge. The vast majority of participants on the *Forum Mens en Gezondheid* consisted of lay people who had already been vaccinated (or whose children, relatives, or other members of their social circles had been vaccinated) or were considering vaccination. In addition, one expert (i.e. a

paediatrician) and several others with experience in the healthcare sector were active on the forum. These experiences, emotions and interpretations constituted the most important focus in terms of commons knowledge. Although the participants in the *HiFi Forum* were also lay people, they were members of a community that also seemed to share an orientation towards fact-based discussion.

In summary, in view of the limited interaction between knowledge domains, each discussion that we have investigated should be regarded as only a partial approximation of a boundary object. If we consider each of the three discussions separately, the ideal type of a boundary object would be better approximated with the participation of:

(1)   authoritative 'ambassadors' of commons knowledge in the *Wetenschapsforum*;

(2)   more experts and representatives of health authorities in the *Forum Mens en Gezondheid;*

(3)   experts in the *HiFi Forum.*

The role of these 'ambassadors' and other individuals facilitating the discussion (e.g. the 'infoteurs' on the *Forum Mens en Gezondheid* of Infonu.nl) underlines the importance of brokers in the functioning of boundary objects (Wenger, 2000; Pawlowski, Robey and Raven, 2000).

Our findings have several implications for the practice of policymaking. Government organizations should be more aware of the variety of online forums in which discussions about societal risks take place. One initial step could involve monitoring online forums in which discussions about risks take place in order to establish where these discussions take place, as well as the types of participants, the topics and the types of arguments. A further step might consist of encouraging independent experts and experts within their own ranks to participate in existing forums

(see also: Nicholson & Leask, 2012). A third step might be to establish a discussion platform or to encourage third parties to do so. This would require special attention to appropriate design consistent with the concept of boundary objects. Specifically, the design of these online forums could be better attuned to the accomplishment of learning effects. Furthermore (and in line with Slovic's suggestion, as mentioned in Section 2.4), such discussion platforms should be located nearby the centre where policy decisions are made. A 'citizen jury' with advisory and monitoring powers might offer an adequate model (Smith, 2009).

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Table 1: Analytical framework

Research factor	Specific research questions
Participants	- How many people participated in the discussions and from which domain (i.e. experts, policymakers and laypeople)?
Arguments about risks	- What were the dominant risk definitions in the discussion? - How did participants argue about the causes and effects of risks pertaining to the disease? - How did participants argue about the causes and effects of risks pertaining to the vaccination?
Communication about knowledge	- Which types of knowledge were advanced by participants and with regard to which topics? - Which kinds of knowledge were dominant in the discussions? - Which status was attributed to knowledge? Did participants accept the trustworthiness of the three sorts of knowledge? On which grounds?
Interaction between domains	- Did the discussions facilitate the linking of various individual meanings?

	- Which interactions occurred between the three sorts of knowledge?

Figure 1: Conceptual model

Expert knowledge: participants ,

Commons knowledge: participants , arguments, references, links

Policy assump-tions: participants, arguments, references, links

Online forums as boundary objects:

Societal acceptance of policies