The Expert-lay Controversy in Risk Research and Management
Effects of Institutional Distances

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LIMAC PhD School
The Doctoral School of Language, Law, Informatics, Operations Management and Culture

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PhD. thesis

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Henrik Merkelsen

Frederiksberg, 5. februar 2011

Declaration of co-authorship

My contribution to the paper 'Consumer Perceptions of Food Risks: How do Consumers Assess the Risk of Concrete Food Products?' consists of statistical data computation of the survey data.

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Effects of institutional distances on the expert-lay controversy in risk research and management. Introduction to the thesis.

Abstract: This introduction to the four papers included in the thesis explains the choice of food risk as an empirical focus as well as the overall scope and theme of the thesis: to come to a more nuanced understanding of the expert-lay divide through focusing on the effects of institutional distances between the actors involved in risk analysis, risk management, risk communication and risk taking. Then a brief introduction to the theoretical framework is offered. From this point the remaining sections of this introduction serve the double purpose of summing up results and theoretical points from the individual papers and synthesizing between them.

Introduction

This thesis consists of four papers which address different aspects of risk. All the papers in the thesis relate one way or another to food risks, but food risks is not the core subject matter of the thesis. The overall theme is about how risks are defined, perceived, managed and communicated. However, the empirical focus on food risks is not a result of mere coincidence. During the past decades society has witnessed a number of food scares such as BSE, avian bird flu, E-Coli, Salmonella and Dioxin residues (Löfstedt 2006; Knowles 2007). New food risk topics related to novel foods and biotechnology such as GMO have added to the public concerns over food risks (Frewer et al. 2002; Sjöberg 2008). Obesity and other consequences of lifestyle related food risks cause severe health problems (Seiders 2004). Recently the growing concern about climate changes has led to significant public concern and media attention to the environmental impacts of food miles and green house gas emissions in food production (Weber and Matthews 2008). As a consequence of this development consumer concerns over food safety have increased steadily since the 1970s (Knox 2000). The sum of all these risks and the resulting societal anxiety are a politicization of food risks similar to that of risks related to new technologies. The politicization of food risks is accompanied by increased public demands for regulation, which, similar to the case of regulating new technologies, lead to the necessity of a better understanding of what factors drive public attitudes towards those risks. Subsequently the studies of public perceptions of

food risks have increased steadily over the past decades (Löfstedt 2006, Hohl and Gaskel 2008)).

However, food risks are in many concerns different from the technological risks, which were in focus when the scholarly field of risk perception emerged and still remain the preferred objects of investigation (Löfstedt 2006). Technological risks such as nuclear power rarely involve any direct decision making from the individual consumer of energy, but we all have to make decisions about the food we eat. It may be that we have to tolerate or accept risks imposed on us by industry and regulators, e.g. pesticide residues. But unlike the case of nuclear technology we are confronted with a choice every time we enter a supermarket, and we can actively choose to take certain risks and protect ourselves against others, e.g. by avoiding certain risk items, choosing organic product etc. Because of these choices we actively engage ourselves in risk taking when confronted with food risks. The ambition to come to a better understanding of risk in a context where people both have something at stake and a possibility to influence the outcome through their decisions has been a major reason for the empirical choice of food risks in this thesis.

The expert-lay divide in risk perception

The definition, perception, management and communication of risk involve a number of different actors: Some actors are risks producers (e.g. industry) while others have to live with the potential consequences of risks (i.e. the citizen-consumers). In order to ensure acceptable risk levels political institutions regulate risks, and the risk regulators are informed by experts who analyze risks. Although overlaps between these groups exist (especially because everybody has to eat), in general the different groups tend to perceive risks differently; whether these differences are caused by factors such as level of knowledge, predicted exposure and/or benefit, level of involvement etc.

The most studied and debated differences in risk perceptions are those found between experts and lay people. This gap, which is often described in terms of a 'knowledge discrepancy', emerged in various risk perception studies in the seventies that were conducted as a consequence of a general public skepticism towards nuclear technology (Slovic 2000; Sjöberg 2006). Throughout the past 40 years studies have persistently pointed to the existence of such a knowledge discrepancy, more or less regardless of risk or hazard type (Brun 1994). Many studies have been conducted within the psychometric paradigm, which has grown into becoming the preferred method by most scholars of risk perception. However, the psychometric approach to studies of risk perception, which was developed by cognitive

psychologists interested in decision making, has met vast criticism. Sociologists within the theoretical framework of Science and Technology Studies have rejected the notion of a knowledge discrepancy (e.g. Irwin and Wynne 1996), especially when the expert-lay gap has been described as the result of a cognitive deficit (see e.g. Slovic et al. 2004). These critics are generally informed by findings within their own research tradition which rely heavily on qualitative studies (see e.g. Wynne 1996). But the psychometric approach has also been subject to criticism which, more directly, has questioned the psychometric method and the validity of the results (e.g. Sjöberg 1996; 2002).

From risk perception to risk communication

Those challenges to the psychometric paradigm are both important and interesting. Although the psychometric findings of differences in expert vis-à-vis lay attitudes towards risks are hard to neglect, they tend to be explained differently depending on the theoretical approach to the subject matter. The psychometric paradigm points to cognitive factors as the cause of these differences and the preferred remedy has not surprisingly been public education through risk communication (Slovic 1986). In the early stages of risk communication the preferred method was one-way dissemination of information from the knowledgeable experts to the ignorant public (see Fischhoff 1995 for a general overview of the various stages in risk communication). Although one-way communication may occasionally lead to good results (see Löfstedt 2005 for a critical discussion) the initial efforts to educate the public was met by a surprising unwillingness to be educated. From lessons learned in the initial stages of risk communication, risk communicators have along the way implemented more dialogical approaches in order to engage citizens in risk communication. However, those approaches to citizen engagement have been far less efficient than predicted (Rowe and Frewer 2000; Petts 2004; Seifert 2006).

The relatively poor results of risk communication indicate that the initial psychometric assumption, that the cognitive deficit would be eliminated by providing sufficient information, is wrong. This could either be because the gap between expert and lay attitudes to risk is not caused by a cognitive deficit or it could be that the communication means employed have been inadequate. In either way several questions arise: If not cognitive restraints and/or knowledge deficits then what produces this gap? And what are the conditions for bridging the gap? If the problem is not due to cognitive restraints and lack of knowledge, what should we expect from risk communication efforts? Questions like these – as well as the scientific debates over their answers – have motivated this thesis.

The theoretical framework

Methods for coping with uncertainty in relation to decision making can be traced back to 3200 B.C. (Covello and Mumpower 1985). The term 'risk', however, did not appear until the transitional period between the late middle ages and the early renaissance (Luhmann 1993: 9). The introduction of probability theory by Pascal in 1657 as a rational foundation for decision making with an uncertain, and possibly adverse, outcome, led to the establishment of a definition of risk, which is reflected in contemporary risk definitions: Most current definitions of risk include an estimate of uncertainty (probability) about an event and the severity of its consequences (Drottz-Sjöberg 1991; Brun 1994). Ortwin Renn furthermore observes that "[a]ll risk concepts have one element in common, however: the distinction between reality and possibility". When this distinction is accepted, "the term 'risk' is often associated with the possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities (Renn 1998).

But this is as far the agreement over the concept of risk goes. There is no general agreement about the relative importance of probability and severity (Drottz-Sjöberg 1991). Thus, the risk literature is far from unequivocal when it comes to whether uncertainty should be expressed in terms of probability, expected value or simply as uncertainty (Aven and Renn 2009). Furthermore the severity of consequences may be distributed unequally among a population, thus changing the perspective from 'How safe is safe enough?' (Fischhoff et al. 1978) to 'How fair is safe enough?' (Raynor 1987). And even with an equal distribution of consequences the combination of probability and severity will lead to different results depending on whether the yardstick of risk measurement is reduced life expectancy, deaths per hour of risk exposure etc. (Slovic 1998). All these tensions, which are present in the field of risk research, can be summarized with Slovic's (1999) evaluation of 'the risk-assessment battlefield': "… polarized views, controversy, and overt conflict have become pervasive within risk assessment and risk management. […] This dissatisfaction can be traced in part to a failure to appreciate the complex and socially determined nature of the concept ''risk'''.

A brief overview of the field of risk research

The various branches of risk research reflect the complexity of the risk concept. In order to create a general overview of risk research Ortwin Renn (1992) has made a systematic classification of risk perspectives. While all approaches to various degrees deal with how to

cope with uncertainty the left part of the table focuses on *risk assessment* and the right part on *political legitimation*.

	INTEGRATED APPROACHES (e.g. Social Amplification of Risk)						
	Actuarial Approach	**Toxicology Epidemiology**	**Probabilistic Risk Analysis**	**Economics of Risk**	**Psychology of Risk**	**Social Theories of Risk**	**Cultural Theories of Risk**
Base Unit	Expected Value (EV)	Modelled Value	Synthesized Value	Expected Utility (EU)	Subjectively Expected Utility	Percieved Fairness & Competence	Sharewd Values
Predominant Method	Extrapolation	Experiments Health Surveys	Event & Fault Tree Analysis	Risk-Benefit Analysis	Psychometrics	Surveys Structured Analysis	Grid-Group Analysis
Scope of Risk Concept	Universal	Health & Environment	Safety	Universal	Individual Perceptions	Social Interests	Cultural Clusters
	One-Dimensional	One-Dimensional	One-Dimensional	One-Dimensional	Multi-Dimensional	Multi-Dimensional	Multi-Dimensional
Basic Problem Areas	Avaraging over space, time, context			Preference Aggregation		Social Relativism	
	Predictive Power	Transfer to Humans Inventing Variables	Common Mode failure	Common Denominator	Social Relevance	Complexity	Empirical Validity
Major Application	Insurance	Health Environmental Protection	Safety Engineering	Decision Making	Policy Making and Regulation Conflict Resolution (Mediation) Risk Communication		
Instrumental Function	Risk Sharing	Early Warnings Standard Setting	Improving Systems	Ressource Allocation	Individual Assessment	Equity Fairness Political Acceptance	Cultural Identity
Social Function	Assessment	Risk Reduction and Policy Selection (coping with Uncertainty)					Political Legitimation

Table 1. A systematic classification of risk perspectives (adopted from Renn 1992: 57)

In the three first technological approaches to risk the expert-lay divide represents a rather unwelcome obstacle, since the researchers within these approaches constitute the formal risk expertise. But this obstacle is not an object of investigation within these approaches and for this reason the thesis will not employ theories pertinent to these approaches. The theoretical domain of risk perception, risk management and risk communication is by and large to be

found in the last three approaches (psychological, social and cultural) and to some degree the economic approach. As the thesis focuses on the lay-expert divide it has been natural to draw on theories within these approaches.

The two cultures of risk research

Slovic (1999) describes the domain of risk assessment as a battlefield. Jasanoff (1993) illustrates the conflict by pointing to how the technological vis-à-vis social approaches to risk analysis represents two distinct cultures of risk research. Bridging these cultures is far from being a straightforward task as differences in meta-theoretical assumptions reflect gaps whose proportions are similar to the empirical gaps found between experts and lay people. Especially the ontological status of risk has been a dividing factor in risk research (see Aven and Renn 2009; 2010; Rosa 2010 for a recent discussion). The early work within the psychometric paradigm conceived risks to be real and this approach fitted nicely into the technological approaches in terms of risk ontology. And even with the psychometric re-conceptualization of risk as a social construct the general structure of a difference between expert and lay perceptions of risk is maintained, thus minimizing the practical impact of this new meta-theoretical orientation. But to some scholars within the social science approaches to risk it has been an important task to provide a more solid meta-theoretical foundation for risk research and reduce the 'ontological gap' between technical and social science approaches. These efforts have been termed critical realism or reconstructed realism (Renn 1998; Rosa 1998; 2003) or critical realism (Renn 1998). Still other social scientists, especially within the STS framework locate themselves as distant as possible from the realist perspective on risks so that the field of risk research is characterized by one major 'ontological gap' as well as several minor gaps.

How this thesis places itself within the field of risk research

The Social Amplification of Risk Framework (Kaspersen et al. 1988; Pidgeon et al. 2003) is an attempt to bring together the different and often conflicting approaches to risk. To some degree the framework has been successful; scholars from different approaches have been brought together into this holistic framework. But as a platform for theoretical developments the framework has been less successful. Scholars from different approaches have replicated their existing theoretical assumptions without the framework being capable of integrating them into any kind of theoretical development. In this sense the framework rather reflects than solves the problems of mediating between the different approaches to risk.

The focus on institutional distances in this thesis is conceptually affiliated with the idea of the Social Amplification of Risk Framework that social dynamics influence risk perceptions through effects of amplification or attenuation. But while the notion of risk amplification (as well as risk attenuation) implicitly reflects a contestable point of departure, namely that correct risk perceptions corresponding to real risks are somewhat distorted through social dynamics, this thesis contests both the realist and the essentialist assumptions behind the idea that risk amplification leads to wrong or inappropriate risk perceptions. As elaborated upon in the first paper, entitled 'The constitutive element of probabilistic agency in risk. A semantic analysis of risk, danger, chance and hazard', the thesis holds that: 1) Risk is subjectively defined, because 2) risk is not a quality of the hazard or risk source (the essentialist perspective) but rather a quality of the *relation* between the subject as a potential target and the risk source (a relational perspective).

This subjective perspective on risk, however, does not imply a radical "social constructivist view in which risk is treated as a subjective narrative that cannot be evaluated according to criteria of truth or appropriateness" (Aven and Renn 2010). Drawing on Searle's distinction between brute facts and institutional fact, the thesis holds that risk is an institutional, or social, fact, which is defined by its social function. Searle (1995) makes a sharp distinction between brute facts (i.e. natural phenomena) and institutional fact, which rely on social conventions. But as he emphasizes, the social reality of institutional facts fits into a larger ontology of objective fact. Thus, the concept of risk would be pointless if no real dangers existed. But risk belongs to a subjective ontology that "exists only in relation to the intentionality of agents" (Searle 1995: 10). In this sense the thesis argues that the concept of risk is inseparable from the social activity of risk taking.

The effects of institutional distances on risk assessment and attitudes towards hazards

It is a fundamental assumption throughout this thesis that societal or institutional distances play a significant role for the perception of risks. This assumption is, inter alia, motivated and inspired by Herbert Simon's theory of *bounded rationality* (Simon 1947; 1957), where the rationality of decision making is influenced by a variety of organizational factors. Simon has been a major source of inspiration to the Oregon group which founded the psychometric paradigm (Slovic et al. 1974). But while the 'boundedness' of lay people's rationalities is well documented in innumerous psychometric studies, the psychometric approach seeks the explanations for this boundedness in cognitive rather than organizational or institutional

factors. The focus is on the individual's psychology and not how the individual is situated in an organizational or any other societal setting.

Risk and the functional differentiation of society

Another equally important source of inspiration has been the systems theory of Niklas Luhmann (see Luhmann 1995 for a general overview of the theory). To Luhmann the concept of risk is inseparable from decision making; risk is a decision where someone chooses to put something at stake in order to gain a benefit in the future (Luhmann 1993). But as it is impossible to gain total control over the future through risk decisions, danger constitutes a residual effect which is beyond human control. The distinction between risk and danger is a cornerstone in Luhmann's analytical sociology of risk. At first glance it may seem paradoxical, since risk and danger are treated as both distinct and identical concepts. But this distinction makes it possible to maintain a double perspective on risk, thus explaining how time affects the concept of risk on its course from decision to manifested consequences. According to Luhmann, danger is attributed to external factors, as opposed to the risk which is attributed to the decision. In this sense risk involves agency (control by decision making) whereas danger is something we tolerate as passive objects because it is beyond our control. What is risk to the decision maker is at the same time danger to those affected. But according to Luhmann, even the decision maker will be confronted with danger once the decision has been made and he faces the threat from an adverse outcome. As such the distinction between risk and danger does not pertain to different individuals but rather to different perspectives or, as this thesis suggests, to distinct institutional positions. According to Luhmann, the separation of risk and danger is first and foremost pertinent to a difference in perspective which evolves over time: The concept of risks serves to bind time by linking the actual (which is present) to the potential (which resides in the future). But attempts to control the future through risk decisions will at some point have to face the fact that the contingency of any future is bound to become the present, which by its nature appears as more deterministic, simply because it is what actually happens. So when risk decisions reach the point where consequences occur, the future has become the present and risk has become danger.

When risk becomes a social problem it is because those affected by risk decisions are separated from the decision makers in what Luhmann refers to as a 'functionally differentiated society'(Luhmann 1995). In this sense it is not the risk as such that causes social problems (manifested in protest movements and demands for risk mitigation) but rather the distribution of dangers that affect those not involved in the risk decision. From the

perspective of an individual risk taker, facing dangers as a residual effect of the risk decision is a tolerable by-product, because the benefits of the risk decision in general outweigh those dangers. But many risks are beyond the control and decisions of individuals: Technological risks associated with nuclear power and chemical plants are the results of decisions made by industry and regulators.

One result of the separation between decision and consequence is that people may question the fairness of how societal risk consequences (i.e. dangers) are distributed; leading to questions such as 'how fair is safe enough?' (Raynor and Cantor 1987). But from this perspective it is plausible to infer that it is the disengagement from the decision making process that causes most lay people to evaluate societal risks in terms of their consequences rather than in terms of their probability. Sjöberg has found that it is the severity of consequences which is most important in driving policy attitudes towards new technologies, whereas the question of probability plays an insignificant role (Sjöberg 1998; 1999; 2000). Thus, Sjöberg argues that "'risk' is a concept most closely related to the probability of unwanted events and hence its usefulness for understanding policy attitudes is limited, if not altogether non-existent" (Sjöberg 2000). It is not unreasonable to assume a connection between lay people's bias towards disregarding the element of probability in their risk assessments and the fact that the risks they are to assess are imposed on them rather than being a result of their own choice. Probability may be considered a 'guide of life' (Good 1959) for decision makers, but the usefulness of probability to those without choices may be limited.

An intra-societal adaption of institutional distance

Luhmann's analytical sociology of risk offers a possible explanation for the differences between expert and lay perceptions of risk: they are ultimately produced by a functional differentiation of society where experts perceive risk from a decision perspective while lay people perceive risk from a consequence perspective. These perspectives are separated by time for the individual risk taker. But for large-scale technological risks the perspectives are separated by institutional distances.

The concept of institutional distance, as it is used in this thesis, is borrowed from the strategic management literature. Originally it was conceived to capture differences between institutional environments of two countries (Kostova 1999). The concept is inscribed in a neo-institutionalistic approach to social theory where institutional environments are defined by

regulative, normative and cultural-cognitive factors (Scott 2001). *Regulative* factors refer to how governments and regulatory bodies regulate society through laws and other requirements. *Normative* factors include the societal values and norms that direct behavior through social obligations and expectations. C*ultural-cognitive* factors imply a framework of basic assumptions which result in "prefabricated organizing models and script of actions". Thus, a common framework of meaning is established, justifying certain types of action while making other types inconceivable.

In this thesis the focus on institutional distance, however, does not involve comparative studies of different countries or societies. Rather the concept of institutional distance is adapted to explain differences in risk perceptions on an intra-societal level and how the effects of institutional distances are reflected in differences regarding influence over decision processes and in world views[1]. Thus, the concept of institutional distance reflects that distances between actors and organizations in a societal setting is not just a matter of geography.

How to study risks through the lenses of institutional distances

Adams (1995: 16) advocates that "the starting point of any theory of risk must be that everyone willingly takes risks". But as he concludes, this is far from the starting point of most of the literature on risk. Although the distinction between voluntary and involuntary risks has been has been central to the research literature on risk perception from its earliest studies (Starr 1969), the focus on large-scale societal risks has directed attention towards risk tolerance at the expense of risk taking. As Sjöberg (1999) explains: "[T]he special problem of risk seeking behavior, such as mountain climbing…is exceptional, and requires a very different discussion. Normally risks are disliked." While mountain climbing may be a peripheral niche within risk seeking behavior, this thesis is based on the assumption that all risks at some level are closely affiliated with risk seeking, or at least risk taking, behavior.

[1] In risk perception studies the concept of world views is often associated with Mary Douglas' Cultural Theory, where worldviews fit into a group-grid matrix resulting in four archetypical worldviews. The present use of the word is more in accordance with its heritage from German philosophy where Dilthey explains that: "Weltanschauungen [i.e., "worldviews"] are not products of reflection. They are not the fruit of the mere will to know. The perception of reality is an important force in their formation, but only one. They arise from the process of life, from our experience of life, from the structure of our psychic totality. The ascendance of life to consciousness, in the knowledge of reality, the acceptance and appreciation of life, and the accomplishments of the will – this is the slow and difficult work that mankind has performed in the development of its Weltanschauungen" (cited from Goodale 2009:152). In this sense the concept of world view is comparable with how a system observes its environment in Luhmann's systems theory.

Large scale technological risks only exist because somebody, e.g. industry and regulators, has made a decision which involves risk taking. Even the relationship between humans and natural hazards such as floods has to involve decision options (evacuation, building dams, buying insurance policy etc.) if the hazards are to be meaningfully conceived as risks. If no decision options exist, risk calculations will be pointless and risk taking impossible.
The negligence of risk taking is particular evident in the technical literature on risk where agency is clearly associated with the risk source and humans are defined as objects of exposure (see Christensen et al. 2003 for an overview of the technical risk terminology). But contrary to the general belief within the technical literature on risk, the thesis argues that it is human agency, and not technical systems or natural phenomena, that causes risk.
However, the focus on humans as objects of risk exposure is justifiable. Many large-scale technological risks imply that lay people are not actively engaged in the decision making which produces the risk. As a consequence the functional differentiation of society (Luhmann 1995), the institutional distance from risk decision to risk consequence is huge. Because of this institutional distance most lay people find themselves in a position as passive targets of risk exposure stemming from decisions made elsewhere in society. Thus, the thesis pursues the assumption that it is the institutional distances between risk decision and risk consequence that causes experts and lay people to perceive risk differently: In short, it is the distance that makes the difference.

Research strategies

At first glance the focus on institutional distances points to a preference for studying risks as a social phenomenon and hence to inscribe the thesis in a sociological tradition. However this is not the intention. The empirical studies in the thesis employ methods that can be categorized as psychological as well as sociological and the choice of data collecting methods as well as overall research designs have been driven purely by the nature of the empirical phenomena under study. The focus on institutional distances is motivated by the assumption that while such distances do exist (e.g. the distance from risk decision to risk consequence or from risk expert to risk source) it would be fruitful to take them into consideration – regardless of whether a given study deals with individualistic or societal concerns over risks.
The ambition to take these institutional differences into account is carried through in the two empirical studies which constitute the empirical core of the thesis; one exploring how lay

people perceive food risks and one exploring how food risks are reported from risk source to risk expert.

The focus on institutional distance has two important consequences for how risks are studied in this thesis:

1. In the first empirical study the risk perceptions of lay people are examined in a way that takes the element of risk taking into account by asking the respondents questions which reflect decisions they actually make. In this sense the research design tries to compensate for or bypass the effects of institutional distances, which cause a separation of risk decision and risk consequence.
2. In the second empirical study the alleged simple structure of experts' risk perception is challenged by an examination of the entire network of risk expertise, from the lowest organizational level where risks are produced to the higher levels where the formal risk expertise is situated. The research design in this study seeks to broaden the individualistic perspective on the risk expert to an exploration of the institutional distances within a network of expertise.

These two approaches to studying risks represent two very different research strategies which underlie the two empirical studies of the thesis.
The study of risk expertise seeks to understand the conditions for risk rationality in a network with multiple actors, thereby transcending the individualistic approach in psychological studies of expert perception of risk. The implications of this approach is discussed more in detail in the section 'How do institutional contexts and communication flows affect the conditions for rational risk expertise?' The overall ambition of this research design is to focus on institutional distances in order to take into account the organizational factors which are left aside in individualistic psychological approaches. Thus, the study contributes to the criticism raised against the alleged simple structure of experts' risk perception in risk research (Sjöberg 2002).

Limitations of the studies

At this point it is important to note that the two empirical studies are not comparable in any sense. They study different objects and employ very different methods. The only thing that binds the studies together is the idea of an expert-lay divide as conceptualized in risk perception research. Because the empirical studies are so dissimilar, the thesis is not based on

a single method but employs a wide range of methods pertinent to the individual studies. For similar reasons the thesis is not limited to one all-embracing research question and it does not aim at an all-embracing conclusion. The specific research aims, methods and findings pertinent to the individual papers will, together with relevant research literature, be explained more thoroughly in the papers.

Aim and outline of the thesis

The theme of the thesis is embedded in this expert-lay controversy. As such it is not solely an investigation into the specific nature of food risks. The four papers in the thesis are at the same time contributions to the ongoing discussion about the existence of, and possible challenges associated with, the expert-lay divide in risk perception and its consequences for risk communication and risk management. The overall aim of the thesis is to come to an understanding of the expert-lay divide through focusing on the effects of institutional distances between the various actors which produce, analyze, regulate, tolerate, communicate about and most importantly take risks.

The composition of the thesis

The composition of the thesis is based on this introduction followed by four individual papers, each of which has their own scope and focus:

The first (introduction) paper accounts for the general idea behind this thesis. It describes the empirical focus and the research aim and it provides an overall theoretical foundation. In addition this paper seeks to synthesize the remaining papers.

The second paper entitled 'The constitutive element of probabilistic agency in risk. A semantic analysis of risk, danger, chance and hazard' defines the core terminology and accounts for the meta-theoretical position of the thesis. But the paper is simultaneously an autonomous contribution to an ongoing debate about the definition and ontological status of risk. The paper is not purely conceptual as its theoretical points are informed by a semantic analysis of central concepts in the risk terminology.

The third paper entitled 'Consumer Perceptions of Everyday Food Risks' contains one of the two empirical studies of risk in this thesis; in this case the consumers' perceptions of food risks. The methodological approach taken in this study is to some extent based on the discussion and findings in the previous paper.

The fourth paper entitled 'Institutionalized ignorance as a precondition for rational risk expertise' contains the second empirical study of risk; in this case the effects of institutional

contexts on risk expertise. This is a case study of risk reporting procedures in the Danish division of a multinational food service company.
The fifth paper entitled 'Risk Communication and Citizen Engagement: What to Expect from Dialogue' uses the Danish Consensus Conferences as a case in point for a theoretical discussion concerning the role of citizen engagement through dialogue in risk communication. While the two previous papers each addresses one of the two sides of the expert-lay gap, this paper offers a theoretical explanation for why it is so difficult to bridge this gap through public dialogue.

The following sections serve a double purpose: To sum up results and theoretical points of the four papers and to synthesize between them in order to account for the general idea behind this thesis.

What do we mean by risk?
As Slovic (1999) states any "attempt to study risk has to confront the question of 'What is risk?'" This question is raised in the second paper of the thesis entitled 'The constitutive element of probabilistic agency in risk. A semantic analysis of risk, danger, chance and hazard'.
The paper is a contribution to a recent debate in *Journal of Risk Research* on the definition of risk. This debate has revitalized a general discussion in risk research concerning the ontological status of risk. Aven and Renn (2009) set out to challenge the widely accepted definition of risk proposed by Rosa (1998; 2003) which assumes risk to be an objective fact. While agreeing with Rosa that the concept of risk is better expressed in terms of uncertainty than in terms of probability, Aven and Renn (2010) insist that "uncertainty must be someone's uncertainty" and therefore the concept of risk cannot escape the element of subjectivism.

Risk and probabilistic agency
Based on previous studies of risk in corpus linguistics (Fillmore and Atkins 1994; Hamilton et al. 2007) and a semantic analysis of the terms risk, danger, chance and hazard the paper identifies a distinct presence of what is termed *probabilistic agency* as a constitutive element of the risk concept. The term probabilistic agency emphasizes the *subjective agency* involved in probability calculations. That ordinary people engage themselves in probability calculations is not meant to denote engagement in advanced statistical operations. As evidenced by Tversky and Kahneman (1974) people more often than not make probability calculations

through various shortcuts or heuristics. These heuristics may bias the results and call for advanced statistics in order to obtain more accurate results, but this is irrelevant to the point being made: namely that even ordinary people use probability in order to predict uncertain outcomes.

Both Rosa (2010) and Aven/Renn (2009; 2010) make a clear distinction between risk as a concept and its practical application. This distinction enables both parties in the discussion to locate uncertainty on the conceptual level, while probability is considered a useful tool in the practical application of the concept. However, the paper argues that risk, in the sense that it is a subjective – and not objective – fact, cannot be separated from its social function (Searle 1995). Therefore it is impossible to distinguish risk from its practical application. In short, the paper argues that risk only exists because somebody takes a risk and that this activity involves some kind of probability estimations. Furthermore, the paper finds that uncertainty is not an adequate component when defining risk, since subjects (and even technical systems) can tolerate some level of uncertainty without acting upon it. In this sense, the paper argues, it is more adequate to base a risk definition on probability, because probability involves agency, understood as an activity that seeks to gain control over uncertainty.

The general focus on institutional distances in the thesis plays an important, although not very explicit, role in this paper. Defining risk in terms of probabilistic agency means that someone has to act in order for a risk to exist. This act may have consequences for that someone – or for someone else. Thus, some take risks while others tolerate risks. If risk is defined objectively, correct assessment is possible and the problem of 'incorrect' risk perceptions is likely to result in discussions about cognitive restraints. But if risk is defined as something someone takes, 'incorrect' risk perceptions perhaps merely reflect that probability is a more salient concern for someone taking a risk than for someone tolerating a risk. The latter has no direct influence over the risk, so his/her stake in the risk is consequences (and not probability).

The social reality of risk

The semantic analysis shows that the act of gaining control over uncertainty is semantically embedded in the risk concept. The immediate consequence of this finding is that if the concept of risk is to be in accordance with the everyday usage of the word, it should be defined subjectively. Thus, risk cannot be an ontological fact, at least if the concept is to be in accordance with its everyday usage. For this reason (and several others) the paper as well as the remainder of the thesis defines risk as a social construct. But as noted before, defining risk

in terms of a social reality does not necessarily lead to a radical social constructivist view on risk. Dangers are real in the sense that they exist independently of our understanding of them, and human risk taking is based on the knowledge (including knowledge about lack of knowledge) of the dangers that may occur in the future.

How do lay people perceive food risks in situations which involve choice?

The third paper of the thesis entitled 'Consumer Perceptions of Food Risks: How do Consumers Assess the Risk of Concrete Food Products?' is based on the assumption that despite the recent focus on concepts such as *citizen-consumer* and *political consumer*, people tend to behave as consumers in purchase situations and as citizens in political situations.

Risk items reflecting political concerns vis-à-vis consumer concerns

The idea that consumers act politically through their consumption is appealing but results tend to be overrated (Boström et al. 2005). A recent study of political consumption in Denmark, a country which has coined the concept of political consumerism and which is generally considered to be a forerunner in this area, reveals that only a small minority of the political consumers act in accordance with their political beliefs (Halkier and Holm 2008). Most of the alleged political consumerism is merely verbalized and not acted upon. So the case is that when consumers are confronted with consumer decisions they tend to act as consumers and not as political activists. In other words: If we explain political consumerism as an irrational element that neglects the economics of rational choice, people tend to be irrational grumblers but rational actors.

The reason for this could be that in a purchase situation people put something very dear to them at stake (i.e. their money), whereas political beliefs and statements are free.

The main reason for including products and not specific risk items such as salmonella and pesticide residues is that many of these items are merely tolerated and not as such chosen by the consumers. They may be a side-effect of a concrete product, but since many risk items do not offer any benefits, it is on the product level that risk-benefit tradeoffs are made. It is also at the product level that consumers put something at stake (their money and health) and can influence the outcome, simply because consumers make (risk) decisions concerning products, but not necessarily concerning specific risk items. The consequences of exposing oneself to a specific hazard or risk item will of course play a role in the purchase decision. But in the end the purchase decision is about a product and not about a specific risk item.

The ambition behind the study in this paper is to capture the risk perceptions of consumers in a situation where they think as consumers. Thus, the study presents respondents to concrete food products and not specific risk items, that may be subject to 'outrage' (Sandman 1987) which is motivated by political rather than consumer concerns. As it is a fundamental assumption in the thesis that institutional distance, rather than risks as such, cause this outrage, the study aims at capturing the consumer risk perceptions in a way that so to speak bypasses the effects of institutional distances. From this perspective it is hypothesized that the element of control over risk will be less significant as compared to studies based on specific food risk items.

Benefits matter – risks are less important

Many studies following the tradition from the psychometric method have pointed to how dread and knowledge are the most salient factors in consumer perceptions of food risks (e.g. Sparks and Shepherd 1994; Fife-Schaw and Rowe 1996; 2000; Kirk et al. 2002). However, some studies have shown that there are significant individual differences among consumers' perceptions of food risks (Siegrist et al. 2006) – echoing a general critique of the psychometric method and its use of aggregated data (Sjöberg 1996; 2002). Other studies reveal important differences in risk perceptions across different risk items (Miles and Frewer 2001; Williams and Hammit 2001).

The study in this paper takes a particular interest in what role the presented risk items play in consumers' perception of food risks. This methodological aspect appears to have great influence on the results of risk perception studies. If, for example, consumers are asked to rate specific risk items such as salmonella and campylobacter, they will perceive risks to be significantly higher, compared to how they perceive similar food safety risks in their local supermarket (Senauer 1993).

The study is to some degree based on the same methods as psychometric studies of food risk perception. Similar to the study by Fife-Schaw and Rowe (1996), risk characteristics are based on data from focus groups, but as the participants were confronted with concrete food products and not specific risk items, the risk characteristics turned out to be very different. The statistical data analysis is based on principal component analysis, but with quite different results compared to previous psychometric studies.

As hypothesized, control over risk is not a salient issue. Benefit seems to be the main driver in shaping attitudes towards the food products in the study. This is hardly a surprise for most of the products, but for the novel food products this finding is interesting. All three novel food

products (cornflakes based on GMO, beef fed with growth hormones and vitamin enriched convenience food) came out with almost identical factor loadings in single component solutions. This finding is interpreted as a result of indistinct risk perceptions that may be subject to a stigma effect. But apparently the stigma effect is defined by perceived lack of benefits rather than perceived risk.

Rational but misinformed risk experts

The fourth paper entitled 'Institutionalized ignorance as a precondition for rational risk expertise' has a more direct approach to how institutional distances affect risk perceptions. The study does not as such contest the rationality of risk expertise, but through a rigorous examination of risk reporting practices within a major food service provider the study finds that the majority of risks are dealt with immediately on location and hence never reported through the official risk reports. Therefore the paper concludes by suggesting that the experts' perceptions of risk do not owe their rationality to a superior level of information on the subject matter, but rather to a lack of information. It simply becomes easier to maintain a rational position when most irregularities are dealt with locally and thus never enter into the reporting system. In this sense the institutional distance from risk source to risk expert produces a certain kind of 'institutionalized ignorance'.

The study was motivated by a very practical problem. The organization in question, the Danish division of a multinational food and service company, from time to time experienced some critical incidents, but their risk reporting system failed to account for any risks prior to these incidents. This suggested that their risk reporting system was unreliable and led to a research project which served a double purpose: 1) To ensure better routines for anticipating and managing food risks within the specific organization, and 2) to come to a better understanding of which factors effect information flows from risk source to risk expertise. The study is guided by three hypotheses: 1) Since risk taking is a way of optimizing future outcomes (Luhmann 1993) it is anticipated that the risk management of the organization should reflect a tension between concerns for profits and concerns for safety. 2) Risks that are perceived to be under control generally are underestimated (Starr 1969), and therefore risks concerning human malpractice should be underrepresented in the failure reports as they will be perceived to be more under control than risks stemming from system malfunctions. 3) Employees fear that an overrepresentation of minor risks in the risk reports affects their superior's judgement of their professional competence and therefore they measure the risk of

getting caught in not having reported a risk up against the risk of being perceived as less competent and ultimately facing sanctions.

The study employs a wide array of qualitative methods. The research design is a case study including a network analysis, onsite participant observations in 28 canteens, 56 semi structured interviews with canteen managers, chefs and canteen assistants, interview with the hygiene manager and results from a risk identification workshop with participants from executive management as well as district and canteen managers. The methodological approach is inspired by grounded theory and each step of the research design serves to inform the subsequent step in order to gradually accumulate knowledge (Strauss and Corbin 1998).

The institutional attenuation of risk

The network analysis indicates that concerns for profit are of greater importance to the organization than the concerns for safety. However, the fieldwork shows that what is at stake is more complex than a simple dichotomy of profits vs. safety. While this dichotomy can explain the behavior of managers who are motivated by incentives to optimize production, it fails to account for why lower ranking employees display similar attitudes and behavior towards food safety and reporting procedures. As it turned out the reluctance towards reporting minor risk and especially risk caused by human factors is motivated by a complex combination of different factors with knowledge, responsibility, conflict of loyalty and trust as the four most decisive factors. These factors are all imbedded in the organizational power structures, lines of command, and communication channels that constitute the institutional context of risk reporting. And they all contribute to an institutional attenuation of risk which is facilitated by a risk reporting procedure which to some extent is made up by fantasy documents, i.e. symbolic reassurances to outside audiences that risks are under control (even when they are not) (Clarke 1999). The overall implication of the study is that when the risk expert or rather risk expertise is studied in its institutional setting, as a part of a network dependent on efficient communication channels for corrective feedback, the rationality of risk expertise becomes a questionable fact.

What should we expect from dialogue when trying to bridge the expert-lay divide?

The two empirical studies of the thesis deal with risks from each side of the expert-lay divide. Since the identification of this divide in the early risk perception studies many studies have pointed to how lay people are less irrational than first assumed. Other studies have problematized ’the alleged simple structure of experts’ risk perception’. These studies point to

how experts tend to be rational only within the very narrow domain of their own expertise. When they evaluate risk outside this domain they tend to behave like lay people (Sjöberg 2002b). As such the initial assumptions behind the expert-lay divide have become more nuanced over the past decades. The ambition behind the empirical studies of this thesis has been to contribute to this refinement. But the improved theoretical understanding of the expert-lay divide does not eliminate the practical challenges associated with it: Whenever a new risk is introduced to the public agenda regulators will find themselves situated between technological risk experts who know more about this specific risk and lay people who know less.

From deficit to dialogue

Introducing risk communication to bridge the gap between differences in risk perceptions and to create a common understanding of the problem seems to be a reasonable solution. After all, the Latin origin of the word communication, *communicare*, means to make something common. In recent years risk communication has taken the form of two-way communication where citizens are to be engaged through a public dialogue (Löfstedt and Boholm 2009). This development towards involvement has to a large extent been motivated by the scarcity of results stemming from one-way risk communication. Educating people about risks has been met with an unwillingness to be educated and similar to other professional communicators like PR professionals, risk communicators have been forced to reconsider the appropriateness of one-way communication when a common understanding is to emerge from highly complex and possibly politicized matters. But even though the mutuality of dialogue intuitively may sound appealing, the dialogical attempts of citizen engagement have not been a straightforward exercise. Several empirical studies of political engagement in general and engagement in science and risk in particular point to the lack of political results from these exercises (Rowe and Frewer 2000; Petts 2004; Seifert 2006).

Two opposing models of dialogue

The fifth paper entitled 'Risk Communication and Citizen Engagement: What to Expect from Dialogue' concludes the thesis by looking into the difficulties of engaging citizens in public dialogue. The paper draws on one of the internationally renowned methods for citizen engagement, the Danish consensus conference, as an empirical case in point and highlights the dimension of communication symmetry between the participants of this institutionalized encounter between experts and lay people. The paper points to how the consensus conference

is successful in eliminating the geographical dimension of the institutional distance between experts and lay people but less successful in eliminating the normative factors pertinent to the scientific vis-à-vis political worldviews and expectations towards the dialogical outcome of this encounter.

The paper traces the root of the problem back to a clash between two opposing conceptions of dialogue in Ancient Greece, namely "Plato's Socratic interrogations in pursuit of self-knowledge and virtue, and the Athenian deliberations for collective governance" (Linder 2001). Whereas the former conception of dialogue claims the existence of a truth which is to be discovered by dialogue, the latter conception is less concerned with truth claims and sees dialogue as a vehicle for creating commitment between the participants. Although ideals about public reasoning in the era of enlightenment have blurred the distinction between these two opposing models of dialogue (Arendt 1961), the scientific vis-à-vis political discourses constitute their modern counterparts in a functionally differentiated society.

When risks become politicized the ancient clash between the two opposing models reappear and deliberate techniques such as the consensus conference, despite its attempts to blur the presence of a knowledge deficit, cannot disregard that while the Athenean model presumes communication symmetry the Socratic model favors communication asymmetry. In this sense the consensus conference operates through a dialogue that presumes both equality and inequality among participants. The paper argues that while the inequality constitutes a threat to the deliberative aspirations of the consensus conference, the equality among participants constitutes a threat to the authority of science.

Dialogue as hypocrisy

It may however be argued that there are practical solution to these threats. But the fundamental problem that causes these threats leads to yet another problem, namely that the knowledge transfer that enables participants to enter the deliberative dialogue at an adequate level simultaneously deprives the participants of the quality that made them relevant to the deliberative project in the first place: namely their representativeness. Once enlightened through the asymmetrical knowledge transfer from the experts the lay panelists no longer represent the public in general. As a consequence their political relevance disappears and this may be one of the reasons why deliberative projects of this kind hardly ever have any external political efficacy.

Nevertheless, dialogical approaches to risk communication are in vogue. Apart from the poor results from one-way communication a possible explanation for this tendency could be the

fact that public dialogue is a normative ideal for political governance. But exactly because "participation is self-evidently a good thing in its own right, without the need for justification" (Stirling 2005) participatory processes of public dialogue are vulnerable to strategies of hypocrisy. A particularly relevant recipe for hypocrisy is offered by Brunsson (2003, 2009) who explains how organizations in ambiguous situations characterized by conflicting stakeholder demands are likely to split up the natural chain of decision making where communication informs decision making which eventually leads to action. By dislocating the element of communication public dialogue can serve as a surrogate for influence on decision and action. This strategy does not solve the problem but it offers some relief since members of a skeptical public at least have the opportunity to voice their concerns.

Concluding remarks

The expert-lay controversy is a focal point of interest throughout the thesis. The emphasis on institutional distances is first and foremost chosen as an analytical strategy in the empirical studies. Hence, it is not the ambition to present a new theoretical framework for social science studies of risk. Rather, the focus on institutional distances offers a different analytical perspective on risk that hopefully can yield new insights. Maybe future studies adopting this analytical strategy can provide the basis for a more elaborate theory, while the papers included in this thesis only offers small and preliminary steps.

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The constitutive element of probabilistic agency in risk. A semantic analysis of risk, danger, chance and hazard

(Under review in Journal of Risk Research)

Abstract: Defining central concepts with accuracy is crucial to any scientific discipline. A recent debate over risk definitions in this journal illustrates the far reaching consequences of divergent definitions. Aven and Renn (2010) define risk as a social construct while Rosa (2010) defines risk as an ontological fact. Both claim that their definition reflects the common usage of the word risk. Through a semantic analysis this paper points to a constitutive element of what is termed *probabilistic agency* in the risk concept. In this respect risk is distinct from danger, and because Rosa's main argument is based on the apparent synonymy between risk and danger, the premises for his risk ontology are not valid. The paper furthermore argues that Aven and Renn's attempt to bridge between epistemology and ontology is based on a distinction between a conceptual level of risk and its practical application which is impossible to uphold if a risk definition is to be in accordance with the ordinary usage of the word. The paper concludes by arguing that risks are only real within a subjective ontology.

Key words: Risk definition; risk perception; uncertainty; probability; ontology; epistemology

Introduction

A debate between Aven and Renn (2010) and Rosa (2010) in a recent issue of *Journal of Risk Research* illustrates how difficult it is to define risk. The debate was initiated by a paper by Aven and Renn (2009) that analyzes the risk definition proposed by Rosa (1998; 2003). This definition is broadly accepted in the social sciences of risk and describes risk as "a situation or event where something of human value (including humans themselves) is at stake and where the *outcome* is uncertain".

According to Aven and Renn (2009) this definition leads to conceptual difficulties that are incompatible with the everyday use of risk in most applications when compared to standard terminology used in risk research and risk management. The problem is, according to Aven and Renn, that in Rosa's definition the risk equals the event or the situation in which the event occurs as a state of the world. It follows from this definition that risks must be real, since

events are real. But according to this definition the dimension of uncertainty or likelihood is only associated with risk, but it does not constitute a part of the risk concept itself. Therefore risk as an ontological entity in Rosa's definition is deprived the dimension of uncertainty and thus becomes impossible to measure. Because of this, Aven and Renn argues, the risk definition offered by Rosa is of little help to risk experts that need to compare and quantify risks. Instead Aven and Renn propose a definition that is more compatible with the practice of risk research and management: "Risk refers to uncertainty about and severity of the events and consequences (or outcomes) of an activity with respect to something that humans value" (Aven and Renn 2009). This definition includes the dimension of uncertainty as a quality that relates to both the event and its consequences.

Both parties in the debate agree that uncertainty is a better term than probability when describing risk on a conceptual level. In this respect uncertainty is regarded as a more fundamental concept, while probability is just a practical tool for measuring or describing the amount of uncertainty. In Rosa's definition the dimension of uncertainty does not violate the ontological status of risk, since this dimension does not constitute a part of the risk concept. But Aven and Renn's definition includes uncertainty and therefore incorporates a subjective element. As Aven and Renn (2010) argue, "uncertainty must be someone's uncertainty" and therefore the risk concept cannot be founded on ontological grounds alone; it has to include an epistemological dimension as well. According to Aven and Renn the concept of risk entails two components: the event and its consequences which are real, and an element of uncertainty which "is a construct of human imagination to cope with potential future outcomes that can become real" (Aven and Renn 2009). Therefore their risk definition constitutes "a bridge between an ontological state (…) and an epistemic component reflecting that we do not know the outcome of the future…" (Aven and Renn 2010).

According to Rosa (2010) this "fusing of ontology and epistemology results in a fatal flaw of logic" and the inclusion of words like consequences and severity in Aven and Renn's risk definition smuggles in a subjective and constructivist element which violates the ontological status of risk.

Rosa claims that one of the strengths of his definition is that it is not only in accordance with the professional and scientific conceptions of risk, it also matches the common use of the word by lay people (Rosa 1998; 2003; 2010). Aven and Renn (2009), on the other hand, claim that Rosa's definition is incompatible with the everyday usage of the risk concept, although it

remains unclear whether they refer to how it is used by experts, by lay people or by both – an ambiguity that Rosa (2010) correctly points to. Both parties argue that contrary to the general focus in risk research their definitions have the advantage of including voluntary risks.

The debate reveals (at least) two major points of conflict. One is meta-theoretical and has to do with the ontological status of risk and uncertainty. Rosa (2010) understands both concepts as features of the world independent of percipient human observers whereas Aven and Renn (2009: 2010) see them as inseparable of human perception. Given the meta-theoretical nature of the conflict no empirical evidence can prove either position right or wrong. The other conflict, however, is empirical insofar that it is about to which degree the two risk definitions match the common use of the word risk, whether by experts or by lay people.

The two points of conflict are somewhat interrelated. The ontological status of risk and its semantic value are not completely distinct problems. The meanings we ascribe to concepts are crucial to our understanding of their true nature. Therefore, a solution to the empirical problem of what risk really means could be an important contribution to the general debate over the ontological status of risk.

The purpose of this paper is to examine the meaning of the word risk in order to improve the foundation for the debate over its ontological status. This examination is carried out in a semantic analysis of the words risk, danger, chance and hazard with a special emphasis on the relationship between risk and danger. This analytical strategy is chosen because Rosa (2003; 2010) disputes the distinction between risk and danger suggested by other scholars (e.g. Slovic 1992; 1999; Luhmann 1993). The distinction between risk and danger is common within risk perceptions studies where dangers are seen as ontological realities whereas risks are epistemological constructs (e.g. Slovic 1999). By consulting dictionaries Rosa (2003) finds no basis for such a distinction in the ordinary usage of the two words, in fact they are apparently more or less synonymous.

The synonymy between risk and danger is a cornerstone in Rosa's argumentation for the ontological status of risk. But compared to the intellectual strength and vigor that Rosa demonstrates in most parts of his meta-theoretical framework it seems strange that a fundamental dispute over the core terminology of a scientific discipline should be solved with a reference to dictionary definitions. Because of the space constraints of standard print dictionaries their definitions rarely account for the more subtle semantic nuances of words (Hamilton et al. 2007) and a major deficiency of the lexicographical method is the frequent

circularity of definitions (Fernandez-Young and Young 2007). Furthermore according to Fillmore and Atkins (1994), "[a] close study of the sense differentiation of RISK in ten major monolingual dictionaries shows that there is no commonly held view about the semantics of this word".

Therefore a more thorough semantic analysis is called for to shed light on the actual meaning of risk and danger. In the debate with Aven and Renn Rosa illustrates his key points with some figures that depict a scenario in which a couple is placed under a boulder that may or may not dislodge from a ledge and hit the couple. The semantic analysis of risk, danger, chance and hazard in the present paper is based on different sentences that describe this scenario.

The arguments of the paper fall in five stages. The first section addresses the controversy over risk definitions and highlights the distinction between realist and constructivist definitions. The second section discusses the relationship between risk and danger and proposes that Rosa's best argument in favor of treating them as synonymous concepts is his reference to the ordinary usage of the words. The third section performs a comparative semantic analysis of risk, danger, chance and hazard. The results of this analysis reveal that risk and danger are far from synonymous and that the risk concept contains a significant element of agency which is absent in the concept of danger. The forth section discusses the implications of these results for Rosa's risk ontology and argue that a risk definition should be based on probability rather that uncertainty. The fifth section concludes the paper by arguing that risks are real but only within a subjective ontology.

Risk Definitions and Risk Research

Aven and Renn (2009) as well as Rosa (2010) point to how multiple definitions of risk have been proposed over the past four decades of risk research. Nevertheless most definitions share some common features. According to Renn (1998), "[a]ll risk concepts have one element in common, however: the distinction between reality and possibility". When this distinction is accepted, "the term 'risk' is often associated with the possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities (Renn 1998). In this respect Renn's observations are much in line with Drottz-Sjöberg (1991, 168)

who refers to Svenson and Karlsson's (1983) conclusion that "[t]wo components are always, however, included in risk definitions. Firstly there must be a *probabililty* (likelihood or possibility) at hand for an event which secondly has *negative consequences*."

Despite the similarities, there are however differences between the many risk definitions. The fundamental distinction between risk definitions is whether risk is considered as objectively given or it is a social construction (Otway and Thomas 1982). This is the same conflict that Rosa (1998; 2003) points to in his meta-theoretical considerations: Is risk an ontological entity of the world independent of human perception or is risk produced by epistemological attempts to cope with the world?

Although Rosa emphasizes that his risk definition is based upon an intellectual tradition that seeks to avoid the pitfalls of what he refers to as the practical and managerial tradition, the impact on practice of such meta-theoretical considerations should not be disregarded. As Slovic states: "Attempt to manage risk has to confront the question: 'What is risk?'" (Slovic 1999). This is because how risk is defined (more or less explicitly) has a significant influence on how risks are studied by researchers and subsequently managed by decision makers.

The field of risk research has since its conception in the early seventies been heavily influenced by the psychometric paradigm (Slovic 2000, for a critical perspective see Sjöberg 1996; 2003). The early psychometric studies assumed that risks were real (Kermisch and Labeau 2010) and the differences in expert and lay perceptions of risk could easily be ascribed to a 'cognitive deficit' among lay people. But later in the development of the psychometric paradigm Slovic (1999) as one of its founders redefined risk as a social construction and rejected the dichotomy between objective analysis of real risks and subjective risk perceptions (Slovic 1998).

Slovic and his colleagues within the psychometric paradigm, however, do not reject the notion of a cognitive deficit. Early writings within the paradigm propose that for lay people risk assessment in term of probability estimates "may be beyond human cognitive abilities" (Slovic et al. 1974). And although later research points to how lay people's "conceptualization of risk is much richer than that of the experts" (Slovic 1986) their risk perceptions are based on intuitive risk judgments as opposed to how "the technologically sophisticated analysts employ risk assessment" (Slovic 1987). The cognitive deficit remains, resulting in politized risks "when ancient instincts and our modern scientific analysis clash" (Slovic et al. 2004).

It is well documented that lay people express different attitudes to risks than experts do. The massive amount of empirical research, especially within the psychometric paradigm, speaks for itself. But when Slovic rejects the notion of a risk ontology the conclusion that experts have a better understanding of risks than lay people becomes problematical. This would require that risks are objectively defined. What Slovic and the psychometric paradigm seem to argue is that risks are not real but nevertheless that lay perceptions of risk are biased by cognitive inabilities. The lack of internal coherence between these propositions points to how the abandonment of a risk ontology has weakened the meta-theoretical foundation for the psychometric paradigm.

However, to most researchers within the psychometric paradigm this inconsistency is not an important problem. The research produced by the psychometric paradigm is an attractive input for decisions makers and the strength of the paradigm is perhaps to be found in its appeal to practice rather than in its theoretical robustness (Sjöberg 2003). But to Rosa and the intellectual tradition in risk research the ontological inconsistency is a fundamental problem that has to be resolved. In arguing for the ontological status of risk Rosa seeks to restore the meta-theoretical foundation for most risk research, and it is in light of this enterprise that Rosa rejects the fusion between epistemology and ontology in Aven and Renn's definition. It may be that the theoretical foundation is more elaborate but Aven and Renn's definition reflects the same logical problem as in the psychometric paradigm: Risks are both objective and subjective, or with Rosa's words "both fish and fowl" (Rosa 2010).

Risk vs. Danger

To Slovic a solution to the ontological inconsistency within the psychometric paradigm is found in a separation between risk and danger: "Risk does not exist 'out there', independent of our minds and cultures, waiting to be measured" (Slovic 1998). According to Slovic (1999) "dangers are real, [but] there is no such thing as a 'real risk' or 'objective risk'". Risk is seen as a social construction insofar that "human beings have invented the concept *risk* to help them understand and cope with dangers and uncertainties of life" (Slovic 1999, italics in original). Apparently both danger and uncertainty are ontological entities, but Slovic is rather unclear about this. In fact the distinction between these concepts seems not to be motivated by any elaborate analysis.

A more elaborated understanding of the relationship between risk and danger is to be found in a treatise about risk by the German sociologist Niklas Luhmann (Luhmann 1993). The distinction between risk and danger is a cornerstone in Luhmann's analytical sociology of risk. In linking the actual (which is present) to the potential (which resides in the future) Luhmann operates through an epistemological[1] separation of risk and danger to explain how risks are linked to decisions that attempt to control and exploit the potentiality of the future. But as it is impossible to gain total control over the future through risk decisions, danger constitutes a residual effect which is beyond human control. Danger is then attributed to external factors as opposed to the risk which is attributed to the decision. According to Luhmann risk involves agency (control by decision making) whereas danger is something we tolerate as passive objects because it is beyond our control.

When risks become a social problem it is because those affected by risk decisions are separated from the decision makers in what Luhmann refers to as a 'functionally differentiated society' (Luhmann 1995). What is risk to the decision maker is at the same time danger to those affected. In this sense it is not the risk as such that causes social problems (manifested in protest movements and demands for risk mitigation) but rather the distribution of dangers that affect those not involved in the risk decision. But according to Luhmann even the decision maker will be confronted with danger once the decision has been made and he faces the threat from an adverse outcome. As such the separation between risk and danger does not pertain to different individuals but rather to different points of view.

In his meta-theoretical considerations Rosa (2003) addresses the way Luhmann's systems theory separates risk from danger. According to Rosa the distinction made by Luhmann fails to take into consideration the ordinary language usage, and can only be justified as an instrument that serves to point out the problems of social inequalities. I shall deal with the first point of criticism in the following section. The second point, I will argue, does little justice to Luhmann's analytical position. Surely many sociological attempts to approach risk rest upon value-laden assumptions about social inequalities and societal fairness (e.g. Beck 1992; 1994; Giddens 1994; 1999), but Luhmann has explicitly refuted those sociological positions (Luhmann 1993: 5) and he is well aware of the pitfalls of a critical sociology – as well as of a positivist one (Luhmann 1994). In fact, the systems theory proposed by Luhmann rejects the metaphysical assumptions about social fairness that is predominant in the critical

tradition of sociology. Therefore it is hard to understand how Rosa comes to the conclusion that Luhmann's distinction is motivated by problems of social inequalities.

In his debate with Aven and Renn Rosa (2010) once again argues against a distinction between risk and danger. And again the apparent synonymy between the words plays a critical role in his argumentation. According to Rosa the distinction poses three problems: 1) it would result in a semantic discontinuity as risk in many situations should be re-labeled as danger (e.g. perception of danger), 2) it would send us into a definitional circularity (risk is defined as danger and vice versa), and 3) it would imply a rejection of the analytic separation of ontology and epistemology.

The first problem about semantic discontinuity is not really a problem. The semantic continuity of the core terminology in risk research is based upon tradition and not logical consistency. A central concept such as 'risk perception' is an illustrative example of this. Within the risk perception studies most scholars claim that risk is a construction produced by subjects. As Sjöberg (2000) points out, this subjective position renders the term risk perception rather absurd. Perception is the immediate sensorial information processing based on impressions from an external world. It follows from this that if risk is a subjective construct (i.e. produced by human cognition) it cannot be perceived. But for pragmatic reasons we have to accept the term as it "seems to be here to stay, in spite of its basically confusing meaning" (Sjöberg 2000). In other words: We can for practical reasons decide to sustain the core terminology despite of its logical inconsistency.

It is difficult to understand how Rosa arrives at the third problem about how a separation of risk and danger necessary leads to a rejection of the analytic separation of ontology and epistemology. Aven and Renn (2009) argue that a separation is necessary because risk is constructed (i.e. an epistemological concept) whereas danger is real (as an ontological fact). Their separation of risk and danger is based on (and would be absolutely pointless without) an analytical separation of ontology and epistemology.

So it seems that the most robust argument Rosa has against a distinction between risk and danger is to be found in the second problem: That risk and danger are synonymous. Therefore a separation of risk and danger would violate the common usage of the two words. Rosa refers to how dictionaries such as the *Oxford English* and *Random House* define risk and danger in

terms of each other. This is true, but it is equally true that dictionaries rarely capture the entire semantic value of a word. Therefore the following section seeks to reveal the different meanings of risk and danger through a more thorough semantic analysis. In continuation of the link between risk and decision proposed by Luhmann the analysis will emphasize the aspects of control and agency.

A semantic Analysis of Risk, Danger, Chance and Hazard

The following section analyzes the semantic value of risk, danger, chance and hazard in six different sentences that describe a scenario in which a couple is placed under a boulder that may or may not dislodge from a ledge and hit the couple.

The words risk, danger, chance and hazard have been chosen because to various degrees they are all suitable for describing scenarios where the outcome is uncertain. The words risk, danger, and hazard are familiar terms in risk research while chance tends to be an outsider. The inclusion of chance in the analysis is motivated by its capacity to account for the uncertainty of an outcome in neutral terms. The respective definitions of the words may differ in scientific and technical vocabularies, but this analysis is based on the contemporary acceptable usage of the English language. The semantic distinctions may be different in other languages and historical epochs. Sentences that are grammatically or semantically unacceptable are marked with an asterisk (*) while sentences that are rare or unusual are marked with a question mark (?).

Example 1: The couple placed under the boulder is exposed to (a) risk

This sentence refers to risk as something we can be exposed to as passive targets and the two words risk and danger are virtually but not completely synonymous. By using the phrase ‘exposed to’ the sentence contains a semantic cue indicating that the subject (i.e. the couple) has no control over the situation. Because of this risk and danger can be used interchangeably. Both sentences make sense and there is no change in the meaning of them.

The couple can be ‘exposed to risk’ or ‘exposed to danger’ as a more general condition without a specific object. In this case the two sentences refer more broadly to the situation as a coincidental configuration between the subject and the object[2]. The situation is marked by

uncertainty and this uncertainty is framed explicitly as a negative condition. But the couple can also be ‘exposed to a risk’ or ‘exposed to a danger’ where the object is defined and in this case it is plausible to infer that the exposure stems from the specific object rather than from the situation.

In the first case the same coincidental configuration is present in the sentence ‘exposed to chance’. Again the situation is marked by uncertainty, but the uncertainty is framed in more neutral terms. The problem seems to be not so much the potentially negative outcome from the object, but rather the uncertainty of the situation: They cannot know what will happen. This becomes even more evident if we should propose a sentence like ‘exposed to a chance’, referring to chance as a more specific object. This sentence is not very common and it seems that when we use the word chance, we have a preference for referring to the uncertainty of a situation rather than to the threat from a specific object.

The threat from an object is present in the sentences ‘exposed to a risk’ and ‘exposed to a danger’ and likewise in the sentence ‘exposed to a hazard’. But where both risk and danger are applicable when referring to the situation as well as when referring to the object, hazard is usually only applicable as a characteristic of the object. We rarely find sentences such as ‘exposed to hazard’.

To sum up: The subject in this sentence is a passive target of exposure and has no agency. Agency is more or less explicitly ascribed to the object (exposed to a risk vs. exposed to risk). In this case risk and danger are completely synonymous. Whilst chance refers to the uncertainty of the situation and hazard to the threat from a given object, both risk and danger are perfectly applicable for both purposes.

Example 2: There is a risk that the boulder will hit the couple

In this sentence the couple is yet again a passive target, but the agency is explicitly defined as a quality of the object. The risk refers to a general condition under which the boulder might hit the couple. Unlike example 1 the coincidental configuration (the risk) and the object (the risk source or hazard) is clearly separated. The risk as a general condition or situation involves no agency, but the potentiality of the situation points to the possibility that the object may or may not act. Because of this the semantic value of the words risk, danger, chance and hazard changes slightly. All sentences make sense, but in the common use of language there is

a preference for using the word risk rather than danger or hazard in a sentence like this. If we were to replace the word risk, chance would in this case be a better substitute than danger or hazard; despite its lack of negative connotations. An explanation for this, as well as for the preference for risk over danger, could be the element of uncertainty which has a stronger semantic presence in risk and chance than in danger and hazard.[3]

Example 3: The couple takes a risk by placing themselves under the boulder

In this sentence the couple is no longer a passive target. They assume agency as they actively take a risk. They can take a risk or take a chance, and the preference for one over the other depends on the negative vis-à-vis neutral or positive framing of the situation. But they cannot take a danger or take a hazard. In this sentence the presence of agency associated with the subject excludes danger and hazard as valid substitutes for risk. This indicates that risk is semantically distinct from danger when agency is ascribed to the subject as the deliberate act of creating a coincidental configuration between the subject and the object. Example 1 and 2 point to risk and chance as concepts which are more strongly related to uncertainty than danger and hazard are. This indicates that the deliberative act of creating the coincidental configuration between the subject and the object involves the mastery of or control over uncertainty. Contrary to example 1 the couple is to some degree in control of the situation, and as it is the situation (and not the object) which is marked by uncertainty, the control involves some mastery of uncertainty.

Example 4: The couple placed under the boulder is in a risky situation

So far we have analyzed risk, danger, chance and hazard as nouns. If we look at the words as adjectives it becomes evident that the element of uncertainty is clearly related to the situation and not the object (i.e. the boulder as a risk source or hazard). In this example all sentences make sense although the meaning might differ slightly. For instance the word chancy (and in this specific case also hazardous which would be more appropriate – see note 4) indicates that uncertainty is the main issue whereas the word dangerous more specifically points to the negative characteristics of the potential outcome or consequences. Whether we have a preference for risk or danger is contingent upon factors related to the specific situation (see example 5). In the present example we have a preference for using danger as an adequate

description of the situation. This is because there is a preference for describing the object (or the threat), which is a constitutional part of the situation, as dangerous and not risky.

*Example 5: *The boulder is risky*

The boulder in this sentence is neither risky, nor chancy nor hazardous. The boulder is dangerous, and this quality of the object is independent of any attempt to control the situation. But the boulder is not dangerous because of its position as the object (the risk source or hazard). Other objects such as advanced financial products are risky and not dangerous. Nanotechnology is usually described as risky rather than dangerous. Likewise the situations that surround these objects (financial markets and nanoscience) are rarely described as dangerous. They are risky. Similar to the analysis of risk, danger, chance and hazard as nouns, what seems to be the main characteristic that distinguishes risk from danger is the coexistence of agency and uncertainty, unified in act of controlling uncertainty.

Example 6: The couple risk getting hit by the boulder

This act of controlling uncertainty is very obvious when we turn to look at risk, danger, chance and hazard as verbs. In some occasions it is possible to use hazard and chance as verbs which describe the act of putting something at stake. The idiomatic expression 'to hazard one's life' is an example of this, and while the sentence 'The couple hazard getting hit by the boulder' sounds odd a sentence like 'The couple hazard their lives by staying under the boulder' would be common. However, generally there is a strong preference for using the word risk. And what is mostly important, it is absolutely impossible to use the word danger as a verb. Therefore the most common sentence in this example would be: The couple risk getting hit by the boulder. Again the coexistence of agency and uncertainty can account for this.

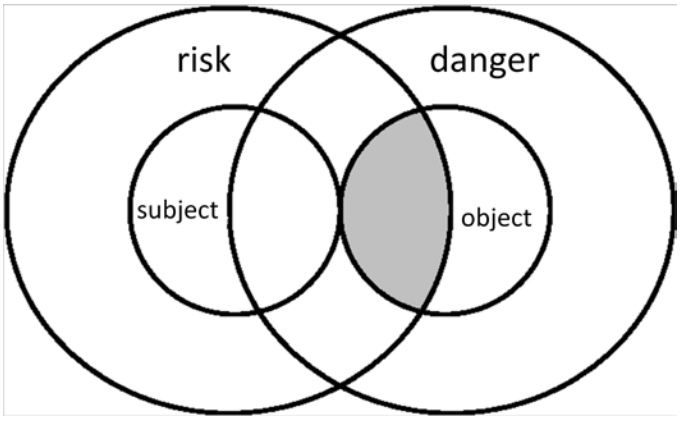
Risk vs. danger as a noun	**Risk vs. danger as an adjective**	**Risk vs. danger as a verb**
Example 1: The couple placed under the boulder is exposed to (a) risk The couple placed under the boulder is exposed to (a) danger (?)The couple placed under the boulder is exposed to (a) chance ?The couple placed under the boulder is exposed to (a) hazard Example 2: There is a risk that the boulder will hit the couple There is a danger that the boulder will hit the couple There is a chance that the boulder will hit the couple There is a hazard that the boulder will hit the couple Example 3: The couple takes a risk by placing themselves under the boulder *The couple takes a danger by placing themselves under the boulder The couple takes a chance by placing themselves under the boulder *The couple takes a hazard by placing themselves under the boulder	Example 4: The couple placed under the boulder is in a risky situation The couple placed under the boulder is in a dangerous situation ?The couple placed under the boulder is in a chancy situation The couple placed under the boulder is in a hazardous situation Example 5: *The boulder is risky The boulder is dangerous *The boulder is chancy *The boulder is hazardous	Example 6: The couple risk getting hit by the boulder *The couple danger getting hit by the boulder ?The couple chance getting hit by the boulder ?The couple hazard getting hit by the boulder

Table 1. Semantic variations of risk, danger, chance and hazard.

This is of course not a complete analysis of all the variances of the words risk, danger, chance and hazard. For instance it could be argued that it is possible to use the word danger as a verb in the form of 'endanger'. This is true but it would not alter the semantic elements of control and agency associated with risk and danger. To endanger other people may involve a risk

decision (and hence control), but the affected party has no control over the situation. The word endanger therefore refers to the point of view of the affected party. If a bus driver decides to ignore a red light, he takes a risk but the passengers are endangered if an accident is close to occur or has occurred as a result of this decision. Likewise it would be possible to construct sentences such as 'I exposed myself to a risk' or 'he exposes himself to a danger' which indicate that exposure is not necessarily correlated with lack of control. But in such phrases there is usually an element of dissociation or condemnation which indicate that the person in question were not aware of the possible consequences. This dissociation can either be temporal as in the first phrase or due to the external position of a more knowledgeable observer as in the second phrase.

The main point is that a semantic analysis reveals that although there is a large semantic overlap between risk and danger, the former is more closely related to the subject and the attempts to control the uncertainty of a situation whereas the latter is more related to the object and the severity of its potential impact. In this respect the analysis provides some empirical motivation for Luhmann's distinction between risk as a concept closely associated with control and decision making and danger as a concept associated with tolerance of consequences. The semantic differences and overlaps are illustrated in model 1.



Model 1. The semantics of risk and danger.

The semantic analysis shows that the distinction between risk and danger in most risk perception research is in accordance with the semantic value of the two words. Risk and danger are, despite some semantic overlap, semantically distinct concepts. But as the model

shows it is possible, like Rosa does, to argue that risk and danger are synonyms. But in doing so one would have to disregard the full semantic value of the two words. This is illustrated in the grey toned part of the model which accounts for the semantic spectrum where risk and danger can be used interchangeably without altering the semantics.

Discussion

The previous analysis has shown that the apparent synonymy between risk and danger that Rosa (2003) found in dictionaries can only account for a very narrow understanding of the words.[4] Risk and danger are only synonymous when subjects are passive targets of risk exposure. In those cases where subjects actively engage in risk taking the common usage of risk and danger turns out have quite different meanings.

But this does not necessarily disqualify Rosa's risk definition; we can accept Rosa's definition as well as the argument in favor of a risk ontology, although it is based on a very narrow understanding of risk and danger. But Rosa furthermore argues that his risk definition can account for voluntary risks as well as for those that are involuntarily imposed on humans (or what they value).

It is Rosa's ambition that his risk definition should cover voluntary risks and Rosa is not the only scholar to point to the striking negligence of voluntary risks in risk research. Adams (1995: 16) advocates that "the starting point of any theory of risk must be that everyone willingly takes risks". But as he concludes, this is far from the starting point of most of the literature on risk. In fact, most risk researchers ignore the role of risk taking. Agency in the technical literature on risk is clearly associated with the risk source and humans are defined as objects of exposure (see Christensen et al. 2003 for an overview of the technical risk terminology). Likewise in the social sciences where "the problem of risk seeking behavior…is exceptional, and requires a very different discussion. Normally risks are disliked" (Sjöberg 1999).

Compared to the total semantic value of the risk concept most risk perception studies are founded on a very narrow understanding of risk. In fact, all elements of subjective agency are absent. In this respect Rosa's risk definition corresponds to the general practice in risk perception research, which is probably why his definition has become so popular. So despite its intentions Rosa's risk definition can only account for involuntary risks, ie. the type of risks

that subjects are passively exposed to. If voluntary risks (i.e. the acts of risk taking) are to be included in Rosa's definition a more broad understanding risk is required and in this case risk and danger are not synonymous. But then the argumentation in favor of a risk ontology falls apart; not just because risk and danger can no longer be considered as synonymous, but most importantly because a subjective dimension has entered into the risk concept. The problem with Rosa's argumentation is that on the one hand he states that risk and danger are the same, and on the other that his risk definition includes voluntary risks (which implies that risk and danger are not the same, if his definition is to be in accordance with the everyday usage of the word).

So Aven and Renn do have a point when they insist that the concept of risk has a subjective dimension. But a question remains to be answered: is there an objective dimension as well? And if so: how are these dimensions integrated in the concept of risk? Aven and Renn propose that the risk concept is defined by two components: the event and its consequences which exist objectively, and uncertainty which exist inter-subjectively in the sense that future events and consequences are unknown.

But if we return to the fundamental distinction between possibility and reality in risk definitions (Renn 1998), it becomes evident that the only events that meaningfully can be categorized within an ontological state of the world are those that have happened or actualized a possible state of being. The events and consequences that meaningfully can be included in a risk definition, however, are those that have not yet occurred, i.e. the "potential future outcomes that can become real" (Aven and Renn 2009). And since the mere possibility of being (as the not yet actualization of an event) does not qualify for inclusion into a state of the world, the events and consequences in the risk concept cannot be regarded as ontological facts. The prevailing realist perspective that sustain a clear distinction between reality and possibility may be challenged by quantum physics where possibilities are assumed to be real and hence on the same ontological levels as their actualization, and in philosophy we find similar thoughts, recently in model realism theories of possible worlds. But since these theories neglect the distinction between reality (as actualization) and possibility, they are incompatible with the general conception of risk.

Both Rosa and Aven/Renn make a clear distinction between risk as a concept and its practical application. On the conceptual level both parties prefer uncertainty rather than probability as a component in their risk definition because the former is considered to be a more fundamental

concept. But uncertainty, whether it is conceived to be objective (Rosa 2010) or inter-subjective (Aven and Renn 2009), is a condition which does not necessarily involve any agency; there are innumerous uncertainties we for many reasons chose to ignore. Subjective probability on the other hand is a more distinct concept which is characterized by its ability to transform uncertainty into something manageable. And as we have seen in the analysis, the element of subjective agency associated with controlling uncertainty accounts for the majority of the semantic value of the risk concept.

That agency is a constitutive element in the risk concept is confirmed by empirical results from corpus linguistics (Hamilton, Adolphs and Nerlick 2007). They confirm that together with bad outcomes, such as loss of a valuable asset, the semantic core of the word risk emphasizes *actions* and *agents*. Furthermore data suggests that risk "represents something computable, the computation involving the negative value of the Harm, the positive value of the intended Gain, and the probabilities associated with each" (Fillmore and Atkins 1992). It seems that probability as a measurement of uncertainty is not confined to technical risk assessment; probability is semantically affiliated with the risk concept in the everyday usage of language. This semantic connection between risk and probability weakens the argument of Aven and Renn (2009) that a risk definition should include uncertainty and not probability – at least if it is to be in accordance with the everyday usage of language.

Aven and Renn acknowledge that probability is a useful tool for measuring risks, but to them the practice of measurement should be separated from the conceptual level of risk. Their main argument is that probability cannot account for all uncertainties. As Aven (2010) argue, important uncertainties may be hidden within probabilities. But this understanding of probability fails to acknowledge the element of agency. As de Finetti (1970) argues probability is an indispensable instrument for reasoning and *behaving* under uncertainty, hence probability not only measures uncertainty; it transforms uncertainty.

This act of transformation can be termed *probabilistic agency*. It is an act that enables us to make decisions as if there were no uncertainty. While uncertainty generally is defined as lack of information (Klir 2006), probability calculations provide the missing information and thus enable us to make rational decisions. Luhmann (1995) points to this important feature about both risk and probabilistic calculation when he observes that "[b]oth concepts appear to be able to guarantee that even when things go wrong, one can have acted correctly".

While it is obvious that probability is different from confirmed knowledge (or truth), the point being made is that the transformation of uncertainty into probability enables us to deal with uncertainty as if we had knowledge. For the point being made it is of no concern that the actual probability calculations being made may be biased by various heuristics (see e.g. Kahneman and Tversky 1972; Tversky and Kahneman 1974; Kahneman, Slovic and Tversky 1982). The point is that uncertainty as non-information is transformed into probability which serves as information. Since the 1960'ies the unique connection between probability and uncertainty has been challenged by theories such fuzzy logic, evidence theory and possibility theory (Klir and Wierman 1999), but this challenge does not affect this basic function of transforming non-information into information.

The presence of probabilistic agency identified in the semantic analysis of the risk concept refers to this act of transforming non-information into information which is more than just a practice of measuring uncertainty. Because of this transformation probability can serve as "our guide of life" (Good 1959) while uncertainty cannot. And since the element of probabilistic agency is semantically present in the risk concept it is impossible to distinguish between the conceptual level of risk and its application in risk assessment. The concept of risk cannot be separated from its application – at least if it is to be in accordance with the ordinary usage of the word. In this respect we should not consider risk to be, what Searle (1995) terms a brute fact but rather an institutional fact which is defined by its social function.

Concluding Remarks: A last comment on the ontology of risk

Both Aven/Renn and Rosa treat the event in their risk definitions as if it was an actual and not just potential event. In this respect it is important to make a clear distinction between the threat from an object and the event that occurs if and when that threat is transformed into an event. The threat is not an objective given in the same sense as the event since it cannot be evaluated without any reference to a subject which is threatened. A threat is what Searle terms a performative (Searle 1969) and as such its very existence is dependent upon its perlocutionary effect. In other words: the target of a threat must recognize that threat if it is to be considered a threat. As Aven and Renn (2010) explain this recognition can occur by proxy by a more knowledgeable outside observer, but the threat is dependent upon recognition in order to exist. The link between the threat and the event is defined by time and they cannot

exist simultaneously; once the threat is transformed into an event it loses its perlocutionary effect and ceases to be a threat.

The same holds true for the concept of risk; once the event has occurred, the risk is absent. It has so to speak exploited the element of potentiality which is a constitutional element of the risk concept. Both threat and risk are concepts which

involve and are dependent upon subjective perceptions of reality. But as Aven and Renn (2010) argue, "this does not mean that risk assessments are arbitrary or void of any objective knowledge". We do have objective knowledge about the world and therefore the subjective element in the risk concept should not lead to a radical social constructivist definition of risk.

I agree with Rosa (2003) that the extreme positions of both objectivist and subjectivist views of risk are poor descriptions of reality. In a similar vein I appreciate Aven and Renn's efforts to find a compromise, although I agree with Rosa that the result is logically inconsistent. I hold that risk must be subjectively defined, but that does not necessarily imply "a naïve social constructivist view in which risk is treated as a subjective narrative that cannot be evaluated according to criteria of truth or appropriateness." The threat from a given object, whether this threat is produced by a risk decision or the risk decision is a reaction to a recognized threat, has to be founded in an ontological reality. In returning to the boulder example, the threat from the boulder is dependent upon the existence of boulders as well as it is dependent upon a subjective recognition. The boulder is dangerous and this danger is real independently of any human observer. Since the threat is dependent upon danger it must somehow fit into an objective reality although it belongs to a subjective reality.

Searle (1995) argues that the social reality of institutional facts fits into a larger ontology of objective fact but that the social reality itself belongs to a different ontology. This ontology consists of facts that cannot be separated from their subjective perception, usage and function. In contrast to the objective ontology in which Rosa attempts to categorize risk, the subjective ontology "exists only in relation to the intentionality of agents" (Searle 1995, 10). I hold that risk belongs to this subjective ontology. Thus risks are real, but only insofar that there is a social reality in which subjects engage in risk taking.

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Notes

[1]. Luhmann's systems theory is basically a theory of how observers observe, hence a theory that focuses on epistemology. Luhmann does not reject the existence of a world independent of human observation, but in his epistemological constructivism a world independent of human observation is cognitively inaccessible and therefore he does not engage his theory in speculation about this world.
[2]. What is referred to as the object is generally termed *hazard* or *risks source*. This may cause some confusion as the technical risk literature defines objects as the humans who are exposed to risk. At this point we should not enter in a discussion of whether these terms are appropriate or not. It suffices to say that in this specific case the object is the boulder.
[3]. The semantic presence of uncertainty in hazard is somewhat ambiguous. When hazard is defined as an object it is more or less synonymous with danger. But when hazard is used in a less concrete context the element of uncertainty, or more precisely randomness, is predominant.

4. In fact, if we should accept dictionary definitions, Rosa's own definition of risk would face some problems. If we for instance look up the word 'stake' in the *Oxford English Dictionary (OED)* (1989) the following definition is offered: "That which is placed at hazard". As Rosa correctly point to, most dictionaries define concepts such as risk, danger, peril and hazard in terms of each other and following the definitions in *OED* we could add 'stake' to that category. If we look up the idiom 'at stake' in the *Random House Compact Unabridged Dictionary* (Random House 1996) a similar definition emerges: 'at stake' means "in danger (of being lost)" or "to risk (something), as upon the result of a game or the occurrence or outcome of any uncertain even". More superficial online dictionaries would simply refer to synonyms such as 'at risk'. If we accept the definitions by dictionaries as adequate descriptions of the meaning of words, we could easily use 'at risk' as a valid substitute for 'at stake'. In this case Rosa defines risk as "a situation or event where something of human value (including humans themselves) is 'at risk' and where the *outcome* is uncertain". Surely Rosa would be dissatisfied with this definition as it represents a tautology, which he so enthusiastically disputed in his defense of a unification of risk and danger (Rosa 2003). Confronted with this apparent tautology Rosa would probably point to the fact that dictionaries do not account for the many situations where "at stake" means something different from "at risk". Just as this paper has pointed to how "risk" means something different from "danger" depending on the situation in which we use the words.

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Consumer Perceptions of Food Risks: How do Consumers Assess the Risk of Concrete Food Products?

(Submitted to Risk Analysis)

Abstract: Through a principal component analysis the present study explores how consumers perceive food risk by asking respondents of an online survey (n=732) to assess the risks of concrete food products. The study confirms the hypothesis that control over risk is not a salient issue for consumer decisions about concrete products. The study finds that consumers assess food products in terms of benefits rather than in terms of risks. This is also the case for controversial novel food products such as genetically modified food. Three very different novel food products exhibited almost identical single component solutions in the analysis. This result is interpreted as the consequence of a stigma effect. This effect is apparently produced by lack of perceived benefit and not by perceived risk. The analysis furthermore suggests that organic food benefit from a halo effect and that a cognitive imprint remains for products which have been subject to food scandals, even if consumers have readopted their previous purchase behavior.

KEY WORDS: Food risks; risk perceptions; decision; control; novel food.

1. INTRODUCTION

During the past decades society has witnessed a number of food scares such as BSE and avian bird flu.[1,2] Furthermore, new food risk topics related to novel foods and biotechnology such as GMO have added to the public concerns over food risks.[3,4,5] Moreover, society is currently struggling with the massive consequences of lifestyle risks related to obesity,[6] although consumers paradoxically rate these risks as significantly lower than technological risk such as GMO.[7,8] On top of that the growing concern about climate changes has led to significant recent public concern and media attention to the environmental impacts of food miles and greenouse gas emissions in food production.[9]The sum of all these risks and the resulting societal concern are a politicization of food risks similar to that of risks related to new technologies. As a result of this development, studies of food risk perceptions have increased since the 1990s.[10]

Although the politicization of food risks in some respect makes them comparable to traditional technological risks, which have been the preferred objects of investigation in risk perception studies,[1] there may be good reasons to believe that food risks are distinct from other risks: Firstly, since food is vital to survival, avoidance is not an option.[11,12] Secondly, our risk decisions concerning food consumption become intertwined with completely different logics concerning food quality, taste and other preferences.[13] Especially the perceived benefit in terms of anticipated enjoyment is salient in consumer decisions, often at the expense of perceived health benefits.[14,15] Thus, there are strong arguments in favor of developing a more specific school of thought for food risks.[1]

1.2. Risk regulation vs. purchase decision

Most studies of food risk perception can be divided into three categories: 1) General studies of the relationship between risk items and risk characteristics,[16,17,18,19,20] 2) studies that focus

on particular food-related hazards such as GMO,[3,4,21,22] and 3) studies that look into specific food scares such as BSE.[23,24]

Sparks and Shepherd[16] were the first to apply the psychometric approach to food risks, and their results more or less replicated the results obtained in the previous psychometric studies, which have been conducted over a broad range of hazards: The two factors *dread/severity* and *knowledge* explained 78% of the variance in their study. Subsequent studies have led to similar results.[17,19,20] However, the psychometric studies have been criticized for neglecting individual differences in risk perception,[25] and a study by Siegrist, Keller and Kiers shows that there are significant differences in lay people's perceptions of food risks.[18] Yet other studies suggest that people view food risks as dissimilar and therefore assess different risk items according to different risk characteristics.[26,27]

Especially the methodological aspect of whether risk perception studies present specific or general risk items to the respondents seems to play an important role in their assessment of these risks.[16,28,29] Sparks and Shepherd suggested that "there is unlikely to be a simple evaluative relationship between general and specific hazards" and note that the naming of certain hazards may evoke negative connotations that affect the assessment of these hazards.[16] Sparks and Shepherd modified the risk characteristics advanced in previous psychometric studies and selected their risk items on the basis of media coverage. Fife-Schaw and Rowe used focus groups to select risk characteristics which reflect the most salient public concerns. Their selection of risk items was based on voiced concerns in the focus groups as well as on previous studies.[17] The selected risk items in both studies, however, did not represent a homogenous level of specificity. This problem, which the authors are aware of, may have some important consequences for the element of control in the risk assessments: While some risk items are subject to direct personal control and may be chosen because of specific preferences (e.g. artificial sweeteners), other risk items are tolerated rather than

chosen, and these risk items can only be controlled indirectly through political regulation (e.g. pesticide residues). In assessing the methodological approaches to studying food risk perceptions Frewer and colleagues point to this crucial distinction; that "[f]ood safety is seen to be as much a societal issue as one which is under the control of the individual, implicating credibility and trust in risk regulators as well as individual choice over risk exposures."[11]

1.3. Research Aim and Rationale of the Present Study

The aim of this study is to come to a better understanding of how consumers perceive the risk they are confronted with in a purchase situation. Some studies point to how consumers perceive food risks in purchase situations very differently from how they perceive the more specific risk items chosen in many risk perception studies.[11, 30] In marketing research risk is defined in terms of product performance as well as product safety,[31] and an explanation for the more positive evaluation of food risks in purchase situations could be that the expected benefit associated with a concrete product has an effect on how consumers assess the specific risk items pertinent to that product. Chicken meat is a well-known source for salmonella contamination, but at the same time it is lean and nutritious. Many studies find that perceived benefit is inversely correlated with perceived risk,[32] but this inverse correlation of risk/benefit is not captured in studies that confront respondents with specific risk items such as salmonella. Thus, in the present study it was decided to include concrete products rather than specific risk items. In a purchase situation consumers have to decide whether or not to purchase a concrete product, and risks and benefits are weighed up against one another. The consequences of exposing oneself to a specific hazard or risk item, however, is not irrelevant as to various degrees it will play a role in the purchase decision. But in the end the purchase decision is about a product and not about a specific risk item.

However, the present study does not neglect the effect various food scandals have had on trust in industry and regulators,[33] and the importance of trust, e.g in the acceptability of GM technology in food.[34] Nor does it suggest that these food scares and specific risk items are irrelevant to consumers' purchase decisions. Many studies suggest that they are. But in continuation of the innumerous studies since Starr's[35] distinction between voluntary and involuntary risks, this study assumes that consumers' risk perceptions, and especially their risk tolerance, will be different when confronted with concrete products instead of specific risk items. The rationale behind this assumption is that while consumers actively make choices about food products, they often find themselves in a situation where the choices concerning specific risk items have been made by others.

1.3. Hypotheses

The study is focus through two hypotheses. The first hypothesis relates to the element of personal control in consumer decisions on a more general level. It has the character of a working hypothesis, since it does not specify any distinct outcome. The second hypothesis is more distinct and suggests that the respondents will assess the food products included in the survey according to some basic criteria.

H1: Because the respondents are asked to rate the risks of concrete products, their risk assessments will be influenced by a sense of personal control. Thus, it is hypothesized that control will be a less salient concern compared to studies that ask respondents to rate specific risk items.

Since Starr's distinction between voluntary and involuntary risks[35] many psychometric studies have shown how the element of control contributes to the dread factor in lay

perceptions of risk.[36] The element of control seems to be a main driver in shaping public risk perceptions of food related hazards as well.[16,17] Lack of trust in regulation contributes to the general impression held by the public that man-made hazards, such as BSE and potential hazards from biotechnology, are out of control.[37] As a consequence these risks are rated as relatively high. Conversely, the sense of personal control related to life style risks and bacterial contamination in domestic household practice leads to low risk assessments and risk neglecting behavior.[7,38] The combination of perceived control and low risk assessments can be explained as a result of optimistic bias,[39] which has also been a recurring theme in the literature about perception of food risks.[40,16]

The present study asks people to rate the risks of concrete products, which in most cases form part of their everyday food consumption. Therefore it is assumed that respondents in general will perceive the risks as under their personal control. Thus, the element of control arguably should manifest itself differently as compared to studies where respondent are asked to rate specific risk items, which for a large part is not under their personal control.

H2: The risks from the presented food products will be assessed according to different criteria, and some of these differences will manifest themselves in a continuum from products with a halo effect (positive ratings) to products with a stigma effect (negative ratings).

Similar to controversial technologies such as nuclear power, certain products may become stigmatized.[41] This can happen in a shorter period of time during a food scare such as BSE,[24] or it can become more or less permanent as in the case of genetically modified food.[42] The effects of stigma direct attention away from possible benefits and result in avoidance of the affected object.[41]

Other products profit from an opposite effect. As an element in consumers' risk reduction strategies they can choose to rely on certain brands or labels across brands and product categories, e.g. those that guarantee sustainability with respect to the production chain from earth to table.[31] Like stigma the halo effect implies that risks and benefits are assessed according to one (or a few) salient lay belief(s). In this case the positive associations pertinent to the specific label would have a spillover effect on the general evaluation of the product. A good example is food labeled as 'organic' which often is perceived to be safer, more nutritious and of better quality than conventional food.[43]

Both stigma and halo effects can be viewed as the results of risk and complexity reduction strategies applied by consumers that during their grocery shopping have to make choices about a large number of products in a very short period of time. Thus, it is hypothesized that novel food items will be subject to a stigma effect and conversely that organic and fair-trade labeled food items will profit from a halo effect.

2. PRE-STUDY: SELECTING FOOD RISK ITEMS AND RISK CHARACTERISTICS

A pre-study was set up in order to identify salient risk characteristics. 13 participants, which represented a fairly heterogeneous group with respect to socio-demographic traits, were selected through snowball-sampling.[44] The participants were divided into two groups, and two focus groups with an average length of 45 minutes were conducted.

The aim of this pre-study was not to obtain specific risk assessments of concrete products, but confronting the participants with concrete every day food products served as a vehicle for discussions that expressed which risk characteristics were most salient to the participants. The participants were presented with the task of rating the risk of 17 food products up against each other. The products selected represented a wide range of food items included in the average consumer's grocery shopping. At this point no controversial products such as

genetically modified food were included, as it was judged that such products would lead to extreme but tacit evaluations. The participants were instructed to not just rate the risks associated with the products, but most importantly to explain the rationale behind their ratings. The assumption behind this method was that the participants' arguments and discussions would expose some general parameters on which they evaluate risks concerning their food consumption.

The discussions that followed were transcribed and coded. The initial codes were compared and arranged into fewer and more abstract categories. At the most abstract level three major categories appeared: 1) concern for self, 2) concern for society, and 3) concern for nature. This level of abstraction did not, however, match actual words used by the participants, and also the participants appeared to rate the risks of different products on different parameters. Therefore it was decided to select the risk characteristics on a lower level of abstraction. This resulted in seven characteristics which together with a question regarding the overall risk and benefit were included in the survey (see table I). Data from the focus groups showed that the participants rated the risks according to a tradeoff strategy where risks and benefits were compared across different products. Therefore many of the 'risk characteristics' include both a positive and a negative dimension (a-e). Overall risk and benefit were included as risk characteristics in order to see if there would be any pattern in whether the remaining characteristics were associated with risk, benefit or both.

As the purpose of the focus groups was to identify salient risk characteristics, many of the 17 products were similar in terms of product class but differed on certain qualities, e.g. fresh vs. frozen vegetables, conventional vs. organic chocolate etc. In order to meet space restraints in the survey, the number of products was reduced to five. The food products were selected so that each product would include a combination of specific risks and benefits. Three novel food items were added, resulting in a total of eight food risk items. The novel food items

included still play a very little role in the Danish food consumption: There are very few functional food products in Danish supermarkets, genetically modified food has to be labeled and the European Union has banned production and import of beef treated with growth hormones. However, these risk items were included in order to shed light on consumer attitudes to novel food product and not just the specific technologies behind the products. Based on the initial hypotheses and a categorization of the risk characteristics from the focus groups, the eight products were selected so that they would match four overall categories: 1) Conventional food, 2) candy, 3) food that was labeled as organic or fair trade, and 4) novel food (table I).

Table I. Risk items and Risk characteristics

Risk Items	Risk characteristics
1. Carrots	a. Effects on climate/environment
2. Fairtrade labelled coffee	b. Effects on animal welfare/working conditions
3. Organic rolled seasoned meat	c. Effects of pesticides/additives on personal health
4. Fresh Danish chicken	d. Effects of sugar/fat level on personal health
5. Winegums	e. Effects of vitamin/nutrition level on personal health
6. Cornflakes based on genetically modified corn	f. Health effects from harmful bacteria/microorganisms
7. Beef from animals fed with growth hormones	g. Overall benefit
8. Vitamin enriched convenience food	h. Level of control over risk
	i. Overall risk

3. METHOD

The survey data was obtained in October 2010 from an online consumer panel in collaboration with the Danish Cooperative Consumer Organization FDB. 1001 respondents returned the questionnaire.

3.1. The Questionnaire

The questionnaire was based on the combination of eight risk items and nine risk characteristics (including a general risk assessment), resulting in 72 questions, arranged as

nine batteries. The questionnaire included 23 additional questions not pertinent to the present study, which resulted in a total of 95 questions. Participants were asked to rate the risk characteristics on a five-point scale. The question structure in the batteries from a. to e. included a positive as well as a negative dimension. These questions favored bipolar scales, and the scales were anchored between 'very positively' and 'very negatively'. The structure of the remaining questions from f. to i. favored traditional rating scales. These scales were anchored between 'none' and 'very large'. In order to avoid question order bias the question order was randomized, except for the questions concerning control and overall risk/benefit (g, h, i) which appeared at the end of the questionnaire.

3.2. Participants

3.2.1. Data imputation

Some questionnaires were returned with too many blanks. Respondents who had completed less than 85 percent of the total of 95 questions were omitted, resulting in 732 useable questionnaires.

2.2.2. Sample and Respondents

The sample used to analysis (n = 732) were comprised of 49.6% women and 50.4 % men, 28.8 % between 15 and 34 years, 40,2 % between 35 and 54 years and 31.0 % between 55 and 74 years. Twenty-one percent were living alone, 4.4 % were living in families comprised of one adult with one or more children, 39.2 % were living as a couple without children, 29.9 % were living as a couple with children. The remaining 4.8 % were children around 18 years old about to settle alone.

2.5. Data Analysis

As the respondents were sampled from an online panel, weights can be assessed for all of the respondents and, furthermore, separate weights for the included and omitted subsamples. There were found no differences of gender distribution, age distribution, occupational distribution and also no differences between included and omitted respondents with respect to income etc. Furthermore, there were found no differences of the weights for the included and omitted respondents. The factor analyses were performed with and without weights giving the same conclusions of the analyses. In the factor analyses missing were replaced by mean values, however, performing list wise exclusion or pair wise exclusion leads to the same conclusions.

The method of extraction was principal components and the solution was rotated using the varimax method to clarify ambiguous loadings and obtain a simple structure. The decision about how many components were appropriate for each PCA was made using the scree figure and including factors with eigenvalues greater than one.

3. RESULTS

Table II shows the mean ratings of the responses to the questionnaire. The full range of possible scores was observed for all scales and there were no floor and ceiling effects.

As could be expected the mean values of benefit and nutrition regarding carrots were high, while these characteristics were perceived to be very low for wine gums. The novel food products were rated as more risky and less beneficial than the remaining products. In general risk and benefit appear to be negatively correlated.

While the mean ratings of most characteristics in general show much variance across products, control appears to be rated consistently with a variance across product between 2,0 and 3,0.

Table II. Risk perceptions of all food products (mean values)

	1. Carrots	2. Coffee	3. Meat	4. Chicken	5. Winegums	6. Cornflakes	7. Beef	8. Conv.food
a. Effects on clima/environment	3,6	3,6	3,3	3,0	2,4	2,2	1,9	2,3
b. Effects on animal welfare/working conditions	3,6	3,9	3,5	2,9	2,6	2,3	2,0	2,5
c. Effects of pesticides/additives on personal health	3,0	2,9	2,9	2,7	1,9	1,9	1,7	2,1
d. Effects of sugar/fat on personal health	4,0	3,2	2,7	3,3	1,8	2,2	2,2	2,1
e. Effects of vitamin/nutrition on personal health	4,3	3,2	3,2	3,5	2,0	2,4	2,2	2,5
f. Health effects from harmful bacteria/microorg.	2,0	2,2	2,5	3,0	2,8	3,1	3,6	3,1
g. Overall benefit	4,3	3,4	3,2	3,5	1,7	2,1	1,9	2,1
h. Control over risk	3,0	2,9	2,8	2,7	2,3	2,1	2,0	2,2
i. Overall risk	2,0	2,2	2,5	2,7	3,3	3,6	3,8	3,5

3.1. Exploratory factor analysis

Data from the pre-study suggested that consumers rate different risk items according to different risk characteristics. However, one of the main benefits from factor analysis, as it is used in psychometric studies, is that it provides a mental map which offers the possibility of comparing a large number of hazards with respect to a number of risk characteristics. Hence, a principle component analysis was made on the collection of all food products (Appendix A). The purpose of this analysis was mainly exploratory; to see if some risk characteristics would cluster in factors across risk items.

The Principal Component Analysis shows a large number of factors, each with relatively little explanatory power as to the percentage of variance explained. The two main factors explain only 20% of the variance. The cluster of risk characteristics in the first factor, explaining 13% of the variance, yields no consistent pattern with regards to the risk characteristics. Rather it seems that the common denominator correlates with the risk items; all the factor loadings on this factor are produced by attitudes to novel foods. Control comes out as second largest factor, explaining 7% of the variance. In this case the factor comprises all risk items. Thus, perceived control appears to be an issue that relates equally to all food products.

Most of the remaining factors seem to be results of general attitudes towards the specific products, while only a few are comprised by common risk characteristics across different products. Most noticeable is that perceived general risk emerges as an independent factor (4% of the variance), comprising all the products except the two novel food products with GMO and hormones. The risk from harmful bacteria emerged on two factors; one comprising novel food and wine gums (3% of the variance) and the remaining products on the other (4% of the variance).

In sum, no consistent pattern was found in the exploratory factor analysis. The only significant findings at this level of analysis were that control is a consistent factor across all products, general risk loaded on one factor across most products and risk from harmful bacteria loaded on two factors. As these factors are small (explaining between 3% and 7% of the variance), their explanatory power is rather poor.

3.2. Separate Principal Component Analyses

Separate principal components analyses (PCA) were performed for each of the eight food products in order to identify distinctions and similarities. It was of particular interest to see if there were any signs of stigma and halo effects as hypothesized. Since control came out as an independent, although rather small, factor in the exploratory factor analysis, it was furthermore of interest to see what role this control factor would play in the assessments of individual product.

Most of the separate PCAs resulted in two component solutions, each explaining roughly 50% of the variance. However, as could be expected from the pre-study and the exploratory factor analysis, the factor loadings were rather dissimilar across products. Some products, most noticeably within the category of novel foods, came out with only one component, also explaining about 50% of the variance.

3.2.1. Conventional food products

The PCA on carrots resulted in a two component solution explaining 51% of the variance (Table III). Benefit and risk load highest on the first factor, which explains 32% of the variance. The remaining loadings on this factor all relate to personal health. The second factor, which explains 19% of the variance, is dominated by characteristics that one way or another relate to environmental issues. The data from the pre-study suggested that the effects of pesticides are assessed mainly in terms on their impact on human health, and therefore pesticides were grouped together with additives in a single characteristic in the survey. The high loading of this characteristic on the second factor, together with characteristics concerning environmental issues, suggest that the respondents differentiate between effects on humans and effects on nature, and in this case the effects on nature have been decisive. Control loads relatively high on the second factor, suggesting that control is an issue with respect to environmental concerns. However, the perceived risks as well as benefits appear to be associated almost exclusively with effects on personal health.

Table III. Rotated PCA on carrots

	Component	
	Personal health (32%)	**Environment** (19%)
Benefit	**,800**	,091
Risk	**-,718**	-,066
Bacteria	**-,711**	-,051
Nutrition	**,677**	,219
Fat/sugar	**,528**	,381
Pesticides/additives	-,029	**,784**
Control	,098	**,592**
Climate/environment	,499	**,512**
Animal welf/work cond	,453	**,497**

The PCA on chicken meat resulted in a two component solution explaining 52% of the variance (Table IV). The first factor explains 28% of the variance, whereas the second factor explains 24%. There is no distinction between personal health and environmental issues as found in the assessment of carrots. But the second factor shows that the risk from bacterial contamination is important in the assessments of risk from chicken meat. Risk and benefit do not load on the same factor; the first factor accounts for benefits pertinent to both health and environmental issues, whereas risk appears to be exclusively associated with negative health effects from bacterial contamination. A possible explanation for this is that previous food scares concerning salmonella still have an important impact on consumer attitudes towards chicken meat.

Table IV. Rotated PCA on chicken

	Component	
	Health/environment (28%)	**Bacteria** (24%)
Fat/sugar	**,784**	,027
Pesticides/additives	**,674**	,030
Climate/environment	**,627**	,419
Nutrition	**,625**	,362
Benefit	**,584**	,490
Animal welf/work cond	,486	,458
Control	,279	,206
Bacteria	-,056	**-,829**
Risk	-,187	**-,794**

3.2.2. Candy

The PCA on wine gums resulted in a two component solution explaining 54% of the variance (Table V). The first factor, which accounts for 31% of the variance, concerns characteristics related to traditional life style risks. The main issue appears to be the effects of sugar on personal health which together with additives and (lack of) benefit and nutrition load high on

this factor. Control loads on this factor as well, but rather low. While this factor appears to account for concerns regarding lifestyle risks, these concerns are associated with (lack of) benefit rather than risk.

Risk loads on the second factor together with health effects from bacterial contamination, animal welfare and environmental issues, explaining 23% of the variance. An explanation for this conjunction of apparently dissimilar risk characteristics could be the effects of the BSE scare, where the European Union banned export of British beef and cattle as well as their derivatives such as wine gums. The main concern appears to be the effects on personal health from bacteria, but in the BSE case these concerns go hand in hand with concerns over animal welfare and, perhaps to a lesser degree, the environment.

Table V. Rotated PCA on winegums

	Component	
	Personal health (31%)	**Bacteria** (23%)
Fat/sugar	**,839**	,050
Benefit	**,757**	,169
Nutrition	**,749**	,187
Pesticides/additives	**,710**	,249
Control	,249	,193
Bacteria	,042	**-,824**
Risk	-,210	**-,718**
Animal welf/work cond	,380	**,624**
Climate/environment	,479	**,544**

3.2.3. Organic and fair-trade labeled food

The PCA on organic rolled seasoned meat[1] resulted in a single component solution explaining 38% of the variance (Table VI). Benefit loads highest on this factor, whereas effects on personal health from both bacterial contamination and from fat load surprisingly low. The level of saturated fat in rolled seasoned meat is generally high and cold meat is a major source for bacterial contamination. Thus, it should be expected that these risk characteristics would

load higher. An explanation for this, as well as for the single factor solution, could be the hypothesized halo effect. Previous studies suggest that consumers perceive organic food to have a variety of benefits, and it is plausible that labeling a food product as organic will have a general risk attenuating effect.

Table VI. PCA on organic rolled seasoned meet

	Component
	Halo effect (38%)
Benefit	**,766**
Nutrition	**,694**
Climate/environment	**,641**
Animal welf/work cond	**,633**
Risk	**-,620**
Pesticides/additives	**,590**
Bacteria	**-,585**
Fat/sugar	**,577**
Control	,377

The PCA on fair-trade labeled coffee resulted in a two component solution explaining 49% of the variance (Table VII). The first factor, explaining 25% of the variance, is difficult to explain. Most characteristics relate to personal health, but effects on climate and environment are salient in this factor as well. Level of fat, sugar and nutrition loadhighest, but these are hardly important concerns with regard to coffee. Like most of the other two factor solutions, risk and benefit load on different factors.

The second factor, explaining 24% of the variance, consists of general risk and animal welfare/working conditions, the latter probably being of main concern in this case. A possible explanation for why risk is related to working conditions could be media attention on the issue, but it could also be that the fair-trade label directs attention this way.

Risk from bacterial contamination also loads on this factor, which seems odd. There are no known risks from bacteria in coffee, and, what is perhaps even more puzzling, it would be

rather difficult to find any connection between bacteria and working conditions. But risk and bacteria load together on the same factor in all the two component solutions. While this structure is somewhat strange with respect to this particular food product, it suggests that in general people associate food risks with the effects of bacterial contamination. Again, control loads low.

There is nothing that indicates the presence of any halo effect. But admittedly, the two factor solution may be a consequence of the fact that most of the risk characteristics are irrelevant to this particular product.

Table VII. Rotated PCA on fair-trade coffee

	Component	
	Personal health? (25%)	**Ethics?** (24%)
Fat/sugar	**,738**	,021
Nutrition	**,676**	,164
Pesticides/additives	**,653**	,090
Climate/environment	**,554**	,490
Benefit	**,538**	,451
Risk	-,058	**-,807**
Bacteria	,006	**-,759**
Animal welf/work cond	,391	**,580**
Control	,250	,343

3.2.4. Novel foods

The PCA on all of the three novel food products resulted in remarkably similar single component solutions explaining roughly 50% of the variance: 52% for cornflakes with GMO, 50% for beef with hormones and 48% for vitamin enriched convenience food (Table VIII). In all three cases benefit loads highest together with the effects on personal health form nutrition and pesticides/additives. Risk loads moderately and control loads surprisingly low. Most studies into biotechnology and genetically modifies food suggest that risk, and

especially the unknown and uncontrollable effects, is the main driver in lay people attitudes. While there is no reason to question these previous findings, it appears, however, that when asked to assess concrete products instead of the more abstract technologies, consumers tend to focus more on the (absence of) benefits.

The single factor solution in all three cases suggests that the risk perceptions are indistinct, thus providing some evidence for the hypothesis that these products are subject to stigmatization.

Table VIII. PCAs on three novel food products

	Cornflakes (GMO)	**Beef (hormones)**	**Conv.food (+vitamin)**
	Stigma effect (52%)	**Stigma effect** (50%)	**Stigma effect** (48%)
Benefit	,830	,815	,811
Nutrition	,797	,790	,767
Pesticides/additives	,790	,802	,762
Clima/environment	,787	,747	,746
Risk	-,771	-,775	-,718
Animal welf/work cond	,756	,706	,702
Bacteria	-,663	-,608	-,604
Fat/sugar	,645	,652	,700
Control	,319	,382	,241

4. DISCUSSION

The main aim of this study was to explore how lay people perceive risk from food when assessing concrete products instead of specific risk items. It was hypothesized that this setup would reflect the decisions consumers make in purchase situations, and that the sense of personal control in these situations would result in control being of less importance in the assessment of food products. Control did come out as an independent, however rather small, factor in the exploratory factor analysis. In the separate factor analyses, however, the general picture indicates that control is not a salient concern. The low loadings on the component

analyses of separate products, together with the consistency in mean ratings across the different products, indicate that perceived control is not affected by any distinct product traits. Some studies argue that perceived control correlates with individual psychological traits such as e.g. self-esteem.[45] Since the mean values used in the study do not take individual variances into account, this would explain why the assessment of control is remarkably stable. In many cases perceived control appears together with perceived overall risk. However, in general perceived risk appears to be marginal compared to perceived benefit in the respondents' attitudes toward the products. Perhaps it should not come as a surprise that perceived benefits play an important role in consumers' assessments of risks associated with concrete food products. Apart from being a vital source for survival, food is also a major source for enjoyment and pleasure.[13,14,15]

Some of the analyses show that environmental concerns play an important role in the general attitudes toward the presented products. These concerns, however, tend to be associated with benefit, or perhaps lack thereof. Risk appears to be narrowly defined as the risk of being contaminated with harmful microorganisms and bacteria: these two characteristics loads together in all the two component solutions.

This narrow understanding of risk is particularly salient for products that have been subject to previous food scares. Food scares have been shown to have a negative impact on sales,[46,31] but in general sales gradually regain their previous level when the problem is solved and negative media attention disappears.[47] Although consumers gradually readopt their previous purchase behavior when a food scare is over, the scare may have left a cognitive imprint. While consumers may forgive (or lack other options), the findings of this study indicates that they do not forget: Both chicken and wine gums (containing gelatin from cows) have been subject to previous food scares and concerns over bacterial contamination are salient in the two component solution regarding these products.

The effect of this imprint is that these and similar products become more crisis prone. Not only because the original or a similar food scare can reemerge giving cause to further uncertainty and anxiety, but also because individual products and brands become easy targets for 'manufactured uncertainty'[1] and rumors. In such cases the dependence on public perceptions is likely to cause severe harm to the product's brand equity, which in these circumstances is a fragile asset.[48]

It was hypothesized that some of the products in the study would be subject to a stigma effect while others would benefit from a halo effect. The results indicate that this is the case. Whereas the products categorized as conventional food tended to come out with two component solutions, generally concerning personal health and environmental concerns, most of the other products were presented in single factor solutions. The single factor solution, together with the general positive assessment, indicates that the organic meat product benefits from a halo effect, whereas there were no traces of this effect with respect to fair-trade coffee. The remarkably similar single factor solutions concerning the novel food products provide some evidence in favor of a stigma effect. The mean ratings for these products showed that they are perceived to be more risky and less beneficial, especially with respect to environmental effects and the impact of pesticides/additives. Other studies have shown how consumers rate novel food and the technologies behind them negatively because of their 'unnaturalness'[49] and that the moral disassociation from 'tampering with nature'[50,51] is an important driver in shaping attitudes toward new technologies. It is possible that the attitudes towards novel food products in the present study are driven by this 'tampering with nature' effect.

But contrary to what was expected, perceived risk loaded significantly lower than perceived benefit on all one component solutions for the novel food products. While it is no surprise that food products in general are assessed in terms of their benefits rather than in terms of their

risks, previous studies suggest that consumers perceive food associated with biotechnology to be high risk man-made hazards which are difficult to control.[35] However, it appears that similar to food safety in general, consumers assess the concrete novel food products differently from how they assess the circumstances and technologies behind the product. This finding, that consumers assess novel food products mainly in terms of their benefits, offers some new perspectives, especially concerning genetically modified foods, which are subject to recurring public debates over their potential and unknown risks.

Most studies find that public opposition to biotechnology in food production is driven by risk perceptions. However, a study by Gaskell and colleagues[52] suggests that the assumptions behind most studies in GM food are subject to a 'misperception of risk perception'. As is the case in the present study, their findings suggest that it is mainly lack of perceived benefits that cause public opposition to GM food. Hence, they recommend that risk communication should focus more on benefits and less on risks.

Environmentalists and other skeptical stakeholders have been successful in setting the public agenda concerning novel food and the use of biotechnology. As a consequence these debates focus almost exclusively on risk issues. Under these circumstances it may be difficult for industry and regulators to promote benefits at the expense of the voiced concerns over risk issues, at least when these issues are subject to political debates.

But if lack of perceived benefits is the main barrier to the acceptance of novel food, and the present study suggests that this is the case, there are reasons to believe that there is a market for novel food products, including GM food, if marketers are successful in promoting the benefits of these products.

4.1. Limitations and further research

The present study has identified both similarities and distinctions in risk perceptions across a number of food products. But since the number of food products in the study was limited, there is reason to caution against overgeneralization of the findings. The differences in risk perceptions across products found in this study also call for attention on the appropriateness of the risk characteristics used in the study: The puzzling two component solution for fair-trade coffee illustrated that many characteristics were less relevant to this product.

This problem, which mainly concerns the number and the specificity of the risk characteristics, could perhaps be solved in future studies by dividing the four main product categories (conventional food, novel food, candy and special label food) into more distinct subcategories. If general patterns in risk perceptions within these subcategories should emerge, this would offer a better foundation for comparisons across product classes.

NOTES

1. Rolled seasoned meat is a very common Danish charcuterie. It is from pork or lamb and contains a high level of saturated fat.

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Appendix A. Exploratory rotated factor analysis for all products

	1 (13%)	2 (8%)	3 (5%)	4 (5%)	5 (5%)	6 (4%)	7 (4%)	8 (4%)	9 (4%)	10 (4%)	11 (4%)	12 (3%)	13 (3%)	14 (3%)	15 (3%)	16 (2%)
Benefit(g) - beef(7)	**,778**	,082	,069	,012	,043	-,009	-,108	-,024	-,016	,092	,051	,014	-,036	,027	-,041	,122
Benefit(g) - cornfl(6)	**,777**	,046	,135	,036	,037	,047	,008	-,088	,004	,139	,070	-,034	,072	,073	-,120	-,272
Clima/envir(a) - cornfl(6)	**,748**	,043	,114	-,018	,076	-,036	,005	-,023	,023	,120	-,054	-,064	,128	-,001	,118	-,182
Vitamin/nutrition(e) - cornfl(6)	**,739**	-,016	,108	-,057	,083	,130	,084	-,233	,039	,139	,010	-,060	-,083	,097	-,108	-,124
Ani welf/work cond(b) - cornfl(6)	**,731**	,088	,019	,011	,012	,028	,012	-,107	-,013	,074	,028	-,048	-,005	-,026	,288	-,068
Pesticides/add(c) - cornfl(6)	**,728**	,067	,183	,331	-,062	-,048	-,041	-,068	,012	,139	,019	,040	-,076	-,044	,020	-,187
Vitamin/nutrition(e) - beef(7)	**,728**	,020	,090	-,039	,026	,034	-,014	-,184	-,043	,066	,027	,014	-,174	,120	-,034	,199
Risk(i) - cornfl(6)	**-,696**	-,003	-,041	,026	,031	,041	,079	,217	,447	-,099	,092	,038	-,061	-,007	,114	,052
Pesticides/add(c) - beef(7)	**,688**	,079	,196	,283	-,015	-,110	-,125	-,011	,069	,084	-,113	,108	-,116	-,123	,047	,131
Risk(i) - beef(7)	**-,688**	-,035	-,045	,023	,007	,061	,162	,128	,423	-,080	,180	,059	-,015	,031	,051	-,270
Clima/envir(a) - beef(7)	**,684**	,020	,138	,014	,058	-,106	-,080	,065	,035	,087	-,168	,015	-,020	-,056	,284	,159
Ani welf/work cond(b) - beef(7)	**,666**	,021	,087	,020	,056	-,024	-,063	,098	,054	,001	-,068	-,003	-,045	-,106	,352	,302
Sugar/fat(d) - beef(7)	**,567**	,032	,092	,086	-,001	,037	-,072	-,091	-,018	,097	-,035	,468	-,173	,034	,101	-,097
Ani welf/work cond(b) - conv.food(8)	**,510**	,020	-,024	,023	,017	,058	,015	-,049	-,031	,407	,038	-,004	-,012	-,050	,475	,034
Sugar/fat(d) - cornfl(6)	**,495**	,039	,229	,039	-,033	,076	-,010	-,092	,037	,217	-,047	,383	-,147	,035	,054	-,364
Control(h) - org meat(3)	-,047	**,845**	-,048	,069	,020	,186	,099	-,031	-,028	-,029	,004	,015	-,054	-,068	,051	-,069
Control(h) - conv.food(8)	,164	**,839**	,095	,009	-,057	-,008	-,054	-,065	-,001	,077	-,099	-,010	,033	,061	-,052	,037
Control(h) - cornfl(6)	,213	**,835**	,135	-,002	-,047	-,008	-,063	-,030	,025	,031	-,087	-,047	,069	,068	-,063	,030
Control(h) - winegums(5)	,039	**,822**	,157	,038	-,054	-,007	-,019	-,054	,025	,105	-,002	-,035	,001	,030	,105	,009
Control(h) -coffee(2)	-,085	**,820**	-,034	,103	-,027	,065	,255	,047	-,043	-,052	,037	,009	-,037	-,066	,030	-,036
Control(h) - chicken(4)	-,027	**,813**	-,053	,064	,262	,023	,041	-,003	-,035	-,015	,030	,070	-,069	-,066	,040	-,032
Control(h) - beef(7)	,241	**,798**	,147	-,020	-,066	-,006	-,103	-,020	,021	-,030	-,118	,017	,026	,043	-,033	,153
Control(h) - carrots(1)	-,059	**,783**	-,094	,097	,024	-,005	,057	,047	-,050	-,005	,188	,097	,084	-,073	,026	-,061
Sugar/fat(d) - winegums(5)	,124	,064	**,755**	,062	,071	-,043	-,006	,076	,014	,086	-,228	,185	-,038	-,024	,086	-,009
Benefit(g) - winegums(5)	,234	,140	**,743**	,027	,031	,090	-,042	-,001	,065	,075	-,006	-,043	,016	,022	,034	-,065
Vitamin/nutrition(e) - winegums(5)	,212	,048	**,718**	-,046	,061	,046	,047	-,081	-,058	,035	-,163	-,074	-,083	,110	,059	,130
Pesticides/add(c) - winegums(5)	,243	,003	**,609**	,397	-,048	-,027	,002	-,077	,020	,127	-,109	-,024	-,094	-,105	,193	-,013
Pesticides/add(c) - carrots(1)	,062	,139	,013	**,808**	,064	,035	,005	,026	-,055	,042	,099	,028	,179	-,014	-,009	,000
Pesticides/add(c) - chicken(4)	,116	,036	,067	**,805**	,342	,015	,001	-,040	-,011	,057	,055	,096	,053	-,059	-,009	-,021
Pesticides/add(c) - coffee(2)	,045	,074	,060	**,797**	-,071	,072	,342	-,016	,024	,010	,010	,145	,002	-,046	-,023	,062
Pesticides/add(c) - org meat(3)	,038	,091	,008	**,769**	-,041	,407	,025	-,078	-,015	,017	-,026	,109	,032	-,007	,014	-,036
Clima/envir(a) - chicken(4)	,044	,008	,062	,108	**,758**	,132	,136	,120	-,003	,086	-,093	,108	,267	-,073	,084	-,066
Benefit(g) - chicken(4)	,096	-,023	,014	-,013	**,708**	,121	,071	,071	-,092	-,032	,420	,065	-,061	-,066	-,060	-,070
Ani welf/work cond(b) - chicken(4)	,038	,000	,114	,062	**,693**	,156	,092	,093	,022	,035	-,130	-,045	,364	-,021	,099	,029
Vitamin/nutrition(e) - chicken(4)	,073	-,026	-,065	,034	**,640**	,211	,053	-,095	-,019	,049	,465	,106	-,124	,030	-,031	,256
Benefit(g) - org meat(3)	,019	,066	,127	,087	,104	**,761**	,166	,095	-,020	,038	,144	,029	-,035	-,130	-,046	-,169
Vitamin/nutrition(e) -org meat(3)	,039	,028	,077	,075	,146	**,723**	,104	,007	-,033	,063	,171	,003	-,042	-,020	-,119	,277
Ani welf/work cond(b) -org meat(3)	-,064	,056	-,156	,143	,117	**,622**	,171	-,126	-,044	-,058	,028	,015	,303	,085	,159	,008
Clima/envir(a) - org meat(3)	-,091	,091	-,074	,115	,284	**,536**	,229	,011	-,019	,058	-,191	,120	,119	-,025	,274	-,081

Sugar/fat(d) - org meat(3)	,050	,036	,256	,069	,089	**,522**	-,087	,207	-,023	,075	-,081	,475	,194	-,116	-,076	,061
Benefit(g) - coffee(2)	-,002	,070	,113	,011	,097	,210	**,728**	,134	,003	-,032	,121	-,045	,024	-,165	-,133	-,123
Clima/envir(a) - coffee(2)	-,160	,046	-,102	,137	,143	,071	**,704**	,038	-,011	,056	-,001	,123	,263	-,055	,159	,006
Ani welf/work cond(b) - coffee(2)	-,139	,039	-,183	,162	,016	,173	**,616**	-,130	-,112	-,031	,129	,018	,277	,166	,119	-,006
Vitamin/nutrition(e) - coffee(2)	-,021	,074	,152	,015	,131	,181	**,590**	,095	,111	,065	,077	,070	-,036	-,135	-,144	,450
Harmful bacteria(f) - winegums(5)	-,078	-,034	-,240	-,050	,161	-,053	,053	**,746**	,150	,026	-,184	-,066	,037	,074	-,172	,077
Harmful bacteria(f) - confl(6)	-,504	-,030	,035	-,018	,026	,018	,016	**,733**	,079	-,005	,017	,000	,024	,102	,028	,125
Harmful bacteria(f) - conv.food(8)	-,268	-,035	,032	-,044	-,016	,055	-,007	**,695**	,108	-,382	-,025	-,009	,043	,165	-,058	-,046
Harmful bacteria(f) - beef(7)	-,458	-,035	,001	-,033	,011	,042	,117	**,650**	,031	,003	,132	,015	,094	,146	-,023	-,134
Risk(i) - org meat(3)	,022	-,093	,111	-,075	-,081	-,469	-,037	,067	**,654**	-,024	,010	-,066	,124	,213	-,023	,084
Risk(i) - coffee(2)	,073	-,031	,065	-,018	-,048	,006	-,540	,128	**,636**	,014	-,131	,020	,061	,124	-,009	,012
Risk(i) - chicken(4)	-,105	-,026	,008	-,044	-,537	-,062	,000	-,021	**,614**	,065	-,116	-,005	,051	,233	,063	-,054
Risk(i) - winegums(5)	-,148	,027	-,430	,018	,106	-,042	,108	,280	**,585**	-,064	-,034	,000	-,027	-,091	-,194	-,014
Risk(i) - conv.food(8)	-,491	,004	-,049	,007	,037	,077	,057	,174	**,559**	-,434	,073	,068	-,080	,014	,001	-,113
Risk(i) - carrots(1)	,073	-,023	,169	-,013	-,086	,059	-,068	,035	**,483**	,056	-,408	-,068	-,229	,311	-,035	,145
Vitamin/nutrition(e) - conv. Food(8)	,442	,003	,080	-,024	,056	,106	,117	-,153	-,038	**,676**	,064	-,026	-,038	,081	-,055	,053
Benefit(g) - conv.food(8)	,516	,021	,142	,071	,054	,062	-,004	-,004	-,048	**,640**	,060	-,051	,072	,063	,007	-,024
Sugar/fat(d) - conv.food(8)	,356	,048	,199	,061	-,015	,056	-,078	,005	,005	**,612**	-,115	,373	-,018	-,074	,058	-,099
Pesticides/add(c) - conv.food(8)	,456	,040	,094	,389	-,037	-,032	-,035	-,061	-,029	**,567**	-,023	,041	-,076	-,062	,088	-,002
Clima/envir(a) - conv.food(8)	,474	,053	,082	-,009	,086	,007	,029	-,055	,029	**,532**	-,090	-,052	-,010	,000	,388	-,002
Vitamin/nutrition(e) - carrots(1)	-,093	-,019	-,213	,111	,084	,131	,139	-,136	-,005	,000	**,709**	,091	,181	,002	,051	,205
Benefit(g) - carrots(1)	-,099	-,033	-,204	-,008	,095	,046	,129	,058	-,082	-,003	**,699**	,119	,215	-,167	-,008	-,153
Sugar/fat(d) - chicken(4)	-,006	,078	-,054	,201	,437	,061	-,013	-,075	-,056	,023	,236	**,651**	,039	,027	-,004	-,027
Sugar/fat(d) - carrots(1)	-,127	,045	-,221	,167	-,001	,037	,063	-,087	-,024	-,049	,419	**,614**	,250	,049	,050	-,051
Sugar/fat(d) - coffee(2)	-,082	-,007	,090	,143	-,020	,082	,428	,039	,055	-,006	,034	**,612**	,174	-,010	-,060	,145
Ani welf/work cond(b) - carrots(1)	-,101	,016	-,019	,090	,131	,118	,159	,062	,010	-,019	,225	,078	**,751**	-,056	-,013	,066
Clima/envir(a) - carrots(1)	-,098	,029	-,118	,132	,207	,030	,207	,082	,031	-,006	,183	,159	**,650**	-,142	-,025	-,086
Harmful bacteria(f) - org meat(3)	,032	-,040	,007	-,066	-,025	-,448	-,060	,263	,136	-,046	-,011	,002	,024	**,657**	-,034	-,020
Harmful bacteria(f)- chicken(4)	-,088	-,035	-,116	-,062	-,477	-,054	-,031	,077	,087	,056	,051	,051	-,028	**,618**	,039	-,098
Harmful bacteria(f) - carrots(1)	,020	,017	,160	-,079	-,046	,060	-,096	,136	,172	,007	-,360	,004	-,309	**,610**	-,008	,048
Harful bacteria(f) - coffee(2)	,077	-,049	,072	-,030	,035	-,030	-,368	,460	,178	-,030	-,115	-,038	-,063	**,537**	-,011	-,014
Ani welf/work cond(b) - winegums(5)	,260	,065	,416	-,031	-,039	,044	,005	-,109	-,067	-,007	,140	,010	,002	,045	**,688**	-,028
Clima/envir(a) - winegums(5)	,224	,057	,462	,010	,117	-,010	,001	-,186	-,022	,111	-,069	,016	,011	-,009	**,564**	-,078

Institutionalized ignorance as a precondition for rational risk expertise

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ABSTRACT: The present case study seeks to explain the conditions for the experts' rational risk perception by analyzing the institutional contexts that constitute a field of food safety expertise in Denmark. The study highlights the role of risk reporting and how contextual factors affect risk reporting from the lowest organizational level, where concrete risks occur, to the highest organizational level, where the body of professional risk expertise is situated. The paper emphasizes the role of knowledge, responsibility, loyalty and trust as risk attenuation factors and concludes by suggesting that the preconditions for the expert's rationality may rather be a lack of risk specific knowledge due to poor risk reporting than a superior level of risk knowledge.

Keywords: Food Safety, Risk reporting, Social Amplification of Risk

1. INTRODUCTION

1.1. The expert-lay dichotomy in risk studies

In addressing the effects of institutional settings on the conditions for risk expertise the present study asks the overall question: How are risks reported to the risk expert and which factors affect the quality of the data reported? In order to answer this question it is necessary to look upon risk expertise as a network of knowledge rather than the risk expert as an isolated entity capable of making rational judgments in an institutional vacuum. In doing so, the present study challenges two underlying assumptions in many risk studies: 1) the risk expert as a rational actor unaffected by institutional irrationalities, and 2) the sharp division between risk experts and lay people.

The massive amount of studies throughout the past forty years that have tried to answer the overall question about "how safe is safe enough"[1] has led risk perception studies to a distinction between experts' rational risk perceptions and lay persons' more emotional and contextual approaches to evaluating risks; a distinction which is one of the most debated issues within the risk field, both in quantity and persistence.[2] Departing from Starr's[3] study of general attitudes towards risks, most studies within the psychometric paradigm have focused on lay risk perceptions and have scrutinized the basis for and subsequently nuanced earlier statements concerning the 'irrational' risk perceptions of the general public.[4,5,6] This scientific progress within the psychometric paradigm have, however, been subject to some criticism, most enthusiastically from Sjöberg[7,8,9,10,11] who raises questions upon the lack of clarity regarding the definitions of experts vs. lay people in the early empirical studies and furthermore problematizes the presumption concerning the 'allegedly simple structure of experts' risk perception'.[12] In empirical studies among Swedish high school students Drottz-Sjöberg and Sjöberg[13] have identified rational risk perceptions similar to those of experts and proposes a reversed causal relationship: It is not the expert knowledge that causes a certain

rational view on risks but rather certain world views that cause a given professional interest, which again may lead to a career as an expert.

However, these explanations, both from the psychometric approach and from its critics, suffer from the fact that investigations of the risk perceptions are limited by the psychological approach of the studies behind them. The risk perceptions of experts (future or present) are brought forth by addressing respondents individually outside their organizational or institutional setting in which they make practical use of their expertise. In short, the studies assume that risk expertise exists in an institutional vacuum.

1.2. The influence of institutional settings on risk perception and risk behaviour

The development of the Social Amplification of Risk Framework (SARF)[14], which has grown to become an influential cross disciplinary framework for risk studies[15], overcome this problem of institutional vacuum as the framework takes into account the institutional context in which the risk perceptions are embedded. The impact of organizational design on factors such as information availability, goal setting etc. and their consequences for decision making has been the object of many studies since Herbert Simon introduced the theory of 'bounded rationality'[16,17] – a theory which has been a major source of inspiration for the development of the psychometric paradigm as well.[18] But surprisingly few studies within the broad framework of SARF have questioned the rationality of risk experts on the basis of their organizational embeddedness. Rather studies within the framework, with very few exceptions[19], have replicated the initial knowledge divide between experts and lay persons. The mere name of the framework, with its emphasis on amplification and not attenuation, reflects this: the expert's allegedly correct risk judgment is somehow distorted (amplified) in the course of communication sequences through different institutional layers, with the media as one of the most influential actors on the stage.[20] As in the psychometric studies the notion

of the expert as a rational actor remains unchallenged. The development and subsequent impact of Douglas' cultural theory[21] has, however, challenged this notion and departing from this theoretical platform scholars like Adams have observed that experts like lay persons are informed by beliefs and worldviews and that experts are institutionally biased by their task to minimize risk, often to a level that exceeds a rational risk-benefit calculation[22]. Yet another source of criticism regarding the alleged rationality of risk expertise that take into account the institutional settings is to be found within the framework of science communication,[23] but with little impact on the traditional domain of risk analysis which has maintained the notion of a knowledge deficit between experts and lay persons as a theoretical cornerstone.

1.3. The object of investigation

As the body of professional risk expertise in organizations is often situated distant from where the actual risks occur it seems reasonable to assume that the institutional context will affect risk reporting. The reason behind the present study indicated this: From time to time the food and service company Compass Group Denmark experienced some critical incidents, but their risk reporting system failed to account for any risks prior to any of these incidents. In fact, risks were almost only reported under one of two conditions:

1) When irregularities concerning food safety were discovered and prevention measures were implemented before risk exposure.

2) Detection of infectious diseases among canteen guests due to improper hygiene procedures.

What characterizes these two conditions is that the actual risk is not present: In the first case prevention measures have been taken and the risk is eliminated. In the second case the risk has exploited the potentiality of a bad outcome, which is a constitutional characteristic of risk.

This situation indicated that Compass Group's risk reporting system was not reliable, thus making it an interesting object of investigation.

Compass Group Denmark is the Danish division of the multinational food and service company Compass Group, PLC. In Denmark the main activities of the company is its catering business, a business operating around 220 canteens and personnel restaurants, each working with a relatively high degree of autonomy. With regards to food safety issues the canteens are linked directly to corporate headquarters through a hygiene department and indirectly via a district manager who refers to the operational management.

As from 2002 the Danish Veterinary and Food Administration (DVFA) has made it mandatory for businesses in the food industry to launch self-inspection programmes, which direct businesses to self-inspections and subsequently documenting and reporting failures to comply with the governmental food safety standards. These standards follow the EU-legislation and are organized in accordance with the principles embodied in the HACCP system (Hazard Analysis and Critical Control Points).

In the Danish division of Compass Group a common self-inspection programme covering all 220 food production sites has been implemented. In order to make sure that risks are kept at a minimal level the hygiene department has made company specific standards even more stringent compared to the governmental standards.

New hygiene and risk reduction procedures regarding the self-inspection programme as well as warnings about specific food products are communicated through an intranet, on e-mail and sometimes by phone, depending on the urgency of the matter. Feedback in terms of failure reports are documented and archived as a part of the self-inspection programme. In severe cases, such as food poisoning among canteen guests, special procedures are used, but in case of less acute failures to comply with the governmental food safety standards it is sufficient to document those deviations, so that they are accessible to governmental control.

As illustrated in figure 1 the self-inspection programme of Compass Group function as an intermediary link between each canteen and the governmental food inspection agency, but it also links the canteen to the headquarters; a link that is also present through the operational line of command.

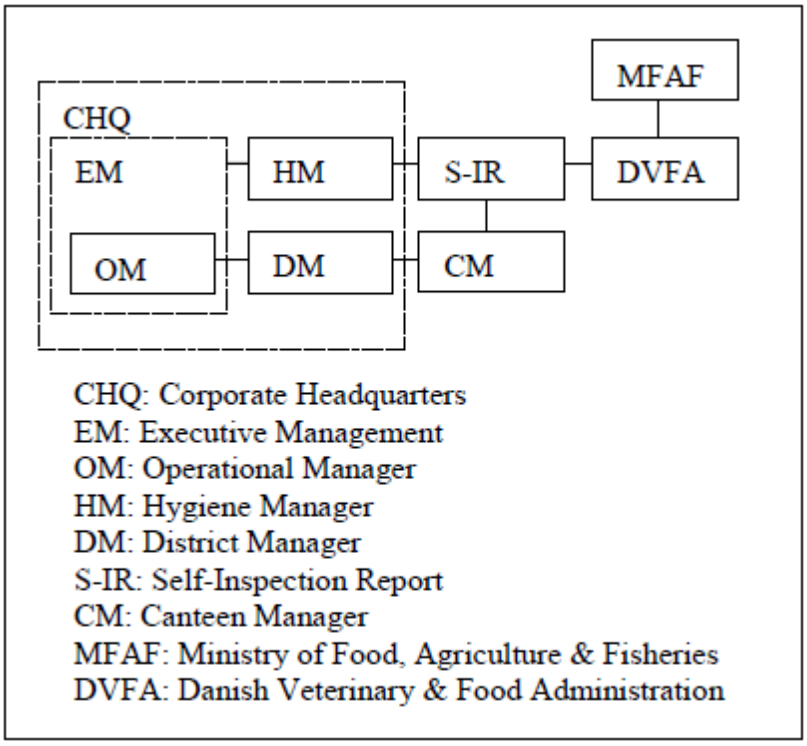

Figure 1. Network diagram of risk reporting

These two links to the corporate headquarters serve each their own purpose: The operational line of command has its focus on economy, meeting budgets and ensuring that business is run in a profitable manner whereas the link to the hygiene department focuses on meeting food safety and hygiene standards. It is notable that whereas the operational manager is included in the company's executive management the hygiene manager is not. It is equally notable that the operational management is not linked directly to the self-inspection programme. These observations indicate that concerns for profitability are prioritized at the expense of concerns for safety.

1.4. Preliminary hypotheses concerning risk reporting

As noted the influence of organizational settings on the rationality of decision making has been an important component of decision making theory since the publication of Herbert Simon's *Administrative Behavior*.[24] Rational behaviour implies complete access to and understanding of information. But as these preconditions are rarely met Simon's notion about 'bounded rationality' in organizations has guided the initial three hypotheses concerning how the canteen workers perceive and report risk. The aim of this study is not to confirm or reject the following hypotheses. Rather the hypotheses serve as a preliminary guide to understanding the behaviour of the persons responsible for risk reporting.

The self-inspection programme does not just serve as a risk management tool for the individual business in the food industry. It is first and foremost a political instrument that serves to ensure acceptable food safety standards on a national level. The survival and legitimacy of any sovereign state rests upon the capacity to ensure its members safety and acceptable conditions for material reproduction.[25] Although these two capacities mutually precondition each other, finding the right balance between concern for production and concern for safety often lead to conflicts of interests and therefore creates problems for policy makers. A way of solving these sometimes insurmountable legitimacy problems is the fabrication of *fantasy documents*[26] which serve as symbolic reassurances that risks are under control. As a political instrument the self-inspection programme has this reassuring function and if this function gets detached from the actual risk management function, the programme will fall into the category of fantasy documents.

H1: The overall conflict of policymaking is reproduced in the organizational setting of a company that has to balance the need for compliance with governmental safety regulations and concerns for profits, thus imposing a conflict of loyalty for risk reporters.

The fundamental problem is that risk taking is a way of optimizing productivity[27] whereas safety precautions serve the purpose of reducing risks. From a single perspective (e.g. the perspective of risk experts) it may be possible to balance risk taking and safety precautions to reach an optimum, but in a functionally differentiated social system[28] legislators and businesses often have different perspectives on and interpretations of risk issues. In the present study this would imply some tensions between the operational management's wish for profits and the hygiene department's wish to meet governmental safety regulations.
This conflict is deeply rooted in the institutional setting surrounding the risk reporting behaviour, but psychological factors affect the quality of risk reports as well. Since Starr's model of risk preferences[29] numerous studies have confirmed that the sense of being in control lead to biased and very optimistic risk perceptions. As risks in the present study can roughly be categorized in risk stemming from human errors (malpractice) and risks stemming from technological system errors (malfunction) it should be predictable to find human malpractice to be underrepresented in risk reports, because risk reporters are biased in their judgement of risks under their immediate control. Likewise technological malfunctions should be overrepresented. This bias may also be accompanied by a more conscious strategy at the lower organizational levels to counter the tendency at higher organizational levels to blame people and not systems.[30,31]

H2: Risks concerning human malpractice should be underrepresented in the failure reports as they are perceived to be less risky as opposed to risks stemming from system malfunctions beyond immediate human control.

A last hypothesis regarding risk severity has guided the study. Although a chain of minor irregularities may lead to major disasters[32] these latent conditions for accidents are found in almost all organizations.[33] There are many explanations for this risk negligence towards small risks. The third hypothesis offers an explanation by suggesting that reporting risks implies yet another risk dimension for the risk reporter. If too much attention is allocated to minor irregularities the risk reporter will appear to be less competent than his peers and he (rightfully or not) may fear sanctions from his superiors. Following from this a competition among peers implies that risks should be of a certain proportion before they are reported.

H3: The perceived risk of getting caught in not having reported a risk (e.g. after risk exposure) should exceed the perceived risk of facing sanctions related to reporting minor risks. If not, risks are unlikely to be reported.

Obviously H3 is correlated to H2 as the notion of control plays an important role in what is judged to be a minor irregularity. However, H3 could also be correlated to H1 as the additional risk dimension has to do with the organization's strive for a smooth production line in order to optimize its profits. To sum up: the fewer risks reported, the fewer problems caused for the risk reporter as long as the risks don't result in critical incidents.

2. METHOD

2.1. Design and procedure

The research design is a case study including a network analysis, onsite participant observations in 28 canteens, 56 semi structured interviews with canteen managers, chefs and canteen assistants, interview with the hygiene manager and results from a risk identification workshop with participants from executive management as well as district and canteen managers. The method applied in the study has followed the guidelines of grounded theory and the large amount of data has been coded in each step of the process to inform the next step and produce the three guiding hypothesis. The study was conducted in three parts:

2.1.1 Risk identification workshop

Part 1: A risk identification workshop was held as a joint project with the communication department in Compass Group Denmark. The CEO and members of executive management together with representatives from the canteens and district managers formed a group of 10 individuals who spent a day together identifying risks and discussing major crisis scenarios. The primary scope of the workshop was to identify risks as a part of the issues and crisis management plan of the company. As a secondary scope the results of the workshop should function as a preliminary study of the priority of risks at different organizational levels. The data concerning food safety risks was coded in four main categories: 1) Risks related to suppliers, 2) risks related to system or technical failures, 3) risks related to employee attitudes and behaviour, and 4) risks related to compliance with safety procedures.

2.1.2. In-depth interviews and network analysis

Part 2: Prior to the field studies in the canteens two in-depth interviews with the hygiene manager were conducted. Between the two interviews an initial network analysis was made in

order to identify communication flows and key actors related to risk reporting procedures in the organization. The scope of the interviews was partly to disclose the hygiene manager's risk perception regarding the food safety in the canteens and partly to get an initial perspective on what prevented canteen personnel from reporting risks.

2.1.3. Field observations and semi-structured interviews

Part 3: 28 canteens were selected on the basis of size and geographical location as stratification parameters. The smallest canteen employed two persons and the largest employed 18 persons. In the smallest canteens the manager which is responsible for risk reporting would be involved in all daily operations, whereas the manager of larger production sites rarely would be involved in the daily operations, thus introducing at least one more organizational layer in the chain of risk reporting. The geographical locations were selected so as to represent the major regions in Denmark, some near the corporate headquarters with face to face contact on a more regular basis and some very distant from headquarters and subsequently more dependent upon formal communication channels.

The reason behind the selection was not to meet the requirements for statistical data processing, the study after all being a single case study, but rather to avoid bias stemming from extreme cases. On the basis of theoretical considerations, data from the pre-studies, and the subsequent preliminary hypotheses, two separate interview guides were constructed, each consisting of four themes: 1) Responsibility for reporting, 2) interpretation and priority of risk procedures, 3) potential conflicts of loyalty and 4) evaluation of current communication channels.

The interview guide for canteen managers was tested and a pilot study of eight canteens including field observations and two interviews on each site were conducted. With some

modifications of the interview guide for non-managerial canteen personnel the rest of the studies were conducted according to the initial research design.

As the scope of the study indisputably appeared controversial to the respondents (scrutinizing their reporting habits in situations where they did not meet governmental standards on food risk issues), a lot of effort was put into creating an atmosphere of mutual trust between the interviewer and the respondents. For that purpose the interviewer spent one and on some occasions two working days in the canteen working in the kitchen together with the respondents. This furthermore enabled the interviewer to refer to concrete field observations during the interview so as to avoid some of the standard 'we are doing everything by the book' answers that are most likely to occur when the questions are controversial.

The interview guide was semi-structured and based on open-ended questions, which allows for some variance in terms of approaching the subjects from different angles, thus improving the likelihood of getting as much relevant data as possible. Each interview, with an average length of approx. 40 minutes, was taped and subsequently condensed to a shorter abstract. As the field observations mainly served the purpose of improving the quality of the interview data, the field notes were only included in the abstracts when necessary for understanding the context referred to in the interviews.

The interview data was ad hoc coded during the two month of field work using generative coding. This allowed for a continuous modification of the interview guide so as to approach new issues and address new questions that appeared during the ad hoc coding process. The codes were compared and subsequently condensed into four major categories: 1) knowledge, 2) responsibility, 3) loyalty, and 4) trust. Not surprisingly these categories reflect, at least to some degree, the themes from the interview guide and the preliminary hypotheses. But the combination of the semi-structured interview guide and the generative coding allowed for trust to appear as an independent factor not accounted for in the initial stage of the study.

3. RESULTS

3.1. Three risk personalities

After the fieldwork a separate coding was made to categorize the respondents as it turned out that the respondents' attitudes towards the reporting system correlated with some general demographic traits. This observation was important as their attitudes towards the risk reporting procedures not only affected their reliability as informants but presumably also as risk reporters. Although the attempt to create an atmosphere of trust in the interview situation by and large turned out to be successful it was evident that in some interviews the respondents were very reluctant to deviate from standard answers – even when confronted with contradictions in their own accounts.

In coding the answers from all 56 respondents it became possible to identify three risk personalities. They should not be confused with Douglas's cultural risk categories[34, 35], although some similarities between the categories exist (not surprisingly as they are very broadly defined categories). The categories identified in the present study are induced by empirical data and they concern people in a professional risk network. The personalities identified are:

3.1.1 The sceptics

The socio-demographic traits are: Often male with a professional education as a chef or similar. Usually hold a position as canteen manager in a large canteen after a career in hotels and a la carte-restaurants. Individuals in this category have a high professional self esteem and they feel that their professional identity is threatened by stringent rules that to some extent render their expertise superfluous.

They are most likely to overtly express their dissatisfaction with the rules as they consider their own professional expertise as superior to governmental food safety procedures. As such they are reliable informants as well as good sources for information concerning risks.

3.1.2 The enthusiasts

The socio-demographic traits are: Often female with a very short or no professional education. Usually hold a position as a canteen manager in a small canteen after having worked her way up in the canteen business. Individuals in this category use their knowledge about food safety as a surrogate for their lack of professional education. They are most likely to express their enthusiasm with the food safety rules. They have a tendency towards considering food safety as equivalent to food quality. When individuals in this category are confronted with rules which are difficult to integrate meaningfully in their work procedures they tend to be excessively creative in their interpretations of the rules. As informants they tend to be unreliable if not confronted with the contradictions and creativity of their interpretations of the rules. In such situations they tend to express a modest dissatisfaction with some of the rules, but they are much less harsh in their critique compared to the sceptics.

3.1.3 The indifferent

The socio-demographic traits are: Both male and female with no professional education. They rarely hold positions with any responsibility at all. They are not indifferent as a result of a strategic choice, but rather because of their incapacity to reflect upon the rules imposed on them. On the surface individuals in this category are remarkably similar to the enthusiasts as they tend to express their complete satisfaction with the rules. But confronted with inconsistencies they don't try to reinterpret the rules as the enthusiasts do. They rather accept the inconsistencies and insist on following the rules – even when evidence to the contrary is

presented to them. Often they have difficulties in understanding the rules, although they insist on complying with them. As informants they are unreliable and it is extremely difficult to make them reflect upon their own behaviour and their relation with the rules. Their major concern seems to be not the food risks but rather the risk of getting caught in not complying with the rules.

3.2. Common sense vs. expertise

Knowledge about risk, risk reduction and risk reporting was the first of the main categories that appeared after the data coding process. Among the canteen personnel there is a widespread understanding concerning the necessity of strict hygiene regulations. In that sense most respondents emphasized the difference between cooking in one's own kitchen and cooking for others as a profession as the latter implies some professional standards. Those not making that distinction, mostly individuals in the category of enthusiasts, usually impose the professional standards on their home cooking.

Individuals within the category of sceptics emphasize their own professional expertise as a better source for risk reduction than the governmental hygiene rules. They tend to agree with some rules but consider many of them superfluous and sometimes even counterproductive as the rules tend to focus more on paperwork and reporting and less on actual risk reduction. In this sense they made a clear distinction between efforts concerning risk reduction and efforts concerning risk reporting. In contrast, the enthusiasts did not make this distinction and were generally positive in their judgment of the hygiene regulations.

Furthermore the enthusiasts tend not to distinguish clearly among parameters such as food safety and food quality – the first being a precondition for the second in an almost causal relationship. In a sharp contrast to this, the sceptics expressed a more elaborated understanding of quality which they associate with gastronomy or 'fine cooking' and they

made a clear distinction between the measures taken into use in order to ensure food safety vis-a-vis quality. As such the sceptics had the experience that many hygiene regulations acted counter to their own professional ambitions to create high quality dishes. The sceptics generally contrasted the self-inspection programme to actual risks reduction measures. They see risk reduction as a practical enterprise that is integrated into their cooking procedures on basis of their professional education and experience. In their opinion the self-inspection programme is unnecessary paperwork. In contrast to this, the enthusiast favoured the self-inspection program and see it as a firm basis for the actual risk reduction.

One explanation for the opposing judgements of the self-inspection programme could be the lack of professional education among the enthusiasts: 1) their professional identity is not threatened in the same degree as with the sceptics who often have a professional education, and 2) due to their lack of education they don't have sufficient professional competencies to reflect upon the hygiene risks and judge them accordingly. The strict regulations become a relief to them as they release them from the responsibility of using their own judgment. They usually feel content with the measurable risk limits such as correct temperature but less comfortable with situations where the standards are less quantifiable. They also tend to interpret the standards in a normative way, which acts counter to the intentions behind the standards. For example, observations of measuring the temperature of the refrigerator showed that some canteen workers would repeat the control in different parts of the refrigerator until the 'correct' temperature was found, not concerning themselves with the previous deviant results.

If the canteen workers have to depend on their subjective judgment all respondents with only one exception stated that the rule of thumb in these situations was answering the question: Would I eat it myself? This rule of thumb is clearly in conflict with the sharp distinction between cooking at home and professional cooking. Whereas the latter distinction imposes

professional standards on the risk evaluation the former rule of thumb undermines this professional approach. In practise the rule of thumb allows for the canteen personnel to set aside, or creatively reinterpret, most of the official hygiene regulation. As such this common sense approach expresses the failure of implementing the governmental hygiene regulations in a way that makes sense to the target group.

3.3. System vs. human risks

Responsibility for risk, risk reduction and risk reporting was the second of the main categories that appeared after the data coding process. The preference for measurable risk limits is not just a trait of the enthusiast. The reporting practice concerning failure reports clearly demonstrates this. Failure reports are rarely completed and when they are the failures either concern system errors such as refrigerator breakdown or the failure of others such as delivery problems. What characterizes these situations is that the canteen personnel are not to blame for the occurrence of the risks. Although it is their responsibility to prevent and report these risks they cannot be held responsible for their occurrence.

Especially the system errors had a remarkably high frequency in the failure reports. Two factors account for this phenomenon which can be exemplified by a refrigerator breakdown: 1) the risk has been identified before risk exposure and prevention measures can be implemented, ie. discarding the food, and 2) the canteen is compensated for the costs only when filling out the failure report. As such many respondents treat the failure reports as a tool for economic compensation rather than a tool for risk reduction.

When asked about their reporting habits most respondents admitted that according to the rules they ought to report more. Their dilemma is that errors are already time consuming as it is and that reporting about them does not help the matter. Their preference for reporting system errors is a result of their reluctance toward exposing themselves or their colleagues in reports

open to governmental control. Again, loyalty towards colleagues and the team turned out to be a decisive factor when it comes to risk reporting. But it is also a result of the DVFA and/or Compass Group hygiene department not succeeding in communicating the importance of completing the failure reports. As a consequence the errors are dealt with locally by the canteen manager confronting the employees with their misdeeds and correcting them. This is a widespread practice that seems more fair to the respondents compared to reporting the errors in official documents.

The field observations revealed that human errors on a small scale occur with a high frequency without being reported. This is a result of the heavy workload and a need to meet the deadline when lunch is to be served. Thus washing one's hands thoroughly is frequently compensated for by a swift rinse under the water tap, just as replacing the cutting board is compensated for by a quick flip over. If an employee is too sloppy, for instance turning over the cutting board twice or failing to comply with standards regarding personal hygiene, this employee is likely to be corrected by a colleague or the canteen manager, but nothing will be reported. Human errors are only reported when a risky behaviour, such as cross contamination, has resulted in food poisoning among the canteen guests. But in these cases the risk has exploited its potentiality and by definition no longer constitutes a risk. The result of this reluctance towards reporting human errors is that official failure reports far from represent that actual risk level in the canteens.

3.4. Tension between concern for productivity and concern for risk reduction

The third of the main categories that appeared after the data coding process had to do with conflicts of loyalty in various situations. A major concern regarding food safety in the canteens is whether to discard food or let it re-circulate in the production. This decision captures the fundamental dilemma in balancing concerns for productivity and concerns for

safety. Although all respondents expressed a general understanding of the need for safety procedures many canteen managers, especially within the category of the sceptics, overtly complained about how these procedures conflict with the necessity of running a profitable business. Some canteens have tighter budgets than others and they obviously feel the conflict more. In terms of incentives the canteen manager is rewarded if budgets are met whereas risk reporting, although not officially expressed, is perceived to be negative and perhaps unwelcome feedback to the operational management.

All the respondents expressed a higher degree of loyalty towards operational management as compared to the hygiene department. This should not come as a surprise: The canteen managers have regular meetings with district managers that represent operational management and the topic of these meetings is usually how to meet the budgets. As opposed to this, the hygiene department is situated in distant headquarters and has only occasional interactions with the canteen managers. This priority is also evidenced in the organizational structure where the operational manager is part of senior management and the hygiene manager is not.

Although concerns for profits is vital to the organization, thus imposing a certain pressure on the canteen manager, interviews with the non-managerial members of the canteen staff showed no indication of this being a major concern. Their actual behaviour, however, showed a widespread reluctance towards discarding food. When specifically addressing this issue it appeared that especially the skilled workers take a lot of professional pride in using as much of the available ingredients as possible. They feel a conflict of loyalty between meeting risk reporting standards and exploiting the potential for their professional creativity. As one respondent verbalized her opinion about the risk reporting procedures: “It used to be fun working in a kitchen. You could make use of your creative skills. Now there’s nothing joyful about it left. I have relied on my professional education and skills for many years, but the

system has no trust in our professional judgment anymore. Today you have procedures for everything. This kills the fun of cooking." Thus, for the skilled professionals, concerns for budgets go hand in hand with professional pride in counteracting safety regulations.

Yet another aspect of loyalty appeared to be significant when the respondents were asked about how their health condition affected their inclination to stay home due to illness. The health condition of people working with food is a critical parameter due to the risk of contaminating guests with infectious diseases. However, almost all respondents could recall incidents where they had ignored regulations and company policy and went to job even though they knew that their health situation was likely to increase the risk of compromising food safety. All respondents were motivated by their loyalty towards colleagues and their team. Most canteen managers and supervisors expressed the underlying conflict between concern for food safety and care for the individual employee on one hand and concern for team productivity on the other hand. Whereas canteen managers generally expressed their will to send sick employees home, no non-managerial staff could recall incidents where this actually had happened. Both managerial and non-managerial canteen workers were to various degrees disposed to letting their colleagues stay home, but they were all very reluctant towards calling themselves in sick. Team loyalty appeared to be a strong motivational factor that exceeds both company policies and governmental risk regulations.

3.5. Trust in governmental bodies

Trust in the governmental hygiene inspectors and the control agency was the fourth and the final of the main categories that appeared after the data coding process. The canteens, and in particular their self-inspection reports, are subject to regular control by the DVFA. On the general level all the respondents expressed their understanding of this system of control. But when relating to the control of their specific canteen many expressed their dissatisfaction and

stated that the control was unjust: Everyone was not measured by the same standards, resulting in cheap take-away restaurants with low hygiene standards often receiving relatively good control results.

Several respondents referred to a period of very stringent inspections by DVFA where practically no one came out without critical remarks. This happened immediately after a turbulent episode in the Ministry of Food, Agriculture and Fisheries where food scandals were exposed on a daily basis in the media, criticism was raised concerning the lack of sufficient control visits by the DVFA and the minister finally had to resign his position. As a result of this the DVFA was granted a larger budget and as one of the respondents commented: "They had to prove that they were worth all that money and the only way to do that was to detect more irregularities and file more critical reports. And even in a kitchen with the highest hygiene standards you can always find something if you look hard enough. It is after all a working place".

Some canteen managers, however, have a good relationship with their local DVFA inspectors. They can have informal dialogues and get advice on how to improve standards. Other canteen managers regret that this is not the case in their situation as they don't trust the inspectors and therefore develop verbal strategies of ambiguity in order to answer the inspectors' questions without lying and without the risk of exposing their failures to comply with the standards.

In this sense, lack of trust in the governmental control agency and their inspection officers makes risk reporting a risky business for the canteen managers as it imposes yet another risk dimension to them: the risk of receiving negative sanctions as a result of proper reporting far too often outweighs the perceived risk of a negative outcome when nothing is reported. As a result, neither the company headquarters nor the governmental hygiene authorities get an accurate account for the actual risk levels.

4. DISCUSSION

4.1. How the institutional context attenuates risks

As dealt with in the previous section knowledge, responsibility, conflict of loyalty and trust are four important factors affecting the quality of risk reporting procedures. These factors are imbedded in the organizational power structures, lines of command, and communication channels that constitute the institutional context of risk reporting. And as evidenced, many of these factors contribute to a social or more precisely an institutional attenuation of risk.

In this sense the present study offers a contribution to the large amount of studies within the Social Amplification of Risk Framework.[36] The framework has been successful in bringing together the different approaches and theories of risk analysis in a holistic conceptualization, but as a platform for theoretical developments the frameworks has been less successful. Most studies have focused on the amplification of risk, replicating existing theoretical assumptions concerning the rationality of risk expertise and subsequently investigating how the media or other societal institutions have distorted the risk proportions with a misinformed public as a consequence.

Rather than taking the rationality of risk expertise for granted the present study takes a relational approach to exploring the conditions for risk expertise in a network where silence and communication are equally important factors in shaping risk perceptions. Applied to the Social Amplification of Risk Framework the relational approach employed in the present study implies a shift of focus away from an allegedly correct risk assessment to be found in a specific area or social station of the framework. Instead this study focuses on the relationships between actors and institutions that act together in producing a certain rationality of risk expertise. As such the approach employed in the current study seeks to exploit the full potential of SARF as it brings the framework into play as a platform for theory building rather than fitting an existing theory into the framework.

Although there was no intent to confirm or reject the three preliminary hypotheses, the empirical data suggest that H1 could account for how tensions between concerns for productivity vis-a-vis safety serve as an important risk attenuation factor. H2 suggested that the perception of risks being under immediate personal control would contribute to risk attenuation as well. This hypothesis was only partly confirmed. No doubt the perception of being in control made the respondents underestimate the risk level of small scale risks, but in terms of risk reporting all respondents expressed reluctance towards reporting risks even when they were acknowledged. Together with a time pressure that favours productivity over reporting, the relationship between control and responsibility can account for this. The respondents deliberately avoided reporting risks stemming from human malpractice in order to escape sanctions and blame associated with their personal responsibility. In this sense H3 turned out to be very relevant. The reluctance towards having one's own malpractice exposed to company headquarters and the governmental control agency in most situations outweighed the perceived risk of the malpractice.

The present study raises serious questions concerning the alleged rationality of risk expertise. As demonstrated in the study, risk expertise does not exist in an institutional vacuum as it is dependent on feedback from the risk sources. The organizational distance from risk source to risk expertise is long. Thus, clear and efficient communication channels for feedback from risk sources to risk expertise are vital if risk experts are to assess risks correctly. But as evidenced in the present study many factors affect the efficiency of these communication channels. At the most simple level the risk prevention guidelines in the self-inspection programme were interpreted in very dissimilar ways by the canteen personnel. The mere understanding of the messages in the programme was not only a question of literacy but also a question of heavy (and sometimes rather creative) interpretative work linking risk issues to

issues such as professional integrity, loyalty towards colleagues, mistrust in the governmental control system and various common sense considerations.

Evidence was found that suggests the self-inspection programme as a risk detection and risk reporting tool to act counter to its intentions when dealing with risks caused by human action. Many respondents stated that they felt uncomfortable confronting colleagues with their failure to comply with the food safety standard and everybody rejected the idea of reporting such incidents as it would be disloyal toward their colleagues. The line of command and the communication channels within the company with the canteen managers as important information gatekeepers result in the encapsulation of important risk knowledge as local knowledge. Paradoxically this knowledge is located as far as possible from the company's risk professional in the hygiene department.

These results raise some serious doubts about the quality of the self-inspection programme as a risk management tool. It may be, however, that the regulatory bodies are content with not getting risk information that might disturb the image of 'everything is under control'. As a senior canteen manager with many years of experience in the business commented during an interview: "The politicians want to present the public with an image of complete safety. So they impose regulations and hygiene procedures that in practise are impossible to comply with. Then we have to be creative in filling out our self-inspection reports, and when we get caught in cheating it is easy to point out the bad guy". This comment points to how the risk reporters perceive the self-inspection programme to be made up by fantasy documents. As a political instrument the programme may be suitable insofar as it provides the politicians with sufficient technical authority when they reassure the public that risks are under control. But the present study has revealed how the technical assessment of risks provided by the self-inspection programme is far from reliable. And even as a political solution it may turn out to be short-sighted. In the long run such fantasy documents prevent the public from exercising

control over the risks that they are exposed to and as such the fantasy documents corrupt the control mutuality[37] between the parties that produce, regulate and live with risks.

The embeddedness of risk management in a political context points to one of the more delicate scopes of risk reporting, namely the distribution of responsibility. This notion of risk expertise as a part of a political blame game is interesting, yet underexposed. Slovic has already emphasized the political dimension of lay people's risk perceptions as a driver for risk amplification[38], but in this case the politics of risk becomes a strong attenuating factor.

5. CONCLUSIONS

The overall implication of the study is that when the risk expert or rather risk expertise is studied in its institutional setting, as a part of a network dependent on efficient communication channels for corrective feedback, the rationality of risk expertise becomes a questionable fact. On the one hand it becomes dubious to label the risk expertise of the present study as rational, knowing that important information concerning risks is never reported. On the other hand one might argue that the rationality of risk expertise has better conditions in an environment protected from input that might disturb the model-like cleanliness of expert risk perceptions. In this case the argument is that experts' perceptions of risk do not owe their rationality to a superior level of information on the subject matter, but rather to a lack of information. This institutionalized ignorance is provided by a risk reporting procedure which to some extent is made up by fantasy documents. Surely the experts are aware that reporting biases occur. But in order not to interrupt with the fragile balance that ensures the legitimacy of the reporting system and to maintain their position as rational experts they have no choice but to rely on the official data.

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Risk Communication and Citizen Engagement: What to Expect From Dialogue

(Acceptet for publication in Journal of Risk Research)

Abstract: Despite the last few decades' devotion to deliberative methods in risk communication many studies point to how important challenges arise when citizens are engaged in public dialogue. Since the era of enlightenment public dialogue has occupied a position as a normative ideal for political governance. But ideals are social constructions that have a tendency to direct attention away from underlying conflicts. The concept of dialogue is no exception, and exemplified by the Danish solution to dealing with public scepticism in relations to technological controversies, the internationally acclaimed 'consensus conference', the paper seeks to offer a better understanding of the contemporary use of the concept of dialogue as well as its ancient roots. The paper argues that behind the aspirations for deliberation lie two opposing models of dialogue. When these two models encounter in deliberative processes, their different presumptions about the role of communication symmetry are likely to appear. This points to how the models hold very different expectations as to the dialogical outcome, thus imposing some fundamental conflicts regarding the political efficacy of citizen engagement as a strategy for bridging the gap between expert and lay attitudes to societal risks.

Keywords: risk communication; citizen engagement; public deliberation; consensus conference; dialogue

Introduction

Citizen engagement in risk management has been in vogue in the recent decades (Powell and Colin 2008; Löfstedt and Boholm 2009). Traditional one-way communication from experts to the public seems to have outplayed its role in contemporary risk communication approaches. Yet many studies indicate that citizen engagement through dialogue is far from being a straightforward exercise (Rowe and Frewer 2000; Petts 2004; Seifert 2006).

The consensus conference is one of the deliberative frameworks that have enjoyed much attention from practitioners as well as scholars in the recent years (Horst and Irwin 2010). But what kind of consensus is achievable when you bring together a sample of lay persons to discuss technically complicated topics such as the risks concerning genetically modified foods? And how does the role of the expert panel fit in to the concept of deliberation and consensus? Do lay persons and experts share similar expectations as to the outcome when they engage in a dialogue?

While dialogue is generally treated as an uncomplicated vehicle for public engagement this paper argues that when experts and lay persons get together within a framework of public deliberation it is at the same time an encounter of two opposing models of dialogue. Drawing upon the Danish Consensus Conference as an example of citizen engagement in risk communication, the paper argues that while dialogue is sought to bridge the gap between expert knowledge and public concerns, the exercise of citizen engagement is

inclined to manifest how these two models of dialogue have very different purposes. To a large degree the nature of those purposes imposes some important limitations as to the outcome of the dialogue between experts and lay persons. The paper furthermore argues that this mechanism has important consequences for the efficacy of citizen engagement.

The arguments of the paper fall in five stages. The first section briefly addresses the emergence of risk communication and how it has developed from one-way communication approaches to citizen engagement. The second section explores aspects of communication direction and symmetry in risk communication and public deliberation. This section draws upon two classical models of dialogue that during the era of enlightenment have lost some of their distinctness and today are treated as a unified concept of dialogue. The third section draws on the Danish consensus conference as an example of public engagement to illustrate how the two models of dialogue and their different attitudes towards communication symmetry cause important problems regarding the political legitimacy as well as the authority of science. The fourth section deals with the problem of imperfect representation by the lay panel which is a consequence of the encounter of the two models of communication. This problem is linked to the lack of political efficacy in deliberative methods and serves as an explanation for the missing link between public dialogue and political decision making. The fifth section concludes the paper by explaining the potential for hypocrisy inherent in the concept of dialogue and argues that we should lower our expectations towards citizen engagement through dialogue.

Risk communication: from deficit to dialogue

Despite evidence that point to our society being safer than ever before, public concerns about risks are rising (Slovic 1993, 1999). Whether this increased risks sensibility is dealt with sociologically as a matter of a late modernistic societal self reflexivity (Beck 1992) or psychologically as a matter of biases in public perceptions of risks (Slovic 1987) it does impose some practical challenges to regulators that are dependent upon public acceptance of risks. It is out of this practical need for public acceptance that the field of risk communication has developed and the initial efforts to systematize an approach to risk communication rest upon the theoretical assumptions from the early risk perception studies (Otway and Wynne 1989). These psychometric studies assume a clear distinction between expert analysis and lay people's perceptions of risks and the task for risk communication has been to fill the gap in risk perceptions between experts and the public (Fischhoff 1989; Renn 1992).

Fischhoff (1995) describes progress in risk communication that has evolved from one-way reactive communication efforts to two-way proactive efforts where members of the public are made partners. Although this progress can be described in terms of phases, it constitutes a continuum with each previous 'phase' as a precondition for the subsequent one. In a more recent comment Hayenhjelm (2006) point to a tendency among scholars to differentiate more roughly between older and newer approaches to risk communication using dichotomies such as technical vs. democratic (Rowan 1994; Durant 1999), one-way vs. two-way (Rowe and Frewer 2000), top-down vs. dialogue (Löfstedt and Boholm 2009) interchangeably in order to account for this progression.

The early psychometric studies assumed risks to be real and the task for risk managers was to use advanced statistical tools, fault tree analysis etc. in order to "get the numbers right" (Fischhoff 1995). In this perspective experts have the ability to account for the actual level of risk whereas the perceived level of risk by lay people would be biased by various heuristics. Knowledge about these biases could inform risk managers about how to design an effective risk communication strategy. The relationship between expert analysis and lay perceptions was marked by a knowledge deficit (Irwin and Wynne 1996) and dissemination of risk knowledge from experts to the public was seen as the proper cure.

As the psychometric paradigm matured and more attention was given to the nature of risk perceptions, a more nuanced understanding of the relationship between risk experts and lay people emerged. On the one hand studies found that ordinary people do not judge risks in the same narrow way that experts (are supposed to) do, i.e. ideally according to the probability and severity of an adverse event (Kaplan and Garrick 1981). Instead their risk perceptions are informed by worldviews, ideologies and values, which are influenced by affect heuristics (Slovic 1999). In this sense the risk perceptions of lay people were found often to be richer and more sophisticated than those of the risk experts. On the other hand a critique of 'the allegedly simple structure of experts' risk perception' (Sjöberg 2002) has drawn attention to how expert perceptions are less rational than the early psychometric studies indicated. These advancements within risk perception studies point to how risks are socially constructed and context dependent (Slovic 1999). Although some scholars of risk perception insist on granting ontological status to risk (for a discussion see Rosa 1998, 2003), the authority of expert knowledge as opposed to lay fallibility has been questioned. The expert-lay dichotomy, however, has remained as a key concept in the psychometric paradigm and serves as an important conceptual foundation for the more in-depth studies of risk perception

in mental models approaches (Morgan et al. 2002). So despite progress in risk perception research many current models of risk communication are still influenced by the transmission model of communication (see Wardman 2008 for an overview). And even though contemporary risk perception research has called attention to the important role of contexts, the legacy of the subjective-objective risk dichotomy and its close affiliation with the transmission model has rendered these contexts blind spots in risk communication (Boholm 2009).

A similar, but more radical, development has occurred within the sociological approaches to studying how the public responds to science and technology. Under the general headline of 'science communication' emphasis has changed from 'public understanding of science' to 'public engagement in science' (Schäfer 2009). The distinction is crucial: In the first version scientific expertise occupies a more privileged position from where it is supposed to illuminate the public, whereas the second version rejects the assumption of the knowledge deficit as a valid foundation for communication between experts and the public (Wynne and Irwin 1996). Within this tradition the transmission model of communication has been abandoned together with the deficit model of risk perception. Instead approaches to risk communication are founded on Habermasian ideals about public dialogue and discourse ethics. But even these approaches have been criticized for being counterproductive in their emphasis on public consensus, which may lead to hegemony when they conceal legitimate conflicts of interest (Mouffe 2000). Furthermore the Habermasian ideal speech situation fails to take into account the context dependent problems and intensions of the stakeholders (Boholm 2009). As Wardman (2008, 1629) summarizes, "a focus on Habermasian ideals of 'what should be done' has unduly limited the appreciation of real-world practices in terms of 'what is actually done' and the instrumental dynamics that shape them".

Citizen engagement, deliberation and consensus through dialogue

Citizen engagement is a well-known concept in political science, and throughout the past decades the active involvement of various stakeholder groups has dominated a vast number of theories such as corporate management (Freeman, Harrison and Wicks 2007), corporate social responsibility (Morsing and Schultz 2006), marketing (Prahalad and Ramaswamy 2000), public relations (Kent and Taylor 2002), innovation (von Hippel and Katz 2002), science communication in general (Schäfer 2009) and more explicitly risk communication (Löfstedt

and Boholm 2009). Although engagement as a concept as well as a strategy generally is associated with positive attitudes and expectations, the very purpose of deliberative engagement is often unclear (Powell and Colin 2008), and especially in engagements concerning public policy making the empirical evidence has lagged significantly behind the normative claims of theories (Carpini, Cook and Jacobs 2004).

John Stuart Mill argued that citizen engagement in political decision-making will educate people and enable them to actively address societal problems in terms of the collective interest (Mill 2009, 78-80). More recent arguments in favor of citizen engagement through public dialogue assume that engagement will empower citizens (Fischer 1999), enhance trust in regulators (Rowe and Frewer 2000) and ultimately improve the legitimacy of political decisions (Joss 2002). There are, however, important distinctions to be made from this array of expectations. In terms of the political efficacy of democratic participation and deliberation, Morrell (2005) points to the distinction between internal and external political efficacy. Many scholars in political science have addressed the shortfalls of citizen engagement; that engagement does not lead to better decisions (Hibbing and Theiss-Morse 2002, 191), that input from participants is often ignored in policy-making (Seifert 2006), and that participation without empowerment only results in frustrations (Arnstein 1969). These objections mainly deal with the lack of external political efficacy, i.e. citizen engagement does not contribute to the actual political decision-making. The internal political efficacy, on the other hand, describes the participants' perception of personal competence and ability to engage actively in politics (Craig, Niemi and Sliver 1990). It deals with Stuart Mill's educational aspects of public engagement, and studies suggest that internal efficacy is more likely to occur from citizen engagement (Morrell 2005). In line with these more modest expectations from citizen engagement Horst and Irwin (2010, 116) warn against "expecting that deliberation can be used instrumentally as a tool to establish an immediate policy-relevant consensus". Instead they argue that the consensus that may occur through public deliberation should be regarded as a process of building collective identity and reducing social opposition.

Two opposing models of dialogue

Citizen engagement, public deliberation and consensusing are examples of the newer approaches to risk communication which supersede the early approaches based on one-way dissemination of information. The most apparent distinction between the older and the newer

approaches to risk communication concerns the direction of communication. This is the distinction that the one-way vs. two-way dichotomy is based upon. The early approaches operated through one-way communication whereas the newer approaches exploit the potential of engaging citizens in a two-way communication process. In her discussion of asymmetries in risk communication Hayenhjelm (2006), however points to the important distinction made in public relations studies between the *direction* of communication and the *purpose* of communication. In the attempts to account for excellence in public relations Grunig (1989) favors a communication model that not only operates through two-way communication (direction) but also attempts to balance the positions of those engaged in the communication situation so as to generate a symmetrical process (purpose), where mutual change in ideas, attitude and behavior is seen as the ideal outcome. Despite the lack of empirical evidence confirming the hypothesis of two-way symmetrical communication being the most excellent communication model, the model has maintained its position as a normative and more ethical communication ideal. In later discussions the model has been associated with Habermas' ideal speech situation (Habermas 1984) and in contemporary studies and debates within the public relations community the concept of dialogue has occupied the position as the overall normative ideal (Kent and Taylor 2002).

In risk and science communication the question of symmetry is crucial to the technical vs. democratic dichotomy. Technical communication from knowledgeable experts to the ignorant public presumes a fundamental inequality in terms of knowledge. Therefore it has to be asymmetrical. Democratic communication on the other hand rests upon strong normative ideals about all men being created equal sharing equal rights and therefore inequality constitutes a severe threat to the legitimacy of democratic communication. Democratic communication has to be symmetrical. The top-down vs. dialogue is a mix of both direction and purpose, as will become evident in the following exploration of the nature of dialogue.

Symmetries and asymmetries in risk communication

It is evident that approaches to risk communication that employ measures such as engagement and deliberation need to draw on dialogue as a vehicle. Although the choice of dialogue as a foundation for risk communication may enable us to disregard the question of communication direction (dialogue is always a two-way process), the more troublesome questions of communication purpose remain. Hayenhjelm (2006) deals with this problem and points to

three different aspects of influential asymmetry in risk communication: *communicative* asymmetry, *informational* asymmetry and *risk role* asymmetry. These categories cover the ability to set the agenda and frame the object of debate, the knowledge and ability to assess risks and their consequences, and finally the power to make decisions and implement actions in relation to risks as well as precautionary and mitigating actions.

These categories are indeed relevant to risk communication, but far from exhaustive. In a broader societal perspective asymmetries can be associated with any social (or whatever) category, simply because a complex (and what Luhmann 1995 has termed a functionally differentiated) society operates through specialization at various levels. Specialization and differentiation necessitates asymmetries, and even in those cases where symmetry is preferred (and that might be the case in some aspects of risk communication) it seems rather optimistic to expect that communication and dialogue can solve all problems of asymmetry. In fact, many asymmetries such as institutionalized power relations serve to selectively prevent people from getting access to certain communication arenas. In this sense asymmetries have the same function as trust; they reduce the need for communication in order to facilitate smoother decision making and routinize social practice. Still other asymmetries, e.g. in terms of knowledge, are the very precondition for communication. This is the case in the educational systems. It would be pointless for students to go to universities if no knowledge asymmetries existed in relation to their professors. In short, sometimes symmetrical relations in communication situations are preferable and sometimes they are not. Not surprisingly Heyelhjelm (2006) finds it difficult to account for exactly when in her three categories asymmetry is undesirable.

Nevertheless communication asymmetry constitutes a problem to the dialogical approaches to risk communication that embrace concepts such as engagement and deliberation. The reason for this may be that when the word dialogue is used in a deliberative context it affects the meaning of the word far beyond its two-way directional features. It relates, in a highly normative way, to the very intentions of dialogue, i.e. the communication purpose. This paper argues that the fundamental conflict of symmetry has its roots in how we define dialogue, and that these roots are crucial in shaping our expectations towards the dialogical outcome.

Truth and politics

In a short but noteworthy essay Hannah Arendt (1961) offers an explanation of the relationship between truth and politics in our modern society; a society in which the classical distinction between the rational truth of the philosopher and the mere opinion of citizens has been erased by enlightenment ideals about public knowledge.

Before the concept of public opinion gained normative validity beyond its immediate ancient political-legislative domain it was possible to make a clear distinction between two opposing expectations as to the dialogical outcome. The philosophical dialogue would aim at reaching rational truths whereas the political dialogue would lead to mere opinions. In a similar vein Linder (2001, 653) traces our contemporary understanding of dialogue back to two classical models of dialogue in Greek antiquities, namely "Plato's Socratic interrogations in pursuit of self-knowledge and virtue, and the Athenian deliberations for collective governance".

The Socratic model seeks to reach a truth which already exists but is hidden from the view of at least one of the participants in the dialogue. Socrates, who firmly believed that he himself had found the truth, compared his own role in the dialogue with that of the midwife. The interlocutor of the Socratic dialogue is to reach the truth on his own, and Socrates can offer nothing but guidance in that process. The point is that nothing new emerges from the dialogue, because the truth already exists. Dialogue has no other purpose than to bring forth that truth. A similar conception of dialogue can be found in the work of Gadamer and Freud, and the ensuing tradition of psychoanalysis, like other therapeutic practices, rests upon this model of dialogue. The professional treats the dialogical input from the patient as symptoms and his task is to arrange those symptoms in order to make a correct diagnosis.

The Athenian model, on the other hand, seeks not truth but commitment which is to emerge as a new construction through the dialogue. This model of dialogue is inherently political and it is characterized by its ability to create consensus as a foundation for decision making as well as to create cultural bonds between the citizens (Linder 2001). This model of dialogue does not disregard the world as it is, but, as a vehicle for decision making, its perspective is the future rather than the existing world. As Arendt points out, the political dialogue aims at changing the world and in order to achieve this, potentiality and openness towards the future is required (Arendt 1961, 251). In this respect the configuration of truth often constitutes a barrier to the political project, because as Mercier de la Rivière (1767, 185)

mentions, the truth is despotic in its nature; it rejects the very idea of openness and negotiation. For this reason truth and politics are often in conflict with each other, and in the Athenian model of dialogue the truth holds no prominent position as in the Socratic model. The main point is that rather than discovering what already exists, the outcome of the Athenian model is something new which emerges through the process of dialogue. A similar conception of dialogue is to be found in the work of Dewey and Habermas as well as in contemporary efforts to promote public deliberation and deliberative decision making.

In returning to the discussion of symmetrical vs. asymmetrical approaches to risk communication, the two models of dialogue have very different normative claims on the topic of symmetry. The Athenian model of dialogue occurs between equals whereas the Socratic version "presumes differential enlightenment, and thus inequality, as to insight, capacity, reasoning abilities, and so on, not only between participants but especially between participants and everybody else" (Linder 2001, 654). The Socratic model assumes asymmetrical relations as a basis for knowledge production, whereas the Athenian model needs symmetrical relations as a legitimate foundation for commitment and collective governance.

Consequences for risk communication

Arendt identifies a dissolvement of the ancient opposition between rational truth and opinion in the era of enlightenment. But her main point is that the tension between truth and politics has continued within the domain of factual truths, because facts (as opposed to rational abstractions) belong to the same realm as opinions (Arendt 1961, 238). This is the realm of politics, as policy making is about changing facts.

Contemporary literature on risk recognizes this political dimension and makes a clear distinction between the rational domain of *risk analysis* as opposed to *risk management* which is inherently political (Löfsted and Boholm 2009). According to this distinction the task of scientific expertise is to inform policy making, so that the decisions can be made on a rational foundation. Despite its disadvantages the initial one-way models of risk communication ensured that the rationality of risk expertise is kept separate from the 'irrationality' of policy making. But from the perspective of scientific experts their message uncovering the rational truth about the risk subject gets somehow distorted on its way from experts to the public. The

communication flow through political institutions and most notably the media contaminates the message with irrationality and the result is ungrounded risk amplification (see e.g. Koshland 1989; Abelson 1993).

In this respect a two-way dialogue through citizen engagement ought to be a better alternative, because this approach enables the risk communication to bypass the amplifying stations as accounted for in the Social Amplification of Risk Framework (Kasperson et al. 1988). But citizen engagement has its price. When scientists and the public meet, it is at the same time two different models of dialogue that meet. The natural and technical sciences that perform risk analysis rest upon ontological and epistemological paradigms that correspond to the Socratic model of dialogue. But like policy making risk analysis is oriented towards the future, and despite efforts to eliminate uncertainty, the very concept of risk contains an element of potentiality which is open to political exploitation. Because of this openness it becomes difficult to uphold a clear distinction between risk analysis and risk management when one-way risk communication is replaced by a two-way dialogue.

The two-way dialogue often occurs in a framework of citizen engagement and deliberation that is compatible with the Athenian model of dialogue. This paper argues that when the Socratic and the Athenian models of dialogue are confronted with each other the old conflict between truth and politics reappears in a new disguise and with new challenges. The following example from the Danish Consensus Conference will illustrate some of these challenges.

A case in point: The Danish Consensus Conference

The Danish consensus conference is one of the methods employed by the Danish Board of Technology. The board was founded in 1986 on the basis of public discussions about new controversial biotechnologies. Over the years the consensus conference has grown into becoming an internationally renowned concept. In a four-day consensus conference a randomly picked citizen panel of 14-16 lay persons is confronted with the task of reaching consensus about a controversial technological topic of current interest. Their task is not to reach any scientific truths, but rather to reach an agreement about how society should deal with this new technology.

The lay persons in the conference panel are picked from a source of 2,000 randomly selected citizens. The panel is self-selected as participants apply for participation. The planning group from the Danish Board of Technology then selects 12-14 participants to form a panel that is representative in terms of age, gender, employment and geographical location. In the selection process, emphasis is also given to the fact that members are both open-minded in relation to the conference topic as well as interested in debating the issue.

Prior to the actual conference the panel of lay persons participate in two preparatory weekend sessions and receive a report that provide the them with "a varied and comprehensive view of the most important attitudes, conflicts, problems and development trends relating to the subject", so as to enlighten participant with "nuanced, balanced and versatile knowledge" (Danish Board of Technology).

On the basis of this knowledge the panel asks questions to experts in the field during the conference. Similar to the preparatory information, the participating experts represent different views on the topic. Their main purpose is to bring their technical expertise into play. On the basis of the answers received from experts, the panel discusses the topic and assesses how a given technology should be used and sets out any preferences for its development". When the panel has reached consensus, they formulate a final document that is sent to member of the parliament and other important decision makers (Danish Board of Technology).

Despite the ambiguous nature of the problems usually addressed in consensus conferences, the method has proved itself successful in terms of achieving its overall objective, i.e. reaching consensus on a difficult topic. But despite its apparent benefits, the method has been criticized for its failure to affect political decisions (Horst and Irwin 2010). Similar to many other frameworks for public deliberation the consensus conference is successful in terms of internal political efficacy, but fails when it comes to external political efficacy.

The encounter of two models of dialogue

The main purpose of the panel is for its participant to debate the topic in question and to reach consensus. As such their communicative effort resembles the Athenian model of dialogue where "participants interact with talk to form commitments, common purpose, and to reaffirm

the symbolic bonds of culture" (Linder 2001, 655). In line with these dialogical expectations Horst and Irwin (2010) infer that consensusing in the Danish model ought to be measured not solely by its political performativity but in a broader perspective of its impact on building up institutional and national identity.

Nevertheless the citizen panel consisting of lay people is to make its judgment on the basis of solid scientific knowledge. This part of the communication process is similar to the Socratic model of dialogue as the purpose of expert involvement and the preparatory sessions is to inform the citizen panel about the scientific knowledge that surrounds the technological issue in question.

Two threats to the political legitimacy of the deliberative project

Both the Athenian and the Socratic models of dialogue seem to be present in the consensus conference. Since the two modes of dialogue share dissimilar expectations as to the nature of the dialogical outcome it becomes reasonable to raise questions regarding what kind of consensus the conference is aiming at as well as the broader societal usefulness of this consensus. In the Athenian model dialogue occurs between equals whereas the Socratic model is based upon different levels of enlightenment among participants and therefore presumes inequality as to knowledge, reasoning abilities etc.

This inequality constitutes two threats to the legitimacy of this strategy for deliberation: First and foremost the issue of dialogue between experts and lay people. Although there is emphasis on bringing together a diverse range of scientific approaches to the topic, the contribution from experts are of a different nature that the mere opinions of lay people. The purpose of engaging experts is to narrow down the knowledge deficit. This involves a strong element of communication asymmetry which constitutes a challenge to the whole setup of the deliberative engagement. The solution to this challenge is to turn upside down the traditional hierarchy between knowledge and doxa by staging the citizen panel as the highest authority in a tribunal where science is on trial. But the asymmetry is reversed rather than eliminated and the maneuver appears to be of merely symbolic significance.

The other thing that threatens the legitimacy has to do with representativity. The very attempt to diminish the knowledge deficit implies that the citizen panel in the very process loses its significance as representative of the (ignorant) public. Obviously the participants do

not become scientific experts, but rather enlightened lay persons, much similar to clients or patients in a therapeutic treatment. As such they differ from the majority of their fellow citizens still in need of a cure to their ignorance.

A threat to the scientific authority of risk expertise

It seems that despite attempts to facilitate a symmetrical dialogue the consensus conference rests upon some elements from the old model of risk communication. In a proper deliberative dialogue all interlocutors should be equal and willing to change their beliefs and attitudes on the basis of the better argument. But if the risk experts were to accept this principle of dialogue, the deliberative approach would constitute a severe threat to the foundation for their knowledge. In her discussion of the relationship between truth and opinion Arendt points to a mechanism that transforms the truth of the philosopher into just another opinion the very moment he steps down from his lofty isolation and interferes with the political game. If we accept these rather gloomy premises the consensus conference with its mixture of science and politics authorizes and institutionalizes a loss of the authority of science.[1]

John Stuart Mill had high expectations as to the public dialogue. As he argued: "It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied" (Mill 1867, 14). But a truth-seeking scientist confronted with a panel of lay people may feel inclined to rephrase those famous words: Does public engagement in science run the risk of dissatisfying the Socratic interrogations in pursuit of truth on behalf of satisfying opinions that might be foolish? Or to be more precise: Is it feasible and desirable for science to adapt to a consensus-building mode of dialogue rather that a truth-seeking one?

The problem of imperfect representation

In order to confirm the authority of scientific risk expertise scientists need to insist on a Socratic model of communication. Overcoming knowledge deficits constitutes the foundation for this model and the only way to so is to engage in asymmetric communication. This may represent a notion of discomfort to the deliberative aspirations of a consensus conference, but the practical consequences are minor. Once enlightened by scientific expertise the citizen panel can go on with forming its opinions within a deliberative framework. But during the process of enlightenment the panel will be transformed. The experts that are inclined to look

upon the input from the panel as symptoms of ignorance, will so to speak have cured (or at least improved the condition of) their patients. While the process of this transformation may not constitute major practical consequences to the deliberative project, the result of this process certainly does. The members of the citizen panel who were picked randomly to represent the public at large have lost their capacity to represent the public as a result of their enlightenment[2].

This matter of imperfect representation is a severe threat to the deliberative project, because similar to other modes of citizen engagement the consensus conference needs a perfect representation in order to exploit the dialogical outcome in political decision making. If the consensus agreed upon in the conference no longer represents the concerns of the general public, it cannot serve as a viable means for political decisions. Paradoxically the same process of enlightenment that leads to internal political efficacy renders external political efficacy impossible: the members of the panel will improve their ability to understand and engage actively in the debate but the output of that debate will no longer reflect the opinions of the general public.

The problem of imperfect representation is well known in the stakeholder literature. Many stakeholder groups are not genuine stakeholders but what Starik has termed *proxy stakeholders* (Starik 1994, 1995). They are often formal organizations that represent the true stakeholders that for different reasons cannot voice their opinion themselves. The construction of representation by proxy contains an important legitimacy problem. How can we for example know to which degree Greenpeace represents the whales? The truth is that we cannot and therefore the legitimate claims of proxy stakeholders are diffuse (Mitchell, Agle and Woods 1997).

Within the domain of risk management Löfstedt (2005) accounts for the same phenomena. Löftedt found that under certain circumstances by-passing the dialogue with interest organizations will result in more successful risk communication even though the approach would be based on asymmetrical one-way communication. As a result of these findings Löfstedt rejects the conventional wisdom of risk management that prescribes citizen engagement and stakeholder dialogue as a universal cure. Instead Löfstedt suggests that risk managers proceed on a case-by-case basis and test for trust among the afflicted parties.

Successful risk management is contingent upon various factors and many studies have confirmed that trust is a crucial factor (Slovic 1999; Löfstedt and Boholm 2009). Apart from

trust Löfstedt points to the combination of low uncertainty and complexity as a viable basis for one-way risk communication. This is much in line with the insights from Social Presence Theory that relate media choice to the level of ambiguity (Short, Williams and Christie 1976) and the more recent risk governance models such as RISCOM (Andersson et al. 2006) and IRGC (Renn and Walker 2007) that reserve deliberative approaches for ambiguous risks characterized by a high degree of uncertainty. According to Social Presence Theory, a simple and unambiguous message calls for a lean medium in order to ensure successful communication. If the message is highly ambiguous a rich medium such as face-to-face communication is required. The consensus conference, like most current deliberative approaches, is designed to deal with technological risks characterized by a high degree of uncertainty and complexity. But the choice of a rich media is expensive and may not be worth the effort if the only results are internal political efficacy among the lay panelists and knowledge about the public concerns among the participating experts. Löfstedt (2009) comes to a similar conclusion and recommends face-to-face ethnographic interviews as a better source for knowledge about public concerns.

Concluding remarks: The hypocrisy of dialogue

Dialogue is often suggested as a solution to controversial, complex and ambiguous problems that traditional strategic, coercive or hierarchical modes of coordination cannot solve (Linder 2001). In light of the simple dichotomies of so-called older and newer approaches to risk communication citizen engagement through dialogue appears to be a reasonable solution. In many cases one-way communication cannot do the job, because the risks are too complex and ambiguous. But the failure of one-way communication does not necessarily mean that two-way communication and dialogical approaches will be successful. The concept of dialogue is promising, but perhaps it promises too much.

Debates about the supremacy of two-way symmetrical communication in the public relations literature lead to a rejection of the two-way symmetrical model as a basis for best practice. Empirical data suggested that communication is more successful when public relations departments employ a mix of different models (Grunig et al. 2002, 349 ff.). But to many scholars and practitioners the two-way symmetrical model still enjoys a position as a normative ideal because of its alleged ethical nature (Grunig 2006). Other scholars have contended that symmetry and dialogue are problematic ideals (Stoker and Tusinski 2006).

Since the era of enlightenment public dialogue has enjoyed a prominent position in western democracies and "under this normative democratic view, participation is self-evidently a good thing in its own right, without the need for justification" (Stirling 2005, 221). Because of this position the concept of public dialogue is open to strategies of hypocrisy. The apparent unification of truth and opinion that Arendt (1961) accounts for and which forms the basis for Rawl's concept of public reasoning and Habermas' idea about a rationality potential is a fragile construction. Underneath the surface we find elements of the two classical models of dialogue where the Socratic pursuit for truth is clearly separated from the Athenian deliberations for governance. The consensus conference exemplifies how, in situations of controversy, complexity and ambiguity, these two models rather than coming together will manifest their fundamental differences. Because of this the deliberative aspirations behind the consensus conference are prone to failure.

But if the results are poor and the deliberative project rests upon such a fragile construction, why is citizen engagement so attractive to regulators? The concepts of 'organized hypocrisy' coined by Swedish organization scholar Nils Brunsson (2003, 2009) may be able to explain this preference for dialogue. Brunsson has observed how institutions and organizations in ambiguous situations with conflicting stakeholder demands are likely to split up the natural chain of decision making where communication informs decision making which eventually leads to action. By dislocating the element of communication public dialogue can serve as a surrogate for influence on decision and action. This strategy of hypocrisy might not completely satisfy the worried citizens but it may reduce the intensity of their protests because at least they have had the opportunity to voice their concerns. If we accept this explanation it would be wise to adjust our expectations towards public engagement through dialogue. In light of the troublesome nature of dialogue a short answer to the question of what to expect is: Expect less.

Notes

1. A similar threat to the professional expertise has been voiced in relation to the American jury system. Although the legitimacy of jury verdicts is rarely questioned by professionals in the legal system (Jonakait 2003: 81ff.) criticism has been raised as to the capacity of lay persons to understand complex (and especially technical) issues in trials (see e.g. Daniels 1989). This criticism has been pushed to extremes by judge Jerome Frank who stated that "while the jury can contribute nothing of value so far as the law is concerned, it has infinite capacity for mischief, for twelve men can easily

misunderstand more law in one minute than the judge can explain in an hour" (cited from Cecil, Hans and Wiggins 1991, note 37).

2. In many cases the problem of representation arises even before a citizen panel come to exist. As Löftedt (1999) point to participants are usually self-selecting despite efforts to select them randomly. Because of this they do not represent the general public.

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