# Consumers, nanotechnology and responsibilities

## Operationalizing the risk society

Harald Throne-Holst

# CONSUMERS, NANOTECHNOLOGY AND RESPONSIBILITIES
## OPERATIONALIZING THE RISK SOCIETY

**DISSERTATION**

**to obtain**
**the degree of doctor at the University of Twente,**
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**by**
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# 1 Introduction

Our society is a risk society. Risks are pervasive and influence our lives and our surroundings. Society now accommodates to newly emerging technologies, like nanotechnology. Different actors respond to these changes, and they respond in a variety of ways. This includes consumers, a neglected category of actors.

How do consumers (as potentially pro-active rather than passive recipients) respond to emerging technologies (in this study, nanotechnology), realizing that they live in a risk society? This is an important and complex question. A further step is how this can be traced and understood, and perhaps developed further by analysts.

The question has three components: consumers, nanotechnology and risk society, and we can locate them as the corners of a triangle (Figure 1.1). The complexity of the question then resides in their relations, within the triangle as it were.

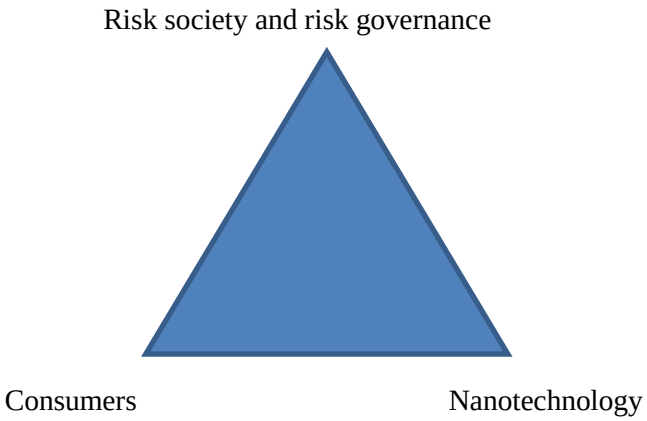


Figure 1.1. The three components of a complex question

Earlier approaches have mainly been concerned with the sides of the triangle (Consumers-Nanotechnology, Nanotechnology-Risk Society; Consumers – Risk Society). It is important to address the full complexity, and I will do so by taking a particular cross-section: How do consumers operationalize the risk society when considering nanotechnology (and what can we learn from their operationalizations)?

To set the scene, I will briefly discuss each of the three corners.

Being a consumer is to assume a role, just like citizen is a role. People are living with risk, and the notion of risk seems to make immediate sense to people in their everyday life. As nanotechnology-enabled consumer products have been made available in the absence of any extensive political debate, the role and responsibility of consumers have become accentuated.

Nanotechnology is an interesting site to have a closer look at consumers' reflections over their role in a society where risks are pervasive. Nanotechnology carries with it expectations of great benefits, but also questions of risks. There are expectations that nanotechnology can alleviate many of the challenges humanity face regarding health, environment and energy production and use. As well as the development of new industrial sectors with potentially large revenues and significant job creation. But there

are also concerns about potential negative effects, for example on health and environment.

In the risk society risks are pervasive, and risk governance measures have to address challenges of uncertainty up to ignorance. This challenge is compounded by what Ulrich Beck called 'organised irresponsibility': In modern society no one appears to be responsible for side effects of new technologies, and traditional modes of accountability and liability turn out to be insufficient. But there are debates on how to regulate nanotechnology, and also discussions on responsible development of nanotechnology. So the problem of irresponsibility is recognized, and to some extent addressed.

The risks of nanotechnology concern potential adverse effects on both human health and the environment. Also, new technologies interact with society and culture in complex ways that decrease our ability to foresee the effects of introducing them. Thus, nanotechnology is an example of a 'modern risk', as Ulrich Beck (1992) identified them. In fact, Beck developed other useful concepts and theoretical observations, on which I will build.

Thus far I have referred to the common sense usage of the term 'risk'. The scholarly literature shows that the variety covered by the term 'risk'. It encompasses calculable risks, but also uncertainty and ignorance about impacts and their occurrence[1]. I will continue with the common sense usage, because this is what the notion of the risk society is about, especially if we ask how consumers operationalize the risk society.

[1] The International Risk Governance Council recently defined three categories of emerging risks, where nanotechnology-enabled products are used to exemplify the category 'Uncertain impacts'. The main feature of this category is a lack of knowledge and experience about possible consequences resulting from the deployment of new technology (IRGC 2011). Risk is about calculating the odds, as in Frank Knight's often quoted phrase (about economic rather than technical risk): if you do not know for sure what is going to happen, but have odds – you have risk (Adams 1995). The now common definition of risk as the combination of likelihood of occurrence and extent of hazard has led to further differentiations. Lack of knowledge about likelihoods, but some knowledge about impacts is a situation of 'uncertainty'. When there is little knowledge of actual possibilities and impacts, but some idea of how they might come about, Stirling (2012) identified the situation as one of ambiguity, where values and priorities are debated. If there is no idea whatsoever, he labels the situation as one of ignorance, and he offers suggestions how to address such situations, e.g. by exploring options with attention to keeping them flexible and reversible.

Risks are experienced and taken up in different ways. Regulators have a clear responsibility to address the risk of new products. Industrialists have a responsibility for the safety of the products they put on the market. Consumers might have responsibilities as well.

People, in their roles as consumers and citizens, are part of an evolving social order. In their everyday practices and interactions consumers and citizens contribute to the reproduction and transformation of our society. Because of that, they might be seen, and see themselves, as having responsibilities. In any case, they contribute to making the risk society operational.

An important mode of operationalization is articulation, making clear and more sharply outlined that what was vague. This happens all the time in and through interactions. It requires effort, or 'work of definition' as Ulrich Beck called it.

Everybody is involved, whether one wants it or not, in operationalization of the risk society. This extends to analysts like me, who study such operationalization. This occurs when analysts become commentators and are listened to. In my study, I explore another and more empirical route: analysts can find or create situations where operationalization can be observed, analyse what is happening, and report on it, or build on it for further analyses.

A very interesting situation is a focus group, if not used for marketing studies (where participants are treated as bearers of existing views and attitudes), but consider them as situations for interaction and articulation. I was able to use two Norwegian focus group studies that had been conducted for other purposes, and re-analyse them.

The operationalization of the risk society by consumers is the overall theme of this thesis. Given my opportunity to re-analyse focus groups exercises, as well as doing further studies, it is split into two sub-themes:

1. If situations are created where operationalization of consumers can be observed, what do we find as the work of definition they do and the potential outcomes of such efforts?

2. What can we show of the ongoing and possibly better operationalization of risk society when insights from the focus groups are combined with further analyses?

To address these themes I will pursue two lines of work:

1. I create situations where consumers can be observed when they reflect and articulate their operationalization of the risk society.
2. I study what is happening from theoretical perspective including, when relevant, the perspective that consumers are active agents, rather than passive recipients.

This is reflected in the chapters of the thesis. In **Chapter 2**, theory and literature is mobilized to identify and position my theme, and develop the concepts of 'operationalization of the risk society' and 'work of definition'. While briefly referring to alternative theoretical frameworks, I focus on how I can build on elements of Ulrich Beck's Risk Society diagnosis. I add a discussion of the willingness and ability of citizens and consumers to engage, be active and make their voices heard in a risk society, with the help of the concepts '*citizen-consumer*' and '*political consumption*'.

Building on Chapter 2, **Chapter 3** presents the research design, with an emphasis on the focus groups. After a brief discussion of how the methodology of focus groups can be used for my purposes, inquiring into the operationalization of the risk society, the set-up of the focus group studies is reported, and the analysis of the transcripts of the focus groups is presented.

In the analysis of the focus group material, in **Chapter** 4, the interactions of the focus group participants were used to identify storylines, recurrent patterns of argumentation. The content analysis had identified items which could be clustered in three groups, and the connections with the basic storyline could be traced.

The studies of specific issues, in the chapters in the second part of the thesis, are all published papers. I offer short summaries of each of them.

**Chapter 5**:

Throne-Holst, H. and Stø, E. 2008. 'Who should be precautionary? Governance of nanotechnology in the risk society'. *Technology Analysis & Strategic Management* , 20(1), pp. 99-112).

The paper first discusses a theoretical link between the Risk Society thesis and the governance concept of precaution. Based on interviews with different groups of Norwegian stakeholder, empirical dimensions for risk society and new governance are identified.

**Chapter 6**:

Throne-Holst, H., Randles, S., Greiffenhagen, C., Strandbakken, P. and Stø, E, 2009. 'Risk, Responsibility, Rights, Regulation and Representation in the Value Chain of Nano-products'. *In*: S. Arnaldi, A. Lorenzet and F. Russo (eds.): *Technoscience in Progress. Managing the Uncertainty of Nanotechnology*. Amsterdam: IOS Press, pp. 31-52.

This paper discusses the Risk Society thesis and innovation studies literature to elaborate ideas on distributed governance. The empirical material consists of interviews with actors along the value chain of textiles and cosmetics, and highlights salient dimensions of the commercialization of nano-enabled products.

**Chapter 7**:

Throne-Holst, H. and Strandbakken, P. 2009. '"Nobody Told Me I was a Nano-Consumer". How Nanotechnologies Might Challenge the Notion of Consumer Rights'. *Journal of Consumer Policy* (32 (4), pp. 393-402.

The four basic consumer rights were formulated almost 50 years ago, but they are challenged by the recent developments in nanotechnology. Content analysis of advertisements and a focus group study allow exploration of this issue.

**Chapter 8**:

Throne-Holst, H. and Rip, A. 2011. 'Complexities of labelling of nano-products on the consumer markets'. *European Journal of Law and Technology*, 2 (3).

Labelling of consumer products with a nanotechnology component is pushed by consumer groups and the European Parliament. It is a complex issue, however, and this is visible in how the participants in the focus groups discussed the issue. This is a stepping stone to consider other approaches to the problem that labelling is deemed to solve.

In Chapters 4-8, the immediate conclusions will have been presented already. In the concluding **Chapter 9**, I zoom out to discuss the overall picture of the concerns of consumers and how they speak to the issue of living with technology in risk society. New technology is both an occasion and an incentive to operationalize the risk society.

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# 2 Theory and literature

## 2.1 Introduction

Operationalization of the risk society by consumers, the overall theme of this thesis, encompasses a wide variety of questions. For instance, which actors are viewed as relevant and legitimate by consumers for the case of an emerging technology like nanotechnology, and vice versa how do stakeholders view the role of consumers? Who should be precautionary in the face of new developments? What can the role of consumers be? Can consumers better be described as passive pawns or can they be active contributors? What kind choices do they reflect that they have in the market to exercise traditional consumer power, or pursue political objectives through political consumption? In the case the consumers want to act on what they perceive as unwanted products or developments in general, what are barriers and how can various forms of action be facilitated?

Some of these questions will be addressed in Chapters 5-8, and the necessary background will be provided there. Further questions relate more directly to risk. For instance, how do the consumers perceive risks of/in "late modern societies". To what degree are the risks perceived as increasing and unavoidable ("you gain some – you lose some", "everything is dangerous")? Or are risks perceived as increasing but actually avoidable? If consumers think the overall risk level is changing (increasing or decreasing), what has been the contribution of newly emerging technologies in general and nanotechnology in particular, in that picture? How do stakeholders view the question of risk of an emerging technology that holds great promise?

There is a temporal dimension as well, starting with the question whether and how lessons from the past can validly and productively influence our decisions about the future? Do the positive possibilities of tomorrow's nano-innovations overshadow the risks the same innovations may bring, so that it is the future rather than the past that guides our decisions today? How do stakeholders and participants in focus groups argue over this balance? Does the precautionary principle play a role, and how?

Of course, not all of these items can be taken up in this study. Some of them will come up in relation to findings from the secondary analysis of the focus groups. Others will inform comments on these findings, and/or be an input in the analyses presented in Chapters 5-8. The upshot is that this theory and literature chapter should not do dedicated literature reviews of what is known about one or another of these questions. Instead, it addresses general issues, of evolving risk society and its operationalization, to the role of consumers and the possibility of reflexive operationalization.

The basic issue is how society, in particular the risk society, is reproduced and transformed in practices and interactions, and how this becomes reflexive. Ulrich Beck's work is important, when he points to patterns and mechanisms that shape individual's perceptions and actions. Beck also discusses connections between risk and responsibility, and introduces the notion of sub-politics which can be used to discuss actual and possible roles for citizens and consumers, for example political consumption.

This structures how the present chapter will proceed, from basic issues of operationalizing societal change, to a discussion of theoretical perspectives on the risk society and the specific contribution of Ulrich Beck, in his thesis of the Risk Society as what constitutes late-modern societies. It then continues to discuss how consumer and citizen roles are merging, and how the new hybrid role can be the basis for active 'political consumption'.

## 2.2 Positioning my theme

Reproduction is never completely faithful, and transformation can start as partial reproduction. To emphasize this, one can write reproduction/transformation of social order. The slash between the two notions reproduction and transformation indicates that they are, as it were, two sides of the same coin.

Reproduction/transformation of social order is not limited to just ongoing actions or interactions. There can be explicit change action, and there are appointed or self-styled change agents. Conversely, there can be disciplining and policing to maintain social order. Think of the injunction contained in a common Dutch saying: 'Do as usual – that's crazy enough!' (Shetter 1971) Similar sayings can be found in other societies, pushing people to follow the norm. Actually, reproduction of social order can be viewed as desirable, even in the face of changing circumstances, e.g. when core values have to be maintained (although that by itself is again an ambiguous claim).

In reproduction/transformation members of a society draw on a cultural repertoire, a toolkit of habits, skills and styles (Swidler 1986), intentionally or not. They need not put every part of this tool kit to use, but they can select differing pieces to construct differing strategies of action. In all cultures there are diverse and even opposing "*symbols, rituals, stories and guide to action*" (ibid., 277), so the culture need not direct actions in one particular direction over another. Cultural repertoire can actually be considered as the "*adaptive potential*" for members of a society (Hannerz 1969: 186).

In their role as consumer, people can contribute unknowingly and unintentionally to reproduction of a social order of the risk society that is less desirable, for example by making product choices that have detrimental health or environmental effects for the consumers themselves and/or their immediate surroundings, or on others, far away – such distances could be geographical (e.g. workers in China) or cultural or temporal (future generations). Reproduction can also be the result of deliberately leaving out the risk considerations, because the risks are viewed as hyped up by the media or other actors with their own particular agenda, or because the responsibility for

attending to certain risks is seen to rest with other actors, like governmental agencies. The reproduction of risk society always includes some change and gradual transformation. Experience with hazards and concerns about risk is appropriated, and taken into account when acting. Consumers and citizens can explicitly think in terms of modifying the risk society. By changing or modifying their practices and interactions, consumers can intentionally work to transform society.

The ambition of transforming the risk society can take different shapes. The idea is not only that risks can be controlled, or at least managed, but also that our ways of living and managing risks can be changed for the better. To mobilize support, there will be reference to aspects of risk society that are deemed unacceptable, and there might be a vision of how to do better. The ambitions range from a better balance between risks and benefits to risk-free products or activities, or even all the way to visions of a risk-free society.

Specific actions directed at reducing a risk, or allocating a responsibility, will also be part of reproduction/transformation of the risk society. It is a matter of structuration (Giddens 1984), where actors like consumers and citizens, intentionally or unintentionally, shape structures in their actions (Williams and May, 1996). Actions of consumers and citizens can have real consequences, but the mechanisms through which they are brought about are not necessarily recognised by those who act.

All this adds up to operationalizing the risk society, making it work in one way or another. Operationalization happens all the time, and involves articulations. For example, concerns are made clear, and become more sharply outlined. And as symbolic interactionism emphasizes, there is always work about the definition of the situation, including questions about what is part of the situation (and thus to be taken into account) and what is not. This occurs in interactions and can have more or less stable, but in any case more articulated outcomes. One can see this also as a learning experience: An individual enters the interaction with his/her own preconception about the situation, which may be quite vague, but become clearer and better outlined through the interactions.

Beck, in his 1986 book and the 1992 translation into English, introduced a further concept: 'work of definition'. This happens all the time in social interactions, and it requires some effort – and thus "work". It can sometimes become dedicated work, to actually formulate definitions. This can happen informally, when people ask whether something is X or Y and the matter of definitions comes up, or when they sit together to discuss a definition of Z (at first unclear) which can be written up and guide further action and interaction. Or more formally, as when there is a need to define what is to be counted as nanotechnology, and the European Union issues a somewhat authoritative document on the definition of nanotechnology (OJ 2011).

As Beck emphasises, this is particularly important for risks: *"[risks]can thus be changed, magnified, dramatized or minimized within knowledge, and to that extent they are particularly open to social definition and construction*" (Beck, 1992: 23). Actually, the stakes may be high. Beck offers the example of how the risks of nuclear power were 'minimized' in the face of the 'dramatization' of the effects of climate change: "*There are always losers but also winners in risk definitions*" (Beck, 1992: 23).

Beck makes further important points about who is involved in the work of definition, and who is expected to be, or not to be. In late modern society (or "second modernity"), where the risk society comes into its own, collective sources of meaning dissolve and individualization occurs: *"[it]leads to all the work of definition henceforth being expected of or imposed on individuals themselves*" (Beck 1996: 29). Thus, there are 'relations of definition', analogous to the Marxist notion of 'relations of production':
"*Risk Society's relations of definition include the specific rules, institution and capacities that structure the identification and assessment of risk in a specific cultural context*" (Beck 2000: 224).

In the case of new technologies like nanotechnology, the existing relations of definition cannot just be assumed to work. There are "holes" in the regime, and its inadequacies are noted and sometimes contested. For the new situation, it is not clear who is to be part of the relations of definition, and who is not. Regulators are facing this challenge when there is a call for more public participation. Legal and other professionals analyse possible relations

of definition and their productivity, although without using the term. The advantage of Beck's notion is that it is not limited to formal arrangements, and can address the politics involved, which are especially visible when the stakes are high.

In general, dedicated work of definition, of a situation or a development, can be done by analysts, for example in analysing actual practices and arguments of labelling nano consumer products. There are two components in such an analysis. One is the characterization of what is occurring, showing how risk society is *de facto* being operationalized. The other is that analysis is work of definition, and when fed back, supports and stimulates the process of de facto operationalization, and can make it more reflexive. Thus, in the publication and dissemination of the outcome of the analyses, analysts contribute to the further operationalization of the risk society.

Relations of definition shape the ongoing, *de facto* operationalization of the risk society. If and when consumers and citizens realize they can deliberately contribute to change, and act on that basis, the operationalization becomes more reflexive. One can see that happening already when consumers and citizens turn their impressions and experiences of living in the risk society (without using the term) into concrete and tangible stories and reflections. These give voice to their views, but can also become part of the evolving cultural repertoire.

In sum, the notion of operationalization of the risk society by consumers and citizens (as well as analysts) that is the overall theme of this study, has been shown to occur all the time, *de facto*, and more or less reflexively. Beck's concepts of 'work of definition' and 'relations of definition' were helpful to articulate the notion of operationalization further. In a more normative vein, it implies that reflections of consumers and citizens are not regarded as opinions or signals public acceptance, but as work (of definition) – as such, it deserves to have more value and more weight in debates on governance and politics in the risk society.

## 2.3 Theorising risk society

There is a large literature on risk, and of course, a vast literature on society. Relatively few authors, however, have tried to formulate theories on the emergence and developments of a risk society. Following Taylor-Gooby & Zinn (2005) and Lupton (2006) there are three major social science perspectives: sociocultural, governmentality and risk society perspectives. Four authors can be taken to stand for each of these perspectives, and they will be briefly discussed here, based mainly on three review articles (Mythen 2004, Taylor-Gooby and Zinn 2005; Lupton 2006): Mary Douglas (socio-cultural perspective), Michel Foucault (governmentality perspective), Anthony Giddens and Ulrich Beck (risk society perspective).The idea is to offer brief discussion of the alternative theoretical framings and continue to develop Beck's perspective as the one that this study builds on.

Mary Douglas is known for her 'cultural theory', where perspectives and approaches of groups are shown to go with specific social forms, characterized by their being strong/weak on 'grid', and closed or open on 'group' dimensions. For example, a low grid, closed group social form ("collectivist") will view nature as vulnerable (so one must be precautionary), while a low grid, open group ("individualist") sees nature as resilient, so one can take risks and learn from the experience. A third social form, high grid, high group ("bureaucratic") leads to a view of nature as manageable, if done carefully. Her cultural theory has been applied in various domains, and for specific controversies. It is then difficult to make the step towards society as such, at least for modern differentiated society (but see Schwarz and Thompson 1990).

Such an attempt was made in the book by Douglas and Wildavsky (1982), a "*controversial essay*" as the blurb has it. A rich description of the US debates and interactions is offered as a struggle between the centre (composed of 'hierarchists' like government agencies and staff, and 'individualists' going for promising technology) and the periphery, where 'collectivists' push their critical perspective. This is a diagnosis of the risk society, but it does not build systematically on Douglas's cultural theory. The Douglas and Wildavsky (1982) essay does discuss modernization, with its shift to awareness of risks as out there, and perhaps calculable (at least by the professional risk analysts

commissioned by the 'hierarchists'). This links up with Beck's diagnosis of late modernity being a risk society (see below).

There have been criticisms of the political undertones in the book, especially since environmental groups were labelled as 'sectist' (rather than the more neutral term 'collectivist'). Another criticism is the homogenzing effect of the strong link between a social form and the views and justifications of action held by the members of that social form. There is variety, and one might want to start from the other side, where specific groups and individuals are taken as offering understandings and responses to risk. Finally, there is a suspicion of a constructionist approach to risks, "[which] *undermines any realism in identifying risk*", as Taylor-Gooby and Zinn (2005: 5) phrase it.

The second major perspective, governmentality, builds on the work of Foucault. Foucault did not do extensive work on risk himself, but he has inspired others (Lupton 2006). Foucault's work includes study of how new techniques have been developed by the nation states since the 17th century, as Taylor-Gooby and Zinn (2005: 9) phrase it, "*for managing their populations and achieving national goals*". The disciplining involved can go through less visible strategies where the citizens are encouraged to self-regulate and self-discipline to be 'good citizens'. Putting on a seat belt while driving your car, or selecting foods that are healthy, are examples from late-modern society (Lupton 2006). There are disciplining effects of discourse (Mythen 2004), and as discourses on risk multiply, so do the requirements on citizens to adopt ever more risk-managing and risk-avoiding practices, thus restricting and regimenting behaviour (ibid). The Foucauldian perspective can then be used to criticize such disciplining, and stress the value to citizens to actively manage their careers, training and food habits (Taylor-Gooby and Zinn 2005). The pervasiveness of disciplining can be linked to the pervasiveness of risks in the risk society, as their being a fit subject for disciplining, but also as an entrance point to criticize such disciplining as new governmentality.

Nikolas Rose has argued that the advanced form of liberalism in western nations includes the twin processes of autonomization and responsibilization, which turn consumers and citizens into agents of regulation in the 'government of freedom'. He has been particularly interested in how life sciences and biotechnology are invoked, and contribute to the current 'regime

of the self' (Rose 1999). Emphasizing such developments as forceful and almost unavoidable opens up the governmentality perspective to a critique, as Taylor-Gooby and Zinn (2005) observe, that people are depicted as puppets of the regime, with little room for agency.

The third perspective, the risk society approach, is carried by Giddens and more emphatically, by Beck. They write from different backgrounds: Beck from the sociology of the family and sociology of institutions, whereas Giddens writes from general social theorist background (Lash and Wynne 1992). Since the publication of 'Risk Society' by Beck in 1986, translation in1992, and 'Self Modernity and Self-Identity: self and society in the late modern age' by Giddens in 1991, the overlap in perspective was recognised, particularly the shared diagnosis of the advent of reflexive modernization, and it has led to co-edited books (Beck, Giddens and Lash 1994).

Both theorists diagnose broad changes in Western societies. A central point in Beck's diagnosis is that contemporary Western societies are moving from early (or "first") modernity- the industrial society, to a late modern age, the risk society (or "second modernity"). In late modernity societies are faced with of a proliferation of hazards and risks. In early modernity the concern was with the distribution of "*goods*", in late modernity a major concern is the distribution of "*bads*". Beck and Giddens both argue that people and societies have always been threatened by dangers, but that these were seen as inflicted on society by external forces of nature: famine, floods and diseases. In the late modern era humans produce the risks that they (and their environment) are subject to: radioactive radiation, environmental pollution, residues of pesticides in foodstuffs and ground water (Lupton 2006). Both argue that the study of risk can tell us much about central elements of modernity (Caplan 2000). Compared with Beck, Giddens tends to pay more attention to how reflexive modernization works out at the individual level (Taylor-Gooby and Zinn 2005).

They diverge on how risk society is to be handled. Giddens wants to integrate risk taking: "*There can be no question of merely taking a negative attitude towards risk. Risk needs to be disciplined, but active risk-taking is a core element of a dynamic economic and innovative society*" (Giddens (1999), quoted in Caplan (2000: 6)) Beck, at least in his original diagnosis of the risk

society, thinks a fundamental change is needed, linked to his dystopian view about the emergence of modern risks.

The risk society perspective has been criticized as difficult to trace empirically and limited theoretically (Taylor-Gooby and Zinn 2005; Mythen 2004; Beck 2000). The focus on the declining role of social structures and the highlighting of personal choice make individual notions of identity and agency predominant over possible differences between social groups (Taylor-Gooby and Zinn 2005). Also, it is pointed out that the "*universalism*" of the risk society perspective overlooks "*the complexity and multidimensionality of everyday negotiations of risk* "(Mythen 2004: 8), and the cultural framings people use in their perceptions of risks (Taylor-Gooby and Zinn 2005).

Specifically Beck's work has been criticized for mixing a diagnosis of current society with claims as to the directions it will have to develop ("reflexive modernity"). He can make sweeping claims in this respect (e.g. in Beck, Bonss and Lau 2003). On the other hand, the basic point, also visible in the extensive empirical work that has been done in Beck's group, is exactly about what is attempted to be captured in the notion of operationalization of the risk society: Beck and Lau phrase this as: "What appears as 'decay' and de-structuration in the unquestioningly accepted frame of reference of first modernity (and in this respect is bracketed off and marginalized), is conceptualized and analysed as a moment of potential re-structuration and re-conceptualization in the theoretical perspective of reflexive modernization" (Beck and Lau, 2005: 552). There are remaining puzzles, like the treatment of risks as somehow given, big blocks that have to be accommodated to. These limitations can be taken up when I develop Beck's thesis and issues of consumers in the remainder of this chapter.

### 2.3.1 Understanding risk

While Beck's diagnosis refers to risk analysis, with its technical use of the concept of 'risk', in speaking of risk society the concept is used in its common sense, and somewhat blurred meaning. So it is a social category: how do people, how does society, use the label risk, and use it to order their practices

and institutions. Risk then is not one big thing, but a lot of things of different sizes. It is possible for actors, like consumers; to have agency with regards to risk, and juggle them in their lives. There are different ways of meeting, ordering, fending off or trying to solve risks. Such room for manoeuvring imply a certain freedom for stakeholders and actors like consumers and citizens.

I can draw on Penny Vera-Sanso's work who introduced the concept of" *juggling risk*" in her account of how Indian women in a poor neighbourhood try to navigate different kinds of social risks: if their husbands fall ill, there is a risk of loss of social status of the family of not having any or very little money – but on the other side women are not supposed to work and there are several risks she will have to position herself against or reason within a strict framework: that she is very reluctant to work, that she works from home, that her husband still is the man of the house, that her brothers appreciate it, and that the money is put to social acceptable uses: paying for the children's education or picking up the family's belonging at the pawnshop (Vera-Sanso 2000).

This is also a general point: looking into other risks than the "social risks" Vera-Sanso is focusing on, the idea of how some risks are accepted to fend off other risks is of interest. Consumers and citizens are not faced with discrete, singular risks, one at the time, but instead they face several at once.

When everything appears dangerous, or risky, an alternative to general anxiety is the possibility that consumers and citizens will just adjust what they identify as acceptable risk levels in their personal lives. If you do not know if carrots are good or bad for you, whether red wine is good for your health, or not – how can you make up your mind over the multitudes of such considerations in your everyday life as consumer (and then often in the role of making decisions for others in their household, for instance when shopping food (Miller 1998)). Maybe as a result of perplexity or fatigue consumers and citizens could just resort to adjusting their comfort risk level up a few notches. Such adjustment would then be a radical juggling act– that some risks come to be just ignored, or rather taken for granted.

There are different types of risks, including social risks of which Vera-Sanso discussed some examples. There are environmental or health risks. Discussing, increasing the definition and deciding on such risks most often involve scientific investigations and evaluations. There is no authoritative clarification from science, however, which settles conflicts on risk issues for environment and health, and "*eruptions of controversies*" will continue (Limoges, 1993). This is a further feature of the risk society. Beck adds that in the risk society, science encounters risks and problems that have been produced by science itself, as in the case of nuclear power.

A compelling illustration of another feature of (modern) risk in the risk society is the accident in the Chernobyl reactor in 1986: A reactor accident triggered a massive explosion and large amounts of radioactive material were spread out across Europe. The release of radioactive isotopes knew no boundaries, neither geographical, or in terms of prosperity or even time[2].

## 2.4 The Risk Society thesis

### 2.4.1 The notion of Risk Society

My theme of an evolving risk society and the attempts by actors and analysts to articulate and analyse what is happening, and what could or should be done will have to address issues and challenges that are encountered also in Beck's perspective, and in other literature on the subject. As it turned out, to profit from Beck's work one has to differentiate between the 'risk society' – a phenomenon out there, to be studied and characterized – and the 'Risk Society' as Ulrich Beck's attempt to draw attention to, and diagnose such a phenomenon. (I am introducing a typographical distinction here, lower case versus capital letters for the initials, to facilitate reference to the one or the other.) He actually goes a step further and makes claims about where and how Risk Society will develop, and that it has to move in certain directions.

[2]Last year, in 2010 around 20 000 animals in Norway still got special feed to reduce radioactivity from the fallout from Chernobyl accident (SLF 2011). 3500 workers are currently (2011) employed at the site in Chernobyl trying to avoid further releases (Nature 2011)

Further conceptualization of consumers and citizens can build on Beck's diagnosis. His claims about directions of development of our society are less relevant and helpful for our purposes. In a sense, this study is more interested in the questions Ulrich Beck asks, rather than the answers he provides.

A further important distinction is the one between a notion of Risk Society that can be used as a label, and the Risk Society thesis. The notion has had great impact, almost like a slogan- resembling a "*lingua franca*" (Mythen 2004:5) as it intuitively and instantly resonates with the sentiments in Western societies on recent social and economic developments. The notion is here understood as associations and reflections with sentiments of consumers and citizens when they are introduced to the notion "Risk society". It is a powerful term, in the sense that the sentiments of a majority of consumers and citizens particularly in the Western world on the notion will be to associate certain features to it as a society of risk, it is characterized by risk. The society produces risks itself, and these risks are distributed throughout the society. Even if the risks are distributed unevenly, it is impossible to avoid them completely. A common understanding of the notion might also be the institutions and institutional arrangements of the Western societies in the face of these risks, which are expected to contribute to the prevention, limitation, information, containment and compensation of risks.

The term "risk society metaphor" has been used by Matthew Gandy (1999), in an article on the legitimacy and capacity of the state for environmental regulation in an age of risk, but without explicit reference to Beck. He uses 'risk society' to indicate both how contemporary environmental risks differ from those of the past, especially with regard to the scale of these risks, and, that there is an increased weakness in the capacity of social institutions for handling the relations between society and nature. These are central points in Beck's Risk Society thesis. They have become so generally recognized that the label can be used without attributing it to Beck's book.

The distinction between the notion and the thesis is made to be more clear about operationalization of the risk society. It is a phenomenon to be studied, but the notion of Risk Society captures something about the risk society, also in the minds of consumers and citizens. Their thoughts, reflections and

associations can be guided by such a notion, independent of the specifics Beck considers in the Risk Society thesis.

### 2.4.2 Risk Society thesis of Ulrich Beck

With the publication of his book on *Risikogesellschaft* (Risk Society) in 1986, Beck firmly put the issue of risk on the agenda for the social sciences. He developed his theoretical framework further (Beck 1996, 1999), but has since gradually shifted his attention towards the concept of reflexive modernization (cf. Beck and Lau 2005), and less so on risk issues.

Implicit when speaking about "Risk Society", is a societal perspective. It concerns society at the macro level, truly a *"...panoramic analysis of the condition of the Western societies*" as the book's back text asserts. Beck highlights how the economic transition from an industrial society to a post-industrial society has far-reaching social consequences. Central among these is the issue of risk. The nature of risk has changed as well as the number of risks, according to Beck. Man now faces modern risks, manufactured by him/her and that these appear as being on the rise and harder to control, as opposed to natural hazards in the pre-industrial age. In his view these hazards were perceived as external forces acting on man. In pre-industrial times risks were mostly local and spatially limited, as well as rooted in nature. In the post-industrial society Beck sees an objective increase in the number of risks, and these risks tend to be global in nature, but man-made, they know few boundaries regarding time or geography, *and* they are invisible. Beck is focusing on three 'icons of destruction' (Mythen 2000): nuclear power, biotechnology and global warming (Beck 1992:39; Beck 1995: 4).

This could be an important observation in itself, but Beck continues, not only is the nature and number of risks changing, but the whole concept of risk is part of the power struggle in modern (and post-modern) societies: what is defined as risks, and in what way they are depicted as acceptable/unacceptable, containable/catastrophic, likely/unlikely is socially constructed (Fitzgerald and Rubin 2010). And these constructions are to a large degree decided upon by what Beck later names "the relations of

definition" (Beck, 1995). This notion implies that those that bear the responsibility for a risk and would be liable to pay compensations, could very well be the same as those who define limits for what threshold value is acceptable for a given risk. Modern risks are challenging and transforming the institutions and political system of Western societies, and although the risk definition is socially constructed, Beck also has a "*fairly realist approach*" to risk (Upton, 2006).

This is Beck's grand narrative, and he develops it theoretically for a number of societal issues. The Risk Society thesis has a wide scope, with chapter headings like "*'I am I': Gendered Space and Conflict inside and Outside the Family*" and to "*Science beyond Truth and Enlightenment*". Aspects like the implications of reflexivity and modernity for the relationship and dynamics between the gender in the family, or the ramification of reflexivity and modernisation for working life, would not explicitly be part of the analysis here. But these aspects are to be kept in mind, if only as a reminder that consumers and citizens are not just abstract roles, but people, gendered, with relationships within their families, and taking, or having taken, part in working life.

Many of Beck's assumptions, postulations and interpretations have been contested, and it has been criticised both theoretically and empirically (Taylor-Gooby and Zinn, 2005; Caplan 2000). Part of the criticism concerns what some see as the Risk Society thesis lack of sensitivity to a number of issues like the risk perceptions of different social groups, individuals' differences in decoding media representations of risks and the complexities in everyday risk negotiations (Mythen 2004, Lupton 2006, Anderson et al., 2009). Even his writing style and way of argumentation have been criticized for impeding the interpretation of his work (e.g. Mythen 2004). Others have discussed how Beck apparently has mixed up theory and diagnosis[3] in his Risk Society thesis.

[3] In chapter 1 these were labeled 'diagnosis' and 'claim'.

### 2.4.3 Nanotechnology as a modern risk

The focus on nanotechnology is developed specifically as to how it has been introduced in the form of nanomaterials in consumer products, i.e. nano-enabled products. The success of such products may pave the way for the large-scale integration of nanotechnology in many fields of application (medicine, energy use and production, transport), however, the risks this set of technologies pose remain unclear. The understanding and possible management of these risks have been focal points in the discussions over nanotechnology. The risk dimensions of nanotechnology can be placed in the theoretical framework of Beck by considering them as modern risks, in the sense of Beck. As laid out in Beck (1992), there are three dimensions and features:

- The new nature of risk in the new modernity:
- Those who define the risks and set their subsequent thresholds are the ones who will have to bear the responsibility and pay compensations. This is an inherent conflict of roles, and is the result of the relations of definition – power relations established by "the core of structure of technocracy" (Beck 1995: 116).
- Temporality: earlier, the past was seen to determine the present, whereas in the new modernity it is the future that has been granted this role. Or as Beck phrases it rather dramatically: "*In the risk society, the past loses the power to determine the present. Its place is taken by the future, thus something non-existent, invented, fictive as the cause of current experience and action*" (Beck 1992: 34). With the future in such a central role also implies a crucial role for anticipations. The similar observation is phrased by Giddens as '*colonization of the present by the future*'(Giddens 1991: 111, 129). But these anticipations are exclusively anticipations about risks (Beck 1992: 33; Giddens 1991:111). In brackets truly: even the description of anticipation in the Oxford dictionary seems to concern itself mostly about negative expectations (Oxford dictionary:42)

Beck makes observations that can serve as building blocks for an improved understanding of the dynamics surrounding and inhabiting nanotechnology: *"Thus, technology no longer prescribes how it is to be employed in detail;*

*quite the contrary, this can and must be fed into the technology"* (Beck 1992; 216).

He makes this observation in light of microelectronics and its possible implications for employment. But exactly because nanotechnology is an *emerging* set of *enabling* technologies, it does not prescribe how it can or should be put to use.

Here it is worth noting that there is a certain tension between *can* and *should* with regard to the developments of nanotechnology. What nanotechnology can *be used* for opens up for research and scientific developments in a wide field of applications where curiosity can be portrayed as the driving force, what it *should be used* for carries with it a more reflexive approach to the possible applications[4]. In the novel '*The Diamond Age'* by Neal Stephenson this tension is formulated as

> *"Now nanotechnology had made nearly everything possible, and so the cultural role in deciding what should be done with it had become far more important than imaging what could be done with it"* (Stephenson 1996)

In Beck (1992) there is emphasis on manufactured risks and their features:

- Manufactured risks know no boundaries- "a world risk society". They can travel across geographical boundaries, like airborne pollution
- These risks can cross the boundaries of time as well. The radioactive waste we bury today will be radioactive for many years to come. More examples include persistent chemicals in the environment; they accumulate and pose growing risks for future generations.
- Manufactured risks are also invisible, we cannot detect them directly with our own senses, but rather we need the "sensory organs of science", so we need the instruments of science to be able to detect them.

[4] This is a point that has been made about technology in general as well: "Bacon's vision of acquiring dominion over nature has been largely achieved by means of technology, but human beings need now to think about what they want to achieve by it." (Buchanan 1994:245-246)

- Manufactured risks often stems from attempt to control other risks.

There are indications that nanoparticles fall under one or several of these points, but there are uncertainties as to how and to which degree nanoparticles will pose these risks. At the present time these uncertainties persist, and nanoparticles cannot be excluded from any of the risk categories here.

Nanotechnology in the form of nanomaterials fits Beck's features of a modern risk: invisible, hard to control and contain, knowing no boundaries, everyone is at risk. Regulation has gained a prominent role regarding the nanotechnologies. For regulation to work in a satisfactorily manner, many articulate a need for more data on the environmental, health and safety aspects of nanomaterials (e.g. RCEP 2008). And the notion of '*relations of definition*' (Beck 1995) can assist in the formulation of questions that concerns the responsibilities of actors – for who is it that set the thresholds and regulations, and what would be their interests – can they be trusted? Trusted in the sense that they may have other considerations than safety, or rather reducing or minimizing risk levels? Could it be that the ones that decide on the thresholds for a harmful chemical for instance, also are the ones that have to pay compensation when the concentration of the chemical exceeds the same thresholds? How can we be sure that 'sitting on both sides of the table' does not influence their decisions on a threshold? Many would even expect these bodies to (assist in) getting rid of all risk – a risk-free society.

A risk-free society may be an utopia (or perhaps a dystopia, if one thinks of the disciplining and policing that is necessary to keep it risk-free). A certain level of risks must be tolerated– that a world without any risks not necessarily would be a very nice and rewarding place (Adams 1995). Beck's claim that that definition of risks are contested, as was discussed in the beginning of this chapter is important in this respect. There are many fields in which experts disagree as to what constitutes risk in itself, and further what would be an acceptable level of the risk in question. These questions are also requests on responsibility and legitimacy, for who is it that can be trusted in late modernity?

Regarding temporalities, they are also at play here: possible regulations of the applications of nanotechnologies are all the time being checked against future revenues (not just in a capitalistic sense, but also for health for instance) by those against "excessive" regulations. This becomes very visible in the debate on precautionary measures – where both sides (*pro et contra*) really are taking about the futures, but where those sceptical to nanotechnologies in reality are drawing historical parallels: most frequently to GMO, DDT[5]. The proponents on the other hand highlight how precaution could stifle innovations that may/will alleviate health, energy and environmental problems (Holm and Harris 1999).

## 2.5 Citizens and consumers in the risk society

The current political system has been said to encounter significant challenges in trying to solve the problems associated with the risk society. Beck's claim is that the apparent impasse as alienated consumers and citizens from politics and that politics have turned into bureaucratic politics in which rational expert knowledge is paramount. Politics is slow working, and only slowly succeeding. As such only a small minority manage to devote much time to it (Holzer and Sørensen 2002). In the face of such development it is no wonder if voter participation and turnout are in decline.

At the same time it appears as more and more citizens and consumers are getting involved, but outside traditional politics. Beck's point is helpful here: politics have been looked for in the wrong places and by using the wrong concepts. What used to be 'non-politics' has now become politics, and what was politics has turned into 'non-politics'. In realizing such a shift, actors that traditionally consider their decisions to be a part of non-politics, and Beck here explicitly points to businesses, must realize, come to terms with and admit that they actually are part of politics: they exert significant power over social living conditions. The decisions taken by businesses have social

[5] GMO: genetically modified organisms where both health and environmental impacts have been discussed, DDT is an insecticide which had significant effects on whole ecosystems, and not only the insects. '

consequences. At the same time politics has turned into non-politics, decisions that have been taken by elected politicians are now increasingly being taken by bureaucrats based on scientific expert advice.

It is not the political discussions in the parliament that is expected to give rise to an alternative society, but rather the practical utilisation of results from microelectronic, reactor technology and human genetics. Despite that it is realised that the state has limited capacity to influence developments, and there are many complaints about the government's/the state's ability to intervene and influence, there is still a prevailing idea that" *the political system [is] the exclusive centre of politics*" (Beck 1992:187).

Beck envisages opening up of the old political system through "sub-politics". He also presents a rather positive view of the media to let people through, even assists, initiates and enables such politics from below on behalf of the consumers and citizens. He is ambivalent in his views on sub-politics. On the one hand he strongly disapproves of what he sees as the structure of medicine's activities has made it an "*extreme case*" of a sub-political structure. Medicine is in his view without any parliament, no executive branch, there is no "*democratically legitimated politics*" in this particular sub-political structure.

On the other hand, he views subpolitics as: "*the growing interest of a new political culture in participation*" (Beck 1992:203). Sub-politics represent a new political culture which opens up for citizen's initiatives and social movements that may originate from outside the political system. Subpolitics can facilitate an increased political role for these initiatives and movements.

The notion of 'opening up' will have positive associations, at least for some actors. This is echoed by how authors involved with nanotechnology argue for opening up "*standard repertoires*" of actors in the debate, or "*to open the politics of responsible development*" (Davies et al 2009). An 'opening up' of the current formal political system, however, does not necessarily lead to desirable, homogenous outcomes. The opening up could also result in neo-corporatism characterized by close collaborations, sanctioned by the state, between major interest organizations on the planning, preparation and the

implantation phases of public policies (Rothstein and Stolle, 2003). The act of ’opening up’ also means that new kinds of stakeholder arrangements and relations will form. ‘Opening up’ can lead to new, but still undesirable constellations. The same groups of stakeholders can be left out, for instance the consumers, or stakeholders that used to be part of a favourable (i.e. *defining*) constellation, may not be included when things eventually settle down. Rather, new constellations may occur. Such incidents will probably be more of a rule rather than an exception; opening up the existing system will lead to new short-circuiting.

## 2.6 Citizens and consumers

Contributions by citizens and consumers in the reproduction/transformation of risk society were sketched out in the introduction to this chapter. It appears obvious that both the consumers and citizens play a role in this. However this may happen without clear distinctions between the two roles, at least if one were to use the traditional interpretations of them. The question becomes if a hybrid notion of the two roles would be more appropriate to describe and understand what is happening.

If consumers and citizens deliberately try to modify the risk society through actions it would be *reflexive operationalization*. One option for such reflexive operationalization is *political consumption* performed by *citizen-consumers*. As an introduction to these terms three issues are pertinent to discuss and clarify:

1. Is there a need for the hybrid notion of citizen-consumers over consumers and citizens? This question is based on the concerns that are raised over combining actions in the market sphere with the actions traditionally connected with the political sphere, that these rather should be kept apart (Johnston 2008, Micheletti 2003, Eriksen and Weigård 1993).
2. A second issue is to raise the question of what the abilities of consumers and citizens are to make reasoned action and choices in complex and complicated matters like nanotechnology?

3. Finally such actions and choices involve ethical considerations (political consumption is also referred to as ethical consumption), and one may ask if there are different ethical considerations concerning emerging technologies like nanotechnology in the laboratory, in the factories and in the market?

Not all agree that it is the consumers that should step up and into new political arrangements. Some have argued that the consumers cannot not be expected have a productive role in the arrangements of responsibility for governance of the future developments of nanotechnology. Wickson et al. (2010) points to that this is something that should be the concern and responsibility of *citizens*, rather than "the public" being referred to as laity, consumers or stakeholders: As consumers nanotechnology appears as a range of existing or future commodities, according to the authors, and the aim is to bring about acceptance for the products already available, or to assist the market in developing new and acceptable products.

In their framing of the citizen, Wickson et al. (2010) see individuals as someone who should be empowered to assist in the shaping of developments of science and technology; as well as someone who have rights and duties as members of communities. A similar point is made by Stebbing (2009) when she claims that by defining "*the public*" as consumers rather than citizens causes limitations of the discussions to "*available and imagined products*", and such a focus will seriously obstruct "*true engagement about the full range of possibilities and risk*" (ibid., 39).

In the real world developments have left us facing nanotechnology first in our role as consumers. Consumer products with a nanotechnology component have already appeared in the shelves on the market, before it appeared on the political agenda. The public were not consulted in their role as citizens. It may be an important issue to get the decisions concerning the advancement of nanotechnology on the political agenda for the citizens to decide, but by and large the issue remains on the market with the consumers. The discussion about citizens 'versus' consumers, while relevant, might be given a twist by considering that there is a move to a combined or hybrid role, that of the 'citizen-consumer' (to be discussed later in this chapter).

Nanotechnology continues to be low on the political agenda, a rather un-prioritized political issue, bar the discussions on national economic growth and job creations. The low political involvement in other issues concerning nanotechnology can be an argument for citizens to engage in the market, and use their market transactions as a way of expressing themselves politically and use the market as a venue for political action. Consumers can be active and indeed want to be active in societal questions and responsibility-taking. They are able to form opinion on complex and complicated matters, and not least they are willing and able to take on responsibility in their role as consumers.

Thus, behind the framing of the consumer developed here there is an assumption that the consumer can be, and to some extent is, a reflected, reflexive, considerate, active and willing actor that under certain circumstances come into play and can deliberately have great, even decisive, influence over political, technological and social choices. *"Consumption not only pacifies people, it can also empower them"* (Micheletti 2003:70). That the consumer has these competencies, is contested, however. Some see him as a victim or even a villain that cannot or will not take responsibility for his choices or actions. In response, others have praised the consumer as a potential hero, which is fully capable of taking reasoned, independent and potentially responsible choices (Blindheim et al 2005).

Stø et al. (2005) review four Norwegian cases of what they label as environmental success, to investigate what role the consumers had in these cases. Rather than starting with the consumer, they looked for and chose cases that were successful initiatives for environmental action, and then went on to map what role the consumers have had in these instances.

The findings were that the roles of the consumers were indeed quite varied. When unleaded gasoline was introduced in Norway in 1985, the consumers were hesitant both in the build up to this introduction, but also in starting to use the unleaded quality, even though many of them had cars that would not suffer any damage by switching gasoline. When Norway's largest lake Mjøsa, at the end of the 1960ties, and beginning of the 1970s had a number of serious

algae blooms, the archetypical consumers, namely the housewives in the area started a movement to stop using textile detergent that were rich in phosphorous. Phosphorous was viewed as one of the main reasons for the algae blooms in the lake. 'The housewife movement' has since become *the* reference for the potential of consumer power in Norway.

One conclusion of the review of the four environmental successes was that other actors were of decisive importance to make these environmental successes, but even the consumers do have a part to play both in the role as classic consumers, but also in their then newly casted role as political consumers or citizen-consumers.

A similar positive view of knowledgeable publics is visible with Daniel J. Fiorino in his assessment of how participation could help overcome some of the limitations of the technocratic approach to science and technology policy: what Fiorino names a substantiative argument, how the participation of citizens can contribute with new knowledge and new solutions complementing experts' views (in Kaufmann et al., 2010). Although contribution is relevant for deliberative processes, it also portraits the citizens also as a source of knowledge, and not just an entity (or indeed entities) that are in a constant deficit of (scientific) knowledge. "*The public does not always know best – but nor do scientists or politicians*" (Marris and Langford, 1996)

The question of co-production could is relevant here as well, in the sense that the consumers actively engages with technology and are not only passively are influenced by it, but that they as actively can contribute in the further development of it – a reference would be the SMS (short messenger service) used for communication between groups of users, which initially was intended for other use by the mobile-phone companies (Jansen and Nielsen 2005). Active contributions by consumers also have crucial effects on an aggregated scale, namely how they in their role as citizens reason around how science and technology ought to constitute life. The answers of these reflections loop around to shape and strongly influence the means and ends of scientific and technological inquiry. The understanding of the citizens as resourceful and able to understand and debate complex issues is emphasised

by Sheila Jasanoff as well when she suggests that science and technology is culturally and societally embedded, and points to that how citizens use "*culturally sanctioned criteria of competence, virtue and reasoning*" to judge whether knowledge can be reliable and if specific scientific claims will be apprehended as authoritative. The potency Jasanoff ascribes to this element is visible in how she uses the term 'civic epistemology' to capture it "*culturally specific, historically and politically grounded, public knowledge-ways*" (Jasanoff 2005: 249).

Consumers as market actors are relevant and important for the success of the nanotechnologies. To take consumers into consideration in the development of these technologies will facilitate the market introduction when products materialise. Such considerations involves assigning the consumers with both responsibility and agency, surpassing the traditional view of the consumer as manipulated and passive buyers of goods produced in capitalistic societies to give the producers a profit. The consumers in their role as consumer-citizens do have civic competence and want to take both individual and collective responsibility for their own needs and interests.

Public engagement exercises are examples of such deliberative processes. Although there have been a number of them on nanotechnology, it is hard to identify instances where they exerted direct influence on political processes (Stø et al 2010). At the moment such public exercises appear more as giving legitimation to politicians. So far they have resembled exercises in a vacuum as there has been little success, and even limited tries[6] to connect them meaningfully to on-going political processes. Often they have been set-up, or 'orchestrated' to produce specific advise that could be picked up and used by politicians. And even if politicians do not make use of the outcomes, the politicians appear hard to criticize, because they can claim to have consulted the publics. One explanation that has been suggested on the limited effect of the public exercises is that the exercises either tend to focus on rather specific environmental, health and safety risks of nanoparticles, or the nanotechnology framing of the exercise, where nanotechnology's wide range of possible

[6] One laudable exception is the initiative of EPSRC in UK, which used a public engagement exercise to rate different applications for a call for research proposals, but this was not a typical political exercise and was also very limited in scope and concerned only this particular call.

applications distracts attention away from how and why specific applications are developed (Doubleday 2007). The premise is that institutional science often impose their own definition of the public meaning on to the public, so the public is believed to only be concerned about limited, 'specific' risk issues which may exclude both more over-arching dimensions of public risk concern as well the publics' concern over "*upstream (usually unaccountable) driving human visions, interests and purposes in the sciences and innovation itself*" (Wynne 2006:217).

Regarding the outcome of public engagement exercises and the relevance for the debate on risk society it appears rather limited. In general there has been a focus of producing a list of advices based on consensus to un-named politicians, and less so on the processes and discussions that brought them forward. It has also been a focus on the expert advice (delivered either in person or in the form of leaflets) and less on the interactions between participants. A narrow focus on particular risks of particular and possible uses of nanotechnology fails to inform on broader issues of interest to us like operationalization, and a general focus on nanotechnology results in that the wide range of promises of possible future applications diverts attention away from patterns and mechanisms both in general but also connected to the development of specific applications.

Turow (2010) finds that authors have started to question the traditional notion that the terms consumer and citizen reflect fully separate social roles. Turow also comments that seeing the consumer as selfish and the citizen as altruistic, can be turned on its head. Routine shopping can to a certain extent be connected to love and care for other members of the household. Such care could be in the form of buying according to the desires and preferences of your household: both through purchasing what they would like to have, but also buying things in the hope of influencing them to change or improve (Miller 1998). Voting on the other hand can be based on rather selfish intentions rather than the public good (Turow 2010). But taken together these points rather lead us to the notions of political consumption and the consumer-citizen.

## 2.7 Political consumption

To address the notion and the possibilities of political consumption, the work of political scientist Michele Micheletti will be used (Micheletti 2003). She uses the concept of sub-politics in its emancipatory meaning to develop the notions of political consumption and the citizen-consumer. As "sub-politicians" consumers and citizens become citizen-consumers. In creating this role of citizen-consumers they make efforts to move away from *de facto* reproducing risk society, and towards an intentional transformation of aspects of risk society.

Micheletti is starting from her observation that there so far seem to have been a strong economic globalisation that only to a limited degree has been accompanied by a corresponding *political* globalisation. It has proven hard to achieve political coordination across borders and across levels. Micheletti claims that politics have become dead-locked in interest-conflicts, in the need for compromise to secure majority, group think and both a lack of financial resources to solve problems, as well as and improper use of the resources that actually are made available. The citizens have lost faith in the political institutions, which resonates with Beck's diagnosis of the developments.

With the reluctance of citizen to engage in formal politics, there have been growing limitations to what politics can accomplish. But a move is visible to introduce other governance arrangements. There, tasks and responsibilities are coordinated and shared in new and less conventional ways. Governance and the new regulatory state represent an answer on the institutional crisis in the Risk societ , see chapter 5. If these responsibilities are not coordinated the actors that are parts of the governance arrangement may pass it around, resulting in "*responsibility floating*" (Micheletti 2003), which would correspond to the "*organised irresponsibility*" in Beck's Risk Society.

When criticism of organised irresponsibility is combined with the growing realisation of the complexity and urgency of the ecological challenges as well as concerns over global justice, it forms the backdrop for the emergence of political consumption. Political consumption provides incentives to businesses in a way that regulation does not (Scammel 2000). Based on

attitudes and a potential vast set of values, political consumers make their choices on the market. Political consumption "*represents actions by people who make choices among producers and products with the goal of changing objectionable institutional or market practices*" (Micheletti 2003: 2). In this theoretical framing of governance perspective there are not only institutional actors, but *individual* actors as well.

Consumers discover that there are political potential in the selection they make at the market. And citizens see that they can work on political causes in the market place. Political consumption is performed by such citizen-consumers. And these actors are ready for responsibility-taking.

Micheletti uses the example of parents discovering that their child has an allergic reaction to a bathing soap to elaborate this point. The parents start to look for alternatives in different stores in the market. When, or indeed if, they find better alternatives they will tell their friends and family, some of whom may have the same problem. (Others with different concerns over soaps, like water pollution, may try the same alternative and find that the same product satisfies their needs). Further the parents may join forces with other parents with the same or similar associated concerns and engage in a collective action. The engagements in a collective action may lead them to assume political responsibility on a higher level than just a local network. They could organise boycotts or coordinate pressures on manufacturer and retail to ensure the availability of a/the alternative.

These three ways of acting are similar to Albert Hirschman's classic model of exit, voice and loyalty (Hirschman 1970). Although there is a tendency to focus on the three actions exit, voice and loyalty as individual and separate actions, it seems that the case for political consumption would be strengthened through a combined use of the three. Micheletti operationalize these three in the context of political consumption as boycott (exit), demands on producers (voice) and smart shopping (loyalty)

The example of the bathing soap also indicates how the developments that form the backdrop can break down the division between private and public life. What started as a private concern in the private sphere could now move

into the public sphere. Political consumption engages both those concerned with furthering the public interest, as well as private interests (like being able to give your family a healthy, nutritional meal) from negative outside pressures. Such division between your private life (as consumer and family member) and public life (as citizen) was central in the first modernity. Responsible consumer choice and smart shopping is politics that truly is coming from below in Micheletti's view, and very much in line with the positive interpretation of sub-politics of Ulrich Beck that have been discussed earlier here: "*A new kind of politics – subpolitics – is emerging from below that encourages, empowers, and allow citizens to take more responsibility for their personal and collective well-being*" (Micheletti 2003: 9).[7]

Globalisation, individualisation, governance, post modernity and reflexivity have changed the political landscape. But they have also transformed the meaning of the term *politics*. The traditional borders between our public, economic and private lives have through these processes more or less dissolved. Blurring of borders accentuates or even *necessitates* political consumption. This is not to be understood as you *have to* make conscious political choices at the market place. But your choices do have political effects, intended or not. There is *de facto* political consumption. To choose domestic or foreign produced goods, ecological or conventional agricultural produce, fair trade, child labour or sweat shops, even for *other reasons* than the political (e.g. price), it will still have *political ramifications*.

There is a presumption here that the consumer has a choice – which he may not always have. To illustrate this: If you would like to have a cola soft drink in Norwegian restaurant, you will not face the choice between Pepsi-Cola and Coca-Cola, because the restaurants are only allowed to stock one of the two[8]. Or, if your grocery store has milk from only one dairy producer, one could hardly claim the consumer have a choice, but still producers may interpret this

[7] As political consumption can be interpreted as a support of a framing of the consumer as sovereign, active and responsible, one should keep in mind that this particular framing may well be in the interest and be actively encouraged by strong actors within the corporate sector, within governments and within NGOs (Jacobsen and Dulsrud 2007).

[8] As the two are made by and sold through two different breweries and these breweries do not allow restaurants to stock both (Døving 2007)

on an aggregated scale as an intended, real choice with potential political objectives.

And just as the producers, retailer or government can misinterpret when the consumers make actual, i.e. conscious choices, they may as well interpret the choices that are made "without" political intentions, as political. Or, in other words, even if the consumer does not think of it as politics, when selecting the cheapest groceries, this is part of the new politics.

Traditionally the role of consumers and consumption has been limited to the market exchange, and the term has been understood in relation to economic goals (Turow 2010). It is an important backdrop for the discussion on political consumption that the view of what consumption entails, has been broadened in current consumer research. Consumption is viewed as a process that from the consumer's point of view embrace several phases like planning, buying, using as well as disposing (Stø et al. 2008: 246)

Consumers are capable to reflect on complex and complicated matters. Their reflections and subsequent market choices will have a direct (economic) effect on the other market actors. But their hands-on experiences of products and services spill over to their role as citizens where conscious consumer choices appears as an available option to respond to political matters, and so political consumption have emerged, and the consumers have shown, have been able to, and have had to take responsibility outside their traditional role, in their newly cast role as citizen-consumers.

Media outlets form an important condition of political consumption, as it often is envisaged that communication between engaged consumers can take place through the media. The final chapter of Beck's book '*Risk Society'* ends with three scenarios. To ensure what Beck sees as a (positive or rather - *desirable*) system of sub-political controls, he emphasises two crucial background conditions: strong and independent courts, and strong and independent media. Others have pointed to how the courts have increased their influence and power in society over the last decades (NOU 2003). The media appear to have more influence on citizens and consumers than the courts.

Through the media concerned citizens and scientists with alternative explanations, diagnoses and suggestions will be able to reach a bigger audience. Through publication in the mass media they can have significantly larger impact and contribute to the unbinding of politics, to bring about a different understanding of politics. Science and businesses in particular must admit that as they contribute to *"(...), changing the conditions of social life and hence making policy by their own needs*" (Beck, 1992: 233).

That media can have significant impact on the political and societal agenda is uncontroversial, but Beck's view on the media comes across as rather if not naïve, then at least superficial (Mythen 2004). It is hardly correct to portray the media as a "microphone stand" available to all. It is not so that everyone that has an opinion, no matter how justified it is, is given time and room in the media: The media do their independent editorial evaluations about what kind of messages or viewpoints that are newsworthy and relevant (Anderson et al 2009: 20-21). It could even be that the current news picture leaves little room for other bulletins. In addition to such editorial decisions, but not independent of, are the ownership structure of the media and their interests (Mythen 2004: 74), which could reinforce further streamlining or even silencing of differing voices. Following from these critical comments on the media, the crucial question would be how individuals make sense of media products." *Public consumption of the media remains diverse as opposed to uniform*" (Mythen, 2004:92). In Beck's analysis of the effects of the media, the reflexive and critical publics he sees as an integral part of his thesis become a rather passive audience for media reports.

Political consumption and the media are instances of reflexive operationalization of the risk society. Citizen-consumers can become reflexive of the outcomes of their own actions, like choices on the market place. Outcomes may appear as less than desirable, and citizen-consumers can then reach the conclusion that things should indeed change, and this change can come about through an action-oriented operationalization. Reflexive operationalization may also entail not changing actions, in the form of not choosing new available products at the market place, if such products are perceived as resulting in poorer outcomes than current choices.

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# 3 Research design and Methodology of Focus Groups

In chapter 1 the topics for the present work were introduced and based on overarching reflection on the topics the chapter ended with two globally formulated research questions. Chapter 2 started with introducing the concept 'operationalization by consumers and citizens', and showed how this was valuable for the topics and research questions of the present work. A more detailed account of 'Risk Society' of Ulrich Beck followed. Subpolitics as a means to open up politics provided an argument for the concepts 'political consumption' and the 'citizen-consumer'. Combined with the term 'civic epistemology', we came to the preliminary conclusions that consumer and citizens (and citizen-consumers) are not only *willing* to dwell upon complex matters, like nanotechnology, but they are actually *able* to do it.

In this chapter the research design of the work is presented. This is followed by a detailed account of the focus group methodology on which the first part of the work is based.

The introduction of nano-enabled consumer products on the market was in chapter 1 chosen as a focus for this work. This choice was based on the uncertainties surrounding the introduction of these products, both concerning the regulatory framework but even concerns about the potential risk aspects of nano-enabled products as well as nanotechnology in general, which have led to calls for the application of a precautionary approach. Thus, one can expect that the work of definition will be visible here.

Tracing the work of definition and evolving outcomes can be done in various ways. In this thesis, focus group exercises with consumer-citizens are an

important, albeit indirect, source of data. This choice of data was based on the availability of two such studies that had been arranged for other purposes (projects).

I will build on the focus group exercises in two ways: First, as data that show present and future work of articulation and indications of sedimentation, taking the focus group exercise as a micro-cosmos that reflects, and to some extent anticipates on, real-world interactions. Second, the focus group exercises are used as an input into independent analyses of real-world issues of nanotechnology in the risk society.

## 3.1 Operationalization of the risk society

Operationalization is part of ongoing changes. Consumer-citizens contribute in their everyday practices and interactions to the reproduction and gradual transformation of the structures of the risk society. My entrance point in studying these processes and their outcomes is the "work of definition", which is based both on the ways meanings emerge through interactions (symbolic interactionism) as well as Ulrich Beck's emphasis on definition in the risk society.

The work of definition can take the form of attempts to formulate definitions, and their contestation. More generally, it is about articulation (of what starts as new and uncertain) and sedimentation (into ways of reproducing society). Consumer-citizens are involved through their daily practices, but can also discuss risk society issues explicitly, referring to circumstances and possible and desirable developments.

Risks are pervasive and influence our lives and our surroundings in profound ways, as such and through our perceptions and responses. New and emerging technologies carry with them both the hope of alleviating existing risks, but also the fear that they may pose new risks. In shaping their opinions on complex issues people will talk and listen to others and how they reflect upon such issues. In this sense social interactions assist in opinion forming, and in subsequent action.

Besides tracing this in real-life, in the ethnographic tradition, one can also create dedicated settings for such interactions. This is somewhat artificial: people become "participants", but the advantage is that interactions can be facilitated and encouraged, and traced more systematically. Well-known dedicated settings are focus groups. Focus group study is a well-known methodology which has moved from marketing studies to become a research tool in various social sciences over the last 20 to 30 years (Krueger 1988; Halkier 2010). It involves from 3 to 12 participants and is led by a moderator. The moderator is expected to facilitate interactions between the participants, but at the same time to ensure that the topics to be investigated will be brought up for discussion. In that sense, it can be viewed as a form of group interview directed by the moderator, but with an emphasis on the open interactions by participants. Depending on the nature of the moderation, a focus group can function as a platform for participants to articulate experiences of the risk society and their responses. And one can assume learning effects, so that such articulations will have implications in the "real" world, contributing to operationalization of the risk society. Thus, focus groups moderated in an adequate way will offer data on operationalization of risk society, as they occur in the immediate interactions in the focus group. This will also be an indication of what happens in the "real" world.

Organizing such focus groups and analyzing the data, as such and in relation to issues of general concern, like precautionary measures or labeling of consumer nano-products, are ways in which an analyst contributes to the operationalization of the risk society. The first round of results of the work of an analyst are reports and papers, and participation in scholarly or societal debate on the issues, sometimes referring back to focus groups findings, and/or using other data and insights. Often, there is no need to set up a new research design to do such separate analyses, but opportunities thrown up by outcomes of the focus group exercises can be exploited, combined with ongoing debate on issues of the risk society. This is how the four chapters in the second part of the present work originated. All were published as articles in scholarly journals or chapters in books. There is no need to discuss the set-up of these studies in this Chapter.

## 3.2 Methodology of the Focus Groups Exercises

One way of understanding and analysing focus group data is to view the participants as more or less passive, their responses being based on their cultural repertoire and their socio-cultural background. They explicate their existing views, and the purpose of the focus group is to tap these views. Another way, which I adopt here, argues that focus group participants are also creating new responses and are learning from each other. They will try out their ideas, and come up with new ones stimulated by the interactions in the focus group. There are specifics to the setting. The interactions take place in a relatively secure situation, a setting where the participants are actively invited to speak their mind, with a moderator who is interested in what they are thinking and saying; and the participants may be a company of strangers which may never meet again.

The data generated from focus groups and the subsequent analysis do not aim to replace survey data, but assist in getting closer to typical opinions, thoughts and reflections *"…it [focus group setting] allows for group interaction and greater insight into why certain opinions are held*" (Krueger, 1988). And, important for my question, they allow for interactions, and thus signal what happens and could happen in discussions of the issues that take place in the "real" world.

## 3.3 Focus groups

Focus groups as a methodological approach and a practical tool was developed in the private sector, as a form of marketing research to assist producers, manufacturers and retailers in understanding what their (potential) consumers were thinking about their business and products (Krueger 1988). Marketing research continued to be its primary application field until the mid-1980s. Since then, it has grown in popularity among social scientists. This popularity is rooted in the possibilities the approach offer for active participation, over the more passive role participants traditionally are assigned in structured one-on-one interviews. Such interviews become dominated by the interviewer. The focus group is a non-directional procedure with open-

ended questions. This allows the participants to comment, to explain and to share – preferably in a permissive group environment.

The maximum number of participants in focus groups is considered to be twelve. With more participants, the interactions tend to split into sub-groups with separate discussions. With three or two participants, interactions change in character: the flow of the conversation will be strongly structured by the moderator and become more like a small group interview (Halkier 2010).

Other methodological approaches, both quantitative and qualitative, presume that people already know how they feel about a product, a service or a societal aspect, or, if their opinions are still to be formed, that this happens in isolation (Krueger 1988). Focus group exercises allow the interactivity of opinion forming to be captured. In the discussion of different opinions held by participants, some viewpoints may change. In my terminology, one can say: work of definition going on.

Focus groups combine group interactions and a focus on certain topics selected by the moderator (in our exercises, social science researchers did the selection of topics). Focus groups give the participants the possibility to express explicitly how their opinions form. Thus, the data informs on the formation of opinions and meanings in groups of people (Halkier 2010). This is not to say that they enable the analyst to look into the minds of the participants. They *formulate* their perceptions, thoughts and opinions and *talk about* what they do, feel and think. If the focus group is video recorded, additional sources of information can become available like body language, gestures and who the participants are addressing when they speak. Versions of conversation analysis can be done on such data. For my purpose, such analysis will help to interpret what the discussion is about, and what conclusions can be drawn about the work of definition that is going on.

Of course, focus groups exercises are artificial, "*transient and experimental settings*" (Lezaun and Soneryd 2007: 280). Still, such situations may not be that experimental to most people nowadays, there are several settings where they would be mixed with people they do not know beforehand and where they are expected to formulate and express their opinion. Lezaun (2007)

considers focus groups as one site to study production of opinions, which he thinks has been neglected:

> *Make the production of opinions a proper object of sociological investigation, in the same way that the creating and circulation of knowledge has long occupied a central place in the agenda of sociological research* (Lezaun, 2007: 132)

This is similar to my aim to trace work of definition.

In pursuing his aim, Lezaun raises an important caveat: focus groups studies use group dynamics to get hold of individual opinions, and thus neglect the tension between an ideal of naturalness (in forming opinions) and the artificiality of the focus group setting with its "theatrical aspects". While this should be kept in mind when analysing focus group exercises, one should note that social life is full of "theatrical aspects" (cf. E. Goffman 1959). For my research question, it is not individual opinions that must be traced but the interactive work of definition – including the theatrical aspects.

This is the more important because the topic, nanotechnology and consumers, is novel and uncertain. The handling of such technology in an evolving risk society will necessarily involve articulation of issues - risk society issues. Thus, to learn from focus group studies they should not be about voicing existing or emerging opinions. The interactions between focus group participants is a process with outcomes in their own right, which here is labelled work of definition.

A last general point: it is hard to validate focus group exercises in a traditional way, because one cannot replicate them, using an identical set-up and participant selection. The interactions that occur are specific (and authentic) to the particular time and space. But as Macnaghten and Jacobs (1997) note, the aim is to explore the range of meanings, understandings and reflections the participants develop on the issues, not to trace once and for all positions and opinions that will occur again in a replication.

## 3.4 Planning, setting up and doing the focus group exercises.

The focus group exercises that provide the empirical data for this work, were conducted in 2006 and in 2008[9]. The planning, setting up and doing of the groups in 2008 is described in Chapter 7. Here, I start describing the focus group exercise in 2006, and highlight parallels and differences between the two exercises.

In both years we worked with so-called mini-groups, with 5 to 6 participants. This choice was practical, to keep the costs down. But mini-groups also allow balancing the requirement of an intimate, permissive environment, while ensuring a large enough size so that interactions between participants would be upfront, rather than interactions with the moderator. This was thought to be especially important when participants were asked to discuss topics that would be quite novel to most of them.

The focus group study in 2006 was part of the empirical basis for a project financed by the NANOMAT-programme of the Research Council of Norway, RCN[10]. This was a collaborative project between SIFO and DNV Research. The point of departure of the project was the question "Who should be precautionary?" together with the further question on who has the legitimacy to decide this. One issue therefore was the relevance and importance of the precautionary principle.

The focus group study in 2008 was part of the empirical basis for a collaborative project between SIFO and Manchester Business School, again financed by the NANOMAT programme of RCN[11]. The theme of this project was ethical aspects in the value chain of nano-enabled products in the consumer market linked to 1) anticipations and responsibilities of actors in the value chain 2) the diffusion of innovation in risk societies and 3) basic

[9] They were parts of two different projects. This means that they were not set up with the present work in mind. Thus, the analysis of the focus groups is secondary analysis: New questions are answered with old data (Glass 1976)
[10] RCN project grant number 171842/S10 (2006).
[11] RCN project grant number 182043 (2008).

consumer rights. The project focussed on the two product categories with most nano-enabled consumer products at the time - cosmetics and clothes ,see chapter 6.

In both years, four focus groups were set up, differentiated according to age and gender of participants. We expected that in discussions on technology in mixed-gender groups, men would come to dominate the conversation. Regarding age, we expected that it could be a factor when it came to familiarity with, and interest in, modern technology. These assumptions were based on general impressions by the market research agency that conducted the study (TNS Gallup), as well as our own views. The choice to differentiate rather than mix creates focus group dynamics that emphasize better articulation of a somewhat shared opinion. This is one way to trace work of definition. In a mixed group, struggles and contestations between participants with different backgrounds would come to the fore.

The participants for the focus groups were identified by TNS Gallup, from their registry of potential focus group participants. One selection criterion was that all focus group participants were to have at least three years of education after compulsory (primary and secondary) schooling, so as to guarantee a certain level of ability in formulating personal reflections and viewpoints. For the higher age groups, this meant a smaller population to draw on, as education after compulsory schooling was less common three decades (or more) ago. Another selection criterion was to avoid having participants working in the nanotechnology field; this was approximated by excluding potential participants with an education in chemistry, biology or physics.

We anticipated limited knowledge about nanotechnology, not just based on the selection criterion excluding people working in the nanotechnology field, but more so because of surveys that had shown low levels of knowledge (Gaskell et al., 2006; Satterfield et al., 2009) and the scarce public attention that had been paid to nanotechnology in Norway. This had implications for the design of the exercises. We wanted to avoid turning the participants into a passive mode which would happen if we started by offering information on nanotechnology. Therefore, there were initial questions to the focus group on different aspects of modern technology. Then, the moderator asked whether the participants had heard, or knew anything, about nanotechnology. This

made a transition to introduce a researcher who offered a 20 minutes introduction to nanotechnology, supported by a Power Point presentation. After questions of clarification from the participants, the moderator asked the participants to reflect on what they had just heard.

### 3.4.1 Doing the focus groups

All focus groups exercises took place at the premises of the TNS Gallup agency, with a professional from that agency acting in the role of moderator. The participants sat around a table during the session together with the moderator (in 2008 they were joined by the researcher). Open sandwiches, cold drinks, tea and coffee were offered at the start of the session. On their way out after the sessions the participants received a gift card as a compensation for their time.

### 3.4.2 2006: four focus groups with 5-6 participants each, Oslo 24 -25 October 2006.

The focus group study was part of a collaborate project together with DNV Research, and Fabrice Lapique from DNV Research gave the introduction to nanotechnology. Lapique's introduction, as well as the moderator's topic guide for the group discussions in 2006, is reproduced in the Appendix.

### 3.4.3 2008: four focus groups with 5-6 participants in each, Oslo 02-03 June 2008.

The moderator's topic guide for the group discussions in 2008 was similar to the one of 2006. In 2008 Harald Throne-Holst (of SIFO) held the Introduction, using a version of the introduction Fabrice Lapique had given in 2006. Both the topic guide and Introduction from 2008 are given in the Appendix.

Additional similarities and differences in the set-up of the focus groups in 2006 and 2008 are summarized in Table 3.1.

**Table 3.1: Additional similarities and differences in focus group set-up for 2006 and 2008.**

| **Similarities** | **Differences** |
|---|---|
| Moderator | |
| A focus on consumer products and consumer issues. | 2006: Genetic engineering a separate topic in the moderator's topic guide<br><br>2006: Only pictures of nano-enabled consumer products<br><br>2008: Mannequin doll dressed up and nano-enabled products on the table |
| Responsibility and precaution were central issues | 2006: Responsibility for precaution, the need to be precautionary, as well as information needs and wants of consumers on various actors. Main focus on political level.<br><br>2008: Responsibility of the actors in value chain: manufacturers, marketing, retail, regulatory authorities. |
| Duration ~2 hours | 2006: Range: 1 h 50min to 2h 4min<br><br>2008: Range 1h 41min to 1h 53 min |
| The moderator is actively and consciously addressing the participants as "consumers" | |

## 3.5 Working up the data

All group discussions were recorded with a camera that was mounted behind the moderator, and saved on DVDs. For the present study, the recording of the focus group exercises were transcribed by a professional transcriptionist in December 2010 – January 2011. Upon receiving the transcriptions they were checked for accuracy by me listening to the recordings with the transcriptions at hand. Generally, the transcripts were of satisfactory quality. The transcriptionist had marked in the transcript where she had trouble hearing what the participants were saying. This could be filled in by the analyst when listening to the recordings.

Not long after the focus groups in 2008 were completed, a check on knowledge levels by age and gender became possible when the annual, country-representative, SIFO-survey of 2008 included questions about nanotechnology. The responses to the question regarding the knowledge level of nanotechnology can be used to discuss the choice to differentiate the focus groups according to age and gender, see table 3.2.

The survey data was collected by Norstat Norway in October/November 2008, through computer-assisted telephone interviews. The questions were answered by 1000 randomly selected respondents, aged between 18 and 80.

**Table 3.2: Responses to the question "How much have you heard about nanotechnology?", from the SIFO-survey in 2008.**

| | | GENDER | | AGE | | | |
|---|---|---|---|---|---|---|---|
| | TOTAL | Male | Female | 18-24 years | 25-45 years | 46-65 years | 66+ years |
| BASE | 1000 | 492 | 508 | 123 | 368 | 380 | 128 |
| Nothing | 40 % | 32 % | 49 % | 27 % | 41 % | 41 % | 52 % |
| Just a little | 31 % | 31 % | 31 % | 32 % | 35 % | 27 % | 31 % |
| Some | 19 % | 24 % | 14 % | 26 % | 14 % | 23 % | 12 % |
| (or ) A lot? | 9 % | 13 % | 5 % | 15 % | 10 % | 8 % | 4 % |
| Do not know | 1 % | 1 % | 1 % | 1 % | 1 % | 1 % | 2 % |
| TOTAL | 100 % | 101 %* | 100 % | 101 %* | 101 %* | 100 % | 101 %* |

**The percentages in the table are rounded up to whole numbers; thus, they do not always add up to exactly 100%.*

These are self-reported levels of knowledge. The higher reported knowledge level may reflect a specific interest in the nanotechnologies, or emerging technologies and technology development in general, and/or reflect willingness to be assertive about knowledge levels (of technology – which may have a gender component).

The table shows a 15 percentage point difference between the genders on the reported level of "Nothing" and an 18 percentage point difference when adding up "Some" and "A lot" categories (37% vs. 19%). Based on these numbers one could argue that differentiation according to gender would indeed avoid dominance of the discussion by participants (i.e. men) because of their higher level of knowledge.

As to age, our focus groups were divided into age groups of 25 to 45 years, and 46 to 65 years. The table show identical reported level of "Nothing" for the two groups, and quite similar for "A lot" with 10% and 8%. Larger differences can be found in the in the categories "Just a little" and "Some", but results diverge. The 25 to 45 years have a higher score for "Just a Little" compared with the 46 to 65 years, while for the reported level of "Some" this is reversed between these two age groups. Based on these numbers one could argue that age has only limited effect. On the other hand if we compare the reported levels for the youngest group, 18 to 24 years with the oldest group 66-80 the differences seem more pronounced. If this is taken into consideration there is support for differentiation according to age.

## 3.6 Analysing the focus groups

The analysis of the focus group data builds on our present research questions, with the concepts of operationalization and work of definition assisting in the development of the analysis.

Focus groups are arenas for social interactions between the participants and with the moderator. This interaction is a process which involves work of definition. Participants tried to make clear what was vague, and articulated issues related to topics introduced by the moderator. Participants in focus group need not be successful in their efforts to define, i.e. what was vague may remain vague. Some themes or issues may be too complex, or abstract for a specific group to accomplish defining. Still work has been involved, which can be traced, seeing how far they have come.

In Table1 in this chapter showed that although there are some differences between the two focus group studies, they also share a number of similarities. There is good reason to say that they share a substantial core of topics, so that all issues raised in 2008, also had been raised in 2006, even though the two studies had slightly different scopes.

In general, even for qualitative analysis, will it be an advantage to have more empirical material available for analysis, up to the point that adding new material does not add new perspectives or insights to your research questions. The question of how many focus groups to include in a project is a balancing act, as qualitative data are time consuming and comprehensive to process. For this reason, one should limit the data material to avoid a superficial analysis and interpretation (Halkier 2010).

It is advantageous to combine the two focus group studies here: this will result in insights on ideas, opinions and perceptions on an emerging technology over time. It is reasonable to expect certain perceptions, thoughts and opinion to be more persistent over time, whereas others are more temporary. Another expectation is that the knowledge of nanotechnology has increased over time, and by combining the two studies facilitates comparison to see if the expected increase in knowledge has influenced the perceptions of the issues surrounding nanotechnology.

The first round of analysis was a content analysis of how participants frame and articulate themes, issues or topics as being of interest (excitement, concern). This is the basis for analysis of how participants increase the definition of these themes, issues or topics and sharpen their outline, including the narratives in which this appears to be embedded.

To identify themes in the focus group material, the questions in the Introduction of chapter 2 were condensed to a set of keywords. The keywords were used as a grid to identify, in the transcripts, where and how different issues appeared

- Actors
- Institutions
- Roles
- Choice
- Freedom of choice
- Responsibility
- Risk
    - Perception
    - Related to technology

    - Evaluations
- Time horizon

A particular focus was on themes, trends, repetitions and ideas that occurred across the focus groups, and this then also allowed the identification of variations and contrasts. Breaks and paradoxes were noted as well, in line with Halkier (2010). There was no reason to do statistical analysis. Focus groups give insights into typical ways of reasoning on questions, issues or topics. Similar articulations in different focus groups do point to reflections that are readily available in the minds of people, in different settings. This would indicate their being part of the present cultural repertoire.

Of course, it was the same moderator, with the same flow sheet and the same lecture in all groups, so the groups have been subjected to similar 'orchestration' (for each year), and this could contribute in pushing the groups towards similar articulation and sedimentation of issues. Thus, an apparent consensus could also at least partly be the result of the similar 'orchestration' of the focus group exercises, even if unintended. The orchestration is materialised through the topic guide, the role and actions by the moderator and the presentation given on nanotechnology. Efforts had been made to have open-ended questions and topic guides, and that the moderator should not intervene too early to close discussions down, and that he would let silence endure every now and then. Also, participants, with their level of education, can be assumed to not be passively led by the orchestration. Overall, we can take it that any shared outcomes across the focus groups will reflect the participant's work of definition, not the similarity in orchestration.

This point is reinforced by the consideration that the social setting differed, as there were different participants in the different groups, and interactions occurring in the groups would be authentic. Even the same group a week later will not exactly replicate the interactions and the corresponding articulations. Ideas are articulated and tried out, new ideas may appear - work of definition is going on. The focus group participants should not be considered to be merely puppets of the cultural repertoire; there are new interactions, with associated learning effects.

Still, it is interesting how certain similar issues, stories or reflections occurred in both 2006 and 2008. The second round of analysis will concentrate on such issues, themes, stories that seem to resemble each other across several of the groups. They are outcomes of the interactions, even when they draw also on existing narratives about technology, risk and society. It is on this basis that I was prepared to make a next step in the analysis, to see whether there was perhaps an overarching story or pattern of argument. Krueger (1988) suggests one should be on the looking out for 'big ideas' which may be easily missed if one keeps too close to the material (Krueger 1988). As will be discussed in the next Chapter, there was an interesting sequence of articulations in one of the focus groups, which put me on track of such a big idea. It was a pattern of argumentation, played out fully in some focus groups, while in others only elements of the pattern occurred. Subsequently, such a 'big idea' can be used to position other themes occurring in the material of the focus groups.

A number of other themes or items were identified in the analysis. Some took place in just one group, but most appeared in several groups. Through an iterative process the items could be organised into clusters. The items in each cluster can be understood as speaking to the same overall theme, reflected in the title of that cluster, as assigned by the analyst.

In general, for the analysis longer articulations in the interactions between the focus group participants are used rather than isolated quotes - with some exceptions. The emphasis on longer articulations is a reflection of my focus on the importance of interactions for the work of definition. I am not interested in individual opinions per se. When quotes of individual participants are used in the analysis, emphasis would be on quotes that seemed to reflect the general sentiment of the articulations that occurred, even if they were not always followed up (verbally) in the interaction in which it appeared.

Quotes opposed to the general sentiment might sometimes be of interest. Such reflections appear as breaks and paradoxes, and they can be as interesting exactly to highlight the common ways of reasoning – "*looking at what rarely happens in order to illuminate what usually happens*" (Gomm et al., 2000). Such occurrences contrast with the group's apparent consensus and put this

consensus in perspective and assist in illuminating what the consensus on a definition really concerned, and where the limitations of it would be.

When there appears to be some consensus in terms of clusters of items or otherwise, one could "*speculate that such consensus might be pervasive within – and therefore of more general significance for – society as a whole*" (Macnaghten and Jacobs 1997:11). This is at best an inference, of course.

These trends have been important for the analysis, to the extent that they could be used to illuminate and talk to the set of questions and issues that were set up at the end of Chapter 2.
These questions were also the basis for investigating specific issues like the role of consumers and responsibility. Risk is a focal point of the work presented here and the transcripts of the focus groups were actively searched for clues on what the participants articulated and used as a frame of reference when they talk about risks. The same approach concern other core terms for this work namely "consumers", and "consumption", in particular when they appeared in settings where the moderator had not explicitly introduced or asked for reflections on these concepts.

As I noted already, materials of the focus group studies were used in other publications (chapter 7 and chapter 8) and in presentations. Except for chapter 8, the material had not been fully transcribed (only particular quotes). In addition to the focus group method, this thesis also includes previously published material (publications). The methods that were used to provide the empirical basis for each of these papers are presented in the individual publications.

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# 4 Empirical findings from focus groups

## 4.1 Introduction

Participants in the focus groups operationalize the risk society through their work of definition, as can be traced in the articulations that are made. Participants articulate ideas and reflections in an interactive setting, thus doing work of definition together. As I emphasized in Chapter 3, what one encounters are not individual opinions often based on preconceived ideas and cultural repertoires, but the results of on-going interactions. This is reflected in how the data are presented in this Chapter: most often as interactions between participants (and the moderator), rather than individual quotes.

In Chapter 3, the differentiation of the focus groups according to gender and age of the participants was discussed, as well as their taking place in two different years. Here, it is the combination of the data from all focus groups which is the starting point. Krueger's challenge to identify 'big ideas', "*trends or ideas that cut across the entire discussions*" (Krueger 1988: 116) is now extended to the whole set of eight focus groups – as they all live in the risk society and operationalize in their daily practices, and are now stimulated to articulate this. Of course, such a big idea will be a reconstruction by the analyst, but building on what occurred in the focus groups. It was actually possible to identify a strong storyline in the transcripts, as a specific pattern of argumentation, and one to which other items in the interactions could be related.

In the transcripts of the young female group in 2008, I noted that the discussion turned at one point, from one perspective to another. After talking about nanotechnology as something to worry about, a broader perspective was invoked where existing products were considered to have worrying aspects as well, and nanotechnology might potentially have significant benefits. This

sequence was also visible in other focus groups, even if less clearly or only in terms of the building blocks of the sequence.

Swierstra and Rip (2007: 4) discussed how positions and arguments (about newly emerging science and technology) "*provoke each other into existence*", and called this a 'pattern of moral argumentation'. Such a pattern is seen to occur here, and it shows how consumers, in a focus group setting, articulate how to conceive life in the risk society. After the introduction to nanotechnology some participants initially voice excitement over the potential of nanotechnology, but this is qualified in subsequent interactions, and nanotechnology is seen as a case for concerns. This then provokes a reaction, when participants reflect on existing products, with their uncertainties and risks. This sets 'the new' (nanotechnology and nano-enabled consumer products) and the old (existing technologies and their use in consumer products) *on a par*. This then provokes a further reaction: one should accept the possible risks of nanotechnology because of the promises to deliver benefits.

This pattern of argumentation is the result of the interactions that take place. An individual would not be expected to create this pattern on his/her own, in solitude. It is the interactions that lead to the emergence of the pattern in the discussion. The further point is that the pattern is not just a contingent outcome of particular interactions; it is recognized and accepted by participants as relevant, across the focus groups. It is important to note this, because sequential effects occur in all conversations. Focus groups discussions have all sorts of shifts and loose ends, and one argument calling another into existence may be accidental. The storyline identified here offers a coherent story, and one that can be drawn upon, as an affordance, in further discussion.

This storyline, a pattern of moral argumentation, will be filled empirically in Section 4.2. I have created headings to identify the three steps that make up the pattern:

> New is worrisome (Section 4.2.1)
>
> But old is worrisome too (Section 4.2.2)
>
> Yes, new is like old – but with possible added benefits. (Section 4.2.3)

Quotes from the discussion will be offered that address each of these argumentative steps. These quotes add up to a convincing reconstruction of the pattern. Elements of the pattern were found in all the focus groups, but the provoking of one step after another was visible only in some of the focus groups.

The identification of this overall pattern (the 'big idea') was in addition to the basic content analysis (cf. Chapter 3). The items found in the combined set of transcripts could be organized (iteratively) in three clusters: Trust and Assurance, Balance of risks and benefits, Roles and agency/influence. They are presented as such in Section 4.3., but they can be linked to the storyline set out in Section 4.2. In that sense, this storyline is actually the main storyline for this Chapter, and I will come back to that idea in the concluding Section 4.4.

## 4.2 An overall pattern of argumentation

Quotes from the interactions are given to show each step in the patter is articulated in the focus groups. These are building blocks, and sequencing, the key feature of the pattern of argumentation, is not always visible.

### 4.2.1 New is worrisome

This argument comes up in the articulations made immediately after the Introduction to nanotechnology by the expert. Although some participants voice excitement at this stage, the general picture that emerges through the participants' work of definition emphasizes the possible worrying aspects of nanotechnology.[12]

> Participant: -*I am thinking about the environment. In the sense that non-decomposing materials that are introduced in such quantities. I think that is scary, if you compare to asbestos and…when you see the effects of hormones and such things* (Females 25-45, 2008)

*

[12] The numbering of the participants in this and the following quotes are used to keep participants in a stretch of interaction apart, and do not identify specific participants across the quotes. Participant 1 in one quote need not be the same person as participant 1 in another quote.

> Participant 1: -*I think it's a little scary that to a nanoparticle there is really no impermeable surface. That you breathe it in, and you can get it rubbed or swept at you, and it becomes almost like a chemical weapon in a way. I think that is a bit scary.*
>
> Participant 2: -*That may happen.*
>
> Participant 1: -*So I am thinking that used improperly it could of course be very scary, but indisputably positive in many respects.* (Females, 25-45, 2006)

*

> Participant 1: -*I got a bad gut feeling*.
>
> Participant 2: -*So do I. I must admit that. That I may both breathe in and apply on my skin things that enter my body that I do not have control over myself, that I know enter my body, that I do not know the effects of them even after ten years, fifteen years…*(Females 46-65, 2006)

In the male groups, the same sentiments are voiced but with more reference to positive aspects.

> Moderator: -*But what is the first impression you are left with? The optimism associated with better products, or pessimism related to the threats and possible adverse effects?*
>
> Participant 1: -*It is not common that both sides are presented. We're accustomed to that we only hear about the positive side, and he comes [the expert] and ruins this…*
>
> Moderator: - *What are you left with? Is it the possibilities, or is it the uncertainty*?
>
> Participant 2: - *I became a bit scared of downsides, just like you [Participant 1] say, that one gets to hear about it. So when you then get to hear about it, then you start to think a little bit and, I think, that it does not sound so good. At the same time there was this dramatic example, which may not be very likely.* (Males 25-45, 2008)

*

> Participant 1*: It is absolutely impressive. That is what it is. But it is scary too.* (Males 46-65, 2008)

In several of these quotes the word scary/spooky ('skummelt') is used to describe the initial reflections of participants following the introduction to nanotechnology. Their articulations at this stage are mainly concerned with the perceived worrisome aspects of nanotechnology.

### 4.2.2 But old is worrisome too

After some time of reflecting on the troublesome aspects of nanotechnology, there is a turn in the discussion in several of the focus groups. Illustrative is what happened in the young female group from 2008, when the participants articulated their initial reflections on the introduction to nano and broadened it to all sorts of products:

> Participant: -*I do not think we can stop it regardless, and there is so much…especially in skin care products, that [already] contain so much 'crap' we are not aware of.* (Females 25-45, 2008)

This did not turn the discussion at first as there were further articulations of the worrisome aspects of nanotechnology, but it was a stepping stone to the later discussion of existing products:

> Participant 1*:- Just think of it when you use deodorant. One has found quite a few..I wonder if it is aluminium or something.*
>
> Participant 2: - *Antiperspirant is aluminium, but not deodorant. There is a difference*.
>
> Participant 1: - *But there are a number of parabenes. They have opened different glands and such on dead people, and found that deodorants are not good for you.*
>
> Participant 3: -*There is a lot of those anti-wrinkle things that injects poison to get the skin to swell up.*
>
> Participant 1: - *We already live in such a society…* (Females 25-45, 2008)

The next quote, from one of the focus groups with older females, is on the topic of new and better products, but with possible question marks:

> Participant: - *If it concerns food, lotions, that I in way…I do know that we cannot protect ourselves against everything that is out there…when we walk in the city. We do know that we are very much affected by a lot of things that aren't good* (Females 46-65, 2006)

In the focus groups with younger females in 2006, their gut feeling was articulated as:

> Participant 1: -*It is somewhat worrisome that there are such skin care products where you do not know about the nanoparticles they contain, what effects they might have.*
>
> Participant 2: -*But then I think: ok, now we have a brief on this, but there is so much…this is the way it is with a lot of things, there are many negative substances with…in another skin cream there are something else that is named something different. So…*(Females 25-45, 2006)

This last sequence is a clear example of the turn to 'old is worrisome too'.

### 4.2.3 Yes, new is like old, but with possible added benefits

The next step in the pattern of argumentation starts with the comment that it might be too early to speculate about adverse effects in the absence of any specific indication of such side-effects. In this articulation, a shift in the burden of proof is suggested: from proving that something is safe, to prove it may be harmful.

> Participant 1: -*I am somewhat sceptical to post such decisions on consumers, and so …that if this is dangerous, it's up to the politicians to ban it and make sure that this is not available. If it is proven and documented that it is harmful, then one should prevent this reaching the market. And then the Food Safety Authority, Food Authority, Inspectorate, all of these authorities should function and make sure that this is not put on the market in Norway.*
>
> Participant 2*: -There is much speculation on how harmful this is. And I think that the functionality of this here is quite ingenious, right, at*

> *least for most of the products. But this is speculation … first there has to come up things that are specifically related to adverse effects.* (Males 25-45, 2008)

Such an articulation occurs in other forms, and again suggesting that benefits as well as risks should be considered.

> Moderator: - *We seem to end up with a somewhat resigned attitude don't we. The development runs its course!*
>
> Participant 1: - *Why should you stop something that you really do not know ... One do not know if it is negative. You don't know that really. That's what our thing here, so why should you ... The only thing was the patch [a patch with nano-silver], but I think you probably would have to look into that. But for the rest here [referring to the products on the table], we do not know if there is any reason to look into them either.*
>
> Participant 2: - *But I think it is important that you have to keep up with….*
>
> Participant 3: - *what one should use it for, not stopping nanotechnology in a way. There are very abstract ... something which in a way could help make this cream good and to like have these health benefits or that create new organs and ... Right, it's…*
>
> (…)
>
> Participant 4: -*At the same time I do agree with you (pointing to participant 1) that…this for instance, that is a fantastic mechanical filter [points to the sun tan lotion with nano-sized sun filter], why should we wait for 15 years before we start to use it?* (Females 25-45, 2008)

The somewhat optimistic view is also visible when risks are mentioned:

> Participant 1: -*I am a bit naïve, because I still believe that there is more research [on side effects] now than there have ever been on asbestos. Because the conditions to investigate possible effects or negative impacts are far greater today than 50-60-70 years ago.*
>
> Participant 2:- *I agree!*

> Participant 3: -*And the potentials in this are so much greater (…)* (Males 46-65, 2008).

Explicit optimism is visible when the participants of the same focus group articulate their final sentiments:

> Moderator: -*[So] Are we ending up with an optimism and a focus on better products, or do we end up with a bad gut feeling?*
>
> Participant 1: -*No, I think…*
>
> Participant 2: -*I am an optimist.*
>
> Participant 1: -*So am I.*
>
> Participant 2: -*Yes, I believe the possibilities are huge. And of course if you have side effects under control and keep an overview of that, then this result in huge possibilities, if what is said here is correct. It is unimaginable…* (Males 46-65, 2008)

What we see is a turn from a general concern about nanotechnology impacts to (in this last quote) a praise song of its huge possibilities. This is not just an opinion, as it might be voiced by promoters of nanotechnology, but the outcome of going through successive steps of argumentation. Thus, the outcome is robust, because it can be justified through the articulations that went into it (cf. Rip 1986). It is a pattern of argumentation that is instantiated in the discussions in the focus groups, but as a pattern it will occur, and be forceful, in the real world as well.

## 4.3 Content analysis and clustering

Through the content analysis of the focus group transcripts a number of items were identified. What overall consideration of interest to this work could each of the items be considered to speak to? I found that the items could be organised into three clusters. Although the clusters are important to understand the overall consideration of each item, each of the items is also important in itself, and not just as parts of the overall story.

The forming of clusters and organising which item belonged where, took the form of an iterative process, where different naming of clusters and the

organising of items were tried out. As the participants discussed a new, emerging and largely unknown technology, there was a number of situations where the participants would articulate how they, in their role as consumers, came to be, or could be assured. So a first cluster could be formed around the issues of Trust and assurance.

An aspect of this appears in a number of the items, and that concerns the balancing of risks and benefits. The items that make up this cluster also illustrate that the participants tend think somewhat broader on this issue, than restricting it to a cost/benefit analysis.

From here it is just a small step over to the issue of roles and agency/influence. This would speak to the other clusters as well as to questions of ‘Who?’, like in ‘Who can be precautionary?’

The three clusters are Cluster 1: Trust and assurance; Cluster 2: Balance of risks and benefits and Cluster 3: Roles and agency/influence. An overview of the items in each cluster is given in table 4.1.

**Table 4.1: An overview of the items in each of the three clusters**

| **Cluster 1: Trust/assurance** |
|---|
| * Techno-optimism and institutional optimism<br>* "See you in court" – the USA liability system |
| **Cluster 2: Balance of risks and benefits** |
| *"It cannot be stopped"<br>* "Everything is dangerous"<br>* A levy on nano-enabled consumer products<br>* But if it really works<br>* The risk of waiting<br>* Genetic engineering as a reference<br>* Mobile phones as a reference |
| **Cluster 3: Roles and agency (influence)** |
| *Information and labelling<br>* Responsibility by elimination<br>* The responsibility of consumers<br>* Independent advice |

Interestingly, these clusters appear to relate to the main story line, the pattern of argumentation as laid out in Section 4.2. The first two arguments ('New is worrisome' and 'But old is worrisome too') raise issues of responsibility, including responsibility for new developments. And indeed, issues of responsibility are articulated further in the discussions. Up to the roles of different actors, and what agency or influence such actors may have. The third argument in the pattern ('New is like old, but with added benefits') in a sense

requires discussion of risks and benefits, and their balancing, and this is what happens, with interesting further articulations.

### 4.3.1 Cluster 1: Trust/assurance

The first item of this cluster captures a general sentiment in the focus groups, their appreciation of technological development and progress. Because there are concerns about prevailing techno-pessimism, I used a heading that suggests there might be another current of thinking as well.

Item: Techno-optimism and institutional optimism

The term techno-optimism here indicates a belief that technology inherently is good. This does not imply that technology development should go unchecked. Measures (by public authorities and producers) are expected to be in place already, or will be put in place. Thus, there is assurance that developments achieve desirable goals.

In the focus group with older males, they responded to the moderator by articulating their thoughts and reflections on modern technology in general:

> Moderator: - *In cooperation with SIFO, we at Gallup are trying to find out what people think and believe. And it's about something that can be linked to the term 'modern technology'. And then I want to start, to get started with a discussion here: When I say this term 'modern technology', what associations does it provide? What are the first thoughts that go through your head based on the expression of 'modern technology'? Let us do a brain storming on that.*
>
> Participant 1: - *Much about electronics.*
>
> Participant 2: - *My first association is tools for communication, whether telephone, video ... and combinations of them.*
>
> Participant 1: - *I would rather pick a different trade, for I do not fancy the data side of things. But I do machine electronics, and that would also be modern technology in this context. So how developments are in my trade, the machine industry, modern technology. Like a remedy.*

> Moderator: - *Other associations to this technology term?*
>
> Participant 1: - *The North sea is a concrete example* [The oil and gas explorations going on there]
>
> Participant 3: - *Energy supply. Solar power, wind power, wave power.*
>
> Participant 4: - *Environmental challenges*.
>
> Participant 5: -*I get these general associations about technology…aids that assist in doing things easier for us and more efficiently.* (Males 46-65, 2008)

Similarly, the older female group in 2006 picked up on the topic of modern technology (prior to the introduction of nanotechnology):

> Moderator: - *What are your relations to the technological development? I can imagine that there are two main types of people. There are those who in a way are saying that: This is moving too fast, while others say: Great, there is a constant development of new and exciting things: If you are to place yourselves in this picture, what do you think about the technological development?*
>
> Participant 1: -*It has been overwhelming*.
>
> Participant 2*:* - *Exciting.*
>
> Participant 3: - *I think it has been great.*
>
> Moderator: - *By exciting I understand something positive. Overwhelming can be both positive and negative.*
>
> Participant 1: - *I was just thinking about when I was a child, and even more so for my mother who is 88, a lot of things have happened. She has tried to keep up with things, managed to learn... At least send messages on mobile and have a PC that she manages to turn on. If she really can do much more than to write something on it and stuff, [I do not know] but still... I am just thinking about this [great] leap. When she was a child, they stood and looked up in the air: '-Oh, there is an aeroplane'! Just this tremendous development. That's how I was thinking 'overwhelming'.*

Moderator: - *But have things developed in the right direction, if we were to take a philosophical view on things? Do we have a better society today compared to fifty years ago?*

Participant 1: - *That is a rather broad question I think.*

Moderator: - *It turned out that way, as the development of society..But has the technological development moved in the right direction, or do you feel different about it…?*

Participant 4: - *It cannot move back again. It ... man is made so that he will always create something new that has not been created before. And it goes forward or ... When you say forward and backward, it's like ... it is certainly new technology, there is something new happening all the time. And one is supposed to challenge what has been made today.*

Participant 1: -*Development, and that that was new for only…like twenty years ago.*

Participant 5: - *But for most innovations then ... it is very much positive, but there tends to be something negative too, but it is really only to sift that out in a way, if you can manage it. For I think the example of internet use, I think it excellent. You could get just about whatever you want there. But ... yes, it was something I forgot to say when I said I did not have children but I have a studio dweller renting with me, a boy of twenty years, and he has to read the newspapers on the internet. The paper version can be on the table down in the kitchen or living room or something, but he rather log on the internet to read. And it somehow ... it's like a little like that ... But if you to overuse things, so I think perhaps that there may turn out a bit negative. But mostly so I think I have to say that we have experienced a lot of positive things.*

(…)

Moderator: - *Ok. What are your thoughts on the technological development, Participant 6?*

Participant 6: - *It's exciting. It's a development that of course do have both positive and negative aspects like everything else. Clearly, it is only moving in one direction, and everything could be misused.* (Females, 46-65, 2006)

In these moderator-modulated interactions, the participants did have some reservations, but their belief in good things associated with technological development dominated. Plus an idea that it is in man's nature to create new things, to be curious and that this is for the good.

However, developments should not go unchecked, as is indicated in the interactions from the focus group with younger females in 2008, here when they articulate their initial reactions to the Introduction to nanotechnology.

> Moderator: - *What is getting the upper hand: the joy of new, good products, or fear of the uncertainty about long-term adverse effects?*
>
> Participant 1: -*Well I think the products I have used until now at least, has worked out nice. I have no need for a very much lighter tennis racket or car that glisten a half years longer or something like that [Referring to the 'Turtle Wax Nanotech extreme' on the table ]. I'd rather take my time and polish my car one more time. [I would] Prefer that over suddenly to discover in thirty years' time it is a huge problem, if for instance all marine life would start to die.*
>
> Participant 2*: -But most people do not know about this. So the common man do not know about this, and they are going to use the products. And the military is going to exploit it for all that it is worth and the world goes on and ... okay. I do not think it is possible to stop this.*
>
> Participant 2: - *Hold on, do not put anymore [on the market]…*
>
> Participant 3: - *I always find new things exciting. But I think there should be responsibilities on the government.*
>
> Participant 2: - *Like with the patches from Sweden? [Referring to an example given in the Introduction where the Swedish pharmacy (a state monopoly at the time), stopped selling patches with (nano)silver]*
>
> Participant 3: - *Yes, because we must be informed that we have to be cautious, and there should be a lot of money on research. And we are very, very rich in Norway, so we may well contribute. And I think it's a bit difficult ethically with the big differences. And like ... I would like to fix my look, but so ... so, where does my selfishness end, or how does my idealism end?*

> Participant 4: - *It would not be good for the planet if all of us got to be 120 years , but at the same time everyone would want one's own to get well when they are sick and so on. So it's…*(Females 25-45, 2008)

So the complement to techno-optimism would be institutional optimism: Technological development can be kept on track towards better products with the assistance and under the vigilance of public/governmental institutions.

Item: "See you in court!" The US liability system

Unexpectedly, there were a number of references to the US liability system, particular in the groups with males. The quote in the heading "See you in court!" is not from any of the focus groups; it is a well-worn phrase in American movies. There was no explicit discussion of how the US liability system works, so the reference to it could be reference to an urban legend. However, big liability cases in the US often get a lot of media publicity in Norway (as well as in other countries). It is clear from the comments of the participants that their idea is that the US liability system makes it extremely costly for a producer to introduce a product on the US market that turns out to be dangerous.

> Moderator*: - Should we have any expectations on the producers' part that they are precautionary?*
>
> Participant 1*: - To a certain extent, the case is that…at least in the US, it is quite risky to introduce goods on the market that turn out to cause harm. We talk about rather tough court decision over in the US.*
>
> Participant 2: - *Yes, that is true.*
>
> Participant 1*: - So I believe that if this is technology that is used in the US as well, then I believe there is self-policing, to phrase it that way. And as long as they do not have any results from research, then…* (Males, 46-65. 2006)

The same point is made when another focus group articulates on the topic whether producers have a responsibility to supply the best possible products, specifically in the case sun-tan lotions:

> Participant*: - I do not think it is harmful, because they are afraid to get compensation issues. If not in Norway then [they would get it] in the U.S. so they are afraid to get lawsuits from customers, consumers.* (Males, 25-45, 2008)

And again:

> Participant 1*: - You may take precautions based on such things, right. But those that rub something on the skin of their kids, that says it is "especially suitable for children", like this one. Then…you believe that this is a good product [picking up a sun tan lotion for kids]*
>
> Participant 2*: - But that is an American product, isn't it, and there litigations are pretty big, aren't they?* (Males, 46-65, 2008)

Thus, the US liability system is viewed by the focus group participants as an assurance that products sold on the US consumer market are thoroughly tested, checked, inspected and examined by all possible means. If products fail, focus group participants expect the producers to face their customers in court and be liable to pay enormous amount of damage. The American liability system is seen as disciplining market actors, and Norwegian consumers can profit from it.

### 4.3.2 Cluster 2: Balance of risks and benefits

Under this heading of balancing of risks and benefits, more issues are taken up than in regular cost-benefit analysis, often having to do with possible action (e.g. more research on adverse effects, financed through a levy on consumer nano-products) or difficulty of action (e.g. because developments can't be stopped). This feeds into discussion of responsibilities, which are collected in the third cluster.

Item: "It cannot be stopped"

In many of the focus group there was a specific reference to the impossibility to stop developments. The quotes here show the participants referring to historical precedents to current developments in nanotechnology and other emerging technologies.

During their initial articulations after the Introduction to nanotechnology, the participants in the focus groups with older females in 2006 referred to historical precedents

> Participant 1: -*But is this not the same as for our grandparents had the time they had petrol and diesel then? They did not know then what kind of emissions it produced and what that would cause, did they?*
>
> Participant 2: -*Probably not.*
>
> Participant 1: - *Like the time when they started putting the additives in food to increase shelf life, as you said, what has that done to the environment? I do not think we can stop the development at all.* (Females, 46-65, 2006)

New adverse effects of this development may well continue to appear:

> Participant: -*What is reasonably certain with this as with everything else, that whatever we feel or not, this will come in full strength. I do not believe it have any significance what we think. And then we have the uncertainties, and still…there have been research on whether mobile phones are dangerous or not, and still nobody knows. In thirty years we may…maybe it is an advantage that we do not resolve this (laughter).* (Males, 46-65, 2008)

The reference to mobile phones will be taken up in another item in this cluster. The quote is used here because of its recognition of ambiguities. Maybe we shouldn't know about adverse effects now, and enjoy mobile phones. The adverse effects may turn out not to be that bad after all. Given that development will continue "whatever we feel or not", this is a message of hope.

A similar sentiment is visible when the focus group with older males sum up their views on nanotechnology: great benefits, and anyway, we cannot de-invent:

> Participant 1: -*I am just thinking of the [nano]technology for water purification, that is just extreme.*
>
> Participant 2: -*Indeed*.
>
> Participant 3: -*…small cars and airplanes that are made less heavy, like he mentioned, less pollution from consumption, you can add it to*

> *gasoline…I am thinking on all those things that can become smaller and less heavy*
>
> Participant 1*: -We cannot de-invent. Inventions are but a step in the part about development.* (Males, 46-65, 2008)

The same notion that developments cannot be stopped comes up in relation ongoing use, perhaps disregarding adverse effects:

> Participant*: - But you have this that people do not know this. I mean, the common herd do not know about this, and they are going to use the products. And the military is going to use it for all it is worth and the world moves on and …OK. I do not believe we can stop this.* (Females, 25-45, 2008)

This participant had heard the term nanotechnology beforehand, but had the idea that it was a future technology that not really had manifested itself in consumer products and significant spending on research, even in Norway. Now that she heard about it in the introduction by the expert, she was concerned that most people will continue to buy nano-enabled products without realizing. And she ends on a note of fatalism.

The inevitability of developments was also related to market forces. The following quote follows on a discussion of the possible responsibility of producers to be precautionary

> Participant 1*: -I also agree to that. You cannot expect them to put too strong restrictions on themselves; the market does not work that way. They are likely to be driven by the competition.*
>
> Participant 2*: -Yes, if demand is there, they will just push on hard. If they do not do that, somebody else will.* (Males, 25-45, 2008)

And there is nobody who is going to stop this:

Participant: - *There are no-one who is going to stop this [nano-enabled consumer products and nanotechnology in general]. This give rise to such possibilities for good and evil, so the precautionary principle, I think we are past that (…)* (Females 46-65, 2006)

Item: "Everything is dangerous"

Fatalism returns when participants recognize that there are a lot of dangerous substances in consumer products already, and assume they will have to live with it (the heading is not an actual quote, but synthesizes the articulations of the focus groups in this item). There are few signs of anxiety in the articulations, the participants appeared to relate to risk as just a part of their life. In the articulations in the focus groups with older females, they appeared more surprised and somewhat angry with regards to what they saw as a lack of control of possible side-effects of nanotechnology.

The tone can be set by the following articulation (during discussion of the responsibility of producers to give the best possible products)

> Participant 1*: -By God, it's so much we do know is dangerous today!*
>
> Participant 2*: -It is crazy how many chemicals you smear on your body!* (Females, 46-65, 2008)

This returned when participants in the focus groups with younger females articulated their initial reactions to the introduction on nanotechnology:

> Participant*: -But I do not think you can stop it anyway, and there's so much ... particularly in skin care products, there's so much 'crap' that we do not know about.* (Females, 25-45, 2008)

And keeping track of everything is unrealistic, as was commented during a discussion of what the consumers might do, in the focus group with younger females in 2006

> Participant*: -How many ... you have nano, but I would think that there are many such dangerous substances in a lot of things, and it is in a way ... that everyone should go and be informed that all substances, it is totally unrealistic really.* (Females 25-45, 2006)

These three quotes point to the impression that there are quite a few dangerous substances out there on the market and in the products already. As they ascertain this, they also imply that they expect further introductions of new problematic substances. This can be the result of a feeling of being kept in the dark, that quite a few products contain "dangerous substances" without anybody really inform the end consumer about it. Or, maybe even it would not even help much to learn that cream A has an ingredient that should be avoided, as the alternative cream B it may well turn out to have harmful ingredients as well.

The picture is summed up in this quote:

> Participant*: -Tell me about something that is not harmful today!*
> (Males, 46-65, 2006)

Item: A levy on nano-enabled consumer products

The two preceding items could be seen as indicating fatalism, but as the participants interact on the topics of who should be responsible to be precautionary, fatalism is backgrounded, and possible solutions or ways out are offered. The idea of a special tax on nano-enabled products came up in seven out of the eight focus groups[13]. The revenues would be used for research on possible adverse effects of these products on environment and health.[14]

> *Moderator: (…) This term precautionary ...do you now sit and think that someone has to be precautionary, or could we kind of go from here and say: Ok, there pluses and minuses associated it with all things, so can we just leave this to itself?*
>
> *Participant 2: - No, I imagine that there is someone who takes responsibility. But it's obviously not the case when I hear ... So I definitely think that politicians and scientists have a responsibility and they should do some educational work here. And these environmental organizations ...The Nordic White Swan* [an eco-label] *and the like, they should also take hold of new technology and follow the research. And even those who design and create new products.*
>
> *Participant 1: - Then the question becomes who should pay for it, because here one should perhaps require the manufacturers of the materials we are talking about, the cloth and the cream and all this ... that they should either donate to or ensure that it is researched as well. For one thing is to make money on the technology, another thing*

[13] The exception is the young (25-45) female group in 2008

[14] It is instructive to refer to the so-called Tobin tax: a global tax on currency dealings proposed by the economist James Tobin in the 1970s (The Economist 2002) to promote exchange rate stability. The question then is on what to spend the tax revenues. In some versions it is suggested to use the revenue for good, but unrelated causes like the fight against AIDS (The Economist 2005). "*Today's anti-globalization activists view the tax more as a fat new source of cash than as a tool for exchange-rate stability. Groups such as Britain's War on Want and France's Attac want to use the tax to fund development projects in poor countries*" (The Economist 2001).

*is that others will use their funds, like the Norwegian state or any research institution, that struggles to do research and are looking for money. So it's a way to raise the money, and say: anyone who makes products with this technology will also have to allocate the funds to research.*

Participant 2*: - And we are used to this in Norway. There are levies on everything we have. So it should perhaps have been an extra levy on nano (unclear).*

Participant 3*: -But even if you do label products; if half the population has never heard about nano, they just read: yes, here is nano. OK… You have to have some knowledge of it in order to… which most people will not have. So labelling alone will not be sufficient. Some research on negative aspects should have been undertaken.* (Females 25-45, 2006)

Even if the participants find it unclear who has the responsibility for the direction of the developments of nanotechnology, they do come up with a specific measure on how the question of potential side-effects could be addressed and financed.

Participant: -*For every [Norwegian] krone you use on research for the development of nano, you should use [one] on research on the consequences.* (Females, 46-65, 2006)

*

*Participant: -I was just thinking…as a follow-up to the previous point, that there should be a kind of tax on untried [new] technology, this could be set aside for research on harmful effects.* (Males, 25-45, 2008)

*

*Participant: -They have to sponsor this kind of research. We [the participants] know nothing, so it is like…what can we tell them? Do more research on the adverse effects?* (Males, 46-65, 2008)

*

*Participant: -Should it not be like that if you sold such a product [nano-enabled], parts of the sum they sold it for, should be set aside to research?* (Females, 46-65, 2008)

It is interesting how widespread the idea of a levy is in the focus groups. There is not just the easy articulation that more research on adverse effects should take place, participants feel obliged to consider ways and means.

Item: But if it really works…

While recognizing there might be negative side-effects of nanotechnology, under certain circumstances participants are willing to go along, if the nano-enabled product really works.

In all focus groups there is an explicit reluctance to use skin care products. The closer the product is to the body, the more the participants reflect on possible risks, see chapter 5.

> Participant: -*I am thinking about more technical uses like car paint and all that, just go ahead. But to the stuff you would eat or rub on you, then I am more sceptic* (Males 25-45, 2008)

Still, there is balancing of costs and benefits, as was clear in three of the female focus groups when they discussed cosmetics, specifically anti-wrinkle cream. They are self-conscious about the lure of beauty and youth. Even when their mentioning the benefits of cosmetics is accompanied by laughter, they are serious about it.[15]

In the focus groups with younger females there was reflection on talking between friends and acquaintances:

> Participant: -*For somebody are like sceptical to new things, and some are just: No, this is good. And then somebody comes and says that cancer … let's say I bought a skin cream then, and I see that I look ten years younger, so somehow … you never (laughter) So there's something about that … then you do not sit and think: Uhmm … sceptical.* (Females, 25-45. 2006)

As the participants in the younger female group two years (2008) later articulate initial thoughts and reflections, the same thought appears:

[15] Women may laugh of the vanity the sales of these products imply, but the cosmetics market remains significant in size and especially European women spend a sizable amount of money on these products. There is expectation, or at least hope, that these products actually help (against wrinkles for instance). That through all the quasi-technological language of the advertisements of cosmetics (see chapter 6) there is a lure of beauty and youth – a "Hope in a jar" (Peiss 1998).

> Participant: -*If somebody had some guaranteed me that: This will make you very pretty! (laughter)* (Females, 25-45, 2008)

And an older woman considers how even young women (with only a few small wrinkles) will fall for the lure:

> Participant: -*When the lady in perfume store tells you that this one is just in, and it is amazing. Then I would like to see the person who has gotten a few small wrinkles say: No, I will not have that.* (Females, 46-65, 2008)

One of the other participants protested, and the woman who made the comment promptly draws back, saying it was only a hypothesis. Her hypothesis may be correct, however, given what was said in the young female groups, who refer to what they themselves might do in such a situation.

There were further instances where acceptance was related to "it works":

> Participant*: -If I can get a raincoat that can keep me dry and warm, then I had probably tried it, regardless of my own thinking on the reverse side of the coin. If I get a shirt or sweater that can keep me warm, even when I am sweating, then it is so good that I probably will try it.* (Males, 46-65, 2008).

And the ambiguity in the own position was recognized:

> Moderator: - *I am a bit provocative and teasing you here now. I am wondering if I really believe you. I think you are very politically correct: Yes we will be conscious consumers, and we are definitely going to keep our distance to this [nano-enabled consumer products], we will in a way lead the way and watch out. Oh, is there something dangerous here? Yes, we will be precautionary, and we will mobilize scepticism.*
>
> Participant 1: - Of course...[Laughter]
>
> Moderator: *-And when you are finished here today , you will go straight over to the pharmacy and buy these products* [sun tan lotion with nanoparticles]
>
> Participant 2: [Laughter] - *Definitely not!*

> Participant 2: *But I can answer the same question concerning that product* [Ski wax with nanoparticles]. *I am going to use it to get the medal in Birken,*[16] *all along until it is banned by the authorities*.
>
> *Moderator: - Have you noticed how it should be applied?*
>
> *Participant 2: My husband does that…* (Females, 46-65, 2008)

Item: The risk of waiting

There are other articulations that show a different aspect of balancing risks and benefits. In the discussion of a need for precautionary action, the point was made that we may miss out on some good things if we wait too long before introducing products on the market. This is especially evident in this interaction in the focus group with females between 25-45 years, in 2008:

> *Participant 1:-At the same time I agree with you that ... I mean, this here, for example, which is a super physical [sun] filter, why should we wait for fifteen years before using it?*
>
> *Participant 2:-To see just in case [ironic]*
>
> *Participant 1:-And if it [the physical sun filter] is really good, we will [in the meantime] get a lot of [unnecessary] severe sun burns and a lot of cancer…*

In this interaction the participants are trying to balance risks against each other: the largely unknown risks of introducing nanotechnology too early, in the sense that it is introduced before we have finished investigating possible risk of side effects. This is then compared with the risks of the effects of not putting these products on the market, i.e. the loss of known and tangible benefits, like less sun burn and reduced levels of skin cancer.

This sentiment about foregoing benefits when waiting for the final verdict on the emerging technology has not been visible in consumers to another emerging technology, genetic engineering, where refusal because of possible risks was the dominant response. It is important to note this, because the fate of biotechnology in terms of responses of publics is often considered to carry important lessons for nanotechnology.

[16] Birken (Birkebeinerrennet) is a long cross-country competition where you get a medal if you finish in a specifically set time.

Item: The absence of genetic engineering as a reference

A substantial literature suggest that the developments, dynamics and the publics' reactions to genetic technology could be paradigmatic for new and emerging technologies (e.g. Mnyusiwalla et al. 2003; Macoubrie 2006; David and Thompson 2008), even while there are also authors who argue that this should be questioned (Rip 2006). For that reason, genetic engineering was a separate point in the moderators topic guide in 2006 (but not in 2008, see Chapter 3). While in 2006 gene technology had been discussed explicitly, this did not (except for one passing reference) lead the participants to refer back to gene technology when discussing nanotechnology. In 2008, without any earlier inducement, direct parallels between gene technology and nanotechnology were drawn twice.

In 2006, the only occurrence was this one:

> Participant: -*In the Norwegian society and among politicians then it is clear guidance as to what one are allowed to do with the research of genetic engineering and not. And yes, one should also stick out their head and do as well when it comes to nanotechnology. For I just have to admit that I have not heard anything about this topic.* (Females, 46-65, 2006)

This refers to governance issues, as does one of the 2008 occurrences:

> Participant:*-I do not know which [public]bodies decide on genetically modified foods and that kind of thing, but it is quite parallel* (Males, 25-45, 2008)

The other quote is more about how emerging technologies are perceived, and that we can expect a similar shift in this perception for nanotechnology, as with gene technology

> Participant: -*I perceive it [nanotechnology] as positive, and I think right away on such a parallel to this here with genetic engineering, which is very negatively charged, but that certainly can be used as much positive too. It sort of looks like to be a bit like the next step.* (Males 46-65, 2008)

That an item does not occur frequently, as is the case here for reference to genetic engineering, need not speak against its importance, as long as it is articulated – which does not appear to happen here. Methodologically, it is

interesting that the expectation that raising the topic of gene technology in the focus groups would make it more available for referencing later in the discussion on nanotechnology does not hold, as this happened only once in 2006, but twice in 2008 when the topic had not been raised.

Item: Mobile phones as a reference

What was surprising were the frequent references in the focus groups to mobile phones. The discussion and uncertainty surrounding the possible health effects from the radiation from mobile phones was used to illustrate a general point about modern technology, and how difficult it could be to balance benefits and risks.[17]

It starts with the recognition of possible risks:

> Participant: -*And radiation from mobile phones too, there has been talk about that all the way from the beginning.* (Males, 46-65, 2006)

It then moves to highlight that mobile phones will still be used:

> Participant: -*We know that we do not know enough about for instance radiation from mobile phones, but despite this, you will be hard pressed to find somebody who doesn't have a mobile phone.* (Males, 25-45, 2006)

And this is then generalized to new products generally:

> Participant: -*I believe everybody know that in a way new products probably has a downside as well. I do have a mobile phone in my pocket, right? I know that there is a significant chance that this mobile phone will have some negative effect on me and my children. Still, I carry it, and the kids would like one too.* (Males, 25-45, 2008)

Clearly, the participant is prepared to live with the risk, and let his children live with it as well. This sentiment was shared among other participants in this particular group. As was visible in other groups, participants are aware of potentially adverse health effects, but do not about precautionary measures like hands-free phoning.

[17] The possibility of health effects from such radiation is well known to Norwegian publics. In a Norwegian survey from 2008, only 1% of the respondents had not heard anything about radiation from mobile phones (37% of the respondents had heard a lot, 40 % had heard some, 21% had heard a little, and only 1% had heard nothing about this issue (Berg et al 2010)).

This is balancing of benefits and risks, tinged with some fatalism. The fatalism is upfront when participants expect to be warned of further health hazards:

> Participant: -*But like radiation and such as wireless network and such things, that the consequences are that we might develop cancer… telephone use…Where we get to hear about it in the media, right?, and the Ministry and Directorate for Health are involved. So it needs to maybe more…I believe more will come for certain, and that we will hear about it here too.* (Females, 25-45, 2008)

*

> Participant: -*Yes, but they said that about mobile phone use as well, that it was not dangerous. And then it became very dangerous, and now it is not that dangerous anymore.* (Males, 46-65, 2008)

Up to a cynical version, better enjoy before it's declared unhealthy:

> Participant: -*Eat carrots while it is healthy!* (Males, 46-65, 2006)

What is presented as truth today, may not necessarily be a truth tomorrow.. Again with reference to mobile phone, there is recognition of these shifts, and a call for "information" that would clinch the debate:

> Participant: -*And it is almost like, it is almost like the case with the mobile phone. Someone says that it is harmful; others claim that it is not harmful. Then you are just as far, so you should really inform, so that people can choose and have knowledge.* (Females, 46-65, 2008)

This participants then adds a further consideration: people will now do informed choosing, and thus be responsible for the outcomes.

### 4.3.3 Cluster 3: Roles and agency (influence)

The final cluster of items to be presented here concerns articulations on roles of different actors, and which actors would be seen to have influence and agency. This includes how participants, in their role as consumers, articulated the agency they thought they had.

Item: Information and labelling

The presence of nano-enabled products on the consumer market, and in particular the number of such products were a surprise to the focus group participants. They expressed the feeling of being left out, or kept in the dark. The need for information was expressed, in general and specifically in terms of mandatory labelling of nano-enabled consumer products. Information and labelling were recurring themes in all the focus group interactions.

When the participants were asked about precaution with regard to nanotechnology, they focused on labelling:

> Moderator: -*What I am inviting you to now is a discussion on precaution.*
>
> Participant 1: -*I think we have touched upon both labelling and that we would expect that someone tells us, and that they take such a responsibility. We have mentioned just now that the Government, State Board of Health and Food Safety Authority and veterinary and stuff ... That is what I think. And I expect that our society enlighten us and give us the label and the explanation we need to make our choices. I do expect that.*
>
> *(…)*
>
> *Moderator: (..) This term precautionary ...do you now sit and think that someone has to be precautionary, or could we kind of go from here and say: Ok, there pluses and minuses associated it with all things, so can we just leave this to itself?*
>
> *Participant 2: No, I imagine that there is someone who takes responsibility. But it's obviously not the case when I hear ... So I definitely think that politicians and scientists have a responsibility and they should do some educational work here. And these environmental organizations ...The Nordic White Swan* [an eco-label] *and the like, they should also take hold of new technology and follow the research. And even those who design and create new products.*
>
> *Participant 1: - Then the question becomes who should pay for it, because here one should perhaps require the manufacturers of the materials we are talking about, the cloth and the cream and all this ... that they should either donate to or ensure that it is researched as well. For one thing is to make money on the technology, another thing*

> *is that others will use their funds, like the Norwegian state or any research institution, that struggles to do research and are looking for money. So it's a way to raise the money, and say: anyone who makes products with this technology will also have to allocate the funds to research.*
>
> *Participant 2: And we are used to this in Norway. There are levies on everything we have . So it should perhaps have been extra levy on those nano…*
>
> Participant 3*: -But even if you do label products; if half the population has never heard about nano, they just read: yes, here is nano. OK… You have to have some knowledge of it in order to… which most people will not have. So labelling alone will not be sufficient. Some research on negative aspects should have been undertaken.* (Females 25-45, 2006)

The start was a clear articulation on the need for information and labelling. Then another articulation occurred about how actors like politicians and scientists should do educational work. Still there will be lack of knowledge among consumers, so labelling cannot be the complete answer.

The ins and outs of labelling were discussed at some length in the focus groups, and further considerations than just the offering of information came up. Sometimes, the participants only offered inchoate responses to the question by the moderator:

> Moderator: - *(…)Right, so some are nano, and tell us they are, other are nano, but does not tell us, and some label their products as nano, even though they are not. But that one is rather special...But help me to articulate the need for information, what would you like to know?*
>
> Participant 1: - *I am thinking that nano is a bit frightening too, so we may put it on our cars, because that makes it nano-shiny (…) But to apply it on my skin, there I am more sceptical to nano.*
>
> Participant 2: - *But if you had never heard of nano and do not know what it is, then there is no point in applying it there either. It would maybe even just confuse you, because if we buy it and it said nano something…what is that? (Females 25-45, 2008)*

In the focus group with young males there was a discussion of what happens in the grocery store:

> Participant 1: - *It all depends on the product, that is rather evident*
>
> Participant 2: - *But I am used to..when I go to a grocery store, then I am used to that the they [the employees] do not know, so I…*
>
> Participant 1: - *I believe most people are like that, really.*
>
> Participant 3: - *I would guess that the more this come up on the agenda or the more appears in the public, that it [nanotechnology] may have negative side-effects and so on, then they would know about it. It is still early. I had hardly heard anything about this, so…*
>
> Participant 4: - *The most important thing is how it will be labelled. At least when you enter a grocery store, people will first look at the product label.*
>
> Participant 1: - *This is still so fresh…I believe it is as you say, there will certainly be more…as this is blown up in the media, people will become more observant and pay more attention to it really.*
>
> Participant 3: - *It is almost a stigma, labelled with nano…and no-one knows if it is dangerous* [(laughter]
>
> Participant 4: - *But the vital thing about the store, is that they have something to choose from, so you can choose something else if you do not want it* (Males, 25-45, 2008)

In one of the focus groups with older males, labelling was linked to responsibilities of consumers, by the moderator, but participants took it up:

> Moderator: - *Ok. Should we close this part by sending some messages to the retail stores? Would you tell them about expectations and messages related to this?*
>
> Participant 1: - *I think it would be fine if it says that nanotechnology is used on those products to begin with.*
>
> Participant 2: - *Yes, labelling is important – and some knowledge.*

> Moderator: - *Then the next step, that is the consumers, yourselves. We have already talked quite a lot about that, but let us be systematic. What is the responsibility of the consumers?*
>
> Participant 3: - *As of today we can hardly have any responsibility because we do not anything about what this is. We can have a responsibility for ourselves and make an evaluation of whether it is dangerous, but this is how it is with all the things we buy. If it would have been labelled in every kind of ways with red triangles or whatever, we probably would have a subjective responsibility whether we choose it or not. Evidently, the more we know, the greater responsibility we get*. (Males 46-65, 2008)

.Interestingly, participants also opened up questions of what it is that the label is labelling, and whether people actually take note of labelling:

> Participant 1: - *They should label their products with what it is.*
>
> Participant 2: - *Label their products. It should be self-evident that as you buy a product, it should state what kind of technology that is used.*
>
> Participant 3: - *Yes, but what technology? The label concerns what is in it.*
>
> Moderator: - *Nanoparticle*
>
> Participant 1*: - Yes, the technology is nanoparticles, such and such. There are already all kinds of strange E-ingredients that do not…*
>
> Participant 2: - *It is a special way of producing things*
>
> Participant 1: - *Especially as things change as they (…) whatever that would be*
>
> Participant 3: - *But if it would be printed [on the products] people would know…*
>
> Moderator: -*This assumes that this runs in parallel with an information...*
>
> Participant 1: -*Yes. That should definitely take place. I agree completely. It should be labelled.*

> Participant 2: -*I must have to admit to I do not read [product labels] to any great extent.*
>
> Participant 1: -*No, but [you would] if you were concerned about it* (Women 46-65, 2006)

Item: Responsibility by elimination

The discussions are also about who it is that can and should take the responsibility, who has influence and agency especially when things are apprehended as partly worrying and partly promising . In most of the groups the participants end up with placing the ultimate responsibility with the government, with political authorities. The way that they reach this conclusion shows a pattern: several of the focus groups explicitly follow a process of elimination to end up with giving the responsibility for future developments to political authorities.

First, producers are considered – but they just want to make money:

> Participant: -*So manufacturers are keen to make money. That's why they make the products. They should be critical of what they use, but experience shows that if they make money, they really do not care that much. So it's not a new phenomenon that manufacturers produce things they know can be toxic, but they still continue to sell it, because they want to make money. So they should get their act together, but I believe that as long as there is money in these products for manufacturers, they will continue to make it.* (Females 25-45, 2008)

Then, retail – but low relevant competence. A majority of those employed are there not on permanent basis. They are not able to answer question like if the product is made with/contains nanotechnology. They would not able to explain the possibilities and potential risks with the application of nanotechnology in products.

> Participant 1: -*But there is something called burden of proof. But we cannot expect too much of people working in a shop and selling things. If we would talked of capital goods, then you would expect…when you buy expensive goods, that people…for instance lighting and such things that can be rather expensive, then it is important that,.and then you should expect that they are able to*

> *absorb some learning about this and to pass this on to the customer. But you cannot expect this in all instances.*
>
> Participant 2: - *And you cannot expect that the sellers are that unbiased either, because when you enter an Elkjøp-store [Norwegian electronics chain] then they may well tell you why you cannot buy the advertised good, but rather buy one that is more expensive.* (Males, 46-65, 2008)

The third possibility is researchers (or the research community) – but they are mainly guided by the fascination of possibilities and of new ideas. There is also the problem of researchers employed by producers – will they, if necessary, really tell on their employer? A possibility is other researchers that can act as whistle-blowers as they see others making controversial inventions/innovations and try to hide findings that would jeopardize their positions and employer.

> Moderator: - *I do not know, but if I'm going to guess at what I believe, I believe that a number of these scientists, they're totally into this. They only see possibilities here and are constantly looking for new areas where products can be improved. So it is sort of a different type of research, which is more like an ethical ...*
>
> Participant 1: - *But it must be initiated when, in that they receive funding for ethical research as well. But I'm also a little afraid that to the extent that this takes off and there is some commercial [potential] in it, then some of these scientists may just move over tor some manufacturers.*
>
> Participant 2: *-Isn't that the norm really?*
>
> Participant 1: *-It is the usual, yes. It is absolutely the usual.*
>
> Participant 3: - *It is quite common, but they are often paid by companies to do it, but it should be independent research, which is then connected to a ...*
>
> Participant 2: -*They are better paid by the company*. (Males 25-45, 2006)

Then consumers are mentioned – but they do not know enough to take on responsibility. Consumers are viewed by the focus group participants as rather ignorant of nanotechnology. This was already evident in the quotes of the preceding item, and here the question of responsibility is up front:

> Participant 1: *-As of today we [consumers] can hardly have any responsibility, for we know nothing about what [nanotechnology] it is. We have a responsibility for ourselves and make an assessment whether this can be dangerous, but we do that with everything we buy. If it had been labelled in every possible way with red triangles, or whatever, then we would have a subjective responsibility to choose whether we buy it or not. But it is evident: the more we know - the more responsibility we get.*
>
> Participant 2: *-It will not be the same as with instruction booklets and such: when all else fails, then you read it.*
>
> Moderator*:- As said a little while ago, and they are not here to defend themselves, but I'm pretty sure that the manufacturers would say: Ok, we cannot in any way prove that there should be something scary about this, and so they send it on to the market because the market wants it. And that's you, right. And then it appears natural to ask : Do consumers have a responsibility in a way to participate somewhat in such a precautionary process here, or what do you think about that?*
>
> Participant 2:- *Not in relation to the dangers, I think. In terms of better products: yes.*
>
> Participant 3 :- *We demand too much of people. They are ordinary consumers; you will not expect them to possess deep knowledge of such matters. That's why I mean that political authorities should come in and act as a watchdog on behalf of consumers.* (Males 46-65, 2008)

In the end, there's nobody left to trust with the responsibility but the political authorities. It is not just by elimination, though. There is a Norwegian (actually a Nordic) tradition of great confidence and trust in the political institutions and authorities (Kjærnes 2010). But still, in the discussion their role is not taken for granted. While the political authorities are expected to pull the process, based on their overall responsibility, but they may have to be pushed:

> Moderator: *-(..)the main question that we are supposed to address is: Who do you expect to be precautionary?*
>
> Participant: *-No, I expect that the politicians are precautionary, but I do not think that they are there, so I believe they must be pressed. And then I think it is natural that all the other three agencies are helping*

> *to push them. And that include the consumers who have looked into technology, they are trying to voice their viewpoints, preferentially through the mass media. And the mass media must ... some of them have to familiarize themselves with the problem and set fire to the idea. And then there will be one of those grassroots that will come ... that grows. And so I think that perhaps the researchers have a special responsibility, because it is so uncertain and so unknown, that there must be some reports that there are concerns with the technology.* (Males, 25-45, 2006)

Here, all actors have their part to play, but the ultimate responsibility is to rest with the political authorities.

> Moderator: -*Okay. Is there more to say to politicians, or have they received clear messages now?*
>
> Participant: -*I think they should assume the responsibility*. (Females 46-65, 2006)

A substantial argument can be added, in that the government is impartial (or should be):

> Moderator*: - Who should be precautionary, which really is the basic issue here?*
>
> Participant: -*I think that there may be some public agency or similar which takes hold of the research at least, if we are to have the reliable and valid in a way. Because from medicine we know that if the manufacturer pays the research, then it will be blended into the research and ...* (Females 25-45, 2008)

Item: The responsibility of consumers

Consumers do have some power and do have responsibilities, but to be able to assume these, they need more information (and might become pro-active in gathering relevant information). This is the overall idea which can be recognized in the discussions of all focus groups. It is not always discussed as such. For example, elements are visible in the discussion of benefits and risks (see the quotes in Section 4.3.2). It would be cumbersome to present all the various stretches of transcript where elements occur. Therefore, I will occasionally resort to summarizing the discussion in a focus group. It is not my intention to actually compare the focus groups depending on their

composition; that would not add much value, given the basic idea of this Chapter, that we see inhabitants of the risk society at work.

In the 2006 focus group with older females, the point about information was upfront, and requirements were formulated: it should be accessible and not unnecessary complicated. Especially the young consumers need to be educated; they themselves are used to being aware and look for information that is relevant for them.

The distinction between the older and younger generation came up in the 2008 focus group with older females as well, but now as part of an explicit (and moderator-induced) discussion of the power of consumers:

> Moderator: - *I have heard the expression power of the consumer, is this something you think about? Can the consumer influence these developments?*
>
> Participant 1: - *If no-one buys it – yes of course!*
>
> Participant 2: - *Just consider the Statoil-Shell incident [two gasoline stations] last week. We can boycott the sale of gasoline. The competition. We can do such things.*
>
> Moderator: -*But are you going to do it? I am still in a provocative mood.*
>
> Participant 3: -*I believe we will do it, but I imagine those that are twenty years old, I do not think they care <u>that</u> much.* (Females, 46-65, 2008)

As is clear in other parts of the discussion, the participants are willing to try new products, and see whether they can deliver on their promises. But can also be precautionary in their buying decisions (cf. quote at the end of item 'But if it really works' in Section 4.3.2.

In the 2008 focus group with older males, the same argumentation is visible. Consumers have the power to decide on buying or not, and thus they have some kind of responsibility. It is not about outright refusal. While there are risks and uncertainties, they are willing to try out a product, to see if it really works. And more or less implicitly they assume that when they stop buying and using the products because of the risk, the risk will disappear. So, possible risks are considered to be reversible. The main discussion is about benefits and risks (cf. Section 4.3.2), as in this quote:

Participant 1: - *We still do not know if it is dangerous?*

Moderator: - *No. And I do hope we have gotten that message through to you, our intentions have not been to make scary projections. But evidently: Significantly improved product properties, but perhaps with some side effects that we do not yet know. That is the issue here ...*

Participant 2: - *Immediately I get very impressed, for through the ages big innovations have occurred,, but no one has made such a big leap for many products as with this technology here. So you get like very impressed. But at the same time you know that there is always another side to everything. There is nothing that is only just good. So you do become a bit sceptical.*

Participant 3: - *What happens if these things burn? What…side-effects* [many talk at the same time]

Participant 4: - *I believe there are regulations in place already*

Participant 4: - *It is not supposed to burn. No, so do not believe ... I do not believe that is the question.*[Here the participant probably refer to an earlier discussion on asbestos]

Moderator: - *Ok, you play squash and you hit… there can be grains of dust that are released each time you hit the ball, but probably minute amounts. But on some point in time the racket is worn out. Will it be hazardous waste?* (Males, 46-65, 2008)

*

Moderator: - *We have some fun with those self-cleaning windows which can save some marriages* [laughter]

Participant 1: .-*Yes, I wonder…dust, I do not know. I live up in Groruddalen* [a part of Oslo with heavy traffic] *and some particles in the air stick to my window… Is it the rain we talk of here?*

Researcher: - *When it rains, it will just glance off.*

Participant 1*: - Exactly. But there are other remedies as well*.

Moderator: - *So the window is clean again. But below it there could be rose bushes, and then you discover that the roses…*

> Participant 1: - *That they die, exactly*.
>
> Moderator: - *That something might happen, there might be a problem*
>
> Participant 1*: -Yes, I understand. But it must be researched on. We cannot go on and believing and guessing - we, the mere mortals, I would almost say. It will not work. Then we will become increasingly negative.* (Males, 46-65, 2008)

In the 2006 focus group with older males, participants see a limited role for themselves to take responsible choices as consumers. They expect that authorities step in, at least by commissioning independent experts:

> Participant 1*: - I would expect that if the public authorities then decide that one should consider the harmful effects, then I'd expect that they [independent experts] will be engaged in the work, really, that one in a way to delegate the work to them. For they [independent experts] are the ones with the know-how.*
>
> Participant 2*: - And that they are honest and contribute with correct information.* (Males, 46-65, 2006)

A contrast can be made between "us" who are aware, and "them" who are not, and need be educated. This happened in the 2006 focus group with older females, as noted above, where "them" were the young consumers. In the 2008 focus group with younger females (25-45) they see themselves as fully able to make their individual choices and thus prepared to take a responsibility - if they get sufficient information. But they also say that consumers in general tend to behave like sheep and that they all go in one direction after the latest fad. (Thus, their responsibility cannot be to stop undesirable products on the markets, political authorities have to step in.)

One of the participants has a list of ingredients that she tries to avoid for health reasons – like chemical sun filters and triclosan:

> Participant 1: -*I have this list of things that I do not want have in creams and toothpaste and stuff on the inside of the toilet closet.*
>
> Moderator: - *Have you then identified the products in the store that you know is in accordance with these specifications or what ...?.*
>
> Participant 1: - *Yes, as far as it goes, so I buy ... or so far as it goes ... there is no problem at all. My children ... I buy sunscreens with a*

> *mechanical filter, and I buy toothpaste without triclosan and without soap.*
>
> Participant 2: - *I do not buy any antibacterial products*. (Females 25-45, 2008)

In the 2006 focus group with younger females, participants also saw themselves as willing to assume responsibility. And they added a point about information:

> Participant:*-I just think that the more information people get, the more power are in the hands of the consumers.* (Females 25-45, 2006)

A parallel was drawn to a controversy in the Norwegian dairy market at about that time, where they saw the power of the consumers at work. But for nanotechnology it may be more difficult for consumers to play an active role, because it can play part in many different products around them, so will have effects through many different channels, and at the same time.

In the 2006 and 2008 focus groups with younger males there was agreement that consumers have a responsibility to take side-effects into consideration before purchasing a product. But they consider that this works out differently for applications like car tyres or sports equipment where there is little cause for concern, or at least, where improved performance will weigh heavily, than for applications like skin care products, applied to the body, so that most consumers will think twice about trying them when there might be side-effects. Being precautionary is offset by willingness to try out things.

> Participant: -*So I would not been afraid to try and see and do it. But maybe if you're a different kind of person who is generally a little sceptical, then you would ... this will make you sceptical, I think.* (Males, 25-45, 2006)

The 2008 participants admit that they intuitively think that products that are on the market have been tested for safety

Item: Independent advice

Occasionally, participants voice their doubts if politicians and political authorities know ‘enough’ to make informed political decisions. But they recognize that there are public bodies to get professional advice on what measures that can be deemed as appropriate and timely, and that further

professional advice may be organized if necessary. When the participants reason around what kind of 'professionals' should be called upon, they all point to scientific experts. Independence of scientific experts is an important argument:

> Participant: -*I think it's very important that research is independent to the greatest extent possible. There will always be interests as you are not able to detect, but that apparently the most independent, the government regulates it to some extent. The government sets aside money for research, it is the Government who mandate research perhaps. Not so much these big medical companies that are clearly going to use it for themselves.* (Females 25-45, 2006).

Participants would like to see an advisory body established for nanotechnology, taking the Norwegian Biotechnology Advisory Board (referred to in several of the focus groups) as example:

> Moderator: -*Regarding the need for information…who do you trust the most in a possible scenario, even though you did not approve of it, if one ends up with the consumers having to make a choice. And then you should have some thoughts on where you would go to get the information you need to make choices?*
>
> Participant 1: -*I would say…yes there should be a place…everything else has…there is information from the public authorities about almost anything in some form. In some way or another it should be available here too. How and in what form and so on, I have not really thought about it.*
>
> Participant 2: -*There is something called The Norwegian Biotechnology Advisory Board, that I guess inform on biotechnological products. Maybe there should be something like that for nano?*
>
> Participant 1*: -Yes, in so much as this [nanotechnology] is such a huge advancement and have considerable influence, that would be worth considering.*
>
> Participant 2: -*I think it is two minimal requirements in a way. One is to have such a committee, a Nanotechnology committee, that assists the politicians to provide guidance and so on, and that ensures labelling of products, that this—that nano has contributed* (Males 25-45, 2006)

Such an institution should be composed of competent experts that are independent of commercial interest. But it the possibility of having members with other competences like philosophers and even politicians is also envisaged. (The latter option would of course raise issues of independence, since politicians will also have to make decisions taking the advice of such a body into account.)

## 4.4 Reflections on empirical findings

In this chapter a number of larger parts of the interactions are written out to illustrate how the interactions occurred and how the work of definition took place. The participants tried out ideas and there were several instances where the participants appeared to learn from each other.

The participants entered the focus groups with a shared cultural repertoire, visible in how certain issues seem self-evident and are accepted by others. There are still surprises for the analyst, as when the reference technology turns out to be mobile phones rather than genetic engineering. That it is part of a shared repertoire is clear from how the balancing of possible risks and the immediate benefits of continued use of mobile phones are taken up by participants rather than being contested.

Whereas the same time, issues were opened up, new questions were brought up for discussion and with subsequent learning effects. In other words the participants did work of definition together. And this left traces, visibly so when the participants in the different focus groups sum up the learning that occurred:

> Participant: - *You get to be more sceptical after this group. That's quite clear*. (Males 25-45, 2008)

Other participants may draw other conclusions, but the point is that they do such summing up. Thus they are thinking about what they will say and do in the real world, after the experience in the protected space of the focus group. This is articulated in various ways.

> Moderator: - *I am teasing you somewhat, but just to go with the good feeling: Isn't it quite tempting to jump at these great products here.*
>
> Participant 1: - *No , actually not.*

Participant 2: - *I don't know if I will jump at it, but I will be more attentive, and maybe ask some questions.* (Females, 46-65, 2008)

*

Participant 1: - *I bought two [skin creams] just before I came here. Not similar, but same brand [as one of the products on the table], and I'm certainly not going to use it. They'll get it back tomorrow. Even if I do not get my money back, they will get it back. I do not want it.*

Moderator: - *Why not?*

Participant 1: - *No, I do not want to apply things that might be harmful. I can use something else.*

Participant 2: - *But you do not know if it is harmful* [many participants talk at the same time]

Participant 1: - *I will really start to look into this now*.[many participants talk at the same time]

Moderator: - *But Participant 1, you cannot find it out!*

Participant 1: - *Well, I am going to. Because there are those who are into such things, like Helios [a retailer of organic and natural goods]… not Helios but natural products and such. They do some inquiries and some things have been tested (…) But now I have learned a lot, because I did not know that this [nanotechnology] was in all this.* (Females, 45-65, 2008)

*

Moderator: - *On the basis of the discussion we've had now in relation to the question: Who should be precautionary, where do you as consumers get into the picture? Is there anyone other than you who will be the brake pads, or should the consumer be the brake pads even here or a watchdog, or what word you would like to use for it.*

Participant 1: - *It is natural consequence of more knowledge on the subject, so now I think this is an item for conversation late at night, for instance*. (laughter).

Moderator: - *That is a very good point, because it's my last topic here. It is a type of players that will surely also come into play, which is*

> *perhaps a little difficult to define, and that is friends and acquaintances. What kind of informal chat do you expect on this topic in the foreseeable future?*
>
> Participant 2: - *It's exciting. It is a very exciting topic*.
>
> Participant 1: - *It certainly is*. (Males, 25-45, 2006)
>
> *
>
> Moderator*: - Very Good. And I think I know some pharmacies are going to get five very critical customers, presumably.*
>
> Participant: - *Definitely!* (Females, 46-65, 2006)

What we see here is that participants, sometimes stimulated by the moderator, are formulating take-home messages.

There are further outcomes of the exercises, showing operationalization of the risk society at work. A recurring thread is how participants on the one hand appear fatalistic (as in the items 'It cannot be stopped' and 'Everything is dangerous'), and on the other hand believe that people (consumers) can make a difference, or at least push for better organization of responsibilities. This reflects how they live in the risk society (and is a finding in its own right, because this ambivalence has not been identified before in the literature), but its recurring articulation in the focus groups will reinforce it, or as the case may be, tone it down, or shift it.

There are other recurring threads. One striking finding, captured in the items in the cluster 'Balancing benefits and risks', is that more issues are taken into account by the focus group participants than are visible in traditional cost/risk/benefit analyses. An action perspective turns out to be important for them. This (again) shows the richness of articulations of consumers, in these focus groups, and by implication, in how consumers operationalize the risk society in their daily lives.

Part of the recurrent thread is also that participants were aware of possible negative effects of technology developments and took these into account. They found it helpful to draw parallels, but these did not often refer to genetic engineering/GMOs (genetically modified organisms), contrary to what one would expect from reading the literature (David and Thompson, 2008; Anderson et al., 2009; Currall et al., 2006, Brumfield 2003). Instead, parallels were drawn with mobile telephony, to illustrate balancing risks and benefits of new technological developments. Strikingly, when considering mobile

phones, all articulations ended up accepting continued use of mobile phones (without much reference to self-precautionary measures, like hands-free, shorter conversations or more use of text messages). The implication that nanotechnology can also be accepted, with only limited precautionary action (at the individual and at the societal level), is visible, in its own right, in quite a number of the discussions (see Section 4.3.2, items 'If it really works' and 'risk of waiting').

A reason why focus group participants referred to mobile telephony rather than GMOs could be that the latter technology is contained, fenced in, at least in Europe. Only limited field trials have been set up to test GM crops, and there are currently no GM foods for sale in Norway[18]. Mobile phones, on the other hand, are pervasive and are with us in our everyday life[19]. With hundreds of various nano-enabled consumer products on the market, and more to come, as the participants were told, nanotechnology is a pervasive technology, up to 'silent creep' of nanotechnology into ever more consumer products, see chapter 6.

A further recurrent thread is about the ambivalences of agency of consumers. Despite articulation of sentiments like 'It cannot be stopped' and 'Everything is dangerous' (Section 4.3.2), the participants not only thought some actors did have agency, but also accepted that as consumers, they had some agency, contingent on information to consumers (which was considered lacking). Examples were referred to where consumer had successfully assumed responsibility, and about measures they themselves had taken to avoid undesirable ingredients or products (Section 4.3.3.). Participants were sometimes sceptical about possibilities and willingness of consumers to assume responsibility of developments, but they did see the question of consumer agency and responsibility as important. The sceptical, or just realistic, approach was also visible in the pattern of assigning responsibility through a process of elimination. The capability or legitimacy of actors to assume responsibility was evaluated, with interesting articulations. Thus, they ended up placing the responsibility for developments and control with political authorities. Also there, limitations were recognized, in particular whether politicians and political authorities would be sufficiently knowledgeable to take the right action. This then led to constructive suggestions, about a Board of Experts on Nanotechnology, broadly composed

[18] The Norwegian regulations are to a large degree harmonized with EU regulations. In Norway those who wish to sell GM foods have to apply to the Food Control Authority. If a product pass the assessments by the Authority, labelling is required.

[19] For Norway more than 90% per cent of the population aged 9 to 79 years use mobile phones (Berg et al., 2010)

(Section 4.3.3), and a levy on nano-enabled consumer products to fund research on side-effects (Section 4.3.2)

While not a recurring thread in the ongoing discussions, it is interesting to note that participants, already in the discussion, formulate take-home messages.

The fact that participants formulate such take-home messages indicates that they realize that they are living in a risk society (without phrasing it that way), and consider the focus group's interactive articulations as an input in how they can continue. This then contributes to the on-going reproduction/transformation of social order (see Chapter 2), and makes it more reflexive, a further step in operationalizing the risk society. Conversely, the findings of the focus group exercises, even if they are contrived protected spaces, tell us something about how consumers operationalize the risk society. This is important for the overall theme of this PhD thesis, but also allows me to build on it for further analysis of issues, for example when I discuss labelling of nano-enabled consumer products in Chapter 8.

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# 5 Who should be precautionary? Governance of nanotechnology in the Risk Society (Published paper)

Throne-Holst, Harald & Eivind Stø (2008). **Who should be precautionary? Governance of nanotechnology in the Risk Society**. *Technology Analysis & Strategic Management*, 20 (1), 99–112

ABSTRACT *This article focuses on one important ethical and political element in the development of nanotechnologies: the relevance and importance of the precautionary principle. The principle recommends political actions based upon experiences and early scientific warnings, even when there is no clear scientific evidence to prove causal links. Our chief contribution to the discussion about the precautionary principle in nanotechnologies is the development of the stakeholder approach in a governance perspective. We link our article to the theoretical and empirical discussions on Risk Society. In at least two ways the risk society of Ulrich Beck seems highly relevant for the precautionary principle within nanotechnologies: Precautionary actions represent one model for the society to deal with modern risks; and Beck redefined the relation between science and society. This article is based upon qualitative interviews with four groups of stakeholders in Norway: (1) Non-governmental organisations -consumer, environment, health; (2) political authorities and politicians; (3) industry and businesses; and (4) the scientific community. In the present phase of the development of nanotechnologies the responsibility for taking precautionary actions are, to a large extent, placed on the individual researcher and the scientific community. We have identified seven issues in the interviews that are pertinent for the scientific and political discourse about nanotechnologies.*

**Keywords**: risk society, precautionary principle, stakeholders, governance, empirical dimensions, technology optimism, nanoproducts.

## 5.1 Introduction: the tension between positive visions and precautionary actions

Over the last decade nanoscience and nanotechnologies have become the fastest growing segment in the knowledge-based economy in the OECD countries. The USA, EU and Japan are investing billions of dollars, euros and yens in basic research, applied research and technological development in a large number of sectors. This is reflected both in the sixth and seventh Framework Programme of the European Union. Internationally, the most important areas are the military sector, medicine, ICT and various consumer products such as sport equipment and cosmetics. More than 500 consumer products are now available to consumers on the Internet[i].

What do we mean by nanotechnologies? Nanotechnologies are a set of technologies that enables manipulation of structures and processes at the atomic level. It is the ability to do things – measure, see, predict and make – on the scale of atoms and molecules and exploit the novel properties found at that scale. The nanoscale is not just another step towards miniaturization, but a qualitative new scale. Many current theories of matter at the microscale have critical lengths of nanometre dimensions. These theories will be inadequate to describe the new phenomena at the nanoscale. The new behaviour is dominated by quantum mechanics, material confinement in small structures, large interfacial volume fractions and other unique properties, phenomena and processes.

Today we find some nanoproducts in the consumer market, such as cosmetics, sport equipment, household appliances and ICT products; but we are early in the innovation process, and the main results of scientific and industrial investments in nanotechnologies are still to come. Thus, in the next 10 - 20 years it is expected that, within many branches, we shall witness a technological revolution that will have major impacts on the everyday life of individuals.

The positive visions for the nanosciences are seemingly without limits. According to these visions, nanotechnologies will have a decisive influence on production processes, energy and material use, information and communication systems and – after a while – on the everyday life of individual consumers and households. We might get cheaper, stronger, cleaner and lighter products. Unlike most previous technologies, nanotechnologies are able to unite economic growth with reduced materials consumption[ii]. However, we observe scepticism along two dimensions. The

first dimension is linked to the lack of knowledge regarding both environmental and health risks of the new nanomaterials. A more "science-fiction"-based scepticism is the contested possibilities to create new intelligence, beyond human control – the "grey goo problem"[iii]. Others point to the challenges and opportunities from a purely technological viewpoint, for instance regarding applications in neuroscience[iv].

Risk assessment and risk management are key elements in further innovation processes, and this is recognised by leading stakeholders. The precautionary principle (PP) is central to risk management when limited knowledge prevents the completion of risk assessments. On the general level, the PP is adopted by the EU in the communication to the Parliament[v], mainly related to environmental and health risks. The principle is included in the Maastricht Treaty from 1992[vi]. In the same year the PP became a part of the Rio Declaration on Environment and Development[vii]. More specifically related to Norway, the Third North Sea Conference stated that the participants "will continue to apply the precautionary principle"[viii].

The PP is not new. In *Late lessons from early warnings* European Environmental Agency[ix] presents data from 14 independent case studies of the PP. Among the most well-known cases are asbestos, radiation, PCB, ozone layer, Mad Cow disease and various early warnings concerning fish stocks in California, Newfoundland and in the British fisheries. The asbestos warnings are more than 100 years old, but one of the first examples is even older. Dr. John Smith wanted to remove the handle from the Broad Street water pump in 1854 in an attempt to stop the cholera epidemic in London. However, his evidence was not "proof beyond reasonable doubt", but the results were probable enough to make a public policy decision that proved correct.

In some of the cases presented in the report, precaution was taken relatively early, before substantial damages had been done. In other cases it took decades before the scientific evidence convinced political authorities of the necessity to take action. Asbestos is a typical example; it took 100 years from the first warning to the UK ban on white asbestos in 1998. The human cost of this delay has been enormous as far as suffering, quality of life and economy are concerned. For the Newfoundland cod, actions were taken too late. They were not able to save the stock[x].

These cases illustrate the importance of knowledge-based decisions; but they also illustrate the main dilemmas of the PP; When is it right to make interventions and who is responsible for taking the necessary actions?

The concept of the PP is debated, especially when applied in the climate change debate. While uncertainty is inherent in the PP, there is "no

uncertainty at all" about the astronomical economic and social costs of actions "designed to avoid all conceivable possibility of catastrophe"[xi]. We should rather wait until we know more about the specific phenomenon and wait until "it would be cheaper anyway" to take action, if action then is found desirable[xii]. The same critique can be found with Lomborg[xiii].

There has been a wide academic debate over the implementation and understanding of the principle in other areas as well[xiv]. The ethicist Myhr[xv] claims that the application of the PP entails identification of risk, scientific uncertainty and ignorance, and involves transparent and inclusive decision-making processes. In an examination of the European overhaul of its chemical policy[xvi] the authors claim that the PP is usually considered to be entailed of four elements: (1) taking preventive action in the face of uncertainty; (2) shifting the burden of proof or responsibility onto proponents of potentially harmful activities; (3) exploring a wide range of alternatives to possibly harmful actions; and (4) increasing public participation in decision-making. They conclude that although the PP is reflected in several parts of recently adopted chemical policy, analysis show there is plenty of room for improvements, and that in the current situation scientific uncertainty is actually viewed as a reason not to act.

This is interesting as the PP is viewed principally as a way to deal with a lack of scientific certainty[xvii], but it is claimed that the nature of scientific uncertainty is changing and that this has lead to increasing pressure on governmental actions to be based on more "rational" schemes such as cost-benefit analysis and quantitative risk assessment[xviii]. On the other hand it is becoming increasingly clear that the results obtained from "science-based" risk assessment are sensitive to what questions are asked, how they are posed and the underlying assumptions[xix].

There are many definitions of PP, and there has been little tendency towards a common definition in various international treaties[xx]. The lack of a clear definition has also been one of the main critiques from the US government on the application of the PP by the EU Commision[xxi]; but what this lack of an unambiguous and fixed definition of the PP really calls for is a contextual interpretation: It must be understood in the context it appears[xxii].

The interpretation of the PP can also vary between "weak" and more "strong" or strict versions of the principle: from calls for more research, to asking for moratoriums. Myhr interprets them as involving risk/benefit analyses (weak), or involving principles of justice, fairness or rights of humans, or embracing of inherent values of the environment (strong)[xxiii].

Precaution is a general principle in the innovative processes in modern societies[xxiv], although some view its application as something that "stifles" discovery[xxv]. So, what is special about the nanotechnologies? From an ethical point of view, there are two strong arguments that the PP has special relevance for nano-innovations. First of all because nanoscience is developing very fast and there is a high level of uncertainty. Second, because the consequences of the nanotechnologies could be massive.

Nanotechnologies are also rather complex and complicated. This means that it is difficult for investors, governmental authorities and various non-governmental organisations (NGOs) to adopt knowledge-based policies and decisions. Historical experiences from other technological developments have shown that innovations cannot be left to scientists and technologists alone. All stakeholders have a part to play. However, in this case it could be difficult to tell what part each stakeholders should play as far as the precautionary principle is concerned. Who has the legitimacy to take this responsibility?

In 2004 the Royal Society and Royal Academy of Engineering in the UK carried out a project on nanotechnologies: *Nanoscience and nanotechnologies: opportunities and uncertainties*. Their report[xxvi] illustrates the fact that nanotechnologies offer many benefits both now and in the future, but public debate is needed about their development. It highlights the immediate need for research to address uncertainties about the health and environmental effects of nanoparticles – one rather small area of the nanotechnologies. It also makes recommendations about regulations to control exposure to nanoparticles.

The aims of that study were to define what is meant by nanoscience and nanotechnology and to summarise the current state of scientific knowledge about nanotechnologies. Furthermore, the study identified the specific applications of the new technologies, in particular where nanotechnologies already are in use, and carry out a forward look to see how the technology might be used in the future. More important for our perspective is the identification of what environmental, health and safety, ethical or societal implications or uncertainties may arise from the use of the technology, both current and future.

We will emphasis three "results" from discussions on nanotechnologies:

- Consumers and consumption are highly relevant for the future of nanotechnologies[xxvii]. The end consumers could influence the

speed of the innovations. If consumers reject the nanoproducts, investors have serious problems.

- To an increasing extent, we will have to face ethical and social issues. Many of these issues are general questions on the relationship between science and society. However, some of them have special relevance to the nanotechnologies.
- The British report puts special focus on the role of stakeholders, and the public dialogue.

Social aspects such as public information and communication, health and environmental issues and risk assessment are further key factors to ensure the responsible development of nanotechnologies.

## 5.2 Theoretical contributions: risk society and the role of stakeholders in the governance of nanotechnologies.

We will develop this article along two theoretical discussions: we want to take part in the theoretical and empirical discussion about the Risk Society of Ulrich Beck[xxviii]; and we wish to contribute to the discussion about the new regulatory state and new governance[xxix-xxx]. A combination of these two perspectives should increase our understanding of the ongoing political processes.

The Risikogesellschaft of Beck seems extremely relevant for the precautionary principle within nanotechnologies in at least two ways: precautionary actions represent one model for the society to deal with modern risks; and, Beck redefined the relation between science and society.

The basic idea behind the risk society is that we are today, to a large extent, exposed to man-made risks. This does not mean that it is more dangerous to live today than it was in earlier times, but the character of risks has changed substantially. What it means is that individuals in pre-modern times feared famine, natural catastrophes, illnesses and wild animals, while modern man fears "civilization products" like toxic waste, nuclear disasters, mad cow disease, PCB, mercury etc. According to Beck, there are three fundamental pillars of risk society[xxxi-xxxii-xxxiii-xxxiv]; and they seem all relevant for our discussions:

- The relationship between *risk, time and space* has changed dramatically. The risks are no longer geographically and temporally contained. Chernobyl shattered European borders and created problems in parts of UK decades after the disaster.
- The manufactured risks are more catastrophic than natural hazards. This *catastrophic nature of risks* is illustrated by nuclear power, environmental despoliation and genetic technology.
- *The breakdown of social institutions and social insurance*. The old political institutions are not able to deal with manufactured risks and the methods of insurance and compensation are overrun by the catastrophic nature of risks (Chernobyl)

To some degree we shall also use the contribution from Luhmann[xxxv] in our analysis of the precautionary principle in nanotechnology. In his book *Risk: a Sociological Theory*, he has developed three dimensions relevant for our discussion. The first dimension is the relationship between risk and danger. Risk is a consequence of decisions, while danger is attributed to external factors. His argumentation is not very far from Beck concept of manufactured risks. The second dimension is the contrasting relationship between decision-makers and those affected by the decisions. Here the argumentation is relatively close to Beck's division between risk, time and space in the Risk Society. The third relevant dimension is the tension between the two main sets of decisions, market and hierarchies.

According to Beck, modern risks are typically the results of attempts to control risks, for instance when an insecticide like DDT, developed to protect crops, turns out to be hazardous to birds and other animals. It is the positive solutions that create potential risks in modern societies. Asbestos gave a substantial contribution to the building and constructing industries in the 20th century as a non-flammable fire insulation. At the same time, the asbestos created serious health problems for those who were exposed to the fine dust the material released when handled[xxxvi].

Beck, however, is not just talking about risks, but about *risk society.* Two other important aspects of risk society are relevant here: the risk distribution and the individualisation of politics and experiences[xxxvii]. The industrial society was a class society and the fundamental political and economic struggle was about the distribution of the "pie". The risk society is "democratic" and the "pie" is poisoned. This brings fundamental changes in both the goals and means in politics. One of these changes is individualisation. According to Beck, citizens, workers and consumers in the post-modern society are responsible for their own risk assessment. It is the

distribution of risk and controlling it that are the challenges, not the existence of risk in itself[xxxviii]. But how is this possible when it comes to potential risks from the nanotechnology industries?

Beck's positive answers to this challenge are the importance of sub-politics, globalization from below and the reflexive modernisation, while Luhmann is exclusively concerned with communication. In the big picture, Beck should be regarded as a modernity theorist, much in the same tradition as Giddens[xxxix]. The global discourse on genetically modified organisms (GMO) in the food sector is an excellent example on this new reflexivity. However, one of the fundamental criticisms against the risk society thesis is the anecdotal use of empirical data[xl]. One of our research questions is to look for reflexive modernisation in the recent discourse on nanotechnology.

Beck has also some very interesting observations on the role of science in modern society, and he is forcefully demonstrating how the natural sciences today become moral or social sciences. He has contributed to the sociology of science. But whom do we trust in the modern scientific discourse in general and in relation to the nanotechnologies in particular? To a large extent modern citizens have lost faith in science, but at the same time they have no others to trust than the scientist. This is the modern dilemma, and we shall contribute empirically to this discourse. Here is the link between our two theoretical perspectives. To what degree does the new governance represent an answer to the institutional crisis in the risk society?

The shift from Government to Governance and the new regulatory state presents a substantial development in legislation, regulation and public policy in Europe[xli-xlii-xliii]. To some degree it represents a deregulation of public policy; in other areas we have witnessed a re-regulation. This may, however, vary from one country to another because of traditions and the fact that the welfare state was developed along different paradigms in the 1960s and 1970s.

The main idea behind the concept of governance is to involve stakeholders in taking responsibility for the political, economic and legislative development of society, in dialogue with political authorities on European, national and local levels. In the White Paper on European Governance[xliv], the main principles of governance are defined as: openness, participation, accountability, effectiveness and coherence. In a report from the Commission of the European Communities[xlv], the discussion on European governance also included democratic legitimacy and subsidiary as other important principles. What role do stakeholders have to play in the regulation of modern nanotechnologies? Is it possible to identify these main principles of governance in the discourse on nanotechnologies?

In recent literature we have seen that governance and the new regulatory state are concepts that are used in very similar ways to describe the same phenomenon. This new theoretical understanding of the regulatory state/new governance implies a more realistic description of what regulation is and how it works, a realization of the regulatory limits of state authority, and the corresponding potential of private actors to block and restrain public policies. It also includes an awareness of the possible positive contributions of private companies, organisations and associations to enhance public goals and policies, and, more controversially, a new normative model of how regulation is supposed to work, emphasizing the interactive and interdependent nature of regulation. However, Olsen argues[xlvi] that formal processes of governance reform may not always produce a precise and stable policy outcome. One of the reasons for this instability is the fact that not all stakeholders have the resources to play the expected part in the political process. This may be the case for almost all stakeholders with regard to nanotechnologies.

Within the food sector we have seen that the industry and retailers in some countries have taken independent initiatives to develop standards and health related schemes. These activities, aimed partly at the enhancement of consumer trust and brand value and partly avoiding litigation claims, increasingly seem to coexist and partly overlap with public regulations in the same area[xlvii]. This kind of private regulation has been named self-regulation, and is the dominant modus of the EU regulation in a number of areas, e.g. food safety and environmental standards[xlviii]. Commentators claim that in some countries and some sectors, these private, often retailer-led initiatives take on responsibilities that public authorities otherwise would have to cover. In some countries a pragmatic division of tasks and responsibilities seems to have evolved between regulating authorities and big businesses, saving public finances and maintaining markets for big business. In this sense co-regulation[xlixl] and private interest regulation[li] have been suggested as appropriate terms for this situation.

## 5.3 Methodology

The project on which this article is based consisted of two empirical parts: qualitative interviews with stakeholders and a focus group study of consumers. We shall here present the results and analysis of the qualitative interviews with stakeholders.

The 21 interviewees were picked out to represent what we see as four central groups of stakeholders: NGOs, politicians, researchers and businesses. Within each of these groups we selected organisations or persons we believed would have a part to play in the public debate on this issue[lii].

The interviews took around 45 minutes and were taped for subsequent transcription. We used a flexible interview guide for the interviews. This flexibility was necessary because the knowledge of nanotechnologies varied substantially among the stakeholders. In some interviews we could go directly to nanotechnology, this was particularly the case for the scientific community. In the case of politicians and NGOs we had to start with more general questions on the relationship between technology and society. In this way the interview guide was adjusted to the stakeholder in question. At one point in the interview, the interviewee was shown pictures of four nanoproducts, and was asked to reflect on them. These products were skin creme with nanosomes, a tennis racket with nanotechnology, ski wax with nanoparticles and a refrigerator with interior walls covered with nano-silver. We are interested in differences and similarities between stakeholders as far as the precautionary principle is concerned. This is particularly the case when it comes to the identification of responsible institutions with legitimacy to propose and decide precautionary actions. We were also concerned about the role of science in modern societies generally, and were particularly searching for elements of reflexivity linked to nanotechnology.

## 5.4 Empirical dimensions in the qualitative interviews

Based upon these interviews we have been able to identify seven issues that are highly relevant for the scientific and political discourse on nanotechnologies, three of them are relevant for the discussion on risk society, the remaining four have more relevance for the new governance discourse.

- Risk society
    - Technology optimism vs. pessimism
    - Ethical reflections on applications
    - All benefit, no risks?
- New governance

- Areas for nanotechnology innovations
- What is really new about the nanotechnologies?
- National, regional or global regulations
- Who has the responsibility and legitimacy to be precautionary?

These issues will be presented briefly and discussed below. We are interested both in the strength of each issue, and agreement/disagreement among the stakeholders within each of them.

### 5.4.1 Risk Society 1: Technology optimism vs. pessimism

In all our interviews we witnessed strong technology optimism. This is characterised by a firm belief in the ability of technology to solve all environmental and health challenges: rather than changing our ways, we may just change our technological choices[liii]. Proponents are optimistic about the technological development:"(…) one of the main responsibilities of the present generation to future generations is to work today to find technological breakthroughs with the potential to deliver eco-efficiency improvements of the needed scale within the relevant time constraints"[liv]. This optimistic position on technological development does appear rather unreflexive, as some would claim there are quite a few examples of new technology that have created new challenges. Technological solutions are of course important to reach a future sustainable society, but the implementation and actual use of the technology will also be critical. Certain measures and important choices must still be made regarding our consumption patterns and lifestyles to avoid environmental harm.

When asked directly whether they regard themselves as techno-optimists, all of our interviewees answered positively. At least in the 1980s, many claimed that technology was as much a part of the problem as it was a part of the solution, which is also very much in line with Ulrich Beck's view,but such considerations do not appear to be on the agenda. Technology is (again) seen as a force that may and will help us towards a better environment and human health. Once and for all it can rid us of what we define as problems. Unintended consequences of new technologies are a thing of the past, or maybe just currently out of focus? Is there no risk society any more?

### 5.4.2 Risk Society 2: Ethical reflections on applications

With regard to the products, there appear to be different ethical standards to different applications of the nanotechnologies. Most do not see any problems with nanotechnologies used to create lighter and stronger tennis rackets, in contrast to skin creams or food products. When discussing these latter products, most of the interviewees start to make ethical reflections. The closer to our own bodies, it seems, the more critical such considerations appear. Thus, so far there appears to be little scepticism towards the nanotechnologies as such in Norway, but rather more to certain applications of this technology. This is exactly what many proponents of nanotechnologies hope for: that possible problems or precautions are handled on a per application basis, so that if preventive measures are considered necessary they will be used on applications, rather than on the technology itself. In this regard the attitudes that are expressed in our interviews so far seem rather mature.

So, the closer we get to our bodies and our skin, the stronger become the doubts and hesitations to the application of nanotechnologies; but, interestingly, when we go further into the human body, penetrate the skin so to speak, namely to medicine, the ethical reflections or precautions somewhat surprisingly turn weaker again, or disappear altogether, see Figure 1.

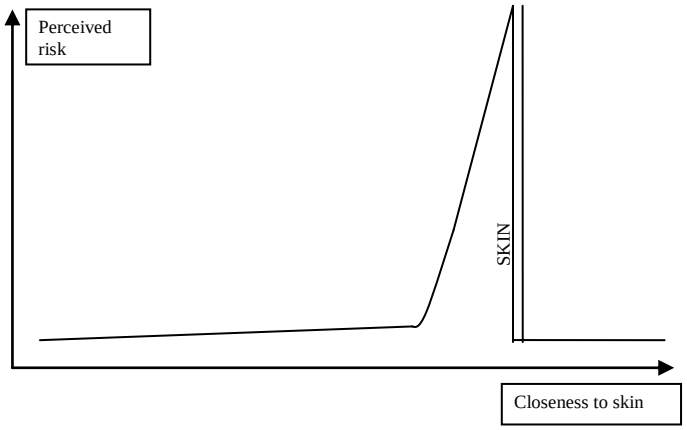


**Figure 1**. Perceived risk of nanoproducts and closeness to skin

High hopes for improving human health and the potential for curing diseases seem to push precautions to the background. An interesting question that emerges from this phenomenon is: Who can be precautionary, indeed dare to be precautionary, if nanotechnologists claim they can cure cancer, for instance? In that case, which does not seem too unlikely, can anybody say: "Hold on, do we know what we are doing, does this come at a price?"

### 5.4.3 Risk Society 3: All benefit, no risk?

Many people working with the nanotechnologies do not like the parallel that often is drawn with the debate on GMO (Genetically modified organisms). One analysis of why consumers rejected the first wave of GMOs is that they were seen as "all risk, no benefit"[lv]. From our interviews the impression of the nanotechnologies is more of "all benefit, no risk". The potential benefits of the nanotechnologies appear as more specific and easier to grasp, than more abstract and ambiguous risks.

The debate over GMOs rapidly became polarized, and a common ground or frame of reference was very limited or even non-existent. No consensus seemed or seems possible. The interesting thing about this from a consumer perspective is that this polarized discussion and the inability of the parties to agree on almost anything, resulted in labelling schemes for products containing GMOs. The consequence is that it is the consumers that have to be precautionary. Is that a development that we would like to see for the nanotechnologies as well?

Apart from this, there is an interesting argument that has appeared in both of the debates, and that is the degree of naturalness: throughout the history of life on Earth organisms have evolved. This has happened through changes or mutation of the genes, and accordingly changes in the genome of organisms are a natural process. It can even be said to be necessary for organisms to survive as environmental conditions change. Along the same lines, the proponents of GMOs argued that they did nothing else than what nature does herself. As we mentioned in section 4.5, the proponents of nanotechnologies would also argue that we have been surrounded by nanoparticles since humankind learned to control fire: soot consist of very fine particles, some in the nano-range; and later, during the last century, we have been exposed to particles from traffic. So some would argue that nothing is new.

### 5.4.4 New governance 1: Areas for nanotechnological innovations

There seems to be an agreement among stakeholders that medicine and nanobiotechnology are the areas with the grandest visions and expectations, and the possibility to detect and cure cancer at an earlier stage is frequently used as an example. The possibility to improve the human body, "playing God" raises a number of ethical questions that are not recognised to the same extent by all stakeholders.

It is not within medicine, however, that we will have the first breakthroughs from basic research to industrial applications on large scale. ICT, energy, food packing and a number of consumer products seem to be more likely candidates. It is within these sectors we must search for new risks and discuss the precautionary principle. However, many of these products use nanotechnologies in a rather conventional way. Does a new ski wax – based on nanoparticles – really represent new dimensions of problems? At the present stage in the development of nanotechnologies, it is difficult for the stakeholders to answer this question.

These new products, however, raise old questions in a new way, at least when it comes to the environmental impact of nanoproducts. If they last substantially longer, to what degree does this represent a problem in the disposal phase of products? As there is no clear answer to this question, it means that the precautionary principle is highly relevant.

### 5.4.5 New Governance 2: What is really new about the nanotechnologies?

Some claim that nanotechnologies bring little new with regard to precautions. Both with regard to pollution from combustion processes and ultrafine particles in the working environment the challenges are well-known, and there are already measures in place to handle these risks. Nanotechnologies have been hyped during the last decade, and many would like to use the term to their field to attract attention and funding. Many scientists have worked on the nanoscale for a long time, particularly chemists, and using the nanolabel on their work looks more like renaming of current practices, than a completely new technology[lvi]. Mankind has been in contact with nanoparticles since the dawn of our species, namely in the form of soot and clay. In the last century, we also became familiar with these kind of particles through pollution from combustion (cars and coal), and in the working environment as a residue from

processes[lvii]. On the other hand, engineered nanoparticles differ in significant ways from ultrafine dusts[lviii-lix].

The proponents of the nanotechnologies in our material are very consciously using the term modifying, rather than manipulating. Although the former is probably more descriptive of the application of these technologies so far, it may also prevent criticism that other new technologies have faced; if we use the term manipulating instead, more people will think of it as playing God, a criticism that has affected biotechnology in general, and stem cell research in particular. This difference may originate from what many see as the first applications of the nanotechnologies: developing new inorganic materials. Modifying or even manipulating inorganic materials does not arouse the same feelings as when someone does the same to organic, living materials, tissues or organisms apparently. The phrase "playing God" does not apply to the same extent in this case.

### 5.4.6 New Governance 3: National, regional or global regulations?

What kinds of regulations are needed to handle the precautionary principle when it comes to the nanotechnologies? Surprisingly, we found disagreement among stakeholders along two dimensions.

First of all, we found disagreement on the need for new regulations. Some stakeholders argued that the present regulatory regime is sufficient to deal with most of the problematic aspects of the nanotechnologies. This opinion follows naturally from the view that there is nothing really new about the nanotechnologies, as described above. Other stakeholders said it was too early to answer this question: we probably need a new regulatory regime, but this has to be related to industrial processes, not to the development of nanoscience. We therefore have to wait for a major breakthrough in the industrial sector. At last, some stakeholders stressed the fact that materials build on nanoparticles have different qualities compared with conventional materials, for instance nanoparticles of silver have different properties than silver, and that we need new regulatory regimes as fast as possible[lx].

Will it be possible to regulate the development of the nanotechnologies on the national level? In principle, many of the stakeholders answered yes to this question. Today we do have ethical standards in Norway that differ from international standards in some areas, such as biotechnology. This could also be expanded to the nanotechnologies, if we find ethical reasons to do so. However, the majority of stakeholders found it difficult to establish single,

national regimes on nanotechnologies because the development of these fields is global in nature.

### 5.4.7 New Governance 4: Who has the responsibility and legitimacy to be precautionary?

So, what does it mean to be precautionary? The term can be interpreted in different ways, from a rather weak or soft interpretation seeing it as a general rule that one should be careful or just take common sense measures. More drastic interpretations are moratoriums, like the one that was passed by an overwhelming majority in the Norwegian Parliament in 1997 on the cloning of animals and humans soon after the cloned sheep, Dolly, appeared[lxi]. As early as 2003 the Canada-based ETC (The Action group on Erosion, Technology and Concentration) argued for a global moratorium on nanotechnology[lxii].

Responding to such claims, some researchers argue that there is noting really new about the nanotechnologies, that they are mere extensions of existing research, in material sciences, engineering, chemistry and physics[lxiii]. This may be a bit hard to swallow since many people for a long time have hyped the nanotechnologies as something completely new. This ambiguity is also evident in the industry's attitude towards regulations: ostensibly, going down in particle size magnifies only the positive, desirable properties of materials. That the same might happen with the negative, undesirable properties like increased toxicity is largely uncommented by the proponents.

We found substantially different interpretations of the precautionary principle among stakeholders. As we see it this principle gives legitimacy to political actions based upon experiences and early scientific warnings, *even when there is no scientific evidence to prove causal links*[lxiv]. For many stakeholders, this was not sufficient; they wanted solid scientific evidence before any actions were taken; but if this is the case, the relevance and legitimacy of the precautionary principle seem rather weak.

Who has the legitimacy and political power to enforce the precautionary principle within the development of the nanotechnologies? There were substantial differences among stakeholders as far as this question was concerned. In principle the responsibility was placed on the political authorities - no other institution can be precautionary. On the other hand, the majority of stakeholders believed that politicians were not able to take this responsibility at the present stage of the development of the discourse on the

nanotechnologies. This was even the opinion of some of the politicians. In these instances the responsibility was placed on individual researchers and the scientific community. They have to come up with a valid and reliable political and scientific discourse that makes it possible for politicians and NGOs to understand relevance of choices. Where is the true risk assessment and mangement in the nanotechnologies? It is also worth mentioning that the responsibility for the precautionary principle was not placed on businesses and the industry. This reflects that we still are in the very early stages of the development of nanotechnologies, but this could change in a relatively short-term perspective.

## 5.5 Conclusion: The future discourse on nanotechnologies

We are still in the early stages of the expected waves of innovations in nanotechnologies. This is clearly reflected in the public discourse about nanosciences and nanotechnologies in Norway. It is difficult to identify the main positions in this discourse, because all leading participants are technological optimists. There seems to be agreement among various groups of stakeholders that the positive visions for nanotechnology truly are without limits. It is not the time to be precautionary; it is the time to continue basic research and product development. The reflexive modernity of Beck and Giddens is not present among the stakeholders interviewed in our research. Technology is not a part of the problem, it is the solution. Furthermore, if new solutions create unknown problems, we will be able to handle these problems when necessary.

At this time, the responsibility for being precautionary has therefore been placed on the scientific community and individual researchers. It is the responsibility of the scientific community to formulate political dilemmas and publish risk analysis in such a way that the responsibility for being precautionary can be transferred from the scientific arenas to the political arenas - where it belongs.

These findings do have implications for governance. For governance to function, all relevant stakeholders should be able to contribute to the process. This presupposes knowledge on the subject; and, as of now, very few of the stakeholders in our study have such knowledge. The scientific community therefore has a crucial role to play in formulating dilemmas that other stakeholders can relate to. This is also in the clear interest of the scientific community: if other stakeholders are left in the dark on these subjects, there is

an overhanging risk of backlash against the nanosciences and nanotechnologies. This will stem from uninformed decisions and actions from the rest of society.

On the other hand, one reason that most of our society has not really become aware of nanoproducts may be that so far they appear more as modifications of products and features, rather than novel manipulations of matter. The often cited car coating with nanoparticles used by Mercedes-Benz to increase scratch resistance does not really strike one as a radical innovation.

In the near future many nano-innovations will influence everyday life of citizens and consumers in ways that may be difficult to imagine today. Before that, the precautionary principle has to be activated. So far it is only a sleeping principle as far as the nanotechnologies are concerned. There will certainly not only be benefits, but also risks. Some of these risks are recognised today within the scientific community, but so far few measures are taken to improve or change the regulatory regimes.

So, how should the precautionary principle be applied for the nanotechnologies? Based on our findings in this project we would agree that a precautionary approach at least should include the 3 restrictions on these technologies posed by Roland Clift[lxv]: regulating nanomaterials as new chemicals; planning end-of-life management of products containing nanomaterials; and presumption against release of manufactured nanomaterials into the environment. We believe we would find strong support for these points both among the stakeholders we interviewed, and also in the focus groups of ordinary consumers we arranged later in our project.

The development of nanotechnologies is often compared to the public discourse on GMOs. So far we have not witnessed the same antagonism in the nanotechnology discourse. One reason for this could be that nanotechnology is much more complicated and difficult to understand for the general public, while the ethical dilemmas in the GMO-discourse are more apparent. So far, it is easier to see the benefits of nanotechnologies. The current view can be summarised as “all benefit, no risk”; but this can suddenly change: if problems or scandals are identified with one nanoproduct, it may well have negative repercussions throughout the entire nanosector. Preventing such domino effects is a big challenge for this sector.

In the course of this project we have several times been asked what we consider to be the greatest risk regarding the nanotechnologies. From what we have learned in this project, we would say that the greatest risk regarding nanotechnologies is our current relationship to technology in general. The strong technology optimism we witnessed may very well prevent us from

discovering and investigating certain critical aspects of these new technologies; and more pressing in this context, it precludes precautionary actions.

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# 6 Risk, Responsibility, Rights, Regulation and Representation in the Value Chain of Nano-Products (Published paper)

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**Abstract**

This chapter reports on a research project which addresses one key question and a number of sub-questions. The key question is, what are the salient dimensions of the *commercialisation and governance* of nano-enabled products, covering regulation, risks, responsibilities, consumer rights, and representations to the consumer? The sub-question , and the particular focus of this paper is, how are nano-enabled products destined for consumer markets *labelled and marketed*? Within this more specifically, how do producers *perceive* and strategically target consumers, and *communicate* with them (or not) about the nano-component of their products? Then, does the way that consumers are conceived of and understood by different actors along the value chain *change* in terms of how the product is *marketed?* Finally, what are the ethical, governance and regulatory implications of the answers to these questions? The chapter builds on an ongoing collaborative project between SIFO (Norway's National Institute for Consumer Research) and the Manchester Institute of Innovation Research at Manchester Business School, UK. The work is a comparison of ethical aspects in the marketing of nano-products in Norway and the UK. This chapter provides preliminary findings and some reflections based on our empirical material; an analysis of web-based and other communications, interviews along the value chain ie with producers, importers , retailers and other 'intermediariers'; and eight group discussions across the two countries focussing on cosmetics and textiles.

**Keywords.**

nano-enabled products, marketing, communications, labelling, cosmetics, textiles, governance, representation, responsibility, regulation, consumer rights, risk, ethics,

## 6.1 Introduction: The Future is Now

Nanotechnology has been termed the Next Industrial Revolution, and is quite often referred to as something that belongs to the future; the next big thing [1].

But what such rhetoric seems to overlook is that there are many products on the consumer market enabled by nanotechnology already. Some of these are obviously using the term without reference to any technological component whatsoever, such as the small gifts dispensed in plastic containers called "NanoEggs",

Indeed according to the inventory maintained by the Project on Emerging Nanotechnologies, there are at the time of writing (September 2008) 803 consumer products on the market, identified as such by the manufacturer. And new nano- products (so-called) are being released at the rate of three to four a week [2]. However, according to the Project's director David Rejeski this figure is just the tip of the iceberg and the real number of consumer goods products incorporating nanotechnology could be much higher [3].

This trend resonates with the argument of McKibben and his general critique of Western consumerism, where he calls us to declare that 'enough is enough'. Simply put, in terms of the rapid entry of new nano-enabled products onto consumer markets, he would charge that we already have 'enough stuff' [4]. This implies a moral and ethical imperative to curb the tendency to divert world resources into the production of, what we might call the 'fluff and flippery' of consumerism.

This point was echoed in the UK consumer groups which we undertook for this study. Across all four groups of younger/older; men/women who participated in the UK part of the research, informants were surprised at the pervasiveness of nanotechnologies now entering peoples' everyday lives via the route of nano-enhanced products. Their surprise was at moments closely followed by irritation that previously acceptable ways and standards of doing everyday things (such as washing and polishing one's car) needed nanotechnology interventions at all. This comment referred to the nano-enhanced car wax passed around in the group discussions. The product was considered frivolous, and probably more expensive than the antecedent versions.

The trend of rapid diffusion of nano-enabled products into consumer markets also raises the stakes for societies in terms of the need for consumers and consumer organisations to become directly engaged with the risk and responsibility dimensions of nano-enabled products as well as the need for greater social science research into the implications for societies of the rapid release of nano-enabled products onto consumer markets.

Most of the high hopes for nanotechnology concern the expected influence of this technology on important and urgent questions pertaining to environmental issues or hunger. But it seems that the nano-enabled products presently available and marketed as such in consumer markets fail to meet these visions. As of now, the products that we find on the consumer market that are marketed as incorporating nanotechnology, are mostly "luxury" products like anti-wrinkle face creams, all-weather jackets, anti-bacterial socks and super-strong, super-light tennis rackets. In addition they can be said to represent "incremental nanotechnology" [5], and appear more like modifications of earlier products, than revolutionary ones [6]. So, there is a rather striking discrepancy between the anticipated applications of nanotechnology that we usually hear of, and the actual and quite mundane applications entering consumer markets.

To take these products as objects of analysis might be a controversial exercise in itself. Some would claim that such studies detract from the high hopes and mightier application possibilities for nanotechnology. Studies of the currently available products on the consumer market may create and stimulate an atmosphere of "unnecessary" distrust in a coming desirable future which can still be brought about by the responsible and ethical development and commercialisation of nanotechnology. Some others have observed that such an application of ethics in the nanotechnology field, "nano-ethics", currently appears more like a path-clearing exercise enabling the smooth development of nano-technology free from controversy than a genuine ethical reflection and on its' future development [7].

## 6.2 How to Represent Nano- in Consumer Products?

From the consumers' point of view, one relevant political point of entry is the consumer rights statement, formulated as a "Consumer Message" from President Kennedy to the US Congress in 1962 [8]. This seems very relevant to the development, launch and marketing of nano-products. According to this classical political document the main consumer rights in modern societies are:

the right to choose; the right to information; the right to security and the right to be heard.

This brings us to the topic of this chapter. The theme is marketing of nano-products in consumer markets linked, from an ethical perspective to 1) consumer confidence and trust that products are released only after due regard to the safety, health, and environmental aspects of their availability in public domains 2) the control of the diffusion of innovations in risk societies and 3) basic and fundamental consumer rights to information which facilitates pro-active participation of consumers in public debates.

This set of concerns pervades this chapter, from philosophical, ethical, and very practical perspectives.

It has been suggested (and confirmed in our research) that some producers choose *to avoid* the nano-label, out of fear of provoking a regulatory (re)action or consumer 'backlash'.. This begs the question, why would businesses seek to conceal some product properties and reveal or exaggerate others? And why might they seek to do so in the particular context of nano-enabled products?

And on the flip-side we should perhaps consider the marketing of products that do not comply with criteria that we might use to differentiate nano-enabled products, of scale, technological engineering and consequentially the emergence of new particle properties, but still are pro-actively marketed using the label 'nano', due to an idea that there are inherent advantages in marketing products as 'nano', even when they are not technically 'nano'. An archetypal example of this is a recent car model from Tata Motors named Nano. The producers give a telling explanation of their choice of name: "*Why Nano? The name 'Nano' was chosen as it denotes high technology and small size*" [9]. Another interesting example is from the scientific institution NASA, which one would suspect of being quite conscious of nomenclature: in August 2008, NASA launched a mission including the satellite "NanoSail-D". Here the term "nano" refers to a class of satellites between 1 and 10 kilograms [10]. On the other hand this should not come as a surprise as the use of the "nano"-label is not regulated [11].

Such questions have been introduced in our interviews with manufacturers, importers and retailers of cosmetics and textiles products, and in this chapter we present some of our preliminary results.

In fact as we have reported elsewhere, we cannot take the label 'nano' on consumer products at face value.

> 'The question of when the term…. (nano) …. Is used has become particularly perplexing of late….. In this context the labelling (or not) of nano-artefacts as such becomes an object of study in itself. …We must ask: What meaning and utility does the label have and what instrumentality does it bring, if any to stakeholders within the value chain; from scientists to marketers, from consumers and users to politicians and regulators? This is one practical way to unpack the situation that otherwise emerges as a patchwork of possibilities, where (1) the nano-label *is* used where the criteria set out (below) suggest it does *not* qualify (2) the nano-label is not used where the technologies incorporated appear to suggest it *does* qualify; and (3) the label is used, the nano-artefact qualifies as such and, moreover, the label is being pro-actively deployed and emblazoned across products and through marketing communications to denote product enhancement and improved performance' [7]

To the above we could add examples which we found in the course of our present research where the term 'nano' is used to enhance a product's *brand identity* by creating and standing in for attributes of scientific and technological superiority.

However if we are to qualify the above sufficiently to provide a systematic frame of reference within which to address the 'is it/isn't it Nano' question, we must provide qualifying criteria for what we consider *is* a nano-enabled product, notwithstanding this is a research field which is notorious for its multiplicity of definitions and qualifying criteria. Indeed, helpfully the term Nanosciences and Nanotechnologies (N&N) has quite recently crystallised into a standard convention within the European Union regulatory sphere at least. And so we will follow this convention henceforth in this chapter [12]. Elsewhere [13] also we have settled on qualifying criteria for distinguishing N&N as:

> dimensional scale (focussing on the nano-range of 1-100nm), properties and behaviours of particles that come into affect when molecules attain a crtical (small) size ie molecular disaggregation., system integration of nano-artefacts to make nanotechnologies and products.

Now we can return to our empirical story, whilst noting that in many of the contexts we discuss, the actors and authors we refer to are less specific on precise definitions either deliberately or unintentionally leaving the inclusive/exclusive question of 'what is nano?' open. Indeed offering reasons and explanation to account for this vagueness, and its regulatory implications, is one of the key objectives of our work.

An interesting question when it comes to consumer information or possibly labelling is the nano-component of the product *packaging* as opposed to the content of the product within the packaging . This is a field which needs greater attention in terms of social science research, and potentially regulatory attention [14]. New and improved functionality can be identified for packaging materials that could contribute to an increase in the shelf life of food, for example. But no-where, to our knowledge, is nano-enabled packaging labelled as such. Is this something that consumers should be aware of? or should they primarily pay attention to the product contents?

## 6.3 How to Regulate: Questions of Responsibility in the Value Chain of Nano-products?

There has been little co-ordinated international regulatory action on nano-particles and this sits uncomfortably with calls from some quarters for a moratorium on all research on nano-particles [15]. Further, disturbing is the finding that the proportion of individuals that believe risk will outweigh benefits *increases* after they learn more about nanotechnology [16]. Some consumers call for mandatory labelling when confronted with the fact that there are products incorporating nanotechnology already on the market in large numbers [6].

But the question of whether and how to regulate nano-enabled products has turned out to be a tough dilemma for regulatory authorities around the world. There have been several calls for greater scrutiny, a new regulatory framework, and arrangements for monitoring. Indeed, US regulators arrived at their first ruling in November 2006, on the use of silver ions in a Samsung washing machine, which some suspected would be the first ruling on nano-particles [17]. Interestingly in their final notice on this, however, the EPA does not actually address the new functionalities of the nano-enabled product. The machine was marketed with claims that it would kill bacteria, which would classify it as a pesticide in the agency's opinion, and it was therefore regulated under already existing pesticide controls [18]. The agency even

specifies that: “The notice does not represent an action to regulate nanotechnology” [19].

The question here actually is whether nano-silver (silver-ions) really is different from silver in bulk form, in the sense that it requires new regulations. Similar controversies surround the labelling and regulation of other materials in the nano scale, such as the various nano-forms of carbon.

Further, it is important to stress that regulation as a notion can be understood as something broader than simply new legislative rules [20].

These two questions: how to represent and how to regulate are in fact interconnected. In an extreme scenario, if it were to come to a ban on all products incorporating nanotechnology such that existing nano-enabled products were taken off the market, there would be no representation dilemma in any case.. It is precisely because the responsibility for assessing and evaluating products is placed with the *consumer*, at the point of purchase, rather than by others in the value-chain (manufacturers, retailers, or indeed through regulatory intervention), that the representation and labelling questions come into the frame at all.

This positions the nano-products debate as part of wider debates around ‘consumer choice’, ie the devolving of the assessment of ‘what is safe and what is ethical?’ to the consumer, whether s/he wants this responsibility or not.

Alternatively a case might be made for mandatory labelling, like the example covering the traceability and labelling of GMOs in Europe in 2004 [21]. A similar debate rages in other areas of labelling such as carbon labelling/carbon foot-printing [22] or Fairtrade. A nano labelling scheme would regulate nano-technology through the vehicle of *informing* consumers and thus empowering them ‘to choose’. However the strategy of devolving responsibility to the ‘choosing customer’ through devices of information and labelling, assumes that the customer is able to negotiate their way through the plethora of ‘is it/isn’t it nano’ questions raised above, covering technical assessment as well as the different representation strategies of marketers. This, as we have said, has already created a situation of multiplex variety and contestation. It is difficult to see how, if all the other actors in the value chain of nano-enabled products contest the definitions of N&N and deploy the term ‘nano’ in a range of contexts, the consumer is somehow meant to ‘see clearly’ that which is not at all clear, or straightforward, to others.

Another labelling possibility is to incorporate labelling and marketing issues into "soft regulation" such as voluntary industry agreements, or Codes of Conduct whether generated by a territorially bounded administrative unit such as the European Unions Recommendations for a voluntary Code [23], or generated by actors in certain sectors; or by actors at a particular point in value chains, such as retailers [24]. This 'soft'-governance option is getting a lot of attention from producers and regulatory authorities currently. It is, perhaps less helpfully, generating a plethora of Codes, and with them, potentially a great deal of confusion at all points of value chain, whilst paradoxically not yet entering consumers consciousness at all. Whether incorporating the issue of labels or not, it represents a governance strategy which places responsibility for the 'soft' governance of nano-enabled products, primarily with actors all along the value chain, rather than with consumers. It is a strategy which again poses problems in a consumer context: How can consumers (and indeed others in the value chain) understand what products, which sectors, and which geographical jurisdiction are covered by a particular Code and which are not?

Even for those studying this Code-creation process and the examples which are emerging across the globe (one might say the recent *proliferation* of voluntary Codes), it is not clear what the content, scope, and differences between the various Codes are, and indeed which have regulatory 'teeth' and which do not..

Then we could have a situation that is similar to what we have found to be the situation on today's consumer market. That some producers explicitly promote and market as 'nano' some of their products which incorporate nanotechnology, be it "nanosomes" (e.g. face creams), "nanosilver" (e.g. socks), "carbon nanotubes" (e.g. tennis rackets). Others participate in working out voluntary labelling and standards schemes, like The Blue Sign for textiles. A number of other producers do not inform consumers that they market products incorporating nanotechnology, not necessarily by hiding it actively, but neither telling it openly. They may boast of properties though, that we would identify as coming from nanotechnology, without saying or claiming it to be a result of that, like "vectors" in cosmetics.

Most studies have found that consumers are quite unknowing of nano or nanotechnology [16], [25], [26], and as such it was of little surprise that they were unaware that there already are products with nanotechnology on the market [6]. On the other hand, in one of the UK group discussions commissioned for this study (older men) informants *were* aware of the existence and availability of nano-enabled products in consumer markets *per*

*se*, but they were unaware and surprised by the quantity,, pervasiveness and *'silent creep'* of 'nano' into products.

This point is developed further by our research team reporting elsewhere on the nano-marketing and labelling strategies of producers and retailers [27]. There, we reflect on the finding that in the marketing of nano-enabled textiles and garments, for example, items are branded for sale not as nano-enabled products according to some technical nano- specification, but rather in terms of the new *functiona*l attributes which the nano-technology brings into being. This becomes the basis of the appeal to the consumer, and also the rationale for charging a (significantly higher) premium price. Ultimately it is a marketing strategy which seeks to create/sustain a market niche/foothold by differentiating the nano-enabled variant from its own antecedents: an appeal which is coupled with the claim to be maintaining a position of innovation-based leadership by improving incrementally upon an antecedent variant (classic incremental innovation), at the same time claiming leadership over competitive products.

What is interesting and novel in our finding is the way in which the new attribute is *explicitly* communicated through the label in terms of enhanced *funcationality* (crease-resistance, stain-resistance, water-proofing in textiles, anti-wrinkle in cosmetics) where the new/improved functionality becomes the key to connecting the technically complex field of nano-technology to the practical task of appealing to the customer. Indeed, more technical appeals related to the actual nano-science/technology specification which explicitly use the prefix 'nano' appear to be *on the decline*, and being replaced by function-related prefixes. This again has implications for regulation and the responsible development of nano-technologies because the nano-specification which sits behind the claim of *enhanced functionality* is all but hidden from the sight of the consumer.

This strategy demonstrates the co-coupling of perceived product enhancement, with perceived customer benefit, via the strategic intermediation of a nano-label. The intentional removal of the nano- prefix from the promotional mix and message, and its replacement with another label which maintains product-enhancing appeals whilst intentionally omitting the nano-part of the label is a key finding of our research. It is also evidence of the still very fluid and unsettled nature of the nano-labelling phenomenon, in the very construction and performance of 'what is nano?'.

How to represent nano in consumer products would certainly also be a reflection of regulatory issues: if mandatory schemes are imposed, little room

for consideration is left to producers whilst at the other end of the spectrum, voluntary schemes are dependent on business co-operation, in that business is given at least some part in the formulation of rules and working out the framework for such arrangements.

The current market conditions, as we see them, offer different roles to producers. The motives for those that choose not to market the nano- aspects of their products, could at least be two: they see no benefit in doing so, maybe only a downside. Or, they might fear that actively telling the market that they use nanotechnology of some kind in some way in their product, could "provoke" regulatory action. This last motive may of course also be the justification for joining one of the current voluntary labelling schemes: signalling to the regulatory bodies that they are responsible and trustworthy actors that can be relied on to make adequate framework, without the need for initiative and resources from governmental bodies.

This last point, where stakeholders themselves take the initiative, is something that fits well into the transition from Government to Governance. This is part of a rationale which not only passively permits, but *actively desires* the inclusion of the full range of stakeholders in the political process (including public deliberation and public engagement exercises), and is an important element of the debate on 'how to govern,?' in an ethical as well as a practical sense. The traditional "command and control" mode of governmental bodies in regulation is complemented or augmented by governance processes, where all those that are involved in the scientific and commercial production, distribution, and consumption of goods or services that are to be regulated, are invited to participate actively in laying down the framework and conditions for such regulations.

Regulatory agencies around the world are grappling with how to handle nanotechnology: can nano-particles of silver be considered to have such new properties that it should be considered a new element, or are the regulations concerning silver in bulk still appropriate?

The new chemicals regulation scheme for Europe, REACH (Regulation for Registration, Evaluation, Authorization and Restriction of Chemicals) is a comprehensive one. There have been questions whether and how nano-particles will fall under its scope. According to European Chemicals Agency, they do, but it is the potential registrants that should consider whether they have obligations under this new regulation. Interestingly, they take into account future development of the knowledge on nano-particles: "The evolving science of nanotechnology may necessitate further requirements in

the future to reflect the particular properties of nano particles" [28]. Under REACH all forms of carbon were at first exempted from testing, which in hindsight was rather striking as nanoscale forms of carbon are among the best known nanomaterials, like carbon nanotubes or buckminsterfullerenes ("Buckyballs"). This was recently amended (June 2008) by representatives of the EU governments. Following final EU approval, it is expected to go into effect within three months [29].

## 6.4 Comparing Norway/UK Consumer Markets for Nano-products: Research Method and Materials

At the time of the Rovigo conference where our project was first reported (May 2008) the primary fieldwork which informs this chapter had not yet been completed. At the time of writing this chapter (September 2008), the fieldwork had been completed but had not yet been fully or systematically analysed.

Below, we provide an overview of the research design and methods, with reasons for choosing the design we did. We promise no more in this chapter than to preview the study-outputs in terms describing the primary data gathered and some preliminary key findings which provides the material for some reflections and conclusions in terms of some governance implications for all those classes of agent (value chain actors, intermediaries and NGOs, consumers, policy makers and regulators) involved in the commercial exploitation and marketing of nano-enabled products, and their regulation. A full analysis and reporting of the empirical study remains for a future date.

We hypothesised at the outset that the markets for nano-based products is rather different in the two countries, and mobilised the two research centres to undertake a preliminary investigation as to whether indeed this is the case. Our starting point for suggesting national differences between Norway and the UK is that there has been a lively debate on nano-technology in Great Britain, partly as a result of Prince Charles' very visible concern, which in part prompted the high profile report of The Royal Society report in 2004. In Norway, by contrast there have been few traces of such a public discourse. (Although it should be noted that the Research Council of Norway actually were quite early in their focus on ELSA-issues when they issued a report on the national needs on research and competence in this field in 2005 [30]).

In addition, we suspect that citizens' trust in regulatory institutions is higher in Norway than in the UK [31].

The underlying study was carried out in Norway and UK, as cooperation between SIFO and the University of Manchester. We focus on two product groups: cosmetics and textiles. That choice was made mainly on the basis of product availability; i.e. where market entry is evidenced by products 'on the shelves of retailers', so to speak, and partly as a result of observations in an earlier project, where we found that perceived risk and ethical considerations increased as the products in question got closer to the body/skin [6].

This 'emergence' of nano-enabled products through value chains, on to markets, and into the everyday lives of consumers, is recognised as under-researched [13]. To an increasing extent the development of nano-technology has become an ethical and social issue [32] as much as a question of the generation and production of new scientific and technological knowledge *per se* attached to potentials for application and commercial exploitation. Many of the ethical and social issues are general questions on the relationship between science and society [13]. However, some of them have special relevance for nanotechnology. Nanotechnologies are enabling technologies, meaning that they are a means to achieve different ends for different products and applications. At this point we must recall the point made by Wood et al. and others that a key reason as to why nanotechnologies differ from antecedent waves of technological development is that nanotechnologies are not, and should not be conceived of as an 'it' [33].

Rather, and most importantly, we are witnessing the emergence and crystallisation of a new technological 'platform' or scientific paradigm, involving fundamentally new scientific method and procedure from which common start point is generated a plethora of new scientific breakthroughs and applications impacting on the full range of material artefacts, sectors, and applications, This implies that nanotechnologies may be implemented on an exceptionally broad scale ranging from energy and medicine to water purification and materials science and technology. And it is this huge variety of potential applications, as well as the variety of actual products entering markets, juxtaposed with still unresolved questions of safety and hazard, in scale and type, which create the conditions for the governance of nanotechnology as warranting the title 'unprecedented'. It is also these features which must inform and drive our choice of social science *research design.*

Our present paper is based on findings in three stages of our comparative empirical research:

- Content analysis of advertisements, packaging and labels in the UK and Norway for cosmetics and textiles.
- Qualitative in-depth face to face and telephone interviews with producers, importers and retailers in the two countries for cosmetics and textiles.
- Qualitative group discussions with the general public (excluding people who worked directly in the fields of natural and physical sciences at a University (graduate) or above (postgraduate) level. Four group discussions were conducted in each country, ie younger/older female groups and younger/older male groups.

The producer communications are mainly from the internet, and are saved as 'screen-dumps' or print-out from various actors: producers, innovators, importers, magazines and retail. These are supplemented by in-store point of sale (product labels and display) materials The first part of the project was to get some insight in the two markets of textiles and cosmetics. To do this we turned to the marketing of their products, chiefly on the net, and looked for nanoproducts on different pages. Which internet pages we visited, and subsequently which entities we turned to for interviews, were based on both commercials and news stories in magazines and newspapers and results from search engines on the web. In addition, we have used leads from the online consumer product inventory of the Woodrow Wilson Centre. We focussed on actors we saw as central, and that we found used "nano" more or less openly. The webpages of the brand Lancôme became central for the study of cosmetics since in their widely sold Revitalift-series, they, on the front of the packaging announce the use of nano-ingredients. We found the information available on the different country-focussed webpages of Lancôme varied, which made these webpages an interesting study in themselves. That said, we also visited the web-pages of all other major cosmetics brands and of textiles and garment producers, from science-orignators through to technology developers, component manufacture and processors, branded-goods manufacturers and various marketing and distribution channels, from direct marketing on the web through to various types of shop outlets. Industry Associations, and consumer 'intermediary' organisations were also interviewed.

We have undertaken interviews with different actors in the value chain of the two product categories. Seventeen interviews have been conducted (12 on textiles and 5 on cosmetics). Interviewees where first contacted by email, and followed up by telephone and face to face conversations. We used a semi-structured interview guide, and the interviews were taped where permission was given by the interviewee. The interview started quite broadly with questions on the interviewee's background and the company's philosophy. We then turned to questions about innovation, novelty, and technological development of their nano-enhanced products. At this time we focussed the discussion on nanotechnologies: what they knew, and if they had any nano-products in their product portfolio. There followed questions on the profile and perceptions of consumers: who they understood to be buying their nano-products, customer trends., and questions on how they perceived or 'constructed' through mental-models , their 'nano-consumer'. We turned to regulatory and governance affairs exploring the interviewees views on the distribution of risks and responsibility for regulating nano- in the value chain, questions on consumer rights and regulatory affairs and finally we asked them to comment on the (5-10 years) future of each of theses issues in turn.

It should be noted here that some actors have been rather unwilling to participate in interviews, both because of stated time constraints, but also due to some scepticism towards the motivation for this project: that our project was more of the sensationalist looking-for-scandals kind of work, and why would be at all interested in this or why it would indeed be more interesting to talk about more sensitive issues. That said, we have also talked to several actors in the field who had few objections of this kind, and happily participated in the interviews.

All interviewees where assured of anonymity. For this reason no reference to individuals is provided in this chapter nor can individuals be identified as working for any particular organisation mentioned in the text.

In this chapter we focus on the interview material collected. In other articles we pay more attention to producer-communications through the lens of web-communication and actual labels in use [27].

## 6.5 Discussion of Findings

The preliminary findings we present below relate to regulatory/governance and marketing/labelling issues as they were revealed in our data and primary research.

*The Rapid Emergence of Voluntary Self-regulation: Codes, Standards and Accreditation Regimes in Textiles.*

In the textile sector we identified and captured views on two UK industry-led emergent voluntary standard schemes and four European (including German/Swiss) ones. They were:

Responsible Nanocode, developed by the industry group NIA in the UK (comprising major trans-national corporations from across the value chain, including retailers). The developers of this code are reviewing the implications that have arisen from a comprehensive international consultation on the code.

A BSI standard is currently in development by the UK network Nanocentral. Its aim is compatibility with a suite of BSI standards and their compliance regimes.

Bluesign is a currently existing European voluntary standard aimed at gaining industry confidence in production processes, storage and transit (in particularly in terms of worker safety) of textiles, tracing throughout the supply chain up to the point of the end-consumer. It is not concerned with post-use disposal.

Hohenstein Institute in Germany creators of Hohenstein Quality Label for nano-enabled textiles (Nanolabel)

The Swiss Retailers Code.
The voluntary EU Responsible Nano-Code, launched in February 2008

All of these Codes and Standards regimes either directly involve or will have implications for product labelling. In our study business representation organisations and business interviewees stressed that their intention in formulating and signing-up to the Codes and Standards regimes is to

demonstrate and participate in a process wherein the nanotechnology component of the product and production process are being managed pro-actively in a 'responsible' way. Importantly, all of these schemes have emerged from *industry co-operation*, collaboration, and mobilisation on behalf of businesses in general, and involve businesses at all points of the value chain. In general the response sits out-with competitive relations, unless couched in terms of *striving to differentiate and communicate to customers* ethical good practice described in terms of following the highest possible standards of safety within existing knowledge on hazards and risk from (quote) *'the cowboys'* who get away with not committing the costs and investment needed to match these high standards. The intent is to 'drive out' the so-called cowboys from the field. Importantly, the early and exploratory development of such codes and standards is a collective rather than an individual endeavour, and is motivated by a collective desire to develop nano-technologies with due regard to safety (especially labour force safety) rather than as an outcome of defensive or passive response to 'regulatory-push'. Typically the initiatives have involved multiple actors from the business, regulatory authorities, public institutes and NGO spheres.

This chimes with the view of Lee and Jose, who say that given the rapid development and commercialisation of nanotechnologies, businesses are in a unique position, in terms of a capability to match governance requirements to the rapid emergence of N&N and its regulatory implications. Given the asymmetries of resources and knowledge between large business, governments, NGOs and other citizen-representation organisations, businesses must/should, they argue, play a key role in 'rapid response' strategies founded on notions of 'corporate responsibility' and guardianship, rather than looking narrowly and solely at short-term concerns such as market exploitation and profit maximisation [34].

Although such industry-led self-regulation can be interpreted in some respects as a way of pro-actively trying to pre-empt anticipated regulation; in general terms our interviewees, especially those from, German or Swiss contexts where 'responsible capitalism' was considered a cultural legacy embraced in the training of engineers; spoke of their commitment to a high standard of care which embraced guardianship of employees, the general public, and natural environments. They took this responsibility very seriously as an underpinning fundamental principle of 'how to do business'. (These respondents were either selling into or had some other relevance to UK consumer markets hence they were included in our study). They stressed that they were motivated by due diligence in NOT taking unnecessary risks (within existing knowledge, hence embracing the 'precautionary principle'

wherever scientific knowledge on safety and toxicity was lacking) with the wellbeing of people and natural environments their primary motivator. It was noted that current codes dealt reasonably well with the health and safety of *people* (the result of antecedent strong controls on health and safety at work) but lagged in terms the well-being of natural environment, in particular issues of recycling and environmental impacts of textiles incorporating nano-chemistry into manufacturing processes. This appears to represent a significant and important 'gap' in current industry self-regulation codes. Voluntary codes are worthy of significant research attention in order to capture and undertake comparative analysis of the origins, development, content, scope and regulatory teeth of existing codes.

However in interviews with informants from other country/business sector contexts, this heightened 'standard of care' was in contrast, not only ignored, but appeared to be proactively avoided if not flouted or resisted by some interviewees. It was not difficult to find examples of accounts (one from the US, one from South Asia) where such ethics of responsibility were not in evidence at all. In one case; the need to remain 'competitive' in the face of global and local competition was deemed the over-riding concern, matched by a tendency to resist external regulatory pressure. For another respondent (a South Asian, small distributor of finished textiles) action appeared to be motivated by a need to assist importers from developing countries to develop their small and family owned businesses in the face of the dominance of large multi-national, predominately Western corporations. Further the informant noted the prohibitively high cost to small importers of registering for regulatory certification. These arguments were cited as the main reasons why s/he proactively avoided both government and voluntary industry-led regulation. It would appear that only obligatory regulation would have a bearing on the actions of informants such as this small importer/distributor.

What is also clear is that the proliferation of 'bottom up' voluntary schemes will require a process of further rationalisation of voluntary initiatives to a single or clearly differentiated smaller number of codes and industry standards regimes. It is as yet unclear how this process will unfold. In each case the aim of the framework is to differentiate those products and processes which carry the endorsement and accreditation of the standard from those potentially 'lower standard' products/businesses which don't. In this sense accreditation marques become a marketing tool as much as a notation of guarantee of performance or safety standard. It can be viewed as a marketing tool as it signals that the actor in question proactively wishes to be associated with a safety/wellbeing standard. And to the extent that consumers may or may not be aware of the details of the standard: its scope, content, and measurable

indictors for the achievement of certain performance criteria; it can nevertheless, in time, contribute (according to one interviewee) to the creation of consumer 'trust'.

The use of accreditation schemes and standards to engender trust, however needs also to be positioned against the replies from one small retailer in the specialist (outdoor sports) context where it was noted that the reputation of the brand, trumped individual technology enhancements in terms of 'standing in for' quality and assurance in terms of customer trust in the product. Of course the accreditation versus brands dimension is not mutually exclusive, as one might expect those brands considered superior in terms of quality and reputation, also tend to carry (or indeed drive forwards) industry accreditation schemes and marks.

**Existing Regulation, the Marketing of Science, and the Science of Marketing in Cosmetics.**

In contrast in the cosmetics sector we did not come across any such initiatives for voluntary schemes. This could be related to the fact that cosmetics are highly regulated at the industry level already. There are for instance national Norwegian regulations which are not fully aligned with the European directives (as the legislation on medicines is not), and first and foremost the producers refer and defer to the relevant national regulations. The new regulations of chemicals on the European market, REACH (Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals) entered into force in June last year [28]. The representative from the cosmetic manufacturers who we interviewed reported that in his view, the REACH regulations in general, and the national cosmetic regulations in specific together cover the issue of nanotechnology in a satisfactory manner: there is subsequently no need for separate regulations of this technology.

The cosmetics regulations also concern how far into the skin cosmetic products are allowed to move, said one of our interviewees. When new products are placed on the European market they are to be assessed by scientific assessors, who according to one of our sources, are supposedly very strict. The latter source also pointed out that the industry would not want the ingredients of their products to penetrate the skin completely – this was not considered desirable for both safety and effectiveness reasons. The industry's aim is to have the active ingredients stay in the skin and have effect there, not entering the bloodstream and moving away from where they are supposed to work.

Some cosmetics producers use the nano-term openly and actively in the marketing of their products. This seems to be simply a single example of a wider a distinctive "tradition", practice or tendency in the cosmetics business to use scientific language *as* marketing strategy, turning it into a fine-art in the creation and deployment of quasi-scientific terms.

Examples of this include: "Enriched with Pro-Retinol A and Pro-Tensium, the formula is specially developed to reduce the appearance of wrinkles and leave skin feeling immediately tautened" [35] or, "Vectorized Vitamin C, Siegesbeckia, high-potency anti-oxidants like NDGA and proven anti-irritants help boost and maintain skin's natural production of collagen and elastin,…"[36] and "Dior Innovation centre selected an exclusive Dior bio-technological extract, Centuline™, to promote the action of this "longevity protein" at the cutaneous level" [37].

This use of quasi-scientific terminology was the object of some irritation among different actors within different functions of one large multi-national cosmetics business. Here, senior scientific personnel expressed irritation that their own marketing department routinely use quasi-scientific language in order to niche-market their products to support premium pricing strategies. In some cases retailers of cosmetics shared this view. However the use of very technical scientific language in the marketing of key cosmetics brands does appear to 'work' in commercial terms, as many brands which use these techniques extensively in their magazine, television packaging communications are commercial successes in terms of sales volumes.

On the other hand, from the point of view of 'identifying nano' through product information and labelling, our study suggests this would be difficult if not impossible in this particular sector. The likelihood that consumers could play a part in a system of 'vigilant governance' in a case-area where a 'continual stream' of supposedly revolutionary cosmetics is a key feature is unlikely in our view. The case of cosmetics highlights problems in the notion that consumers can play a role in the governance of nano- by picking up on marketing and labelling, either to 'police' the field or alternatively to have an influence through improved trust and confidence in influencing labelling and customer information campaigns in a certain direction.

What distinguishes cosmetics is the existence of highly sophisticated marketing and brand-differentiation strategies premised on the use of highly technical quasi-scientific language to the extent that discerning the difference between the provision of information about genuinely new *technical advancements*, and the deployment of *scientific language* in the *marketing* of

this entire class of cosmetics is so blurred as to be indiscernible and confusing. The indistinctiveness of the boundary between the science itself, the science of marketing, and the marketing of science, adds up to such a confusing cocktail, that this is an area where it would be particularly difficult to imagine regulation through labelling playing a role in nano-governance.

Another of our foci in this project has been to identify the nano-compounds used in products by systematic analysis of packaging and advertising communications, and their nanoproperties ie how nano-makes a difference to functionality. One of the most high-profiled nanoproducts in the cosmetics industry, is the Revitalift range marketed by L'Oreal. Here the nanocompound is nanosomes, small bags containing the active ingredients to help them get transported to where they are needed in the skin. Effective transport of active ingredients would be such a property. (This property is also stressed by two of our interviewees). Another well-known cosmetics producer is Estèe Lauder. They do not use nano-terms in their marketing, but rather talk of "interactive delivery agents called Cell Vectors. Their mission, as they report, is to recognise where an active agent is needed, ant to get it there quickly so as to help re-ignite the skin's natural age-fighting ability" [38].

**Industry Structure, Multinational Reach, and Consequential Nano-governance Issues in Cosmetics**

There has been substantial merger and acquisition activity in the cosmetics business over the years. An interesting example in this respect is L'Oréal that is the owner of 26 international brands, among them Lancôme, Biotherm and Body Shop [39] Each of these brands has different profiles and holds different brand niches within cosmetics markets. From this, it seems rather unlikely that any of these brands publicly would raise their voice against nanotechnology, at least in the current situation of apparent lack of rigorous scientific support for a more sceptic stance on the use of these technologies in cosmetics.

One firm, owned by L'Oreal, is Lancôme. Going through the web pages of Lancôme we find important differences in products that are identified as using nano-technology for example when we compare the US webpages, to those of their European counterparts. The French pages for instance seem to have a better liking for the term "micro" over "nano" in the description of identical or similar products. An example being the Lancome Hydra Zen Skin De-stressing cream (In French: Hydra Zen Neurocalm Soin Hydrant Apaisant Anti-Stress). At the French page: "Les micro-capsules de Lipidure et d'acide

Hyaluronic, les céramides vectorisées et le Glycérol…" [40], while at the American page this is described as :Combining Acticalm2™, Biolactone™ and nano-encapsulated Triceramides, …"[41].

This suggests in terms of the policing or monitoring of the labelling and product information dimensions of nano-governance, this may prove difficult to the point of breakdown when we consider all the world-wide communications of all the nano-compounds and the consumer products into which they have, and will increasingly, incorporated.

In one sense this is a rather surprising finding for Lancome that differential marketing and product information is given across its country-based websites, given their premise of equal products in both regions. However it does indicate differentiated marketing of the same products in different parts of the globe, reacting to the marketers' understandings of different local conditions and perceived (or researched) differences in how nano- might be 'received' or alternatively 'resisted' in different country contexts. For example: it is claimed that the Americans like the idea of risk more than comfortable Europeans do [42] and this may play out in differentiated marketing campaigns. A second interpretation might be historical, pertaining to different legacies left by previous controversies which differentially impacted upon, and were differentially responded to, by regulatory organisations in different countries, leaving contextually different patchworks in terms of consumer trust and confidence. An example might be scepticism towards Genetically-Modified food among European consumers compared to Americans.

Interestingly, lately there have been indications on that Americans are turning more sceptical: in a study performed by UW-Madison Survey Centre during the summer of 2007 [43] on a sample of 1,015 adult Americans, only 29.5 percent of respondents agreed that nanotechnology was morally acceptable. The corresponding number in European countries were found to be 54.1 percent in the UK, in Germany 62.7 percent and in France 72.1 percent of survey respondents saw no problems with the technology.

The finding that different nano-communications were used in different countries, whether premised upon consumer differences or the strategies of producers was confirmed in our talks with American players in textiles. The incorporation of nano-technology by American companies has been evident for many years and they have been traditionally very open, even boosterist about their use of nanotechnology applications. On the other hand are they appear more cautious about talking openly about the topic of nano-regulation, on the twin grounds of competitive sensitivities and the potential for

litigation. The latter was also witnessed when recalling a previous (British) nano-controversy over labelling where American respondents indicated their caution over liability issues, citing the antecedent British case.

## 6.6 Theoretical Reflections: Who Will Take the Hot Potato?

Our brief theoretical reflection considers the wider significance of the empirical story set out above. It is driven by a single theoretical and practical puzzle:

> 'What model of *distributed* governance maps most appropriately onto the *distributed nature of innovation, and notions of distributed responsibility in the commercialisation and marketing of N&N?*

A useful entry point is provided by a reprise of Beck's Risk Society. In Beck's terms, an increasing industrial division and specialisation of expert labour combines with the tendency of science to progress from discovery to large-scale in-situ technical application. Such tendencies accompanied, indeed caused the onset of processes which characterised the Western world of late 20$^{th}$ century; an epoch he referred to as late-modernity. At the very time that the privileging of scientific knowledge and scientific method heightened the risks, nature, scale, and potential for (unknown and unknowable) negative and unanticipated outcomes or industrial-scale 'accidents', these processes were themselves creating the conditions of risk-laid-bare, and with it possibilities of imminent large-scale catastrophe, affecting the many and not the few, and reaching geographically well beyond the territorial jurisdiction of the agents responsible for it. This for Beck represented a break with history. The five co-constitutive trends that we can identify are: an increasing division of expert labour; the need for policy to re-connect and organise the interdependent system parts; the difficulties notwithstanding of overseeing and co-ordinating the entire system; the repercussions in terms of creating a world of heightened exposure to technical catastrophe; and ultimately, heightened probabilities of experiencing and then having to deal with the *science as it goes wrong*. These co-constitutive features lay at the heart of Beck's central thesis [44].

And cue the resulting, central, governance problem. As loosely connected and relatively autonomous, but *interdependent* systems of agents and expert labour groups enlarge (Beck mentions the agents of modernisation : business, agriculture, law, politics); then new methods and modes of co-ordinating and

re-integrated such a distributed system of agents and distributed knowledge must be pro-actively sought. The technical exploitation of scientific discovery under conditions of uncertainty now requires a corresponding effort to govern, regulate, and attempt to manage the inherent risks of this process which we might call the practical exploitation and application of scientific discovery. And responsibility for dealing with the negative outcomes and consequences of this process passes into the realm of monetary instruments and institution, such as *ex-post* financial compensation, rather than being taken up by any other more ethics-based governance mechanisms, such as prudence. Key questions for social actors, such as how to organise the *distribution* of risks, regulation, responsibilities, and human rights, come into play. With reference to different agent groups – authorities, science and politics , Beck asks the thorny question:

> '*Who will take the hot potato?'* [44]

Now if we step away from Beck we can re-enter the same debate but from the point of view of more recent literature in the field of innovation studies. Here the object of research is less a critique of science from the point of view of *risks to society*, rather the innovation studies literature provides the flip-side of the coin - a concern to understand the knowledge and innovation process in order to better *encourage* the development of new scientific knowledge and its take-up through technological innovations, markets and economies. Nevertheless a complementary set of organisational features and dynamics to that provided by Beck can be seen. The basic idea in juxtaposing these two literatures is to demonstrate how policy concerned with the *protection* of societies from the unanticipated consequences of the exploitation of science; has a flip-side in both policy and normative terms, which stems from the view that coalitions of actors form around science and technology projects in order to *drive forward* technological innovation into markets, primarily for the purpose of *economic* gain. Of course that isn't always the case, and it may be that certain governance regimes are able to *combine* these two objectives simultaneously (for example providing monetary incentives to channel Science and its user communities into life-enhancing drugs, solar energy, water purification applications) etc. Science and technology is therefore governed from two, conflicting but potentially synergetic directions. The first is concerned with risks and returns to society as a whole, the second concerned to encourage the generation of science and technology as a down-the-line contribution to economic growth. A potential 'third way' is to incentivise the development of science and technology *towards* health and sustainability applications [13].

We can begin by noting that the model of the 'lone scientist' generating basic science in a linear fashion starting from first principles (so called *Gibbons et al* Mode 1 science) [45] is now countered by the view that scientific discovery following a Mode 2 practice, not only exists but arguably has a stronger foothold on scientific practice than does Mode 1. Under Mode 2, scientists work in teams, often in a cross-disciplinary (or some would say inter-disciplinary way) and the discovery process begins from the articulation of a *problem* to be solved by the team rather than a building-up of scientific knowledge from first principles. This theory tends to focus on the integration of different capabilities and strengths of different scientists, integrated through team effort. Within such a team, 'users' of the research may be included (an example in Manchester is University scientists collaborating with and co-authoring publications with personnel from the Christies Cancer Hospital for example). In this case, it seems more likely that the field is orientated around an applied problem – the discovery of cancer treatment drugs – rather than knowledge for its own sake.

Moving on, the literature continues in this direction by taking a more explicit *systems perspective*. First the so-called triple-helix model [46] considers that science progresses through arrangements which bring together the Nation State, academia, and industry –again opening potential for the scientific search strategy to be influenced by others beyond the narrow confines of academia/academic scientific research, where the State and public funds play a role in guiding scientific research and discovery in particular directions perceived as 'desirable'. Finally, notions of open innovation systems and distributed innovation processes [47], conceptually and practically require attention to a new idea, that of *distributed governance* [48] , where governance models are required which map onto the enlarged idea of systemic and multi-actor frameworks for the co-ordination, organisation, and regulation of the process of scientific discovery and its exploitation. To be sure, in contrast to Beck's analysis, the de-bunking of the idea of the isolated and lone scientists in favour of 'group science' which involves *governance agents themselves*, indeed, scientists *as* governing agents provides a very different model of a more collective and collaborative effort than is depicted in the us-and-them framing of Risk Society.

## 6.7 Conclusions and Regulatory Implications

Our research among consumers confirmed the findings of many other studies reporting low levels of awareness and knowledge of N&N, in scientific and technical terms. Added to this, we found consumers to be surprised, and in some instances irritated by the extent to which nanotechnologies have become a constitutive feature of mundane, everyday products. N&N is not, therefore about some blue sky future, an out-there 'revolution', a topic for abstract reflection. Rather it is, in terms of how consumers are *actually* likely to encounter it, about the pervasive yet invisible creep of nano-technologies into peoples everyday lives.

Producers are still experimenting with the marketing of products containing nano-technologies, creating a patchwork quilt of variety in terms of marketing communications. In some cases the prefix 'nano' is used as a positive marketing device, standing in for other brand or product characteristics such as enhanced product functionality and/or advanced technical specification.

Moreover this is a dynamic situation, with some producers explicitly *retracting* the nano- prefix. Far from denoting positive attributes there are fears that the nano- label may bring products into a regulatory gaze that could otherwise be avoided, and open to consumer scrutiny which might otherwise be side-stepped. Indeed the explicit use of the term leaves the producer exposed in the event of a consumer back-lash against N&N. Some foresaw an increase in this tendency to intentionally remove any reference to nano-.

Other producers make the N&N component of their products so lacking in visibility that only the very knowledgeable chemist, inspecting the ingredients list or technical specification of a product can spot the nano- in the nano-enabled product. Even then the presence of a particular ingredient or chemical compound does not reveal crucial information about the scale-range at which it is being used in order to exploit particular properties , nor the chemical process by which the product was manufactured. The *nano-ness* of the product is all but invisible. The rejoinder from producers on this point however is often that, strictly, nano-enabled processes, such as pasteurisation, have been used for centuries without the label nano- and it would be ridiculous for regulators to begin insisting on the nano- description now. Moreover, cosmetics manufacturers were found to be using different marketing terminology and product descriptions in different countries.

Needless to say this plethora of different marketing communications – across product groups, individual products and countries, coupled with the fact that it

is an ever-changing picture, suggests that this would be a minefield to 'regulate' from the perspective of monitoring producer communications. And from the perspective of consumers, it is difficult to envisage how they can take on a role of 'vigilance' in the policing of nano-products in the absence of any standardisation of product information and marketing communications. Until then, consumer contact with N&N is more likely to be via individual 'scares' and controversies communicated through the popular media, such as the controversial use of titanium dioxide in sun-creams.

Furthermore, in the case of retailers, early findings suggest a very low level awareness either of the science of nano, or of how it is used and incorporated into the products retailers sell. Where responsibility was allocated by retailers, it was handed firmly back to manufacturers. An important exception to this is provided by the Swiss Retailers Code where responsibility for surveillance, vigilance, transparency and monitoring of the whole supply chain for nano-enabled products is bravely taken on by the retail sector.

A key point which our research has highlighted is that value chains are of course, global. Firms not only strategically exploit national differences, whether regulatory or in terms of fitting marketing communications to different national contexts, but crucially, the science can be originated in one country, translated into an applied technology in another, travel across continents in the manufacturing process, be imported into another, and sold into markets thus reaching the hands of consumers in another. In regulatory terms, this suggests that in the absence of an international regulatory body, N&N would have to regulated through 'border-control' either at the level of the nation-sate or up-scaled to a regional block such as the European Union, in such a way which is much more aware of the significance of global supply chains than currently appears to be the case.

We can conclude from the above that:

- National Regulatory differences matter and play a role in shaping the economic geography and value chains for nano-enabled consumer products.
- Producers assume that national consumer market differences matter. They strategically use these differences in the marketing of their nano-enabled products, including but not specifically about how the nano-dimension is represented to consumers.
- Large transnational corporations are complex organisations, spanning national borders and with specialist staff spanning many functions. Our preliminary findings suggest that the 'scientists' and the

> ‘marketers’ are not always in agreement about how nano-enabled products should be marketed.

Finally, the short theoretical reprise demonstrates a number of key points. Primary among these is whether distributed innovation processes need to be matched by distributed governance mechanisms, and therefore a notion of *distributed responsibility* as necessarily a ‘good thing’. Or whether paradoxically distributed innovation systems, precisely because they are characterised by global interdependencies of expert labour, whether scientists or marketers , are more appropriately – better? – governed by top-down regulation. Second and lastly is the issue of *temporal distribution*.

As noted elsewhere, real-time regulation [7] attempts to resolve the too-little/too-late regulatory dilemma. The basic premise is that there exists an inherent temporal tension. Real-time regulation is based on the idea that if regulators intervene ‘too late’ then the nano-horse may already have bolted, and in a worst case scenario, an industrial-scale ‘accident’ may have already occurred, or indeed such an accident has a higher probability of occurring in a less, rather than a more, regulated context. But regulate ‘too soon’ and one risks the flip-side of stopping or stalling a process which has the potential to provide a significant scientific breakthrough in key areas of health, hunger, environment protection, or resource-use efficiency.

The response to this from Europe’s regulators has been the promotion of the notion of ‘continual vigilance’ on the part of all actors in the system. This is not envisaged as *replacing* obligations under more top-down instruments of law, but rather as an adjunct to it, creating a regulatory mix which incorporates notions of vigilance and responsibility as temporary measures whilst directives are negotiated and codified, or more likely existing as a more or less permanent and arguably democratic set of institutions sitting alongside codified law, as a part of a mix of hard and soft regulatory ‘tools’. The negotiation, contestation and crystallisation of such a regulatory mix defines the process that we are currently witnessing. Evaluation of its effectiveness as an innovative meta-regulatory method in the governance story of N&N will be the topic of policy and academic debate for many years to come.

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# 7 ”Nobody Told Me I Was a Nano-Consumer” : How Nanotechnologies Might Challenge the Notion of Consumer Rights (Published paper)

Throne-Holst, Harald & Pål Strandbakken (2009). **”Nobody Told Me I Was a Nano-Consumer” : How Nanotechnologies Might Challenge the Notion of Consumer Rights**. *Journal of Consumer Policy*, 32 (4), 393–402

**Abstract**

Regarding nanotechnologies and the consumer, a central paradox is the absence of a regulatory framework while more than 1,000 nano-enabled products are already available on the consumer markets. This represents a serious challenge for the consumer interest. Even though the prospects of nanotechnologies are truly fascinating and represent possibilities to solve major problems—for instance in the realms of health, energy and poverty—it is important to also discuss the potential risks of nano-enabled products. The present study reports on a Norwegian study with data derived from focus groups, a content analysis of advertisements, packaging and labels for cosmetics as well as on a Norwegian consumer survey. Conceptually, the paper is based on the notion of consumer rights introduced by President J.F. Kennedy in 1962. Based on the results of these studies, consumer policy implications are sketched.

**Keywords**

Consumer rights · Nanotechnologies · Nano-enabled products · Consumer information

Nanotechnology—or often today: "nanotechnologies"—has been praised as a new industrial revolution (Marburger 2002). The shift from the singular to the plural form on paper emphasises that there are several different technologies in reality. This again results in a broad range of possible applications that may transform products in a number of industries. Further, nanotechnologies are referred to as enabling technologies, pointing to the ability they may have in dramatically improving well-known technologies to solve many of the pressing environmental and health challenges that face us.

The more than 1,000 nano-enabled products currently available on the consumer market (PEN 2009) appear to be somewhat in contrast to the high hopes and far-reaching visions that tend to surround nanotechnologies. These products strike one as slight modifications of existing products, rather than revolutionary ones (Throne-Holst and Stø 2008). This might be explicable by the fact that nanotechnologies have just begun to be applied to products and that we are early in the trajectory. "Revolutionary" products should only be expected in 5 to 10 years. Still, current applications do not give the impression of being answers to any overriding important challenges: Lighter tennis rackets, odour-free socks, or more effective anti-wrinkle creams do not contribute to the most pressing challenges that face humanity and do not alleviate human living conditions in the poorer parts of the world. Provision of clean water ("Cleaning up" 2008) and cheap energy (DoE 2004) are two examples of such possibilities.

The studies presented here focus on consumer products currently available on the market, herewith avoiding a discussion on potential future benefits and keeping the research close to reality (Rip and Nordmann 2009). Consumer reactions and reflections on nano-enabled marketed products should be of interest beyond academia: If one or more of these products fail spectacularly or induce serious health and/or environmental damage, this might severely impact on consumers' trust and support—and hence on the further development of these promising technologies. Financial and political support may dry up if consumers grow wary of products produced with nanotechnologies. As the focus of our study is on marketable products, we considered it relevant to examine the consumer rights in this context: What about the status of consumer rights on such emerging markets where investments are high and the hopes for the future are soaring?

## 7.1 Consumer Rights and Nano-Enabled Products

The conceptual starting point of our analysis is the famous set of consumer rights. In a special message to the American Congress, the Kennedy administration formulated the following four fundamental rights (Kennedy 1962): the right to safety; the right to be informed; the right to choose and the right to be heard. While an analysis of the legal status of these so-called rights should be left to scholars in consumer law, the basic idea of the concept is that these are principles that consumers might refer to rights and that consumers can claim if they are violated. These four rights have later been elaborated and expanded, for instance by the International Organisation of Consumer Unions (today known as "Consumer International") for the United Nations (UN 2003) as well as by a number of national administrations. The notion of consumer rights has also triggered academic interest: The American Council on Consumer Interest invited international scholars to a conference and later on published a book on the subject in the 1980s (Maynes 1988). This interest has also been visible in the Journal of Consumer Policy where the consumer rights debate always had its home (e.g. Harland 1988).

In this note, we focus on the four original rights since they represent the "core" of the concept while the more recent ones are derived from these four rights. Even though the rights are not often explicitly stated—as for instance, in the Charter of Fundamental Rights of the European Union and European Union Law (European Parliament 2006)—they do form the backdrop for most of EU consumer protection policy. Our starting hypothesis is that these four consumer rights, although revolutionary and necessary at the time they were introduced, can be considered almost self-evident and non-disputed in today's Western world. As such we do not expect them to be seriously jeopardised on most consumer markets, even when products resulting from a new set of technologies are introduced. As most consumers do, we assume that the four rights are widely and generally respected. Yet, the consumer rights come with a number of underlying assumptions and ideas; they were formulated in a specific society in a specific historical and economic situation (i.e., an affluent, industrialised market economy, a consumer society). Since they are still in use and considered relevant, we conclude that either the societal conditions have not changed very much or that they were formulated in a sufficiently general way so as not to become easily outdated.

Based on an empirical study of Norwegian consumers, the objective of this essay is to assess each of these rights as regards markets of nano-enabled products. We are interested in questions such as: What is the status of the respective consumer right among groups of ordinary citizen-consumers? How

are issues that are connected to these rights articulated in public discourse? How are they understood, and how are they brought into the nano discourse? In other words, we aim to evaluate consumers' reflexivity (Beck 1992; Giddens 1991, 1994) as regards nanotechnologies.

First, the *right to safety* was specified[20] as the right to be protected against products, production methods and services which are hazardous to health or life. While this right is widely taken for granted today, this was not the case back in 1962. The idea that businesses might offer unsafe products was considered radical; indeed, most safety regulation was still to come (Swagler 1997). For the field of nano-products, the safety issue will mainly be a question of risk assessment: Given the limited utility of the current products, what levels of risk are we willing to accept under conditions of uncertainty and who should decide on the acceptability of a level? Second, the *right to be informed* was specified as the right to be given the facts needed to make an informed choice as well as to be protected against dishonest or misleading marketing techniques. The relevance for nano-products here is rather obvious: Only if product qualities and markets are made transparent, can consumers make informed choices. In the focus groups of Norwegian consumers, however, participants had no idea that they were already consuming nano-products and, therefore, were never in a position to make a choice for or against them. Hence, the *right to choose* is not secured at all. Only if consumers are informed, they can exert their right to actively decide. Fourth, the *right to be heard* is specified as the right to have consumer interest represented in the making and execution of government policy as well as in the development of products and services. The focus here is not on individual consumer complaints but on the organised consumer interests' right to influence policy as political actor in a governance model. Organisation of consumer power is clearly relevant in consumer policy on nanotechnologies.

[20] The specifications are part of the original Consumer Message by President Kennedy, see Kennedy (1962).

## 7.2 The Study

### 7.2.1 Methods and Data

The present note is based on the analysis of the following data: a content analysis of advertisements, packaging and labels in Norway for cosmetics; a focus group study on nanotechnologies and products in Oslo and a representative Norwegian consumer survey.

The first two were collected in connection with a project financed by the NANOMAT programme by the Research Council of Norway, a collaboration between the National Institute for Consumer Research (SIFO) and the Manchester Institute of Innovation Research (MIORI) at Manchester Business School. The project set out to compare ethical aspects in the marketing of nano-products in Norway and the UK (Throne-Holst et al. 2009). The survey was carried out by the SIFO.

**Content analysis**

Advertisements subjected to content analysis were mainly collected from Internet websites, coming from various sources such as producers, importers, magazines and retail. They were saved as screen-dumps or print-outs. According to an inventory of manufacturer-identified nanotechnology-based consumer products currently on the market, the two biggest product groups to date are cosmetics and textiles (PEN 2009). This is what we focused on in our study. Which Internet pages we visited, and subsequently which actors we selected for follow-up interviews, was derived from the analysis of commercials in both magazines and newspapers and on results from web search such as the above mentioned online consumer product inventory. In general, the focus was on actors who used "nano" more or less openly in their customer communication. L' Oréal, the world's leading cosmetics group with 23 international brands in its portfolio (L'Oréal 2008), increasingly came into the focus of our study: When we started the web search, the company sold and advertised the "Revitalift" series emphasising that the products contain a nano ingredient ("nanosomes"). One of its brands is Lancôme. It turned out that the information available on the different geographically tuned web pages of Lancôme varied, which made these web pages an interesting study in cultural

differences in themselves (Throne-Holst et al. 2009). Other websites of other major brands were also searched.

## Focus group study

The focus group study took place in Oslo in June 2008. Four focus groups of “ordinary” consumers were selected. The recruitment base was men and women between 25 and 65 years of age. Since we assumed that in mixed gender groups, men would dominate the discussion on such a technologically oriented subject, groups were divided by gender. We also suspected that age would matter when it comes to the familiarity of new technologies. Hence, we split respondents into age groups. We recruited from ordinary consumers but explicitly targeted those with a minimum of 3 years of higher education, given the complexity of the issue. To avoid “expert talks,” we excluded consumers with educational background in physics, chemistry or biology—which fields are highly relevant for nanotechnologies. Participants were not informed about the subject of the focus group beforehand. The size of the groups was small (five to seven participants, a “mini-group”) in order to increase the possibility for identifying and expanding on individual attitudes and to allow for reflection and elaboration of positions. The sessions lasted between 1.5 and 2 h and took place in the offices of the market research agency in Oslo. The group discussions were moderated by a professional moderator and the participants were paid 600 NOK as compensation for their participation. One of the researchers (and authors) was present, giving a 30-min introductory presentation on nanotechnologies. Considerable effort was put into making this presentation balanced, i.e. presenting both the pros and cons of nanotechnologies. Before the presentation, the participants discussed modern technology in general. Some clarifying questions were allowed after the presentation. Then, participants were asked to reflect on what they had heard, especially on the role and responsibility of the different actors in the value chain. A range of nano-enabled products where displayed on a table for the participants to look at, touch, and reflect on, namely: car polish, sun cream, ski wax, cigarettes, anti-wrinkle cream, textiles, plaster/band-aid and Apple’s iPod nano.

## Consumer survey

The Norwegian SIFO survey is a country representative annual survey aiming at understanding consumer issues seen from the consumer’s perspective—as opposed to the supply side’s interests. In the survey of 2008, some questions

on nanotechnology were included[21]. The data were collected in October 2008 by computer assisted telephone interviews from a sample of 1,000 randomly selected Norwegian respondents aged 18 to 80 years.

### 7.2.2 Selected Results

**The right to safety**

While nanotechnology-based products are constantly entering the market, the current regulatory framework for these kinds of products remains unclear and unsatisfactory. On the method side, adequate test strategies and assessment procedures are still missing (Orthen 2007). Recently, questions have been raised as regards the appropriateness of the weight/volume thresholds in the new European Community Regulation on chemicals and their safe use (REACH[22]) for handling nanoparticles: For such substances, the production volume might be lower than the ones prescribed by these regulations (ANEC/BEUC 2009; RCEP 2008, p. 65). Testing protocols will also have to be developed for the new substances; however, under current regulations, it can take up to 15 years for a protocol to achieve regulatory approval (RCEP 2008, p. 6).

In the focus groups, the immediate reactions of the participants to the introductory presentation were quite ambivalent; however, in all groups, respondents expressed concern if not fear. In general, men were less worried than women:

> "How can it be possible that these things are being produced when their potential harmful effects are unknown?" (Hanne, female, 45+)
> "The possibility of assessing potential danger in advance is probably higher today than it used to be." (Arnstein, male, 45+)

[21] The following questions concerned nanotechnologies (translated): How much have you heard about
nanotechnology? If so, where have you heard about nanotechnology? Do you think that products produced
with nanotechnology should be labelled? How big advantages do you think nanotechnology can result in?
How risky do you think nanotechnology is? Do you know of any products in shops that contain nanotechnology? If so, which ones?

[22] REACH: Registration, Evaluation, Authorisation and Restriction of Chemical substances. The new law
entered into force on 1 June 2007 (European Commission 2007).

> “I was a bit scared by the downsides. You very rarely get to hear about them.” (Oddvar, male, 25-45)

To date, it is not considered possible to satisfactorily judge the risk of nanomaterials before they are put into use (SFT 2008). This seems to come as a surprise to the participants who generally believe that “somebody” controls products before they appear on shelves.

> “We trust the authorities; if it is on sale in a pharmacy, we regard it as safe.” (Tom, male, 25-45)
> “If it is dangerous or harmful, the politicians and their control agencies have to make sure that it does not enter the market.” (Tom, male, 25-45)

In most countries, the ultimate responsibility for consumer safety is considered to lie with the government. In the case of nanotechnologies, regulation has to deal with questions of whether, how and even what to regulate. For instance, silver on nano scale has completely different characteristics from silver in bulk form. This case is a rather pertinent one: As silver is an element that most people have a positive physical experience with in the form of cutlery or jewellery, most consumers would deem it safe and rather inert. Yet, enter the nano scale form of it and you have a rather potent biocide. This is a difficult message to get across. As of now, regulatory authorities admit that the current legal framework is insufficient. This is partly due to the fact that methods of how to measure and how to assess the risks of nanotechnologies are still under development. We were interested in how consumers regard and relate to potential risks with nano-enabled products. In the focus groups, participants very often seemed to accept a certain level of risk and were reluctant to stop technological development:

> “It is very hard to stop a technology with such a vast potential” (Steinar, male, 25–45).
> “Everybody knows that good new products come with a downside as well” (“Tom, male 25–45).
> “It’s impossible to stop the development” (David, male, 45+).

We suspect that participants often take for granted that the added benefits of nano-enabled products are substantial. Such evaluations seem to be in line with the firm belief in technologies’ general ability to solve challenges without creating new ones, as found in an earlier study of Norwegian stakeholders (Throne-Holst and Stø 2008).

## The right to be informed

Between 2002 and 2006, the Research Council of Norway spent more than 330 million NOK (about 41 Mio. Euro) on nanotechnology development. Nanotechnology is designated as one out of three committed research fields by the Norwegian Parliament, together with ICT and biotechnology (Norwegian Parliament 2005). However, four out of ten consumers in Norway had heard "nothing" about nanotechnology in our consumer survey. This rather low level of public awareness is actually in line with what has been found in other studies in the USA and across Europe (Hart 2008; Satterfield et al. 2009). The question is: Who should be the one to inform and educate consumers? When we asked our survey participants, the majority pointed first to the authorities (as usual in Norway) and then to producers.

We believe that a societal debate on nano issues and a high degree of transparency of markets is a precondition for making the information relevant. It would also contribute to political awareness, as well as the possibilities and the risks surrounding the nanotechnologies. As of today, "nano" is not a protected or mandatory label. This can hit both ways, as we see in the examples in Table 1. Here, "nano" is used in contexts where it does not seem very appropriate. These products are not "nano" but are labelled or named as such. Can this contribute to making "nano" a concept devoid of meaning (for consumers)?

**Table 1** Using the "nano" label when it is not

| Product | Rational for using «nano» |
|---|---|
| TATA "nano"—the people's car | "The name 'Nano' was chosen as it denotes high technology and small size." (Tata Motors 2008) |
| Nano Sail-D (NASA) | The term "nanosatellite" or "nanosat" is usually applied to the name of an artificial satellite with a wet mass between 1 and 10 kg. "NanoSail-D is a very small satellite, just a bit longer than a loaf of bread and weighs in at around 9 pounds" (NASA 2008). |
| "Nano-marketing" | Smaller quantity packaged product at a lower cost to increase market penetration and hence volumes. This low cost-high impact strategy is called "nanomarketing" (Dubey and Patel 2004) |

Even a well-respected science-based organisation such as NASA uses the nano prefix in a context where it is not really applicable.

More worrying is the suspicion that there is a significant group of products that actually *do* use nanotechnologies but where this fact is not stated. In the SIFO-MIORI collaboration, we have looked closely at two relevant product groups: cosmetics and textiles. These are two product groups where until recently producers have actively marketed nano-enabled products. But the advertising trends in these markets are strikingly different: More and more new textile products are marketed with some sort of "nano," while in the cosmetics market, the number of such products are apparently decreasing if not disappearing. In Table 2, we provide some evidence based on our content analysis and web search of the American pages of the cosmetics producer Lancôme on two different dates.

This change can have several reasons: One is a growing awareness of nanoparticles in products and the potentially adverse effects. Hence, Lancôme might reduce its communication on nanoparticles altogether. Another reason could be that the cosmetics market evolves faster than most other consumer markets: The consumers in this market are used to and probably constantly expect product innovations, often communicated in a surprisingly quasi-scientific language (Throne-Holst et al. 2009). Probably this does not mean that nanoparticles are not used anymore but that the effects of these technologies are described and promoted, rather than the enabling technologies behind these effects. It is important to have in mind that there are currently no requirements for producers to inform consumers about whether their product contains nanoparticles. Still, the drastic reduction in matching results shown in Table 2 is remarkable.

The focus group participants were generally very concerned with the lack of information, also as a precondition for any sort of consumers' responsibility:

> "We are the ones that have to say no, we are the ones who have to choose, so obviously we need information!" (Cecilie, female, 45+)
> "As of today, we—the consumers—should not be given responsibility, as long as we really don't know anything about this" (Arnstein, male, 45+)
> "This (to inform consumers) has to be the responsibility of the producers, not the retailers" (Hanne, female, 45+)

**Table 2** The "disappearing" nano

| | 22.06.2007 | 13.11.2008 |
|---|---|---|
| "nano" | 5 | 0 |
| "nano particle" | 9 | 0 |
| "nano technology" | 29 | 0 |

*Matching results on different search terms at www.lancome-usa.com*

*The right to choose* In the SIFO survey, eight out of ten respondents who had heard "a little" or more about nanotechnology were not aware of any nano-enabled products on the market. This is remarkable in itself, as there are more than 1,000 products where the producers openly communicate that they contain nanotechnology. In their marketing, they highlight the improved performance that the nanotechnologies have contributed to.

One (re-)interpretation of the right to choose in a nano consumption context is to highlight the right to be able to choose good quality products without nanotechnologies:

> "What about educating people about other good products?" (Cecilie, female, 45+)
> "I very rarely read product declarations when I buy skin care products. So far I have only checked for animal testing." (Dorthe, female, 25–45)
> "I will start to look closer at what I am buying, because I do not want to use these things." (Hera, female, 45+)

As these statements illustrate, our participants did not like the prospect that they would not have a choice or rather that they were uncertain whether or not they were able or enabled to make informed choices on this matter in the market.

*The right to be heard* The consumer rights are obviously interconnected. The right to be heard in this context means that after s/he is informed, the consumer might want to formulate his opinions, hopes and/or anxieties. Consumer's right to be heard will be usually applied via consumer institutions with the necessary expertise to "voice" their concerns on a political level. Realising the lack of solid scientific evidence in the field and its complexity, nanotechnologies are not an easy field for consumer organisations to suggest knowledge-based policies. In the case of genetically modified organisms, one of the prevailing hypotheses of its supposed failure, at least in the European consumer market, was a lack of communication with the consumers. Based on

these experiences, several deliberative processes on nanotechnologies involving lay citizens have been conducted all over Europe and the US. The SIFO is currently coordinating a European project (NANOPLAT) to evaluate such processes and to suggest a platform for future ones. It seems as if the lesson has been learned that consumer resistance may induce serious repercussions and that such resistance may halt the development and the diffusion of new technologies.

To have the voice of consumers mediated through consumer organisations did not seem to enter the thoughts of our participants, however. They did not, without help from the moderator, bring up the organised consumer interest in the discussions.

**Policy Implications**

As regards *the right to safety*, this note maintains that the regulatory framework in general, and REACH in particular, do not cover nanotechnologies sufficiently—to the surprise and worry of our focus group participants. Moreover, the different national, regional and global initiatives appear to be rather fragmented and not well coordinated. The Working Party on Nanotechnology within the OECD should increase its efforts to coordinate and spur these efforts by combining forces and making markets more transparent. As regards *the right to be informed*, there is much room for better ways of informing and educating consumers.

The participants in the focus groups worried about the lack of information available to them. Governments and societal actors should encourage a societal debate over issues related to the use of nanotechnologies in products. Market transparency and continuous dialogue with industry and retailers on the supply side as well as with consumer organisations on the demand side should be promoted. Mandatory labelling requirements are another option. The latter will also support *the right to choose*. The focus group participants wanted to have a choice in the market between nano-enabled products and high quality non-nano alternatives. Manufacturers should provide meaningful product information on the products and/or at the point of sale about whether product properties are derived from nanoparticles. For instance, it is not helpful if textiles are labelled to have an “antibacterial agent;” rather, the respective nanoparticle should be mentioned. Finally, *the right to be heard* has to be ensured via appropriate consumer representation—and hence adequate financial support for consumer organisations.

Referring back to our starting hypotheses, it becomes clear that consumer rights in the nano age are not self-evident but rather have to be strengthened,

partly redefined and certainly revived in order to empower and protect consumers.

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# 8 Complexities of labelling of nano-products on the consumer market (Published paper)

Throne-Holst, Harald & Arie Rip (2011). **Complexities of labelling of nano-products on the consumer market**. *European Journal of Law and Technology*, 2 (3)

**Abstract**

Various actors, including the European Parliament, press for labelling of products with a nanotechnology component. A few regulatory agencies or advisers are prepared to move in this direction. In deliberative exercises on nanotechnology, people in their roles as citizens and consumers turn out to want such products to be labelled. However, this should not be taken to imply that labelling regulation should be supported without question. There are complexities surrounding labelling: lack of common, international definition of nanomaterials; how labelling is transferring the responsibility to consumers; and low level of knowledge about nanotechnology with the general public. In two Norwegian focus group studies we explored why citizen/consumers are interested in labelling schemes, and use these findings to outline requirements for alternatives.

In 2006 and 2008 we carried out focus group studies with Norwegian consumers. The recruitment base was men and women between 25 and 65 years. The studies concerned consumers, nanotechnology and precaution. Labelling was a recurring theme in all the groups, but participants also had reservations. While one cannot argue against more information, participants realized that large groups of consumers will not benefit from labelling. Accountability, transparency and the need for someone to take responsibility were important considerations in their discussions. We take these concerns as entrance points to discuss other divisions of responsibility than consumers' choices: GRAS lists for which regulators are responsible, and implied warranty which stimulates producers to be responsible. Alternatives could usefully start from the idea of a shared responsibility.

## 8.1 Introduction

The introduction of products based on emerging technologies are often contested, and even the preceding research and development stage of such products have raised discussions and invoked actions, as when field trials of GM crops were destroyed. For nanotechnology, the uncertainty about health and environmental risks is widely recognized, and different responses, up to a moratorium on products containing nanoparticles, have been proposed and contested. One such response is the labelling of consumer products with a nanotechnology component, so that consumers can be informed in their choices. NGOs as well as citizens/consumers appear to welcome such labelling schemes[23]. But labelling of products as containing "nano" is not straightforward. Actually, consumers/citizens recognize some of the complexity. What does this tell us about the wider framing of emerging technologies like nanotechnology, and how citizens/consumers perceive their role in these developments? A key point is responsibility: how it is organised at the societal level, which institutions are involved in such arrangements, and who can legitimately assign or take responsibility?

The availability of consumer products with a nanotechnology component has increased significantly over the last years, with a mean rate of three to four new products per week according to the PEN inventory of nanotechnology-based consumer products. These products span a number of uses, but cosmetics and sporting equipment are thus far the largest product categories (PEN 2011).

However, the definition of nanotechnology is not self-evident. Several definitions have been put forward, but there is no consensus. In this article nanotechnology is understood as a set of technologies that aim at imaging, measuring, manipulating and modeling at the nanoscale. Nanomaterials with novel properties and functionalities are made. These account for the main use of nanotechnology in products.

[23] Citizens and consumers are not two different groups, but rather two different roles: Traditionally the consumer is the role associated with the market and market transactions, whereas the citizen is associated with the political sphere and voting.

The rapid introduction of this set of technologies in consumer products over the last five to seven years has contributed to a heightened focus on possible adverse effects. These effects include environmental toxicity and persistence, indications of nanoparticles crossing the blood-brain barrier, deep penetration into the lungs and cellular damage due to oxidative stress (Oberdörster 2005, Balbus et al 2006, RCEP 2008). This focus has been further sharpened by the uncertainties surrounding such possible adverse effects on health or environment (RCEP 2009), and on the uncertainties to what degree the current regulatory framework is suitable for such novel products. The European Commission has concluded that their present framework is sufficient, but some modifications might be necessary and that implementation of current legislation should be enhanced (EC 2008). The US Food and Drug Administration came to a similar conclusion in their assessment (FDA 2007).

Partly because of their dissatisfaction with these positions, a number of consumer organisations and environmental groups have demanded an introduction of mandatory labelling of nanomaterials in consumer products (Falkner et al 2009a; D'Silva and Bowman 2010; Miller and Scrinis 2010). Such groups have pushed for other labelling as well, like eco-labelling. There is a longer tradition of labelling to indicate ingredients of consumer products in general, and the pushing by consumer organizations and environmental groups is part of the explanation of the wide variety of labels we find on consumer products nowadays.

Labelling schemes can be divided in two main categories: mandatory and voluntary[24]. In this contribution we will mainly be concerned with the discussions and implementations of mandatory labels on consumer products with a nanotechnology component. Examples of mandatory information schemes are declaration of contents, usage and disposal information, products labelling and certificate of conformity (Stø et al 2005, 34.) Although there are some initiatives on voluntary labelling of nanomaterials in consumer products (Fiedeler et al 2010), the political proposals and initiatives for mandatory labelling are front stage, and create dynamic interactions between political actors, regulatory authorities, manufacturers, NGOs and consumers.

[24] There are also other distinctions, like positive (containing X) and negative (not containing X).

Parts of this dynamic are how some political actors, and in particular the European Parliament, have pressed for the labelling of nanomaterials in consumer products, especially cosmetics (Eisenberger et al 2010). This is motived by a concern about the lack of transparency regarding the presence of such ingredients (ENVI 2009, EC 2009, Bowman et al 2010).

Despite the European Commission's earlier conclusion on the current regulatory framework being sufficient, a new regulatory framework for cosmetics was introduced which included mandatory labelling of nanomaterials[25] as ingredients when it entered into force in January 2010. The names of such ingredients must be followed by the word 'nano' in brackets (EC 2009)[26]. The adoption of this regulation was significant as Bowman et al (2010) argue*", not least because it is the first piece of national or supranational legislation to incorporate rules relating specifically to the use of nanomaterials in any products*"[27]. Related requirements, spurred by the same concern for transparency, are proposed for regulation of Novel Foods (D'Silva and Bowman 2010), which recently have been accepted 'in principle' by the European Commission (EC 2011).

Such labelling indicates the physical occurrence of ingredients, and nothing is claimed about possible risks (or benefits). This contrasts with labels like 'organic', 'fair-trade' or 'environmental-friendly', where claims are made about the functionalities of the ingredients or final product.

Labelling efforts find support in publics, as evidenced in a variety of deliberative processes about nanotechnology. More than 60 such processes have been organized since 2004 (Kaufmann et al 2010), involving between 20 and more than 100 participants (Scholl and Petschow 2008). The majority of these deliberative processes has taken place in Europe, the remainder primarily took place in the US and Australia (Stø et al 2010). They were often inspired by a wish to avoid the backlashes of genetically modified (GM) food

[25] Here, nanomaterial is defined as "'an insoluble or biopersistant and intentionally manufactured material with one or more external dimensions, or an internal structure, on the scale from 1 to 100 nm" (Paragraph 1, point k (EC 2009)).

[26] Some Member States had hesitations during the preparation of this regulation, most notably Germany. They raised the issue of whether such a labelling would be understood by consumers as a warning. They wanted to reserve the labelling for instances where 'the particle size results in altered properties' (COD 2008).

[27] Bowman et al (2010:92)

on the European market, which resulted in the difficulties in World Trade Organisation and eventually in the labelling of GM products. This was to be achieved by engaging the public in debates about different aspects of nanotechnology. These deliberative processes were organised by a wide spectrum of organisations. The processes were different in scope, ambition, number of participants, and whether targeted or random sampling of participants was used. When participants were asked to come up with positions, concerns and plan for action, labelling of consumer products with a nanotechnology component regularly figured as one of their top requests (NanoCitoyens 2007; Opinion Leader 2008; Stø et al 2010).

So far we have shown that there are various actors that are pressing for the labelling of consumer products with a nanotechnology component. The European Commission is not alone in the decision making process for development of regulations[28], but they will implement the scheme. And labelling is one of the top concerns of citizens and consumers in deliberative processes. These observations taken together may seem to add up to a clear recommendation to support labelling of these products.

Although labelling of consumer products with a nanotechnology component does have some appealing features, it is surrounded by complexities. We will indicate, in Section 2, three such complexities for labelling of products with a nanotechnology component on the consumer markets.

These complexities motivate us to look for alternatives to labelling. In the focus group studies from Norway on nanotechnology, we identified elements that can help reduce the complexities of labelling: The focus group participants supported labelling, but they also had interesting reservations. In the concluding Section 5, we will use their discussions to explore and position possible alternatives. Focus group methodology and the empirical findings will be presented in Sections 3 and 4.

[28] It is part of the so-called ‘co-decision, process with the European Parliament and The Council of the European Union. See for example Hix (2005) and Scott and Trubek (2002).

## 8.2 Three complexities

There are currently no harmonized, international definitions of nanotechnology or nanomaterials [complexity 1]. Assuming this will be achieved; there is still the question of responsibility. Labelling schemes transfer the responsibility for choices that shape further development of nanotechnology to the individual consumer [complexity 2]. This is probably the least informed actor, as surveys show low levels of knowledge on nanotechnology in the general population [complexity 3].

The purpose of definitions of nanotechnology is to assist business-to-business transactions [cf. ISO, OECD], but also to improve efficient communications. Labelling is a kind of communication, and is rendered difficult, perhaps meaningless if there are no common definitions of what they are expected to communicate. This is especially the case for nanomaterials where there is a myriad of definitions on national, regional and international level (Lövestam et al 2010; SCENIHR 2010).

In the report 'Considerations on a Definition of Nanomaterial for Regulatory Purposes' from the Joint Research Centre, Lövestam et al (2010) address the elements of a science-based definition of nanomaterials. Not only does the current multitude confuse market actors and make labelling difficult. The current variety of definitions also undermines and counteracts the power of each individual definition, since each of them then become applicable only in a very specific sector or in very specific settings within specific organizations (Lövestam et al 2010).

Such a variety could have its advantages though, especially in light of the argument that one should not try to regulate nanotechnology as such, but rather regulate each of the many applications of nanotechnology on a case-by-case basis (Renn and Roco 2006). Tailored definitions would then have their place as the different applications could fall under different regulatory areas. On the other hand, the result of such tailored definitions could cause the same substance under one regulation to be regarded as a nanomaterial, but not so under another regulation. This would create confusion, not only for consumers, but also for manufacturers and regulators (Lövestam et al 2010).

In spite of these considerations, there will now be mandatory labelling of nanoscale ingredients (nanomaterials) in the new Cosmetics Regulation for Europe. A definition of nanomaterial is given in the regulation (cf. note 25). The regulation text also noted that there currently is not a uniform definition for nanomaterials at the international level, but when such an agreement arises, the definition in the regulation should be updated accordingly (EC 2009, s. 29).

To define nanomaterial, one also would have to address the question: What is the size range? There seems to be more of a consensus on the lower limit being one nm, than the upper limit where 100 nm is suggested (SCENIHR 2010; Lövestam et al 2010). One of the issues is that particles of nanomaterials can form aggregates or agglomerates, with the particles retaining their nanoscale properties, while the size of the agglomerate can be far above 100 nm (Lövestam et al 2010). Friends of the Earth have argued that physiological effects of nanomaterials below 100 nm also occur for materials above 100 nm. Accordingly they recommend moving the upper limit to 300 nm (Miller and Senjen 2008).

Defining nanomaterials and the nanoscale is not straightforward, and it reasonable to follow Lövestam et al (2010) when they emphasise that there are choices to be made regarding the definition of terms like material and the nanoscale limits, and that these choices do involve policy choices, which make political decisions necessary. Otherwise, especially on regional and international level, the multitude of definitions will continue to persist.

The second complexity starts with the idea that product labelling offers consumers the possibility to make informed products choices. In general this is a good thing, and supplying the consumers with the relevant information through such labels is believed to strengthen the position of the consumers in the market place. This is the emancipatory effect of products labelling, as consumers for a long time have suffered under not having enough information about the products offered on a market place as it developed from personal relations with the local shopkeeper to less personal, more anonymous relations in supermarkets (Cochoy 2005; Jacobsen and Dulsrud 2007).

Information to the consumers, like labelling has accelerated to such an extent that some fear information overload (Klapp 1986; Buse 1996), and that the

variety of labels may appear like a jungle for consumers, in the sense that it is a chaos of symbols, images, logos and text (Heidenstrøm et al 2010). This is of concern also in the discussion on European level regarding the possible labelling of products with a nanotechnology component, where frequent mention is made to the possibility labelling offers for consumer to make informed product choices (EC 2009, ENVI 2009).

There is an additional problematic aspect of labelling that we will highlight here. In the Cosmetics Regulation for Europe it is admitted that '*At present, there is inadequate information on the risks associated with nanomaterials*' (EC 2009, s30). Thus, the involved European institutions had the possibility to regulate by referring to the precautionary principle, but instead they adopted labelling to offer information to consumers.

This raises the concern that information schemes like labelling *in effect* means that responsibility is shifted to consumers. This is a general point even for labels like 'organic', 'fair trade' or 'eco-friendly', but in these cases the manufacturer is made accountable for following certain standards and rules. For the case we are looking into here, with a 'contains nano' label, the shifting of responsibility to the consumers is more definite. Under such schemes the producer can be viewed as being accountable 'only' for correct characterization of the ingredient. Wider assessment of potential risks and benefits, and whether nanomaterials are desirable in particular products or in general are left with the consumer. The requirement of labelling consumer products with a nanotechnology component is a way to *transfer* the responsibility for the further developments of nanotechnology away from political actors and *to the individual consumer*[29]. In summary: Although it is hard to argue against more information to consumers in the form of labels, one should be careful and consider the extent of responsibility shifting.

The third complexity derives from the level of knowledge about nanotechnology with general publics. As most Western countries have invested heavily in nanotechnology over the last decade[30], led by the US

[29] Producers and retailers still have responsibilities, e.g. under tort law (issue of negligence).
[30] Global public investments in nanotechnology was in 2006 estimated to be $6.4 billion, and investments by private $6.0 billion (Sargent 2008), but global R&D investment data on nanotechnology are incomplete due to the reasons discussed earlier in this section, there is a lack of commonly agreed definitions, as well as statistical frameworks (Palmberg et al 2009).

(Sargent 2008, Schiermeier 2009), several attempts have been made to measure the public awareness and perception of nanotechnology, especially through consumer surveys and public opinion polls[31] (Satterfield 2009). In Europe, since 2002, nanotechnology has been included in Eurobarometer surveys which chart the public's general attitudes to science and technology. At that time *"... in 2002 it is unlikely that many people will have had a clear representation of nanotechnology, it was included in the survey with a view to establishing a base line for studies in the future*". (Gaskell et al 2003, p.8). In 2002, more than half of the respondents (53 per cent) reported they 'did not know' what impact nanotechnology would have on their way of life. 42 per cent of the respondents reported the same in 2005. This year was also the first were the respondents were asked 'Have you heard of nanotechnology?', and here 44 per cent answered 'yes'. (Gaskell 2006). In 2010 the question was adjusted somewhat, so the respondents were asked 'Have you ever heard of nanotechnology before?' A majority of 54 per cent had never heard of it (TNS 2010).

In surveys in the US and Germany since 2004, respondents were asked 'How much have you heard about nanotechnology?' (Reisch et al 2011). For the US the share of respondents that have heard nothing all was at its lowest in 2009, with 35 per cent – which is still substantial when we take into consideration both the range of products available at the consumer market which claim to have a nanotechnology component, and the significant investments that have been made in nanotechnology by both the public and private sector over the last decade. For Germany, the latest survey (in 2010) found that close to 40 per cent reported to have heard nothing at all (Reisch et al 2011).

In a Norwegian survey in 2008, 41 per cent of the respondents reported having heard nothing at all about nanotechnology (see Throne-Holst and Strandbakken 2009). In 2011, the Norstat agency did a survey for the Norwegian insurance company 'if'. Here Norwegian respondents were asked "Imagine 10-20 years into the future, to what degree would you say you fear

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The accumulated US public investments since 2001 are more than $16.5 billion, including the 2012 request (National Science and Technology Council 2012).

[31] The surveys and opinion polls referenced in general had representative samples of 1000 respondents, with the exceptions of the German study in 2010, which had 750, and the Eurobarometer, which have approximately 1000 in each country, but 16500 in total. The data were collected by CATI or web surveys.

[issues]?"[32] 42 per cent of the respondents had 'no opinion' when asked about nanotechnology, which can be taken as an indication that they had not heard of nanotechnology (if 2011)

The sizable investments in nanotechnology by both nation states and private firms, do not seem to have captured the attention of citizens/consumers. The knowledge level found in consumer surveys and public opinion polls continue to indicate that up to half of the respondents do not know anything about nanotechnology.

## 8.3 Focus groups

The complexities that we outlined are reflected in focus groups exercises, which have become increasingly common (cf. also Seitz and Jahnel 2011). We draw on empirical findings on reflections, perceptions and evaluations by Norwegian consumers in two focus group studies on nanotechnology that took place in 2006 and 2008[33]. These two studies were parts of two different research projects at SIFO. The project in 2006 was a collaborative project between SIFO and DNV Research. The point of departure of the project was the question "Who should be precautionary?", with the further question "Who has the legitimacy to decide this?". For the project in 2008, SIFO collaborated with University of Manchester in a project on the value chain of two product categories, cosmetics and textiles that at the time had several available products with claimed nanomaterial ingredients. The questions were about the main messages in, and channels for, business-to-consumer dialogue about such products, and the extent to which this message was understood and trusted by consumers.

We will concentrate on the parts of the focus group studies that addressed themes of the possibility and desirability of labelling of consumer products with a nanotechnology component. Before we present the findings, we offer

[32] In addition to nanotechnology, these issues were radioactive radiation, natural disasters, chemicals in food and clothing, and IT security.

[33] In more recent focus group exercises in Germany in 2011, the overall thrust of the discussions was similar. And participants highlighted that labelling (Kennzeichnung) is no more than signalling, and that positive effects of such labelling require more information being available about the risks and benefits. (Seitz and Jahnel 2011)

brief comments on focus group methodologies and the set-up used in our studies.

## 8.4 Focus group methodology

Since the mid-80s focus group studies have grown in popularity among social scientists in general (Krueger 1988), and sociologists in particular (Halkier 2010). This is rooted in the possibilities the approach offer for active participation, over the more passive role participants are assigned in structured one-on-one interviews. The focus group is a non-directional procedure with open-ended questions. This allows the participants to comment, to explain and to share – preferably in a permissive group environment.

Focus groups are in one sense a form of group interview led by a moderator; a central feature is the interaction between participants. A challenge for other methodological approaches, both quantitative and qualitative, is that they presume that people already know how they feel about a product, a service or a societal aspect. These other approaches also seem to presuppose that people form their opinions in isolation (Krueger 1988). One of the hallmarks of the focus group is the combination of group interactions and a focus on certain topics selected by a social scientist (researcher). This combination results in a data material that can inform us on the formation of opinions and meanings in groups of people (Halkier 2010). Opinion formation is a part of our everyday life, so certain aspects of it become self-evident and tacit. Focus groups give the participants the possibility to express explicitly how their opinions form. Thus, the analyst gets an impression of their perceptions, thoughts and opinions in how they participate in the conversation.

One cannot validate focus group findings by using an "identical" set-up and participant selection: The interactions that occur are unique for that particular time and space. Our goal, however, was not to generalize, but to explore the range of meanings, understandings and reflections the participants offer on the particular subject (Macnaghten and Jacobs 1997). Empirically, one may find similarities in the lines of reasoning between focus groups.

## 8.5 The set-up of the focus group studies

The participants in the focus groups in 2006 and 2008 were differentiated according to age and gender. We suspected that in discussions on technology in mixed-gender groups, men would come to dominate the conversation. Regarding age, we suspected that familiarity with and interest in modern technology would be different with younger and older people. This resulted in four groups each year: two female groups – young (25-45 years) and old (46-65 years), and with corresponding age groups for two male groups.

The participants for the focus groups were identified by a market research agency - TNS Gallup, from their registry of potential focus group participants. A criterion for the selection from this registry was that all focus participants in both studies were supposed to have at least 3 years education after compulsory primary and secondary school. We assumed this would give greater ability of participants to formulate personal reflections and viewpoints. To reduce the chances that anyone would work in the nanotechnology field we excluded those with education in chemistry, physics or biology. In both years four small focus groups were set up, with five to six participants in each[34]. There were practical reasons to go for small groups, but these were also considered favourable to create an intimate, permissive environment.

We expected that the participants would have limited knowledge about nanotechnology. After some initial questions to the focus groups on different aspects of modern technology, the moderator asked if the participants had heard or knew anything about nanotechnology. The moderator then introduced a researcher who gave a 20 minutes introduction on nanotechnology. After questions of clarification, the moderator invited the participants to reflect on what they had just heard, with subsequent questions on how the participants viewed the responsibility of different societal and value chain actors.

[34] The maximum number of participants in focus groups is usually considered to be 12. Above this the interactions between the participants easily splits into subgroups which will pose a challenge for the documentation. With three participants or less, the interactions between participants can be hard to sustain.

## 8.6 Empirical findings

Labelling was a recurring theme in all focus groups. Initially they all tended to favour labels, but most groups soon started to discuss what the effect of such a label actually would be. In their opinion, most consumers hardly know anything about nanotechnology (or nanomaterials). The label might be perceived as a negative marking, but as a participant in the young female age group in 2008 remarked, if nano turns out to be really great, then other products that carry such a label would be associated with something very positive. The participants have hesitations about the possible effects of such labelling, but they do not turn down the idea. Some of the ambiguities are visible in the following quote[35]:

> Moderator: -*This assumes that this runs in parallel with an information...*
>
> Participant 1: -*Yes. That should definitely take place. I agree completely. It should be labelled.*
>
> Participant 2: -*I must have to admit to I do not read [product labels] to any great extent.*
>
> Participant 1: -*No, but [you would] if you were concerned about it.* (Females 46-65, 2006)

Nano-labelling could be interpreted as a warning:

> Participant:- *It's almost like a stigma, labeled with nano. .. and no one knows if it is dangerous.* (Males 25-45, 2008)

There are practical considerations as well:

> Participant: *But most important is the store's range of choice; that you might chose something else if you do not want it.* (Males 25-45, 2008)

[35] The numbering of the participants in this quote, as well as in two later quotes in this section, is not meant as identifiers, they just keep the two participants in such an interaction visible.

Then the key reservation about level of knowledge appears (as in the following quote from a different focus group):

> Participant: *-But even if you do label products; if half the population has never heard about nano, they just read: yes, here is nano. OK… You have to have some knowledge of it in order to… which most people will not have. So labelling alone will not be sufficient. Some research on negative aspects should have been undertaken.* (Females 25-45, 2006)

Even though participants in the focus groups thought that labelling was desirable, there was a further reservation whether labelling would delegate too much to the consumers:

> *Participant 1*[36]*:- We demand too much. These are ordinary consumers; you will not expect them to possess deep knowledge of such matters. That's why I mean that political authorities should come in and act as a watchdog on behalf of consumers.*
>
> *Participant 2: -The nano technology advisory board. Yes, we already have something called the biotechnology advisory board.*
>
> *Participant 1: -Yes, yes, just like that. A good analogy. And say that now we have accepted this specific technology, it can be used in this and that connection, but we do not accept products used in a third connection, because it has not been thoroughly researched, or we are uncertain of possible long term effects. (Males 46-65, 2008)*

Thus, there is a call for a competent body with appointed qualified members (and no ties to commercial interests) that should come up with advice to political authorities on what to do. Such a body will create transparency, and be accountable. This links up with a call for independence of research:

> Participant: - *To me, it is important that research is as independent as possible, even if there always will be interests that we are not able to uncover. The government should regulate it, at least to a degree. It is best if the state finances and initiates research, not the*

[36] Cf. footnote14

> *pharmaceutical corporations who intend to use research (in their own interests).* (Females 25-45, 2006)

The idea of a competent body that can be referred to resonates with the recurrent expectation that there will be somebody, somehow, which is responsible, and can be trusted to be responsible:

> *Participant: - I believe that I, as a consumer, tend to think that as long as it is marketed, it probably has gone through a series of quality assessments; hence it is a safe product. I am probably a bit naïve about the safety of it, more than I should be. The availability of it kind of blinds me* (Males 25-45, 2008)

If things go wrong, somebody will notice and take the required actions. This is apparently anticipated to work like a safety net, and limit eventual damage

> Participant: - *Today, everything changes so fast that you will probably… if it is really dangerous to the environment and so on, it will be prohibited; it will be stopped real fast these days. Everything happens very quickly in society today.* (Males 46-65, 2006)

This sentiment is echoed, but also nuanced in another focus group:

> Participant 1[37]: -*I tend to trust products in the Norwegian market, that someone watches them.*
>
> Participant 2:- *To a certain degree I do too, but not completely, since Norwegian authorities have recommended a number of products that have turned out to be dubious.* (Females 25-45, 2008)

While this implies a need to be vigilant on the part of consumers, this will not be easy, because it requires effort and competence. The basic response remains the projection of responsibility on some authority:

> Participant: -*I think we already have touched upon labelling and that we expect that someone tell us and that [they] take that kind of responsibility. We talked earlier that the Government and the Norwegian Board of Health Supervision and Food Safety Authority*

[37] Cf. footnote14

> *and Veterinary and such…That is what I am thinking. And I expect that our society informs us and provide us the labelling and the explanation we need to be able to make our choices. That is what I expect.* (Females 25-45, 2006)

Industrial corporations, while important as knowledgeable actors, were exempted from specific responsibility:

> Participant: - *I do not think this is a responsibility we should lay on them as… as individuals or as single enterprises… it will have to be imposed from the outside, as laws and regulations. Either as labelling or as mandatory information or something like that.* (Males 25-45, 2008)

As we noted, it is hard to argue against better availability of consumer information. Information is viewed as a good thing, and not wanting to get more information for situations where you have to make a choice, is viewed as archaic and anti-modern. This might well be the reason why the focus group participants in the two Norwegian studies ended up with supporting labelling, even in the light of the reservations they did articulate. Could the hesitation the participants express, together with their conviction that labelling is desired, be met by alternative schemes? What sort of alternative schemes would do the job?

Three concerns appear in the focus group participants' discussions of labelling. *Transparency* was highlighted: those that would be involved in labelling would have to be transparent in their motivations and criteria. *Accountability* was another concern: those who would be involved in setting up and looking after a potential labelling scheme are expected to be responsible and should be prepared to justify their actions. A third concern was that *someone should be responsible*[38]. This implied an asymmetry, as the participants generally envisioned a rather passive role for themselves, hoping

[38] One might claim that tort law operates to ensure such responsibility, but it is liability for damage, so harm or injury must have occurred. Responsibility has a prospective aspect, and the idea would be to avoid harm or injury.

that things eventually would be sorted out without the participants in their role as consumers necessarily being involved[39].

In section 2, we identified three complexities indicating reasons for being hesitant about labelling schemes. Reservations were also expressed by the focus group participants, and these concerns taken together suggest there are good reasons to consider alternatives. In doing so, the three concerns identified here as motivating the focus group participants to support labelling schemes, transparency, accountability and the need for someone to be responsible, can lead us. How can such concerns be addressed without recourse to (simple) labelling schemes?

## 8.7 Alternatives to labelling

We identified three aspects behind the participants' eventual positive appraisal of labelling. Labelling appeared to serve accountability, transparency, and the need for someone to be responsible. However, these concerns can be addressed in other ways than through labelling. We will use the concern about "someone" to carry responsibility as our entrance point to discuss concrete examples of one or another actor carrying such responsibility, which will allow us to speculate about future possibilities.

Responsibility carried by the regulatory agency is exemplified in GRAS – generally recognised as safe – a designation used by the US Food and Drug administration (FDA) for food additives that are exempted from the food additive tolerance requirements on the ground that they are considered safe by experts under the conditions of their intended use. It is those who wish to have an additive designated as GRAS that has the burden of proof to show that there indeed is a consensus among experts regarding the safety of use (FDA 1997). But it is FDA which carries the responsibility for putting a food component on the GRAS list. In the case of substances that were used as additives in food prior to January 1, 1958, they can be listed as GRAS based

[39] If this unique to Norway is an open question. But the political culture in Norway is consensual, consumers are to be protected, and they do not represent an influential political or public voice, compared to Germany or Great Britain where the political culture is more conflictual, at least when it comes to food issues (Kjærnes 2010).

on either scientific procedures or through experience on the basis of a history of safe use in food (Falkner et al 2009b).

Products containing GRAS ingredients can be marketed by producers without informing or seeking review by the FDA, while food additives that are not on the GRAS list are subject to pre-market review and approval by the FDA (Falkner et al 2009b, Mattia and Merker 2008, FDA 1997). Responsibility thus lies with the regulatory agency. The relative success of this scheme has led to proposals to have similar GRAS schemes in other areas/sectors, for example the environment. There have been no such proposals for nanoparticles and nanomaterials in consumer products, but it is definitely a possibility. Under the current uncertainties regarding the risks of nanomaterials, however, it seems unlikely that any nanomaterial could be listed as GRAS. Implementing this scheme for consumer products now, would in effect be a moratorium for their use.

Responsibility carried by the producer is exemplified by the legal doctrine of implied warranty. This is a long-standing legal approach to responsibility about consumer products (in the USA, but increasingly taken up in Europe[40]) where responsibility is located with the producer. There are two types of implied warranties that involve consumer products: an implied warranty of fitness for a particular purpose, and an implied warrant of merchantability (Nolo 2011, see also Serra 1997).

The first of these two applies when a product is bought to serve a specific purpose. If one has specified this purpose to the seller (for instance a sleeping bag for sub-zero use), the sleeping bag s/he sells comes with an implicit warrant that it can be expected to keep one warm under such conditions (Nolo 2011). This warranty does not help to resolve the responsibility for risks regarding consumer products with a nanotechnology component, because the functionalities are determined by the overall system, not by the nanotechnology component. The second warrant is applicable, the implied

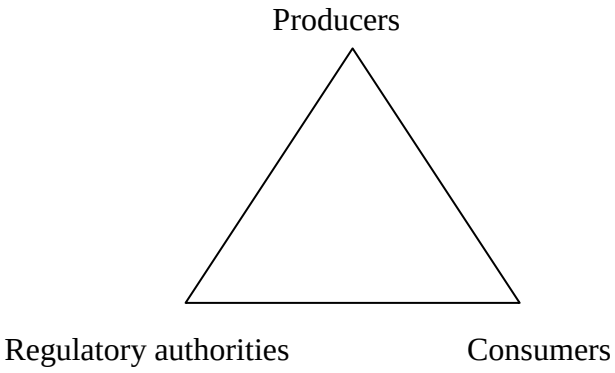
[40] On July 25, 1985 the European Economic Community adopted the Product Liability Directive (85/374/EEC), and in May 18, 1999 the Consumer Guarantees Directive (1999/44/EC) (Hamilton and Petty 2001). Implied warranty is mentioned (in the article and in the Directives), but not thematised. There is definitely a sense that consumer's interests have to be protected better, and that US legal doctrines and actual laws can be a model, even if they should not be followed slavishly.

warrant of merchantability. This type of warrant is an assurance that the items you have bought can be expected to work and are reasonable fit for the purposes that the product reasonably can be expected to be used for. Under this warranty the producers carry a significant responsibility.

Under this jurisdiction, it is up to the producer to decide whether to offer a product with a nanotechnology component to the consumer. In some sectors, like the building sector, there is a long tradition of using coatings and materials with a nano-component (even before the label nanotechnology became important) (Andersen 2011). In other sectors, firms may have second thoughts about offering consumer products once they realize there is an implied warranty.

We noted that labelling schemes transfer responsibility for choices about consumer products to the consumer. GRAS provisions assign the final responsibility to the regulatory authorities, while under implied warranty of merchantability, producers will carry the responsibility. We also noted that such arrangements may not be productive in terms of realizing the potential benefits of nano-enabled consumer products without suffering unnecessarily from possible harm and damage. As such they are all 'extreme' possibilities where responsibility is carried by one actor.

With this discussion in mind one can draw a triangle depicting responsibilities carried by the three types of actors.



For the arrangements we have discussed so far (GRAS, implied warranty and labelling of consumer products), responsibility mainly rested in one or another of the three corners of the triangle. The triangle opens up spaces for other possibilities than one of the three corners. These will be *shared* responsibilities. There are such moves already, as in the European legislative framework on chemicals REACH[41], where the burden of proof is shifted from regulatory agencies and to producers: part of the responsibility is now with the producers.

In Ulrich Beck's (1992) diagnosis of a Risk Society, the notion of shared responsibility is our fate in late modern societies. But it is also an opportunity and a challenge. In Risk Society, Beck describes how responsibility for manufactured risks has tended to dissolve. Everyone is a producer and a consumer of risk – '*Everyone is cause and effect, and thus non-cause*' (Beck 1992:33). Even if responsibility for risks has dissolved, it has not disappeared. Rather a situation of 'organised irresponsibility' prevails. All societal actors and stakeholders have qualms to take responsibility for risks, and given the complexities of late modern societies, it is actually difficult for them to define a responsibility. The question of "*Who will take the hot potato?"* has no obvious answers (Beck 1992:33).

Now turn this diagnosis around. Organized irresponsibility occurs all the time, but attempts are made to reduce it, with some success. New technologies like nanotechnology create additional complexities, but the basic challenge is the same. It is not a matter of just improving regulation, or just introduce labelling of consumer products or not, but to locate all of these as attempts to reduce organized irresponsibility. In terms of our triangle, the problem for new technologies and society (including consumers) is located in the middle of the triangle: the notion of organized irresponsibility captures our difficulty of handling shared responsibilities productively. To address this problem one should consider the division of labour and the division of responsibility between the three types of actors[42].

[41] REACH - the Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force on 1st June 2007 to streamline and improve the former legislative framework on chemicals of the European Union (ECHA 2011).

[42] There are also third parties like insurance companies who have some responsibility, notably so in health care.

Western societies have grown into complex societies, and development of long value chains, global trade and outsourcing have made oversight complicated. Rather than viewing the current state of affairs as unwillingness of actors and stakeholders to take any responsibility, the problem and challenge is that no-one can be *solely* responsible for a given situation. Thus, arrangements for new and productive divisions of responsibilities are necessary. In this article, we cannot discuss specific possibilities, and the legal difficulties of working with shared responsibilities. But we can briefly discuss what the two other concerns in the focus groups: accountability and transparency, imply for alternative arrangements to labelling.

Transparency, as a concern of consumers, tends to be phrased asymmetrically: producers (and retailers) have to be transparent, while consumers can do whatever they wish. This resonates with complaints by producers about volatility of consumer preferences and reactions. This is not the whole story, however: consumers can follow larger concerns (e.g. sustainability) and be articulate in their preferences (cf. political consumption[43]). It does imply that a shared responsibility is recognized, and can be taken up in transparent arrangements. A concrete possibility would be to make the decisions about labelling nano-enabled consumer products a joint responsibility of producers and consumer organizations, with some support from regulatory agencies.

Accountability also starts as an asymmetrical concern: producers (and further relevant actors) should be accountable when they put nano-enabled consumer products on the market. Actually, the legal doctrine of implied warranty already stipulates accountability. The problem there is that the doctrine only applies in cases where damage or harm has occurred, so after the fact. In terms of responsibilities, also prospective responsibilities should be considered, where producers would try to anticipate and prevent damage/harm to occur. Such a 'good faith' effort would then be a consideration in eventual liability claims. This is a real possibility: there is an interesting precedent in technology forcing through (environmental) regulation (Rip et al 1987; Schot and Rip 1997). To have a more symmetrical arrangement, one can consider adding vigilance from the side of consumers to the scheme. For nano-enabled consumer products, producers cannot foresee all possible damage/harm, even

[43] On political consumption, see Micheletti (2003) and Dulsrud and Jacobsen (2007).

when there is a 'good faith' effort. So consumers might bear part of the burden, by accepting nano-enabled consumer products without a full warranty (and thus not hold producers accountable if something untoward happens), and be vigilant about possible negative side-effects, as an early-warning arrangement. Again, there is a precedent: for medical drugs there is post-introduction monitoring, but by medical doctors, not by the patients.

We started by commenting on the complexities that surrounds labelling of consumer products with "nano" ingredients. We suggested that addressing those complexities, or exploring alternatives, must include a *sharing of responsibility*. We indicated an overall approach to do so. For alternatives to be viable the three concerns we identified on the basis of our focus groups studies: *transparency*, *accountability* and *the need for someone to be responsible,* should be taken into account. New and innovative labelling schemes that address the complexities, the three concerns and sharing of responsibilities, would qualify as such an alternative.

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# 9 In conclusion

In the Introductory chapter my overall theme of operationalization of the risk society by consumers was split into two themes

1. If situations are created where operationalization of risk society by consumers can be observed, what do we find as the work of definition they do and the potential outcomes of such efforts?

2. What can we show of the ongoing and possibly better operationalization of risk society when insights from the focus groups are combined with further analyses?

These two themes were addressed in Chapter 4, and Chapters 5-8, respectively. In this concluding chapter, I can discuss my overall theme of operationalization of the risk society by consumers, and indicate further perspectives. There is work of definition involved, in general and by consumers (and citizen-consumers). But operationalization of the risk society also occurs in regulation and through interest politics. While I will occasionally refer to these other kinds of operationalization, my focus has been on consumers and issues related to consumers.

## 9.1 About articulated concerns

The articulated concerns of the focus group participants speak to my overall theme, the operationalization of the risk society by consumers. Such concerns are themes and items that the participants tried to come to grips with, by articulating them and offering arguments.

The consumers have encountered nanotechnology in the form of nano-enabled consumer products. This was new to most participants in the focus groups. Some could name specific products, and all were surprised at the number of available products.

Marketers and producers have experimented with different forms of signalling nanotechnology components in their products, as I indicated in chapter 6. This has happened within a frame of what appears as a desire to show the consumers that novel technologies have been applied in the products. Other manufacturers have had other concerns, they anticipate scepticism on the part of consumers, and they have been reluctant in telling the consumers openly that nanotechnology is a part of their products range. This could take the form of focusing on the enhanced properties or functionalities of their products. A different objective is voiced by others that a too clear signalling of nano content could provoke regulatory actions.

To the focus group participants, this would not appear surprising; they appear to have little trust in producers to tell them 'the truth' about contested ingredients of their products. The participants' solution would be to have more information, either from third parties that would not have a stake in the production (so less risk of skewed information) or as a requirement on producers up to mandatory labelling. But the participants also have doubts as to whether such information would be of help to the ordinary consumer, as they are unfamiliar to nanotechnology. This would imply more consumer education, and/or to have written information that would explain risks and benefits of nanotechnology components. Labels saying simply 'nano inside' are viewed as more problematic as their message is contingent on prior knowledge about nano. Then, if nano-enabled products are to be labelled when offered for sale, it should allow a choice for consumers, in the sense that retail stores should also offer non-nano alternatives in their range.

That consumers are kept in the dark, without enough information is voiced as a specific concern here, but the anticipation that producers must be forced to give out reliable information, indicates that this is a general concern (and not only connected to nanotechnology). And this articulated concern is combined with a definition of a situation where nanotechnology is apprehended as pervasive, that it is or can be anywhere. Pervasiveness emerges as an overriding concern of the participants.

This concern stays with the participants, even if their fascinations of the possible benefits of some of the current products dominate their final comments. It is the benefits that nanotechnology promises to offer in future that tips the balance, as there are risks connected to everything (although there

are also articulations of safe products). The participants reasoning about risks appear to be influenced by widely held beliefs: that the risks they are subjected to may not be that dangerous, someone is watching out, and one can find out if something indeed is harmful. There is a conviction that somehow, products which pose severe risks are sifted out so they never reach the market. Other risks are seen as reversible, so discontinuing the use of a particular product will make potential side-effects disappear.

”Politics from below” is how possible political consumption by consumer-citizens has been positioned: The participants named instances where conscious consumer choice has had clear effects. Consumer power is a concept they are aware of. The examples the participants articulated were of limited scope (e.g. reaction on higher prices or the ‘bullying’ by a dominant market actor of smaller producers). But even limited consumer actions can have significant long-term effects: the boycott of French wines, of which a story goes that the event opened the market to wines from the “new world” with subsequent sustained losses of market shares of French wines[44].

The effect of such consumer boycotts concerns actual changed consumer choices or preferences. In the focus group exercises, the participants articulated a need for information, and less so on boycotting.

These concerns voiced by the focus group participants may indicate that basic consumer rights might be under pressure by the commercialization of nanotechnology. Formulated in 1962 they should by now be well-known and implemented. There is little reference to them, however, perhaps because they are now taken for granted. But there are missed opportunities when they are not activated in context where they still would have relevance (see chapter 7).

In their interactions the participants articulated issues of responsibility, for themselves as well as others. A case in point is the process of elimination described in chapter 4: the participants ended up with placing the ultimate responsibility with politicians, while other actors like producers, retail, researchers and the participants themselves to a large extent where disqualified for different reasons. This elimination was argued from a consumption perspective with arguments like profit motives for manufacturers and low competence in retail. The willingness to articulate and interact on the issue of responsibility, as well as ascribing parts of the responsibility to themselves, shows that the focus group participants are assuming the role of citizen-consumers.

[44] The sales of French wine plummeted across Scandinavia after the tests according to The Economist (1999).

The concerns of the focus group participants discussed thus far included concerns as to what other actors are doing. I am briefly going to look at the concerns of some other relevant actors, not only their concerns over nanotechnology, but also how they view the consumers.

Regulatory agencies have concluded that current regulatory framework is sufficient to cover nanotechnology/nanomaterials, some modifications might be necessary and implementation of current legislation could be enhanced. However, the European Parliament pushed the European Commission to adjust their position for cosmetics: in the new regulatory framework for cosmetics in Europe labelling of nanoscale ingredients are mandatory.

Norwegian politicians have not been very visible in debates on nanotechnology. As large sums of public money have been made available for research and development, the political intentions behind these grants remain opaque in the Norwegian context. The political ambitions if formulated are general and concerns consumers only to a limited extent.

Most NGOs have kept quiet. Their silence may have (at least) two explanations: One is that substantial environmental benefits are projected from the use nanotechnology (e.g. increased efficiencies in both the production and the use of energy). A second explanation for their muted views is that it is challenging to get an understanding of nanotechnology and future possible developments: it is a complicated issue with significant dynamics, not least as substantial resources are used for research and development. The combination of the complexity of nanotechnology itself and its rapid development makes it difficult for many actors, including NGOs, to adopt knowledge-based policies and decision-making.

For manufacturers and retail the commercialization of nanotechnology has involved experimentations in information and labelling. This is somewhat to be expected as nanotechnology is novel, and these actors will need to experiment to fine-tune their messages so they appeal to consumers. However, another concern has also influenced these experimentations, and that has been a fear of ’provoking’ regulatory actions. Too much advertising buzz on the use of novel technology may prompt regulatory agencies to put the use of such technology or materials under scrutiny, resulting in possibly new and stricter regulations.

From this three strategies appear plausible: continue to advertise the employment of novel technology or materials, but not excessively. Not advertise the usage of novel technology or materials, as this is not a requirement, and rather focus on new functionalities or properties that these

enable, and then without necessarily using the "nano-prefix". A current example is (probably!) anti-bacterial/anti-odour. A third strategy is to develop voluntary labelling schemes by industry.

As some of these actors would try to avoid provoking regulatory actions, they have similar concern regarding consumers: Something can provoke a 'consumer back-lash'. This can be spurred on by other actors, and some would point to the call for 'immediate moratorium on nanotechnology' by etc group (etc 2003) as an example of what they are anxious about: some 'alarmists' may cause the consumers to get concerned with the use of nanotechnology in products. This means that the novelty of nano probably will be checked against what the manufacturers and retail anticipate as perceived uncertainties by consumers.

The experimentation with information and labelling by manufacturers and retail have manifested itself as a multi-faceted if not confusing picture on behalf of the consumers: information and labelling on nanotechnology in products appear in certain instances to be at odds with the actual contents of products in question: some products that are labelled nano, are unlikely to contain any, other products are likely to have nano-components, but are not labelled as such. To differentiate between these two groups of products would initially be outside the ability of most consumers, and maybe even for NGOs or regulators, as the definition of nanotechnology and nanomaterials are contested and testing protocols only partly are in place. This is of course also contributing to the confusion, so far it has not been prohibited to label something as nano (or not) irrespective of actual content, as 'nano' lacks a proper internationally agreed definition. EUs new definition of nanomaterial (November 2011) may change this.

As the confusion (and debate) surrounding the definition lingers on, and the consumers' perceptions of nanotechnology and nanomaterials have not yet settled, it may appear sensible to manufacturers and retail to rather advertise the properties that nano-components contribute to– like anti-bacterial, rather than the actual (nano-) content. As a longer-term strategy this is problematic and can be viewed as contributing to the confusion. It is a small step from being perceived as unwilling to inform, to appear you have something to hide.

It would also be problematic as the focus group participants clearly articulate a need for information. There is however, a paradox related to such articulations: The participants voice only vague intentions of actually putting that information to use. One way of addressing the paradox could be to look for alternative explanations to the need for information, see chapter 8. The paradox may also be addressed in a different manner: The focus group

participants may perceive their role, as consumers, as *limited to* requesting information.

At first glance, one sees the participants ascribe a very modest role to themselves: just asking for information However there are two aspects that speak to the significance of assuming such a role.

The first aspect concerns possible 'secondary effects': if manufacturers feel obliged to come up with additional information they may start to reflect whether a product with problematic, uncertain effects should be introduced at all. So, a possible result could be a retraction of a potentially problematic product by the manufacturers themselves.

If the manufacturer still chooses to go ahead with the introduction, then other actors, public authorities, NGOs or concerned citizens can use the information to take actions, if deemed necessary. Such actions could include informing 'ordinary' consumers of not buying or using the products in question, - or more direct interventions as restricting the sale or use of products by laws or regulations.

Compared to direct changed consumer choices on the market place, which would entail most political consumption aspirations, such effects might appear limited or far-fetched.

The second aspect of the potential of asking for information, concerns how a voiced demand for more information and labelling schemes from consumers had a significant effect on the market for genetically modified foods in Europe. As risks concerning genetically modified foods surfaced, European consumers voiced a need for more and better information and for labelling schemes to be set up. Such measures have significantly contributed to the extensive risk assessment procedures that are implemented in Europe. And even when a genetically modified crop eventually makes it through these procedures, they are obliged to be labelled as genetically modified[45].

An important general point from both the focus group studies and the published papers, is that consumers are willing to take on a responsibility - asking for more information, that could have significant effects, but only as a part of a whole, where other actors step up and assume their responsibilities as well.

[45] This is the case for Norway at least.

## 9.2 Living with technology in the risk society

Living in the risk society is not easy. Its inhabitants will have to "juggle" (cf. Chapter 2) different risks, considerations and responsibilities. This is also visible in how focus group participants have contrasting views of on technology in the risk society, but manage, somehow, to hold them together. It is worthwhile, in this final section, to spell this out for the combination of their belief that technology is inherently good, and their view that everything is dangerous, because it allows a further take on the risk society and on Beck's thesis.

At first glance, 'techno-optimism' may appear as an obvious and unproblematic position. After all, technology is a pivotal part of our modern societies and helps to sustain society as we know it with infrastructure, transport, medicine and manufacturing processes. The problem with techno-optimism is that it treats technology as a black box, indicating technology is but one thing. However, some technologies are definitely contested in society at large: like nuclear energy or genetic engineering. Other technologies are of course less contested. Technology as an encompassing term covers a variety of items. To claim that all these varieties will contribute to the same purpose - that such different means will work towards the same end appear far-fetched. Technology does, and can, contribute to laudable goals. But this will not happen automatically. While technology can afford certain uses rather than others, it is definitely not good or bad in itself. It is the whole co-production process from design to final use, which creates value.

The 'techno-optimism' was however also qualified by the participants themselves. Technology can deliver good products, but this would be contingent on measures by public/governmental institutions. With the assistance of these institutions, and under their vigilant eye, technological development will stay on its tracks. This 'institutional optimism' appears as a condition for the articulations of techno-optimism.

In an apparent contrast with this optimistic view then, the focus group participants articulated a sense of everything being dangerous. There are few, if any products that are completely safe. There are a number of dangerous substances in products on the consumer market, and it appears impossible to keep track and avoid them. This comes across as a fatalistic viewpoint.

A further dimension of the "everything is dangerous" view is that it implies that risk is a big block that has little room for agency. Nevertheless the articulations of risks by the focus group participants also carry indications that risks are perceived as discrete, and make up more of a patchwork. If this

indeed is the case that may help to understand why there are few signs of anxiety in the focus groups. When risks are discrete and appear as patchwork, it suggest the risks can be juggled – there are possibilities to meet, order, fend off or try to solve risk, depending on how they are perceived. This implies that the participants see themselves as having agency when it comes to risk taking. It may require effort, but appear doable.

These contrasting lines should probably not come as a surprise. One cannot expect coherent views on emerging technologies in the evolving risk society. Different strands will have to go together.

In light of this evolution, we can revisit the Risk Society Thesis by Ulrich Beck. His thesis was developed in a historical context of rapidly emerging environmental problems in the 1970s and 1980s. An important aspect of the context was the apparent lack or inadequacy of regulatory actions to the problems, which in Beck's view was due to a lack of institutional capacity. Beck's analysis and diagnosis of The Risk Society helped in putting the dire situation firmly on the political agenda. This caused significant attention and investments in risk assessment from the 1980s onwards by public institutions, as well as in industry. With this in mind one could claim that the Risk Society has been a 'self-negating' prophecy.

Today we live in a different world than the world Beck addressed in his thesis. More risks are addressed and risk assessment procedures appear to be in place in several areas. In the focus group exercise it appears that the participants are quite willing to adsorb emerging risks in light of potential benefits. This could indicate a more relaxed, ambiguous attitude to risks. Risks are apprehended as facts of (modern) life. It could well be that this is moderated by the institutional optimism described , so that some unnamed public institution is vigilant and idle and sift out the significant risks. This would imply that the risks to be endured are not really that severe.

It is not just a matter of other approaches to risk, people have moved on from concerns about risk (in the bigger frame), and towards concerns on the issue of responsibility, and how it is organised. Risks are ok, if someone is accountable and we know who that is. The shift from risks to responsibilities also holds lessons for the commercialization future emerging technologies. A potential success will not only be contingent of properly addressing the concerns of citizen-consumers, which the issue of techno-optimism reminds us. Such complexities suggest a definite need to take into account a broader dynamic of costs, risks and benefits.

This shift important in its own right - but then the issue of how such responsibilities could be arranged, comes in much stronger. Traditionally this would involve prior explication of the responsibilities as well as arrangements, before the parties are invited in. Such set-ups have tended to end up with discussing of which is best and most appropriate.

An alternative, at least a potential alternative, would be a distributed, bottom-up process. Then there is the risk of organised irresponsibility, so one should be careful of arrangements. The participants would be part of the negotiations and drafting of responsibilities as well as the arrangements. This would then be open-ended, with significant possibilities for influence by the participating parties, with few or no prior stipulations of the final arrangements.

Citizen-consumers might well be, in their limited way, one of these parties. They have something useful to contribute. They are able to articulate genuine and substantial reflections and points of view that indeed can be valuable in setting up arrangements for responsibilities. As an analyst, I have already built on them, for example in Chapter 8.

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# List of appendices

# APPENDIX 1: TOPIC GUIDE FOR FOCUS GROUPS 2006

## Outline for conversation guide – Nano technology

### 0. Introduction

- Presentation of moderator
- About the arrangement
- Recording and reporting
- Gallup's role
- The purpose of the study
- Presentation of the participants

### 1. Spontaneous conversation about science and technological development (in order to get the group going)

- What are your immediate associations to the term «modern technology»?

## 2. Attitudes towards technological development and new products

- What do you think about the technological development in recent years? Would you say that it has had a positive or negative effect on people in their everyday lives?

Let's stop for a moment and draw our attention away from new products and inventions such as the Internet, mobile phones, the iPod etc. and to old, familiar products which have been improved through advances in technology.

- Could you give me any examples of products which are better now than they were some decades ago?
- Do you have any examples of products where modern technology has not had any improvement/impact on quality or value?
- New products are continuously introduced to us and some people are

always first in line to buy the newest products, while others wait until the products have become more established.

- Where do you see yourselves in this description? Do you prefer to have the latest news, or do you prefer to wait and see?

- Do you have any examples of products that you bought shortly after their release?
    - What are your experiences with these products?
- Do you have any examples of products you wish you had bought earlier than you did?

3. Attitudes towards genetics

Do you pay attention to/have you followed the debate on genetics?

- If so, what is your opinion on genetically modified food? Tasty, delicious and

durable fruit which still is not completely «natural» in the more traditional sense of the word.

- If not, why not?
- We have little knowledge about the consequences of genetically modified food, but is it not better to be safe than sorry? Do you think it is necessary or unnecessary to take any precautions relating to this? And who do you think should be responsible for taking these precautions?

4. Now, we will be discussing a new type of technology, which can significantly improve a wide range of products, but which we do not fully know the consequences of using. We do not know whether there are any adverse effects from the use of this technology yet. This technology is referred to as Nano technology.
   - What do you associate with Nano technology?

- Have you heard about it at all? If so, what have you heard?

We will now give you a short introduction to Nano technology.
(Fabrice)

Questions and answers

5. Immediate reactions

- What are your immediate reactions to the new information you have just been given?

- What do you feel most strongly about now, the wish for improved products or the fear of adverse effects?

6. The «better safe than sorry» discussion

Both with regards to Nano technology and genetics, which we discussed earlier, the main problem is that we do not know

enough about the long-term consequences of the use of these kinds of technologies.

- After being given this information, how do you feel about taking precautions in case the use of Nano technology has negative long-term consequences?

- Based on what you know now, should we reduce/restrict the use of this technology? Do you think one should take precautions in connection with the use of this technology?

- Who should be responsible for enforcing a restrictive attitude?

**Politicians**

- What do you think should be their responsibilities and which role do you think they should have?
- Based on Fabrice's presentation, what do you wish to tell the politicians?

**Manufacturers and the industry**

- Responsibility and role?

- Based on the presentation, what do you as consumers, wish to express to the industry and the manufacturers?

**Researchers**

- Responsibility and role?
- What do you expect from the researchers?

**Media?**

- Responsibility, role, expectations?

**Consumers**

- Responsibility and role?
- To what extent are you willing to be consumer watchdogs and try to influence the development?

**Friends and acquaintances**

- How significant are informal conversations between friends and acquaintances in connection with this?

7. Request for information

- As consumers, do you expect to be informed about this in the future?
- Who do you expect will provide the most objective information?
- If you receive conflicting information, what would you see as the most reliable source of information?
    - Politicians – What will it take to increase your trust in them?
    - Manufacturers – What will it take to increase your trust in them?
    - Researchers – What will it take to increase your trust in them?
    - Media – What will it take to increase your trust in them?
    - Consumer spokespersons – What will it take to increase your trust in them?
    - Friends/acquaintances

- If the bottom line is that consumers are the ones who decide, to what source of information will you turn in order to find information on which you can make an independent choice?

8. An ethical dilemma – summary

A discussion like this often tends to put focus on problems and problematic areas. However, we must keep in mind that the dilemma here is the choice between improved products with clear benefits and the risk of future adhesive effects, which is far from certain.

- What is your opinion of this dilemma?
- How much do you think people are willing to risk in order to have significantly improved products? How much do you think one would risk in order to get products with greater value and user comfort?
- What do you think it will take for consumers to accept that one does not

exploit all new technology to improve and optimise products?

## 9. Closure

Are there other things you would like to report to SIFO, that you think may be useful to them in their work on this project?

# APPENDIX 2: INTRODUCTION TO NANOTECHNOLOGY IN FOCUS GROUPS 2006

MANAGING RISK



# Emerging Technologies

## Nanotechnologies and Nanoparticles

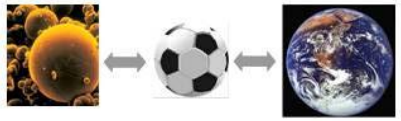
Fabrice Lapique – DNV Research & Innovation
Harald Throne-Holst - SIFO

# How small is a nanometer?

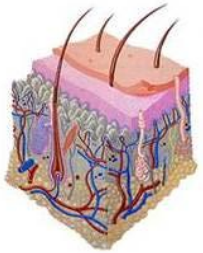
MANAGING RISK DNV

I could have said 1nm=$10^{-9}$m but does that tell us something?

Two examples to illustrate what a nanometer is



The size ratio between a nanoparticle and a soccer ball is comparable to the one between the soccer ball and the earth



Human hair is 80 000 nm in diameter

# Nanoscale

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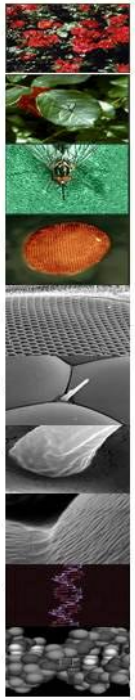

| | |
|---|---|
| 1 m | 1 m: a plant |
| $10^{-1}$ m | 10 cm: a leave of the plant |
| $10^{-2}$ m | 1 cm: a fly sitting on the leave |
| $10^{-3}$ m | 1 mm: the fly's eye |
| $10^{-4}$ m | 100 µm: The fly's eye is made of hundreds of smaller eyes. Each facet is a small lens with light sensitive cells underneath |
| $10^{-5}$ m | 10 µm: In between the facets are bristles which give sensory input from the surface of the eye |
| $10^{-6}$ m | 1 µm: lower part of the bristle |
| $10^{-7}$ m | 100 nm: root of the bristle |
| $10^{-8}$ m | 10 nm: DNA molecule |
| $10^{-9}$ m | 1 nm (10 Ångstrøm): part of DNA molecule |

# What are we talking about?

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- Nanosciences

Nanoscience is the study of phenomena and manipulation of materials at atomic, molecular, macromolecular scales, where properties differ significantly from those at larger scale

- Nanotechnologies

Nanotechnologies are the design, characterisation, production and applications of structures, devices and systems by controlling shape and size at nanometer scale

# Nanotechnology expectations

MANAGING RISK

- Manufacturing
- Electronics
- Improved Healthcare
- Pharmaceuticals
- Transportation
- Sustainability

# Nanotechnology today

MANAGING RISK

I en undersøkelse fra mars i år fant Woodrow Wilson International Center for Scholars 212 nanoprodukter !

Per i dag har de registrert 356!

Hvor mange finnes på det norske markedet?

-Et raskt søk på norske web-butikker fant lett over 20 – hovedsakelig sport/fritid og data

# Nanotechnology expectations

MANAGING RISK DNV

- Manufacturing
  - High performance materials
  - Unique properties and functions
- Electronics
- Improved Healthcare
- Pharmaceuticals
- Transportation
- Sustainability

Nanoparticles as filler to improve mechanical properties

Stain-repellent and wrinkle-resistant fabrics

Desinfecting Silver particles
Samsung's Silver Nano Health System

Self-cleaning surfaces (windows, tiles etc…)

# Nanotechnology expectations

MANAGING RISK

- Manufacturing
- Electronics
  - Miniaturisation
  - Increased capacity
  - Increased data processing and access speed
  - Access to unlimited data quantity
- Improved Healthcare
- Pharmaceuticals
- Transportation
- Sustainability

| Feature | Year | | | | | |
|---|---|---|---|---|---|---|
| | 2001 | 2003 | 2005 | 2008 | 2011 | 2014 |
| *Memory* | | | | | | |
| Minimum feature size DRAM (1/2 pitch in nm) | 150 | 120 | 100 | 70 | 50 | 35 |
| Gbits/chip | 2 | 4 | 8 | 24 | 68 | 194 |
| Density (Gbits/cm²) | 0.49 | 0.89 | 1.63 | 4.03 | 9.94 | 24.50 |
| *Logic (processing power)* | | | | | | |
| Minimum feature size (gate length in nm) | 100 | 80 | 65 | 45 | 30–32 | 20–22 |
| Density (million transistors per cm²) | 13 | 24 | 44 | 109 | 269 | 664 |
| Logic clock (GHz) | 1.7 | 2.5 | 3.5 | 6.0 | 10.0 | 13.5 |

DRAM: Dynamic Random Access Memory, a type of memory used in most personal computers.

Adapted from Compano, 2001

From Greenpeace report Future Technologies, Today's Choices, July 2003

# Nanotechnology expectations

MANAGING RISK DNV

- Manufacturing
- Electronics
- Improved Healthcare
  - Extension of expected lifetime
  - Life quality improvement
  - Extension of human physical capabilities
- Pharmaceuticals
- Transportation
- Sustainability

Nucelle Sunsense SPF 30
(BASF Technology – Zinc oxide)


Nanoparticles used to transport active agents (L'Oréal)

Desinfectant bandage (silver nanoparticles)

# Nanotechnology expectations

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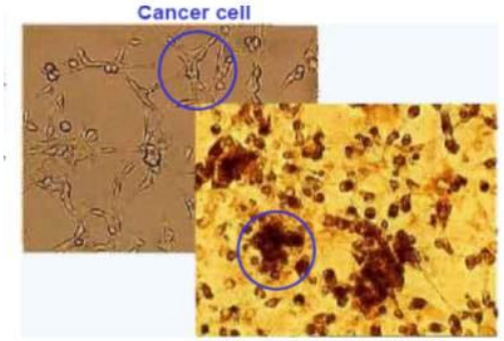
- Manufacturing
- Electronics
- Improved Healthcare
- Pharmaceuticals
  - Diagnostics, medical imaging
  - Drug delivery systems
  - Artificial organs, tissue engineering
  - Implants
- Transportation
- Sustainability


Courtesy: www.nanochem.de,
Dr. Jordan, Charité Berlin




Cells after incorporating modified $Fe_3O_4$-particles

# Nanotechnology expectations

MANAGING RISK

- Manufacturing
- Electronics
- Improved Healthcare
- Pharmaceuticals
- Transportation
  - Nanomaterials and nanoelectronics
- Sustainability

Envirox fuel additive
(Oxonica)


Improved wet grip, wear and rolling resistance
(patent Kumho European Technical Centre Birmingham)

Scratch resistant nanoparticle coating
used by Mercedes-Benz

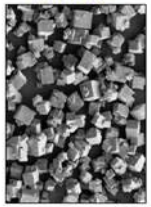
# Nanotechnology expectations

MANAGING RISK

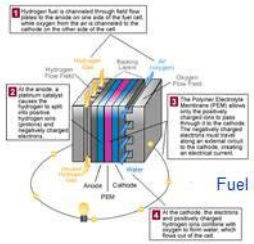
- Manufacturing
- Electronics
- Improved Healthcare
- Pharmaceuticals
- Transportation
- Sustainability
  - Access to water with good quality
  - Enabling renewable energy sources (hydrogen, solar energy)
  - Reduction of worldwide energy consumption
  - Pollution reduction
  - Cleaner environment

$CO_2$ capture

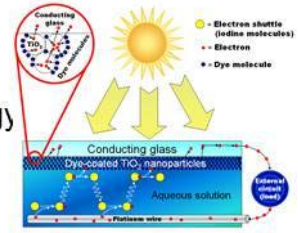
$H_2$-storage for fuel cells



Source: BASF



Fuel cell




Improved solar cell

Organic light emitting diodes (OLED)

# Some nanoproducts






# Nyere produkter- også norske…

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# What are the risks/issues?

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In 10 to 20 years, nanotechnologies will fundamentally transform science, technology and society

- Societal and ethical implications
  - Concerns not unique to nanotechnologies but past experience with other technologies demonstrate that they will need to be addressed
    - Who controls uses of nanotechnologies?
    - Who benefits from uses of nanotechnologies?
- Technological risks
  - Mainly related to production and use of nanoparticles
    - Environmental impact
    - Adverse health effect

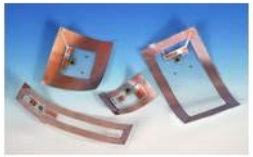
# Societal and ethical implications

MANAGING RISK DNV

The perceived opportunities and threats often stem from the same characteristics

- Convergence of nanotechnologies with information technology
  - Greater personal safety, security and individualised healthcare
  - Possibilities for business to track and monitor their products

    Privacy implications



- Convergence of nanotechnologies with biotechnology, information and cognitive sciences
  - New type of discrimination
  - Human enhancement

    Change in the perception of what is normal

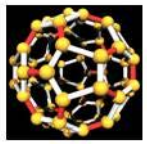

- Nano-divide
  - A minority of the world population will benefit the nanotech revolution

    The difference in life quality will be even bigger than today

# Nanoparticulate materials

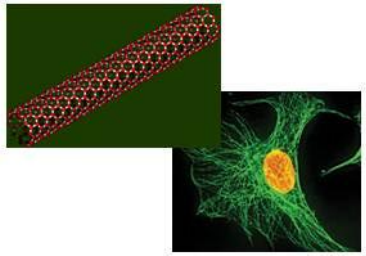
MANAGING RISK

- Nanoparticulate materials
  - 1 dimension < 100nm
    - Platelets, tubes, spheres or needle-like



e.g. nanoparticles, fullerenes (bucky-balls, carbon nanotubes), quantum dots…

- What happens at the nanoscale?
  - Tiny dimensions
  - Classic physics vs quantum effects
  - High surface reactivity



- Adverse health effects of NP are unknow and cannot be predicted from bulk material properties
  - NP should be considered as new materials

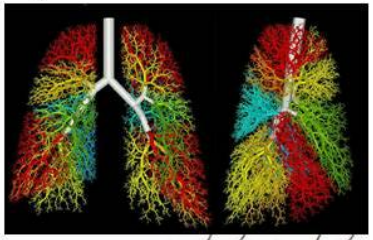
# Nanoparticulate materials interaction with human body - Portals of entry

MANAGING RISK

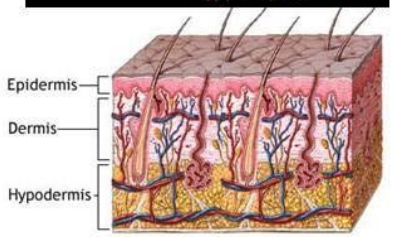
**Nanoparticles can enter the body via 4 main pathways**

- **Inhalation**
  - Airways (2300 km)
  - Alveoli (300 million)

The surface area of the lungs is ≈140m$^2$



- **Skin penetration**
  - Three layers
    - Epidermis
    - Dermis
    - Hypodermis




The skin of an adult human is roughly 1.5m$^2$

- **Digestion**

The intestinal tract has an overall surface of ≈200m$^2$

- **Medical purpose** (drug delivery systems…)

# Nanoparticulate materials – Is there any risks?

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- Translocation to organs or tissues of the body distant from the portal of entry have been observed
  - Brain
  - Nervous systems (olfactory nerves)
  - -…
- But toxicity, adverse long-term health effects and mechanisms involved are still not well documented
- Available evidence of adverse health effects on animals (rats, fish etc…) under specific test conditions

MANAGING RISK
www.dnv.com
20 January 2012
Slide 20
Version

# APPENDIX 3: TOPIC GUIDE FOR FOCUS GROUPS 2008

Outline for conversation guide – Nano-Nina

0. Introduction
   - Presentation of moderator
   - About the arrangement
   - Recording and reporting
   - Gallup's role
   - The purpose of the study
   - Presentation of the participants

1. Spontaneous conversation about science and technological development (in order to get the group going)

- What are your immediate associations to the term «modern technology»?
- Could you give me any examples of products which are better now than they were some decades ago?
- Do you have any examples of products where modern technology has not had any improvement/impact on quality or value?

## 2 General information about Nano technology

Now, we will be discussing a new type of technology, which has already been introduced into many different products, and which will continue to appear in many products in the future. This technology is referred to as Nano technology.

- What do you associate with Nano technology?

- Have you heard about it at all? If so, what have you heard?

3. Presentation of Nano-Nina

Haakon presents Nano-Nina
And points out that
.. she wears clothes and products which are available to the average consumer
..these products are not necessities, but could be classified as luxury items.
..the products have qualities, which benefit the consumer.

Then, it is Harald's turn.

There is something here worth discussing: Harald gives the group a short introduction to Nano technology and some relevant problems and consumer issues.

4. Immediate reactions

- What are your immediate reactions to this new information you have just been given?
- What do you feel most strongly about now, the wish for improved products or the fear of adverse effects?

5. Responsibilities in the value chain:

There is a value chain here, stretching from the manufacturers, through the retailers to the consumers.

Manufacturers:

- What do you expect from the manufacturers?
- What is their responsibility with regards to providing consumers with the best possible products?
- What is their responsibility with regards to the use of this technology if it is

discovered that it may lead to long-term adverse effects?

- As consumers, what would you say to the manufacturers now that you know more about Nano technology?

Retailers:

- What do you expect from the retailers and sales personnel?
- What is their responsibility with regards to providing consumers with the best possible products?
- What is their responsibility with regards to the use of this technology if it is discovered that it may lead to long-term adverse effects?
- As consumers, what would you say to the retailers now that you know more about Nano technology?

Consumers:

- As conscious consumers, what is your opinion?
- Given the choice between improved products and possible adverse effects, what should consumers consider?
    - What will they choose and why?
- What is the consumer's responsibility with regards to the use of this technology, i.e. refrain from buying such products, if it is discovered that it may lead to long-term adverse effects?
- As consumers, what would you say to the retailers now that you know more about Nano technology?

There are other parties involved here as well.

Researchers

- Responsibility and role?
- What do you expect from researchers?

Media?

- Responsibility, role, expectations?

Authorities?

- Responsibility, role, expectations?
    - Who (the Government, public consumer bodies)?

Manufacturers – retailers – consumers

- To sum up, who do you think should be responsible for what (perhaps in particular, who should be responsible for enforcing a more restrictive attitude, if it turns out that this technology may have long-term adverse effects)?
- Based on what you now know, should the use of this technology be restricted, or not?

6. Request for information

- As consumers, do you expect to be informed about this in the future?

- Who do you expect will provide the most objective information?
- If you receive conflicting information, what would you see as the most reliable source of information?
    - Politicians – What will it take to increase your trust in them?
    - Manufacturers – What will it take to increase your trust in them?
    - Researchers – What will it take to increase your trust in them?
    - Media – What will it take to increase your trust in them?
    - Consumer spokespersons – What will it take to increase your trust in them?
    - Friends/acquaintances
- If the bottom line is that consumers are the ones who decide, to what source of information will you turn in order to find

information on which you can make an independent choice?

7. An ethical dilemma – summary

A discussion like this often tends to put focus on problems and problematic areas. However, we must keep in mind that the dilemma here is the choice between improved products with clear benefits and the risk of future adverse effects, which is far from certain.

- What is your opinion of this dilemma?
- How much do you think people are willing to risk in order to have significantly improved products? How much do you think one would risk in order to get products with greater value and user comfort?
- What do you think it will take for consumers to accept that one does not exploit all new technology to improve and optimise products?

## 8. Closure

Are there other things you would like to report to SIFO, that you think may be useful to them in their work on this project?

# APPENDIX 4: INTRODUCTION TO NANOTECHNOLOGY IN FOCUS GROUPS 2008


The possibilities and challenges of the nanotechnologies
Harald Throne-Holst
SIFO

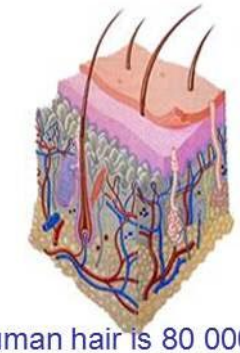
# What is nano?

If you divide a millimetre into one million equal parts – then you've got a nanometre.

Here quantum mechanics rules.

Materials get new properties in this part of the length scale.

And it is these properties that nanotechnology wants to make use of.



A human hair is 80 000 nm

# Expectations

Manufacturing:

High quality products with unique properties and functions

Self-cleaning windows

Stain-repellent and wrinkle-resistant trousers

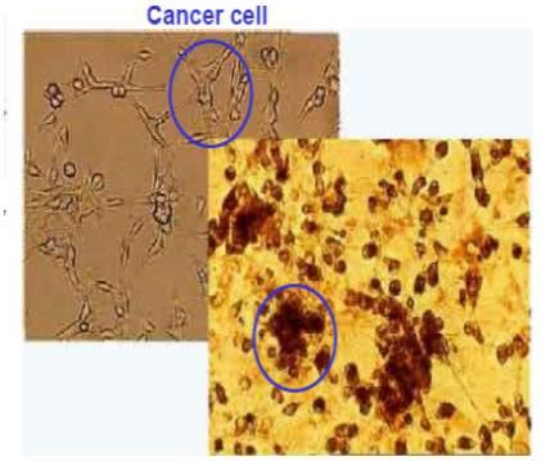
# Electronics

Electronics
Miniaturization
Increased capacity
Increased data processing and access speed
Access to unlimited data quantities


Health
Diagnose diseases at an early stage
Better treatment
Extension of expected life time
Life quality improvement
Extension of human physical capabilities
Harald Throne-Holst
SIFO

# Pharmacology

- Diagnostics, medical imaging
- Drug delivery systems
- Artificial organs, tissue engineering
- Improved implants



# Transport

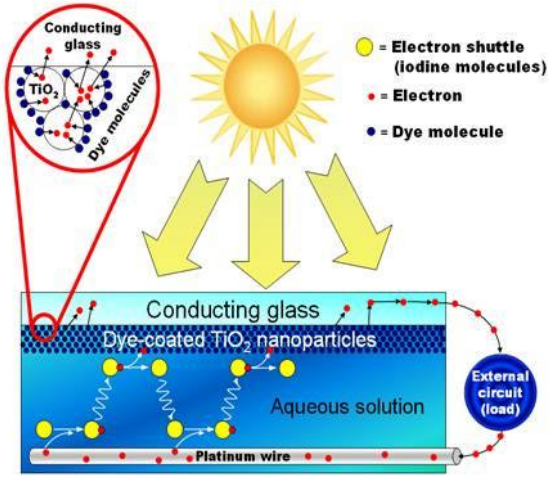
Nanomaterials and nano-electronics

Envirox fuel additive (Oxonica)

Improved wet grip, wear and rolling resistance

# Environment and sustainability

- Access to water of good quality
- Enabling renewable energy resources (Hydrogen, solar energy)
- Reduction of global energy use
- Pollution reduction
- A cleaner environment



# CHALLENGES

In 10 to 20 years, nanotechnologies will dramatically transform science, technology and society.

- **Societal and ethical implications**

-Concerns may not be unique to nanotechnology, but past experiences with other technologies demonstrate that they will need to be addressed:

- Who controls the technology? Who reaps the benefits?

- **Technological risks**

Mainly related to production and use of nanoparticles:

- Environmental impact
- Adverse health effects – a new asbestos?
  - *What happens to the nanoparticles (in the body)?*

# Society and ethics

The opportunities and threats stem from the same characteristics

Convergence with information technology

- Greater personal security
- Tracking of products
  - Privacy implications?

Convergence with biotechnology

- Human enhancement
- A new type of discrimination (insurance)
  - What can be considered normal?

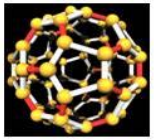
"The Nano-divide"

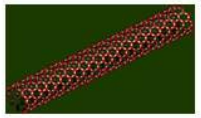
- Who can afford development and products?

# Technology

Nanoparticles: 1 dimension < 100 nm

- Small dimensions
- From classical physics to quantum mechanics
- Large surface (e.g. iron filings)





Adverse health effects are to a large degree unknown. We cannot predict them from how we know the materials on beforehand (bulk).

Should they be considered as new materials(?)

Where do the nanoparticles Some lump together

For others, their fate in the body or the environment are unknown

# Summary

**Consumers, nanotechnology and responsibility. Operationalizing the risk society.**

Nanotechnology is a set of newly emerging technologies. It bears with it promises of benefits, as well as prospects of risks. The promises concern improved diagnostics and treatment of diseases, more efficient energy production and energy use and lighter, stronger materials. Larger revenues and job creation are also part of this picture. The prospects of risk concern potential adverse effects on health and environment, but also that there are potential uncertain impacts of some of the applications of the technology.

There have been significant investments in nanotechnology from both developed as well as developing countries. Still, surveys show a rather large part of the public as being unaware of the technology. This could be considered even more surprising considering that a number of consumer products on the market claim to have a nanotechnology component. The early adoption of the technology in consumer products has accentuated the focus on risks.

Risks are high on the agenda in our society to the extent that we might refer to the society as a risk society. This indicates that risks are pervasive and have influenced our society in profound ways. The German sociologist Ulrich Beck has diagnosed a shift in the perception of risk from "early "modernity as something that was inflicted on society by external forces, to the "late" modern era were serious risks are perceived as being produced by society itself. These are risks to both society itself and to the environment: radioactivity from nuclear activities, environmental pollution and residues of toxins and pollutants in water and foodstuffs. This can also be perceived as a shift from a society concerned with the distribution of "goods" to a situation where a major concern for society is the distribution of "bads".

Into our society nano-enabled consumer products with their possible benefits and risks are introduced. And people in their role as consumers are confronted with these products from early on and their choices might have far-reaching effects. If the consumers reject the products it may have detrimental effects on the further development of and investments in nanotechnology. If, on the other hand nano-enabled consumer products are embraced by consumers it can spur further investments and developments. However, consumers have been a neglected actor in the discussions on nanotechnology.

What consumers think and do, reacting to the mixed message about benefits and risks of nanotechnology, contributes to how the risk society (with regard to nanotechnology) is filled in further, and in that sense becomes operationalized. The theme of this thesis, therefore, is not just the responses of consumers (and how others perceive these) to the introduction of nanotechnology, but also a case study of how the risk society can be operationalized.

By operationalization I here understand how risk society (in this instance) is made to work. Thus, it is an aspect of the broader question how social order is reproduced and transformed. The joint process can be indicated by speaking of reproduction/transformation: reproduction is never copying, there are always new elements, and these can grow and become transformations. And if transformation is up front (de facto and/or intended), reproduction always plays a role as well. Reproduction/transformation processes can be intentional, but also *de facto* effects of what happens for other reasons. Choices of consumers can contribute to the reproduction of a less than desirable social order, if there is no reflection on the further implications of these choices. If there is such reflection, it can still lead to reproduction, but now from a conviction that this social order is good. But it can also lead to conscious attempts to transform social order by changing own practices.

From this perspective, operationalization is not a specific activity, but part of reproduction/transformation processes in general. There is, in operationalization, more attention to articulation of what is the case. This perspective is already visible with Ulrich Beck when he speaks of ‘work of definition’ and how ’work of definition’ becomes organized differently in the risk society. The ‘work of definition’ is about increasing the definition of a situation or a phenomenon. Things become clearer, can be outlined more sharply, without a need to formulate explicit definitions. Social interactions always include more or less ‘work of definition’.

‘Work of definition’ occurs all the time, even if some actors may play a larger role than others. A special role is played by analysts like me. An analyst is

explicitly oriented towards clarification of a situation, a phenomenon or a development, although the result will not always be a direct part of ongoing reproduction/transformation processes. An example from this thesis is the analysis of labelling of nano-enabled consumer products. In a first instance the analyst will investigate what is going on and trace how the risk society is de facto operationalized. In a second instance, with the publication and dissemination of the research results, the analyst's 'work of definition' will become part of ongoing operationalization and make it more reflexive.

Traditionally the role consumers and consumption has been understood as linked to the market sphere and market exchanges, whereas the role of citizens has been linked with the political sphere and voting. Recent consumer research has indicated that there is a blurring of the borders between these two roles. Citizens frustrated by the slow working of the political system have turned to the markets which are seen to offer more efficient ways to exert power over businesses. At the same time has the view of what consumption entails changed, and it is no longer apprehended as just buying products, but that it also includes planning, using and disposing of products. The term citizen-consumers indicate this broader view. Actions of citizen-consumers can then be called political consumption: deliberate actions to change or sustain social order. As such it is reflexive operationalization. Political consumption fits well with Ulrich Beck's idea of the emergence of sub-politics, politics outside the traditional political channels, or politics from below.

There are several ways to find or create situations where 'work of definition' can be observed, and the evolving outcomes can be traced. The choice of focus group exercises as sources of data can be explained by the availability of two Norwegian focus group studies that had been conducted for other purposes (projects) were available. They were conducted in 2006 and 2008, and for both years four so-called mini-groups (with 5-6 participants) were arranged which were differentiated according to age and gender. There were anticipation of a limited knowledge of participants on nanotechnology, and this was reflected in the design of the exercises. After initial questions on different aspects of modern technology, the moderator asked the focus group participants if they knew anything about nanotechnology. After that a researcher was introduced in the focus groups and held a 20 minutes introduction to nanotechnology. Care was taken to make it a balanced presentation of both pros and cons of nanotechnology. After a round of clarifying questions, the moderator asked the participants to reflect on what they just had heard.

Such focus groups exercises can be viewed as a micro-cosmos. It is a protected space compared with the wider world, but what happens in this space reflects and to a certain extent anticipates on interactions in the wider world.

When analysing the focus group material, the transcripts of what was said, emphasis was put on the interactions between the participants, not on individual pronouncements. In the interactions the 'work of definition' becomes visible, particularly because the participants are confronted with a topic, nanotechnology and consumers, which is novel and uncertain.

Content analysis of the focus group material was directed towards identification of items. Subsequently, these were taken together, across the eight focus groups, into three clusters with a certain coherence: Trust/assurance; Balance of risks and benefits; Roles and agency. It turned out there was also a recurrent storyline in the discussions of the focus groups, a pattern of argumentation where an earlier argument calls up a subsequent argument. In summary, the storyline is: "New is worrisome"; "But old is worrisome too" and finally "Yes, new is like old – but with possible added benefits". This pattern of argumentation is the result of the interactions between the participants, one would not expect an individual on his/ her own to create this pattern. The three clusters can be linked to this storyline.

A general finding is that consumers, in interaction in the focus groups, do not limit themselves to risk, but more often discuss responsibilities, of others but also of themselves. This resonates with how Ulrich Beck links the risk society with what he calls organized irresponsibility. In the focus groups, participants go further by reflecting on how new responsibilities might be organized. For themselves as consumers, they saw only a limited responsibility, as asking for information. This is a usual response of consumers, but in the focus groups a next step was made when discussing the issue of labelling of consumer products with a nano-component. Labelling was seen as desirable, but the questions were raised what consumers should and would be able to do with such information. Here, 'work of definition' is visible.

As an analyst I built, in a later chapter, on this 'work of definition'. Labelling of products with a nano-component is pushed by and for consumers, but need not be a good measure. The considerations that emerge when consumers, in a focus group, discuss nano-consumer products are broader and might be addressed by other measures. For consumers, transparency and accountability are important, and that someone should be responsible. With product labelling, this is the consumer. In Chapter 8, other measures are discussed where producers or governments are responsible. In general, one could start

with the idea of shared responsibility, which is then differentiated and specified.

The analysis in Chapter 7 of consumer rights in the age of nanotechnology overlaps with the discussion of labelling because of 'the right to be informed' combined with the 'right to choose' two of the four basic consumer rights. Presently (2008), most consumers are not aware of nanotechnology, and information about consumer products is uneven, 'nano' being used where it does not apply, and not used where it applies. The right to safety is widely recognized as a right, but uncertainties about risks of nanotechnology and limitations of regulation create difficulties in ensuring safety. The right to be heard would have to go through consumer organizations, but the topic of nanotechnology is not high on the agenda, and the complexity of nanotechnology may limit the organizations' ability to adopt knowledge-based policies in the field. Thus, the application of the rights is not self-evident. Focus group data show that consumers think about their rights, not necessarily referring to the basic rights.

In chapter 5, views on nanotechnology and the risk society, as Beck formulated it, are traced in interviews with a variety of Norwegian stakeholders, taking the precautionary principle as a backbone of the risk society. Six topics were identified in the responses, within an overarching techno-optimistic view: (in contrast to GMO (genetically modified organisms), nanotechnology is seen as "All benefit, no risk"). For the stakeholders, the precautionary principle is a sleeping principle – until something goes wrong.

In chapter 6, I move closer to consumers by inquiring into how stakeholders (along the value chain) perceive and target consumers. Two consumer product categories, textiles and cosmetics, the two top categories where nanotechnology is used/marketed (2009), were selected. There is variety across countries in how nano is visible in marketing, even within one company like the cosmetics conglomerate L'Oréal. The chapter also pays attention to the governance challenges that are involved, where regulation has to be complemented by soft actions like codes and vigilance by various actors, i.e. distributed governance leading to distributed responsibilities.

In chapter 9 conclusions and further considerations are offered. The general conclusion is that focus group participants do 'work of definition', building on their experience and insights, and that they take home what they learned to their own situation. Many participants voiced intentions of being more aware up to the point of avoiding nano-enabled products. Generally, however, the

participants articulated an increased interest in the developments of such products.

In other words, what happens in the micro-cosmos of the focus group is part of operationalizing the risk society. Living in the risk society is complicated, and the focus group participants appear to hold contrasting views of technology, with optimistic as well as fatalistic elements. Somehow, they manage to hold these together. Also, risks are viewed as 'facts of life' in a modern society, but there is an increased concern with responsibility for risks.

A more evaluative conclusion is that consumers, in the interactions in a focus group, come with own and important considerations, definitely on the topic of responsibilities for risks and how these can be arranged. Although they see their abilities and powers as consumers as somewhat limited, they are prepared to discuss and take on responsibilities. Thus, they are assuming the role of citizen-consumers.

# Samenvatting

**Consumenten, nanotechnologie en verantwoordelijkheden.**
**Operationaliseren van de risico-samenleving.**

Nanotechnologie, een verzameling nieuw opkomende technologieën, komt met beloftes van voordelen, maar ook mogelijkheden van risico's. De beloftes verwijzen bijvoorbeeld naar betere diagnostica en behandeling van ziektes, efficiënte energie-produktie en gebruik, en lichtere en sterkere materialen.Ook economische opbrengsten en nieuwe banen staan in beeld. Risico's betreffen mogelijke nadelige effecten op gezondheid en milieu, maar slaan ook op de onzekere effecten van sommige toepassingen van de technologie.

Er zijn grote investeringen in nanotechnologie gedaan in ontwikkelde landen, maar ook in ontwikkelingslanden. Tegelijkertijd laten peilingen zien dat een groot deel van het publiek niet van de technologie afweet. Dat is des te verwonderlijker omdat er een aantal consumenten produkten op de markt zijn die claimen een nanotechnologie component te hebben. D evroege adoptie van nanotechnologie in consumentenprodukten heeft wel geleid tot discussie van risisco's.

Risico's staan hoog op de agenda in onze maatschappij, en we zouden daarom kunnen spreken van een risico samenleving. Dat accentueert dat risico's overal zijn en een diepgaande invloed hebben op onze maatschappij. De Duitse socioloog Ulrich Beck heeft benadrukt dat een verschuiving is opgetreden van de vroege moderniteit waarin risico's gezien werden als van buiten op de maatschappij afkomend, naar het huidige laat-moderne tijdperk waarin risico's gezien worden als gegenereerd door de maatschappij zelf. De

impact is zowel op de maatschappij als op het milieu: radioactiviteit vanwege nucleaire energie, milieuvervuiling en residuen van toxische stoffen in water en voedsel. Beck karakteriseert de lange-termijn ontwikkeling als een verschuiving van een maatschappij waar de verdeling van inkomsten ("goods") centraal staat, naar een maatschsappij waar de verdeling van risico's ("bads") centraal staat.

Het is in deze maatschappij dat door nanotechnologie mogelijk gemaakte consumenten produkten met hun mogelijke voordelen en risico's geïntroduceerd worden. Consumenten worden met deze produkten geconfronteerd, en de keuzes die zij maken kunnen verregaande effecten hebben. Hun afwijzen van deze produkten zal verdere ontwikkelingen en investeringen in naotechnologie kunnen benadelen. Omgekeerd, als consumenten deze produkten verwelkomen, zal de ontwikkeling doorgezet worden, met mogelijk veronachtzaming van risico's. Desondanks is er in de discussies over nanotechnologie weinig aandacht geweest voor consumenten als een actor in het spel.

Wat consumenten wel en niet denken en doen, reagerend op de gemengde boodschap over voordelen en risico's van nanotechnologie, draagt bij aan hoe de risico-samenleving (op het punt van nanotechnologie) nader wordt ingevuld en in die zin geoperationaliseerd raakt. Het thema van dit proefschift is daarom niet alleen de reacties van consumenten (en hoe andere actores deze inschatten) op de introductie van nanotechnologie, maar ook een case-study hoe de risico-samenleving geoperationaliseerd wordt.

'Operationalisering' slaat hier op hoe de risico samenleving gaat werken. Daarmee is het een aspect van de bredere vraag hoe de maatschappelijke orde wordt gereproduceerd en getransformeerd. Het gezamenlijke proces kan weergegeven worden door van reproductie/transformatie te spreken: reproductie is nooit copiëring, er zijn altijd nieuwe elementen, en deze kunnen uitgroeien tot transformaties. En als transformatie voorop staat (in feite en/of beoogd) speelt reproductie ook altijd een rol. Reproductie/transformatie processen kunnen beoogd zijn, maar ook de *de facto* effecten van wat er om andere redenen gebeurt. Keuzes van consumenten kunnen een niet zo wenselijke maatschappelijke orde reproduceren als niet nagedacht wordt over verdere implicaties van deze keuzes. Als wel nagedacht wordt kan dit nog

steeds leiden tot reproductie, maar nu vanuit de overtuiging dat deze maatschappelijke orde goed is. Maar kan ook leiden tot bewuste pogingen om de maatschappelijke orde te transformeren door de eigen praktijken te veranderen.

Vanuit dit gezichtspunt is operationalisering niet een specifieke activiteit, maar onderdeel van reproductie/transformatieprocessen in het algemeen. Er is bij operationalisering wel meer accent op articulaties van wat er aan de hand is. Dit perspectief is al zichtbaar bij Ulrich Beck wanneer hij van ‘work of definition’ spreekt, en hoe ‘work of definition’ anders georganiseerd raakt in de risico-samenleving. Het werk verwijst naar het vergroten van de gedefinieerdheid van een situatie of een verschijnsel. Zaken worden helderder, zijn scherper aan te geven, zonder dat er explciiet definities geformuleerd hoeven te worden. Sociale interacties omvatten altijd meer of minder ‘work of definition’.

‘Work of definition’ gebeurt voortdurend, al kunnen sommige actores een grotere rol spelen dan andere. Een bijzondere rol wordt gespeeld door analysten waaronder ikzelf. Een analyst is expliciet gericht op het verhelderen van een situatie, een verschijnsel of een ontwikkeling, al zal het resultaat niet altijd direct onderdeel zijn van voortgaande reproductie/transformatieprocessen. Een voorbeeld uit dit proefschrift is de analyse van etiketteren van consumentenprodukten met een nanotechnologie-component. In eerste instantie zal de analyst onderzoeken wat er aan de hand is en nagaan hoe de risico-samenleving de facto geoperationaliseerd raakt. In tweede instantie zal door het publiceren en de disseminatie van de onderzoeksresultaten het ’work of definition’ van de analyst onderdeel worden van voortgaande operationalisering, deze stimuleren en meer reflexief maken.

De traditionele opv atting van consumenten en consumptie koppelt deze aan de markt sfeer en markt interacties, terwijl de rol van burgers gekoppeld is aan de politieke sfeer en het uitbrengen van een stem. Recent consumenten onderzoek wijst erop dat deze twee rollen niet gescheiden zijn en gaan overlappen. Burgers gefrustreerd door de traagheid van het politieke systeem richten zich op markten die effektievere manieren van beïnvloeding van bedrijven lijken te bieden. Tegelijkertijd verandert de visie op wat con

sumptie inhoudt: het is niet alleen het kopen vasn produkten, maar ook met de planning wat te kopen, het gebruik ervan en de verdere verwerking. De term burger-consument beoogt deze bredere visie aan te geven. Acties van burger-consumenten kunnen dan ‘politieke consumptie’ genoemd worden: weloverwogen acties om de maatschappelijke orde te wijzigen of in stand te houden. Als zodanig is het reflexieve operationalisering. Politieke consumptie past bij Ulrich Beck’s idee van de opkomst van sub-politiek, poltiek buiten de traditionele politieke kanalen, of politiek van onderaf.

Er zijn meerdere manieren om situaties te vinden of te creëren waar ‘work of definition’ geobserveerd kan worden, en de uitkomsten getraceerd kunnen worden. In dit proefschrift is voor focusgroepen gekozen als situatie en bron van gegevens, met name omdat twee Noorse focusgroep studies beschikbaar waren, in 2006 en 2008 uitgevoerd voor een ander doel, maar geschikt voor secundaire analyse. In beide studies waren vier mini-groepen (5 of 6 deelnemers) georganiseerd, gedifferentieerd in termen van leeftijd en gender. Het ontwerp van de focusgroep-exercities hield rekening met de verwachte beperkte kennis van nanotechnologie bij de deelnemers. Beginvragen gingen over aspecten van moderne technologie in het algemeen, vervolgens vroeg de moderator of de deelnemers iets afwisten van nanotechnologie. Na deze korte discussie werd een onderzoeker geïntroduceerd in de groep welke een inleiding van 20 minuten over nanotechnologie hield. Er was aandacht besteed om het een evenwichtige presentatie van pro’s en con’s van nanotechnologie te maken. Na een ronde van vragen ter verheldering vroeg de moderator de deelnemers om te na te denken en te reflecteren op wat ze net gehoord hadden.

Zulke focusgroep-exercities kunnen gezien worden als een micro-cosmos. Het is een beschermde ruimte vergeleken met de wijdere wereld, maar wat er in deze ruimte gebeurt weerspiegelt en tot op zekere hoogte anticipeert op interacties in de wijdere wereld.

In de analyse van het focusgroep materiaal, de transcipten van wat er gezegd was, lag de nadruk op de interacties tussen deelnemers, niet op individuele uitspraken. In de interacties wordt ‘work of definition’ zichtbaar, met name omdat de deelnemers geconfronteerd worden met een onderwerp, nanotechnologie en consumenten, dat nieuw en onzeker is.

Inhoudsanalyse van het focusgroep-materiaal was gericht op het identifceren van items. Vervolgens werden deze, over de acht focusgroepen heen, samengenomen in drie clusters met een bepaalde samenhang: vertrouwen/zekerheid; balans van risico's en voordelen; rollen en 'agency'. Er bleek ook een terugkerende verhaallijn te zijn in de discussies van de focusgroepen, een argumentatiepatroon, d.w.z . een volgorde van argumentaties waarbij een eerder argument een volgend argument oproept. Kort samengevat is de verhaallijn: "Nieuw is zorgelijk"; "Maar oud (= bestaande technologieën) is ook zorgelijk"; "Inderdaad, nieuw is net als oud, maar met mogelijke extra voordelen." Dit argumentatiepatroon is het resultaat van interacties van de deelnemers, van een individu alleen verwacht men niet dat deze dit patroon zal creëren. De drie clusters kunnen gekoppeld worden aan deze verhaallijn.

Een algemene bevinding is dat consumenten, in interactie in de focusgroepen, zich niet tot risico beperken maar vooral ingaan op verantwoordelijkheden, van anderen maar ook van henzelf. Dit resoneert met hoe Ulrich Beck de risico-samenleving koppelt met wat hij noemt georganiseerde onverantwoordelijkheid. In de focusgroep gaan deelnemers verder door zich af te vragen hoe nieuwe verantwoordelijkheden georganiseerd kunnen worden. Voor henzelf als consumenten zagen zij maar een beperkte verantwoordelijkheid, met name het vragen om informatie. Dit is een gebruikelijke reactie van consumenten, maar in de focusgroepen werd verder gedacht naar aanleiding van de kwestie van etiketteren van consumentenprodukten met een nano-component. Etiketteren werd als wenselijk gezien, maar vervolgens werd gevraagd wat consumenten moeten en kunnen met dit soort informatie. Hier werd 'work of defintion' zichtbaar.

Als analyst heb ik in een later hoofdstuk, over etikettering,voortgebouwd op dit 'work of defintion'. Etikettering van produkten met een nano-component wordt gepusht door en voor consumenten, maar hoeft niet de goede maatregel te zijn. De overwegingen die naar voren komen als consumenten in een focusgroep over nano-consumentenprodukten discussiëren, zijn breder en kunnen ook door andere maatregelen geadresseerd worden. Voor consumenten zijn transparantie en toerekenbaarheid van belang, en dat er iemand verantwoordelijk moet zijn. Bij produkt-etikettering is dat de consument. In dit hoofdstuk 8 worden ook maatregelen besproken waarbij

producent of overheid verantwoordelijk zijn. In het algemeen zou als uitgangspunt een gedeelde verantwoordelijkheid genomen kunnen worden, welke dan gedifferentieerd en toegespitst kan worden.

De analyse van consumentenrechten in het tijdperk van nanotechnologie, in hoofdstuk 7, o verlapt met de discussie van etiketteren vanwege het recht geïnformeerd te zijn en het recht te kiezen, twee van de vier grondrechten van consumenten.Op dit moment (2008) zijn de meeste consumenten niet op de hoogte van nanotechnologie, en informatie over consumentenprodukten is ongelijk: nano kan worden vermeld terwijl het niet toepasbaar is, en niet vermeld terwijl het toepasbaar is. Het recht op veilgheid wordt breed erkend als een recht, maar onzekerheden over de risico's van nanotechnologie, en beperkingen van regulering creëren problemen voor het zeker stellen van veiligheid. Het recht gehoord te worden zou via consumenten-organisaties moeten lopen, maar het onderwerp nanotechnologie staat niet hoog op hun agenda, en de complexiteit van nanotechnologie kan beperkingen opleveren voor het vermogen van de organisaties om kennis-gebaseerd beleid te articuleren in dit gebied. De toepassing van de rechten is dus niet vanzelfsprekend. Focus groep gegevens tonen dat consumenten over hun rechten denken, maar niet noodzakelijk met verwijzing naar de grondrechten.

In hoofdstuk 5 worden visies op nanotechnologie en de risico-samenleving, zoals door Beck geformuleerd, getraceerd in interviews met een verscheidenheid aan stakeholders in Noorwegen, waarbij het voorzorgsbeginsef als een kernpunt van de risico-samenleving genomen werd. Zes kwesties werden ondescheiden in de antwoorden, binnen een overkoepelende techno-optimistische visie: in tegenstelling tot GMO (genetisch gemodificeerde organismen) wordt nanotechnologie gezien als "Alleen voordelen, geen risico's". Voor de stakeholders is het voorzorgsbeginsel een slapende regel – tot er iets mis gaat.

In hoofdstuk 6 kom ik dichter bij consumenten door na te gaan hoe stakeholders (in de waardeketen) consumenten zien en als doelgroep benaderen. Twee categorieën van consumentenprodukten, textiel en cosmetica, de twee topcategorieën waarin nanotechnologie gebruikt en gemarket wordt (in 2009), werden gekozen. Er is verscheidenheid tussen landen in hoe nano in marketing zichtbaar is, zelfs binnen één bedrijf zoals het

cosmetica conglomeraat L'Oréal. Het hoofdstuk besteedt ook aandacht aan de governance uitdagingen die spelen, waar regulering gecomplementeerd moet worden door zachte acties zoals gedragscodes en waakzaamheid van verschillende actores – dat wil zeggen, verdeelde governance wat leidt tot verdeelde verantwoordelijkheden.

In hoofdstuk 9 worden conclusies en verdere beschowingen gegeven. De algemene conclusie is dat focusgroep-deelnemers 'work of definition' doen, voortbouwend op ervaringen en inzichten, en dat ze de resulterende inzichten meenemen naar hun eigen situatie. Veel deelnemers spraken hun bedoeling uit meer op de hoogte te zijn, en eventueel nano-produkten te vermijden. In het algemeen echter articuleerden de deelnemers een toenemende interesse in de ontwikkeling van zulke produkten.

Met andere woorden, wat in de micro-cosmos van de focusgroep gebeurt is onderdeel van de operationalisering van de risico-samenleving. Leven in de risico-samenleving is complex en de focus groep-deelnemers blijken contrasterende visies op technologie te hebben, met optimistische zowel als fatalistische elementen. Op de één of andere manier slagen ze erin deze samen te houden. Ze zien risico's ook als een 'fact of life' in de moderne maatschappij, maar er is toenemende bezorgdheid over verantwoordelijkheid voor risico's.

Een meer evaluatieve conclusie is dat consumenten, in de interacties in een focusgroep, met eigen en belangrijke overwegingen komen, met name ook op het punt van verantwoordelijkheden en hoe deze gearrangeerd kunnen worden. Ze zijn realistisch over hun eigen beperkte rol, maar wel bereid verantwoordelijkheden te dragen. Zo vullen ze dus de rol van burger-consument in.

# Curriculum Vitae

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