

## **Mode 2, Systems Differentiation and the Significance of Politico-Cultural Variety**

Reflections on the theoretical foundation of comparative analysis of public engagement practices

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### **Abstract**

The article suggests that research on public engagement with science and technology suffers from an unfortunate deficit of (cross-national) comparative research. It examines the so-called 'mode 2 diagnosis' (Nowotny et al. 2001) and the relevance of the concept of 'socially robust' knowledge production for comparative research on public engagement practices. While providing a stimulating perspective on the novel ways in which techno-scientific innovation must be legitimised in contemporary society, the diagnosis suffers from certain conceptual deficits, which inhibit the ability to conceptualise cross-national variation in a systematic manner. Through a confrontation of the mode 2 thesis with competing theoretical approaches, the article suggests that, rather than assuming transgressions between 'science' and 'society', research must distinguish between societal (de-)differentiation and organisational reconfigurations (Luhmann). Furthermore, the concept of political culture (Jasanoff) is discussed as a tool with which to examine cross-national variation in public engagement practices. Towards the end, suggestions for empirical research building upon the discussed concepts are briefly outlined.

## 1 Introduction

A significant current of STS is devoted to examining how contemporary developments in the relations between 'science' and 'society' have resulted in a rising demand for new, more inclusive modes of governance of science and innovation. It is often argued that an expanded *public engagement* with science and technology is desirable for both normative and pragmatic reasons (e.g. Renn et al. 1995, Durant 1999, Pellizzioni 1999). Such arguments have initiated a lot of normative reflection on the benefits of public participation (e.g. Sclove 1995, Fischer 2000), a search for evaluative yardsticks for participatory processes (e.g. Rowe and Frewer 2000) and a plethora of case studies on public engagement practices. Much of this literature, however, seems to fall into one of two categories.

- It either argues in a rather abstract and generalising manner – seemingly context-independent (e.g. Joss 2002, Edwards 1999, Hennen 1999) –
- or it pertains to specific single-case studies, which are by nature analytically inseparable from their politico-cultural contexts (e.g. Marris and Joly 1999, Guston 1999).

Surprisingly little research on public engagement practices proceeds in a comparative manner between these two poles (see, however, Joss and Bellucci 2002). This contrasts notably with other areas of STS, e.g. analysis of science and innovation policies or risk governance, where there is a well-established tradition for cross-national comparisons. Comparisons exist between different procedural designs for public participation (e.g. Renn et al. 1995, Bora and Abels 2004), but they rarely contain systematic examinations of the interaction between such procedures and the surrounding politico-cultural environment (see, however, Bora and Hausendorfer 2006, Dryzek et al. 2009).

This is both puzzling and unsatisfactory as comparisons provide rich sources of

data and experience, likely to help better understand the potentials and limitations of different modes of engagement in different contexts (e.g. Hansen 2006). In this paper I argue that in the future, research on public engagement practices ought to be strengthened through comparative approaches, and I discuss some theoretical tools that might facilitate such research.

### *Challenges of comparative research*

Comparative research, however, presents its own challenges. In this paper I address an important epistemic challenge relating to this kind of research for which the dominant theoretical perspectives in this area provide little assistance. This concerns the problem of how to calibrate our tools of observation.

- On the one hand these tools must enable us to pay proper attention to the specificities of particular cases embedded in a particular politico-cultural context.
- On the other, this must be balanced with the need to render cases comparable along dimensions of general analytical relevance.

In short, how do we distinguish between what is particular and what is common to processes of public engagement when researching across different contexts?

### *Mode 2 thesis*

The starting point for this discussion is the account of the rising demand for public engagement that can be found in the influential diagnosis by Gibbons, Nowotny and colleagues (Gibbons et al. 1994, Nowotny et al. 2001). They claim that we are moving from a 'mode 1' to a 'mode 2' type of knowledge production, which impinges significantly on the ways in which technological innovation can, and must be legitimised. This diagnosis delivers an original and stimulating perspective that promises to ground the normative, cognitive and pragmatic dimensions of

public engagement procedures in a dynamic understanding of wider ongoing changes in science/society interactions. However, it also entails some overtly homogenising assumptions, which are less conducive for the kind of cross-national comparisons I am pleading for, as politico-cultural differences seem to drop below the research radar in their analyses.

The point I wish to argue, in short, is that the mode 2 diagnosis – along with similar concepts currently informing STS research – entails some important observations of the social transformations which today make public engagement seem indispensable. However, in its eagerness to capture what is novel, the diagnosis neglects to examine how these changes operate in different settings, thus devoting insufficient attention to the potential of comparative research. For instance, an otherwise stimulating and innovative research project in this STS tradition on ‘Participatory Governance and Institutional Innovation’ seems more preoccupied with establishing communalities across cases that indicate a general ‘re-thinking of political space’ than with examining diversities in the appropriation of new life science developments across Europe (Gottweis and Brown 2007, Gottweis 2008).<sup>1</sup> In the mode 2 framework, this problem, I will argue, is attenuated by an insufficient social-theoretical grounding of the diagnosis, which hinders rather than facilitates its empirical applicability. Therefore, the diagnosis needs to be conceptually sharpened and sensitised towards politico-cultural variation (see also Shinn 2002).

<sup>1</sup> Admittedly, the project quoted here does not rely on the mode 1/mode 2 distinction, but it nonetheless embodies similar assumptions about a fundamental reconfiguration in the relationship between science and society, as “Governance is faced with new challenges in this newly developing setting of ‘blurred boundaries’ between science and politics...” (Gottweis 2008: 267), while paying only superficial attention to any cross-national variation, which is clearly visible in the reported empirical material.

## Content

To clarify this argument I will proceed in three steps: firstly, I will briefly recount the central claims of the mode 2 diagnosis and why this kind of reasoning has become central to the study of public engagement processes (Chapter 2). Then I address some conceptual problems entailed in the theoretical grounding of the diagnosis. For this purpose I rely on the work of the German sociologist Niklas Luhmann, which will be used to suggest an alternative and conceptually more stringent view on the social dynamic involved in contemporary science/society interactions (Chapter 3). However, Luhmann also operates at a rather general level of theorising. Therefore, thirdly, I will discuss the concept of political culture as it has been reintroduced in STS by Sheila Jasanoff (Chapter 4). I use this to suggest a more systematic approach to observing variations in the politico-cultural contexts of public engagement processes, which is compatible with the systems theoretical understanding of the interaction between ‘science’ and ‘society’. The argument of the paper is conceptual, but towards the end I offer some suggestions for a comparative research agenda on public engagement with science.

## 2 Public engagement as the product of changing relations between science and society

The pleas for expanded public engagement with science and technology are usually linked to changes in the role played by science in society. Influential contemporary contributions in STS suggest that in the past, science constituted an isolated and autonomous space adhering primarily to its own logic, whereas the safeguarding of legitimacy of its use in technological innovation was a matter for politics. Now, in contrast, knowledge producers and innovators are allegedly confronted much more directly with demands from stakeholders and the general public.

Analyses of these developments are found under headings such as ‘mode

2 knowledge production' (Gibbons et al. 1994, Nowotny et al. 2001), 'Post-normal science' (Funtowicz and Ravetz 1993), 'Triple Helix' (Etzkowitz and Leydesdorff 2000) and the image of a shift from 'science' to 'research' (Latour 1998).<sup>2</sup>

### *Social robustness*

Claims that a transformation or possible breakdown of previously well-established disciplinary boundaries and institutional frameworks is taking place are common to these approaches. This creates a larger role to the various users and publics of scientific knowledge. In short, the *making* and *quality assessment* of new knowledge is said to become more directly implicated with the public *acceptability* and *legitimacy* of its application through techno-scientific innovation. To describe such novel quality requirements for knowledge and innovation, Nowotny and colleagues have coined the term 'social robustness'. By *social robustness* they understand a particular social quality of process of knowledge production. Social robustness ensures innovations are likely to be met with acceptance among those affected by it. In contrast, such acceptance is more difficult to ensure for knowledge claims, products and modes of governance that rely only on a conventional cognitive authority of scientific expertise (see also Ravetz 2004).

The concept of 'social robustness' seems to capture the central goal of most public engagement processes very well. It has become a topic widely used in discussions on how to deal with controversies over new technologies, though mostly in a heuristic fashion

<sup>2</sup> In the remainder of the paper I take the 'mode 2' framework as symptomatic of this broader trend. It is of course debatable how representative the mode 2 framework is for the wider thinking in STS. However, it is striking how often one comes across reference to the concepts of 'mode 2' and 'social robust knowledge' in the literature – often quoting the diagnosis as if it was in fact a proven state of affairs (for an assessment of the impact of the diagnosis see Hessels and van Lente 2008).

(see e.g. the discussion in Wynne et al. 2007). Here, however, I intend to examine the analytical value of the diagnosis for a comparative research agenda more closely.

## **2.1 Science/society interactions changing from mode 1 to mode 2**

The mode 2 diagnosis has been set out in two books and a number of papers. In particular, *Re-thinking Science* (Nowotny et al. 2001) attempts to provide the thesis with a more solid sociological foundation, and this is the work I will primarily refer to. In order to set the stage, let us briefly recount the four inter-related processes allegedly constituting the epochal change from 'mode 1' to 'mode 2'.

### *Co-evolution*

Firstly, the authors suggest that science and society have entered a process of co-evolution. Whereas science in classical modernity (mode 1) historically fought for, and achieved cognitive autonomy from the surrounding society, and this society was a mostly passive recipient of the knowledge produced, the two are now much more closely connected. Due to the intertwining of science and technology into 'technoscience' (e.g. Haraway 1997), scientific knowledge production now has a much more direct impact on society than was the case earlier. 'Society' therefore reacts with attempts to influence science much more vigorously than before. These attempts are successful to the extent that the two now co-evolve, making it difficult to separate developments in the two domains from each other. The increased interaction is summed up in an often quoted passage: "In modern times science has always 'spoken' to society... But society now 'speaks back' to science" (Nowotny et al. 2001: 50).

### *Contextualization*

Secondly, and closely related, knowledge production is increasingly 'contextualised'. Scientific research is shift-

ing focus from 'deciphering' the mechanisms of nature to actively 'producing' them. For instance, science no longer aims only to understand chemical and biological processes; it actively creates them in, for example, genetic engineering and nanotechnology. As a consequence, the traditional distinction between 'context of discovery' and 'context of justification' is circumvented and the validation of knowledge is increasingly undertaken in a 'context of application', where knowledge claims are evaluated not by their epistemic truth-content, but by their ability to facilitate instrumental mastery over physical, chemical and biological processes. In this process, the practices of knowledge production are spreading beyond their traditional institutional location in universities and public research institutes into much wider networks of activities and organisations.

### *Applicability*

Furthermore, therefore, the principles of quality assessment in knowledge production are changing. In mode 2 the mechanisms of peer-review are being replaced by assessments of applicability of the produced knowledge. This makes forms of knowledge that are not only cognitively reliable but 'socially robust' the ideal. In effect, scientific credentials are no longer sufficient to ensure the acceptance of knowledge claims and products of innovation. These are now required to win the acceptance of broader circles of stakeholders, usually on a more varied basis, including ecological, ethical and socio-economic criteria. This argument is not dissimilar to what Funtowicz and Ravetz (1993) call 'extended peer review' and, as I understand it, Latour's more metaphorical notion of a 'Parliament of Things' (Latour 2004).

### *Socially distributed expertise*

In addition these developments change the role of experts and the use of expertise throughout society. Expertise becomes, as the authors formulate it,

'socially distributed'. The links between individual experts and their disciplinary and institutional background become much more fragmented than before. Expertise is becoming 'transgressive', as experts are expected to provide answers to pressing public issues that lie beyond their disciplinary background, even beyond what is normally considered the domain of science (Nowotny 2000). Likewise, persons without scientific credentials are increasingly consulted as experts, such as journalists, practitioners of alternative medicine, representatives of NGOs and patients' organisations. As a consequence, the performance of expertise is moved into the public sphere (or the *Agora*), where different selection criteria are applied to determine relevance and validity of the contributions than in traditional contexts of scientific communication.

The effect of this alleged shift from mode 1 to mode 2 is that "(i)instead of being clearly demarcated from other forms of social practice, and far from being uniform or unified, science itself now consists of a set of complex practices, deeply embroiled, integrated and implicated with society" (Nowotny et al. 2001: 230). This, in effect, amounts to processes of transgressions of institutional boundaries and a wide-ranging societal de-differentiation (ibid: 32, Shinn 2002).

This diagnosis is highly relevant for the study of public engagement processes for two reasons.

### *Public involvement*

Firstly, the image of 'social robustness' captures well the overall ambition of most public engagement processes whatever their specific format (Hansen 2006, Hansen, *forthcoming*). The aim of most public engagement processes – at least according to their self-understanding – is to draw in various ways upon the experiences, knowledge and concerns of 'ordinary people' in order to develop science and technology in better accordance with the

broader values and goals of the societies into which they are introduced.

### *Society speaking back*

Secondly, public engagement exercises constitute institutional loci where 'society' is actually given an opportunity to 'speak back' to science – even if this 'speaking back' is often mediated via politics, which is usually the immediate addressee of public engagement exercises, such as consensus conferences, citizen juries, participatory technology assessments or large-scale, organised public debates such as 'GM Nation?' in the UK (Horlick-Jones et al. 2007).

However, the ambition is that such forums of articulation operate as part of the *Agora* and will have effects on the processes of techno-scientific innovation. If the 'speaking back' thesis is correct, public engagement processes should therefore be one of the places to study how this actually happens in more detail.

## **2.2 Does mode 2 strike in the same way everywhere?**

The analyses by Nowotny et al. have produced both a lot of enthusiasm and important criticism.<sup>3</sup> This shall not be reiterated here (see Hessels and van Lente 2008 for an overview). One issue, however, is absent from the discussions of the merits of the mode 2 diagnosis, namely to what extent these developments unfold in a homogeneous manner across different countries, regions and sectors (see, however, Shinn

<sup>3</sup> The enthusiasm seems to emerge in part from policy analysts and research managers looking for new ways of understanding and governing a very dynamic knowledge producing landscape, and in part from disgruntled academics seeing mode 2 as a rather accurate description of processes they perceive to undermine academic freedom and critical inquiry. Much of the criticism, on the other hand, has emerged from scholars who argue that the diagnosis is largely impressionistic and unsubstantiated by more systematic historical and contemporary empirical inquiries, arguing that the tendencies are neither as new nor as strong as the proponents of mode 2 seem to suggest (Weingart 1997, Pestre 2000, 2003, Shinn 2002).

2002). The proponents seem to be writing about everywhere and nowhere in particular, giving no indication of the scope or validity of their analysis.

### *Convergence?*

This means that the diagnosis ends up reading like an *implicit thesis of convergence*, seemingly suggesting that all modern societies are affected by the transformations in equal measure and in similar ways.<sup>4</sup> While the attempt to bring together a lot of tendencies in one distinction clearly gives the framework a strong diagnostic edge which probably accounts for a lot of its popularity, it tends to conceptually obscure the fact that these developments may appear in different manners and at different rates in different contexts.

### *Meso and macro level*

I will argue that this lack of attention to politico-cultural variety in science/society interaction can be attributed to an untenable extrapolation of empirical observations at the organisational (meso) level into theoretical propositions at the societal (macro) level, which makes 'local' variation seem analytically insignificant. The question in this context is thus how this implicit assumption of convergence can be transformed from a conceptual a priori into a question suitable for a theoretically grounded, empirical examination, while retaining the original insights and intuitions of the mode 2 approach.

Depending on theoretical perspective, there are undoubtedly several possible ways forward from this problem. In the

<sup>4</sup> To be fair to the authors, it should be noted that to my knowledge they do not anywhere explicitly claim that contemporary societies do in fact converge on a shared mode 2 pattern. Rather, it seems they abstain from addressing this issue altogether, which is why I suggest that the diagnosis entails an *implicit thesis of convergence*. However, in particular, since the diagnosis seems increasingly to inspire policy makers in quite different contexts, it may be considered as an important deficit that this issue is not addressed at all. If local circumstances and specificities are paid insufficient attention, unfortunate implications may be drawn for policy making.

following I will propose one based on a confrontation of the mode 2 thesis with the systems theoretical approach of Luhmann and scholars inspired by him. This confrontation will address two interrelated aspects of the mode 2 approach, which are problematic for a comparative research agenda, namely

1. that the diagnosis exaggerates the processes of societal de-differentiation in a manner that is conceptually paradoxical and
2. that it fails to distinguish analytically between changes in the mutual interaction between societal subsystems and changes occurring in the organisations producing and governing innovation.

I do not mean to suggest that a Luhmann-inspired framework is the only possible fruitful basis of a comparative research agenda on public engagement processes. However, I intend to show that it can provide some conceptual clarification, which might help balance research between shared analytical dimensions and the specifics of particular cases in a productive manner.

### **2.3 Are societal borders really transgressed?**

In their attempt to provide their diagnosis with a sociological basis, the authors themselves make explicit reference to Luhmann's work on modern societies in several places (e.g. Nowotny et al. 2001: 34, 201–202, 236–237). However, they part with one of Luhmann's primary theoretical assumptions when they claim that processes of 'transgression' between different sectors of society render his analysis of societal differentiation outdated (Nowotny et al. 2001: 28, 32).

The Luhmannian conceptualisation of societal differentiation is certainly not uncontested. However, the general idea underlying it dates back at least to Max Weber. Indeed, the mode 2 authors themselves accept it as a valid description of Western societies until the onset of the changes they seek to diagnose.

Hence, claiming the end of differentiation as a fundamental structuring principle of modern society is a rather bold move. Unfortunately, it comes across more as a postulate than a substantiated analysis explicating and examining the conditions that must be fulfilled to verify the claim. All the examples provided to illustrate the processes of de-differentiation seem to hint at organisational rather than socio-structural transgressions. This has paradoxical analytical implications, as the diagnosis in fact relies on categories it claims are dissolving. It continues to speak about 'science', 'the economy' and 'politics', claiming that the borders between them are dissolving, but without reflecting on the implications of the diagnosis for the analytical consistency of these concepts.

#### *Dissolving boundaries?*

There are many indications that science and knowledge production today is organised differently in important respects than, say, 50 or just 20 years ago and interacts in different ways with the surrounding society, including its various publics, as the mode 2 proponents argue forcefully. It seems beyond dispute that scientists and scientific institutions today are exposed to more direct demands to legitimise and justify themselves in the eyes of the public and political decision-makers compared to earlier times. However, in order to make this comparison at all, some degree of continuity is required in the manner in which 'science' is observed. Claiming that the boundaries between 'science' and 'society' are blurring or dissolving does not seem analytically helpful.

#### *Necessary distinctions*

My suggestion, following Luhmann, is that such continuity can be found in the understanding of science as a self-referential, communicative subsystem of society (compare Leydesdorff 2007), which is distinct from – but coupled with – other societal subsystems and organisations. Of course, the boundaries between science and the surrounding

society depend on perpetually ongoing 'boundary work', but they nonetheless designate socially significant distinctions that should not be overlooked or abandoned for both analytical and normative reasons.<sup>5</sup>

### 3 The Luhmannian perspective

In order to elaborate this point, I shall briefly expand on the principle of societal differentiation. In its essence, societal differentiation according to Luhmann means that distinct and specialised domains of communication have evolved historically, such as politics, the economy, law, science, religion, education, the mass media etc, which produce mutually exclusive patterns and networks of communication (e.g. Luhmann 1989), just as they produce their own idiosyncratic structures of meaning and motives for action.

#### *Codes and communication media*

In Luhmann's formulation, societal subsystems are conceived of as self-referential systems, operating by means of mutually exclusive, binary codes of communication. Scientific communication is guided by the distinction between true/false, economic communication between payment/non-payment, political communication between government/opposition, judicial communication between legal/illegal, to mention just some of the most prominent systems constituting modern society (Luhmann 1989). These distinctions structure communication in their respective

<sup>5</sup> Although STS scholars have spent the last decades opening up the 'black box' of science and showing how science in manifold ways is interacting with the surrounding society, it seems that there is now a re-emerging interest in also understanding what is particular about science for both analytical and normative reasons. As argued by Pestre in a recent article: "... while STS scholars claim that politics and science are organically intertwined and continuous, scholars also know well how to distinguish them. To say that science and politics are organically dependent does not imply that they are identical, that all claims are worth the same, that we are unable to make distinctions" (Pestre 2008: 113, see also Collins and Evans 2002).

domains by selecting between relevant and irrelevant contributions to communication, and they ensure continuity in the operations of the systems. These differentiated communicative systems by definition do not 'overlap' or 'intermingle' as they observe themselves and their respective environments in different ways, but they mutually condition each others' operations in ways that fundamentally shape the dynamics of modern society.

#### *Structural coupling*

The distinct modes of communication mean that the systems cannot replace each other (e.g. political communication cannot produce scientific truths, just as scientific communication cannot produce collectively binding decisions etc). They also render systems mutually intransparent (e.g. political communication can achieve only a rudimentary understanding of scientific communication and vice versa). At the same time, the systems are mutually dependent as each system maintains functions that are indispensable for the continued operation of other systems. As such, the systems are simultaneously locked into each other ('structurally coupled' as Luhmann calls it) and autonomous in their operations ('autopoietic' as Luhmann calls it).

In Luhmann's view, this combination of autonomy and interdependence accounts for the proliferation of risks and legitimacy deficits in contemporary societies, exactly because unforeseeable feed-back mechanisms constantly operate in the mutual interactions between these coupled systems (Luhmann 1993).

### 3.1 Adaptive systems

Inspired by Luhmann, Peter Weingart suggests that it is important to maintain an understanding of science as a particular and distinct mode of communication 'within' and as part of society, which exists alongside other domains of specialised communication (Weingart 2005). Thus understood, the scientific system can be observed as evolving



over time, gradually modifying the criteria, designating appropriate and inappropriate ways to communicate in the scientific truth-code – often in response to events in the environment of the scientific system. However, the modification of these criteria occurs in the course of the recursive communication in the system as learning or adaptation, and not as a replacement of the true/false distinction with an economic, political or legal logic, as implied in the de-differentiation thesis. In this respect, we can say that science continues to be ‘self-referential’, as it is hard to conceive of communication claiming to be scientific (and accepted as such, rather than simply ignored), which does not in the final instance recur upon a distinction between true and false, and does so in reference to previous scientific communication.<sup>6</sup>

#### *Decreasing distance*

Yet, with a keen eye to the empirical tendencies motivating the mode 2 diagnosis, Weingart suggests that in many areas the social distance between science and other modes of communication is decreasing. Other social activities such as technological innovation and legal regulation increasingly rely on scientific knowledge, which has repercussions for the way knowledge production is organised socially and unfolds over time. However, instead of talking about a general intermingling of ‘science’ with a rather encompassing

image of ‘society’, we need to be specific in our observations on how the scientific mode of communication is conditioned and itself conditions other modes of communication, rooted in other domains of modern society.

Weingart thus suggests that it is both necessary and important to differentiate between observations of specific interlinked processes of, respectively, ‘scientification of politics’ and ‘politicisation of science’; ‘scientification of innovation’ and ‘commercialisation of science’ etc. For instance, when political competition over how to solve pressing social problems is coupled to scientific knowledge at the forefront of research, knowledge production is put under pressure to deliver results fast. This may circumvent the more conventional means of asserting scientific quality, which often works at a slower pace than the political agenda.

#### *Resonance*

However, politics still rely on the cognitive authority of science for legitimacy; it cannot manufacture ‘truths’ itself. The perspective suggested here thus amounts to observing in detail how communication originating within each of these systems *resonates* still more strongly with each other (Weingart 2005: 124) but without losing their domain-specific characteristics.

‘Resonance’ occurs when communication in one context is observed and has effects in other contexts. The concept of resonance has the advantage of pointing out that interaction effects between different systems may be non-linear and very difficult to predict. One consequence of this perspective is an assumption that it is still feasible and important to distinguish between the different modes of communication and horizons of meaning within which actors move, even if they need to alternate still more agilely between them, for instance as ‘academic entrepreneurs’ (see e.g. Vallas and Kleinman 2008).

<sup>6</sup> Even in the most fierce controversies over new technologies, the antagonists usually struggle about what constitutes *adequate* scientific concepts and evidence, and what kind of institutional embedding might render scientists trustworthy, not whether science as such is a relevant resource and scientific reasoning should be abandoned altogether. At the very least, those claiming science to be irrelevant assume a heavy argumentative burden, abandoning one of the strongest sources of cultural authority in modern society. When science is being criticised it is usually for being the ‘wrong kind’ of science or for being infused with other, e.g. commercial, interests, which is exactly an appeal for upholding the principles of societal differentiation.

### 3.2 Distinguishing societal differentiation and organisational transformations

As suggested above, the de-differentiation thesis seems to be based on an untenable extrapolation of changes at the organisational level to the level of societal macro-structures. This is unfortunate, as it may limit the ability to conceptualise and observe varieties in these processes more precisely. In the following I will contrast this with a systems theoretical perspective that distinguishes between the communicative subsystems of society described above and the organisations hosting such communication. The mode 2 authors argue that:

*"... just as the boundaries between state, market, culture and science are becoming increasingly fuzzy, so too are those between universities, research councils, government research establishments, industrial R&D, even other knowledge institutions"* (Nowotny et al. 2001: 166).

#### *Two levels of social reality*

My point is that in order to understand the second kind of fuzziness and reconfigurations, we do not need to assume the first one – rather on the contrary. Varieties of the second – the organisational changes – can be made better sense of if the two levels of social reality are considered as analytically distinct, yet intimately coupled. In fact, the principle of societal differentiation seems to be an implicit, if unrecognised, basis of most organisational theories (Tacke 2001), meaning that our understanding of the dynamics of organisations (implicitly) relies on an understanding of the societal environment as functionally differentiated.

#### *Organisations*

In distinction to societal subsystems, organisations are social systems of communication characterised by two features:

1. They have 'members'. This means that they distinguish between and actively regulate who belongs in the

organisation and who does not, and they ascribe various 'roles' to these members (that is, they produce behavioural expectations).

2. Organisations operate recursively by making 'decisions'. This means that the identity of an organisation is maintained (or changed) through the continued, recursive references to past decisions as the basis of present decisions (Luhmann 1993: 188–190).

The decisive point here is that unlike the societal subsystems, organisations do not operate with reference to one particular code. Instead they must sequentially (or serially) process a multiplicity of codes.

#### *Organisation and society*

The relationship between societal subsystems and organisations is complex, characterised by numerous couplings and mutual feed-back mechanisms. While the societal subsystems rely on organisations, and many organisations constitute their identity around their affiliation to a specific subsystem, no organisations can operate exclusively on the basis of a single communicative code. For instance, a research organisation may see its primary task in the production of new knowledge and contribution to scientific communication. However, to achieve these aims, it needs to ensure adequate funding and staffing, observe the limits of the law and often secure political and possibly public support etc.

In short, while it has a scientific identity, it must also have a capacity to observe and participate in other types of communication. In analytical terms this means that organisations alternate between contributing to the communication of different systemic domains, not that the codes of these different domains fuse or overlap. At any specific point in time, the members of an organisation must decide the appropriate mode of communication, be it scientific, economic, legal, or political etc., and adjust their contributions accordingly.

Therefore, the fact that parliaments these days tend to take a stronger interest in research priorities, and research organisations may feel compelled to modify their priorities accordingly to maintain funding, does not warrant a claim that science and politics are fusing together. It suffices to say that there are stronger resonances between these domains – and that such resonances may occur in unexpected and unplanned manners, which must be studied empirically (e.g. Gläser et al. 2008).

### *Re-thinking mode 2*

The point I wish to emphasise is that analytically it is desirable to distinguish between the communication that constitutes the societal subsystems and organisational communication. The societal systems produce distinct horizons of meaning and organisational communication must alternate between these horizons – possibly at still more rapid intervals. By maintaining this distinction some of the conceptual inconsistencies of the mode 2 framework can be avoided. When considered in these terms, the social processes observed by the mode 2 diagnosis can be interpreted as an expression that

1. the structural couplings between the societal systems are becoming stronger, meaning that the mutual conditioning of their operations are intensified (e.g. the ability to produce economic profit is still more tightly coupled to the ability to produce new knowledge) and
2. that new types of *organisations* are evolving (or old ones changing), which are defined in their identities and self-descriptions as operating at the intersection of a multiplicity of societal subsystems.

In other words, the demand for ‘poly-contextual’ capacities of many organisations involved with the production, validation and legitimation of new knowledge is increasing, and the manner in which they recruit and circulate their members is changing accordingly.

Formulated in these terms, ‘social robustness’ means that organisations are able to fulfil a multitude of expectations, from a multitude of constituencies, which may be manifested in several codes.

### **3.3 Public engagement procedures as poly-contextual organisations**

Because of the developments described above, some organisations are increasingly forced to pay attention to many different concerns simultaneously, including more unspecific concerns of ‘the public’ observed in controversies over new technologies. By ‘unspecific’ I mean here concerns that cannot be neatly categorised as science-based (i.e. pertaining to known physical risks), legal, economic or the like, as appearing from the perspective of scientists, regulators and business operators. This is not a claim that such concerns are void of substance, but the fact that they do not fit neatly within existing, institutionalised frameworks, goes a long way in explaining why they are difficult to handle by conventional means of governance, which are usually geared according to the principles of societal differentiation.

An example of this can be seen in the preparation of the ‘GM Nation?’ public engagement exercise in the UK (Horlick-Jones et al. 2007, Hansen, *forthcoming*, see also Kurath, *this issue*), where the organisers conducted a series of focus groups in order to formulate the agenda of the debate according to the concerns of ‘the public’. This made the organisers observe that

*“... the general public did not demarcate issues and facts into categories of ethics, science, economics etc., as policy makers and professionals tended to ... People approached GM issues through their lived experience (food, my family’s health and future, and the cost to me), not experiences of GM as such, or a ‘debate.’”*

(Minutes of the GM Nation? Steering Board meeting, December 2002, §6; compare further Marris et al. 2001)

### *Organised participation*

The perspective advanced here suggests that public engagement procedures can therefore be considered as *organisations*, the aim of which it is to relay such concerns into forms that are observable/relevant from the perspective of systemic logics, thus seeking to render the operation of such systems more 'socially robust'. Whatever their particular procedural format as citizens' juries, consensus conferences, planning cells or something else, participatory procedures as organisational systems include (different kinds of) members, towards whom different role expectations are directed. This increasingly entails the inclusion of a new category of members, 'lay people', who are introduced in various ways to deliberate on new technologies and – so it is hoped – to mediate between different systemic perspectives from a 'common sense' perspective (Evans and Plows 2007). Such procedures can be considered organisations that need to make decisions, both on 'internal' procedural issues (selecting participants, distributing roles, setting agendas etc.) and about what to communicate to the surrounding world as outcomes. Except in extreme cases, these outcomes will transcend the viewpoints of the individual participants and be a genuinely organisational product.

### *Structural logic and local context*

The analytical advantage of distinguishing between an 'autopoietic' dynamic of societal subsystems and an organisational level when analysing public engagement processes comparatively is that it can help conceptualise more specifically how similar societal 'master-trends' may have different local manifestations (Hansen 2006, Hagendijk and Irwin 2006). It directs attention to the fact that,

- on the one hand, there may simultaneously be a general structural logic in play across contemporary societies caused by intensified mutual

interaction between science, politics and the economy etc., changing the social expectations directed at knowledge production;

- yet, on the other hand, this will most likely assume different organisational or institutional forms in specific national or sectoral contexts.

In theoretical terms, this means that the general societal differentiation is 'over-layered' by differentiations in time and space, constituting local patterns in the interaction between techno-scientific innovations and other activities in society *at the organisational level*. The specific manner in which patterns of regularities develop in the workings of organisations and institutions – and whether there is in fact convergence in this or not – thus becomes an empirical question.

Exploring the regularities in such patterns comparatively across cases and historically across time will thus facilitate a more nuanced picture of the legitimacy practices accompanying innovation in different contexts, including the role played by public engagement practices.

I shall therefore now turn to the question of how the generalising concepts of the previous sections can be complemented with more specific attention to politico-cultural differences, as something which is 'over-layered' on societal differentiation, in a systematic manner.

## **4 Introducing cross-national variation in the production of social robustness**

Outside STS there is a rich literature examining the role of contextual and institutional determinants of innovation, which can broadly be labelled 'neo-institutional'. This includes, for instance, the National Innovation Systems approach (Nelson 1993, Lundvall 1992), the Varieties of Capitalism approach (Hall and Soskice 2001) and the Triple Helix approach (Etzkowitz and Leydesdorff 2000). These approaches conceptualise and analyse variation in

the interplay between a number of societal institutions shaping innovation processes, such as public investment in R&D, labour market relations, educational systems, university-business relations and work organisation in knowledge-intensive firms and sectors, often in cross-national perspectives.

Inquiries in this tradition direct attention to the fact that when scrutinised more closely, deeply ingrained and seemingly lasting differences across different countries, regions and sectors can be observed. The dependent variable in these studies is usually some measure of economic performance, which is related to variables determining the capacity to innovate successfully.

However, most of these approaches devote little attention to the issue at the core of most research on public engagement processes, namely the *legitimatory practices* accompanying innovation. They tend to take for granted that high levels of innovation are desirable per se. It seems clear, however, that the public acceptance of innovations is only indirectly linked to their economic performance.<sup>7</sup>

Having explored in the previous sections how changes in the general conditions of knowledge production in contemporary societies can be conceptualised, how, then, can we go about analysing variation in the legitimatory practices embodied in public engagement procedures in different contexts?

### *Political culture*

Within STS, but linked with the broad neo-institutional tradition, Sheila Jasanoff (2005) has recently suggested reviving the concept of *political culture* to examine varieties in the way biotechnological innovation is appropriated and governed in different national contexts. Inspired by this approach, I shall discuss

<sup>7</sup> At least in a number of technological fields, the prospect of economic benefits is not sufficient to ensure public acceptance, as for instance the introduction of genetically modified crops in Europe amply demonstrates.

how political culture might serve as a conceptual tool with which to structure comparative research on public engagement processes. Although originating in a different theoretical tradition, I will suggest that Jasanoff's perspective on political culture can offer a useful addition to the broadly Luhmannian framework adopted here. Both theories rely on a constructivist epistemology in the understanding of how modern societies deal with the different kinds of risks and uncertainties generated by techno-scientific innovations, and they both emphasise contingencies in the mutual interactions between different societal domains. (For a more elaborate discussion of the compatibility between systems theory and culturalist versions of STS, see Fuchs 2004).

According to Jasanoff, political culture "... refers to systematic means by which a political community makes binding collective choices" (2005: 21). She argues:

*"Political culture in contemporary knowledge societies includes the tacit, but nonetheless powerful, routines by which collective knowledge is produced and validated. But equally, ..., political culture includes the moves by which a polity, almost by default, takes some issues or questions out of the domain of politics as usual."* (ibid.)

This understanding of political culture arguably corresponds to and extends the systems theoretical assumption that political communication proceeds by means of contingent distinctions, which inevitably produces certain blind spots, by providing conceptual tools to specify in more detail how this takes place.

### *Different political cultures*

It is implied in the concept that different political cultures exhibit different, but relatively stable, patterns in terms of which issues are included and excluded from public attention, how decisions are reached, what counts as legitimate kinds of evidence and argumentation etc. 'Culture' is thus the regularities that can be observed if we explore systematically how different actors direct

and mutually adjust their observations of each other in particular, shared contexts, such as for example in a national policy arena.

As Fuchs argues, “‘self-similarity’ across a more or less demarcated network of distinctions creates a ‘culture’” (2004: 19), whereby ‘self-similarity’ may be the shared focus of interaction of otherwise diverse actors, which emerges when they operate in, for instance, a German rather than in a British policy context. This makes political culture a useful structuring device when seeking to observe and explain variation in the way public engagement is institutionalised and used across different national contexts (compare also Münch and Lahusen 2001). Different expectations are directed at public engagement procedures in different contexts (e.g. Hansen, *forthcoming*), and a politico-cultural perspective assumes that these differences are not incidental but are linked to how the policy arenas are otherwise configured.

#### *Variation*

Observing policy arenas in terms of political culture makes comparative inquiries indispensable, as political culture must be understood in a non-essentialistic, relational manner (Jasanoff 2005: 21–23). Political culture is not something that can be observed in and of itself. Rather than an essence, ‘political culture’ is the product of attempts to identify regularities in the reservoirs of interpretive frames and guidelines for (inter)action, which actors rely on in situations where the contingency of possible actions need to be decreased or eliminated. When it comes to examining public engagement practices, the concept is therefore well-suited as a handle on politico-spatial specifics of science/society interactions.

As such, the generalising aspect of the mode 2 diagnosis and systems theory, which serves to ensure comparability between different cases, can be counterbalanced by a stronger sensitivity to variation in the processes of (perhaps changing) legitimacy practices. In

this context, political culture thus designates regularities in the modes of interaction and mutual observation of actors, which is overlaid on the societal differentiation of modern societies. Political culture is more contingent than the socio-structural principle of societal differentiation. This is why the most interesting organisational and institutional variations can be observed exactly at this level, as well as where the question regarding convergence or continued variety can be addressed empirically.

What are we to look for, in order to observe political culture? Jasanoff suggests three dimensions which can guide examinations of the more specific patterns of interaction between science and society: representation, participation and deliberation (Jasanoff 2005: 280–287). According to Jasanoff, these dimensions designate analytically relevant features of variation in the ways in which the public engages with science in different contexts.

#### *Representation*

‘Representation’ concerns the framing of issues, by which Jasanoff emphasises that some aspects and consequences of techno-scientific innovation are brought to public attention and made the object of collective reflection and decisions, while others are not. Any political culture exhibits biases in regard to what should be considered important and less important consequences of technological innovations and uncertainties, but the distinctions through which this is observed vary across contexts.

#### *Participation*

‘Participation’ concerns the processes of inclusion and exclusion of different actors as legitimate participants in the arenas of public reflection. It designates that political cultures contain – often implicit – norms and expectations about what kind of actors are important to engage and what roles they are expected and allowed to play in collective decision making. This includes what exactly

is to be understood by 'the public' in different polities.

### *Deliberation*

'Deliberation' concerns the manner in which collectively binding decisions are made within the polity, e.g. how expertise and competence are established and exercised, what role is played by science vis-à-vis other modes of communication. Political cultures thus designate – and naturalise – what can be called institutional role-distributions and responsibilities in the way polities make decisions about new technologies.

My suggestion is that these dimensions of political culture can serve as a tool to order observations of local or 'institutional' specifications into how science interacts with politics, the economy and the legal system. These interactions are in principle contingent but often produce relatively stable patterns of expectations over time in particular contexts. Processes and procedures of public engagement designate one particular type of institutionalised locus of such interaction, and as such their operations are inevitably embedded in a political culture.

### *Repercussions*

Just as public engagement processes are shaped by their politico-cultural environment, they may have various kinds of repercussions feeding back into the systems making up this environment. Public engagement procedures generally strive to achieve and maximise their impacts in their societal environment, and impacts constitute important areas of interest when such procedures are evaluated (e.g. Rowe and Frewer 2000). As mentioned earlier, such impacts can be observed as resonance, namely when communication in one context is observed and has impacts in another context (or not).

Public engagement procedures are likely to be both implicitly shaped by, and in some cases consciously tailored to fit the politico-cultural contexts in

which they unfold, and their ability to achieve resonance is likely to hinge on their compatibility with the politico-cultural context in which they operate. For instance, 'consensus conferences' are originally tailored to fit the Danish political culture (Klüver 1995), and despite significant international interest it is a matter of dispute as to how well this procedural format can be successfully transplanted into other contexts (e.g. Nielsen et al. 2007, Marris and Joly 1999, Einseidl et al. 2001).

However, this is not to say that we can expect to find a one-to-one static relationship between existing political cultures and the way public engagement and participation is organised and unfolds. This is exactly what must be explored empirically in a comparative fashion. The goal of comparative research on public engagement from the perspective suggested here should therefore be to specify empirically and compare

1. how public engagement processes perform and legitimate the choices they make (for instance on the dimensions suggested by Jasanoff) and
2. how their communication resonates with the centres of societal decision-making.

In this manner we can enhance our understanding of how social robustness is established – or not – *in particular contexts* and how this may be changing over time.

## **5 Summary and suggestions for empirical research**

My initial question concerned how otherwise diverse instances of public engagement procedures can be rendered comparable without unduly ignoring their specific histories and paying due attention to the contexts in which they are naturally embedded. My suggestion is that public engagement procedures – whatever their specific format – can be considered as (temporary or more permanent) organisations established to let 'the public' – in the specific shape it is given by such procedures

– engage with techno-scientific dynamics. In this respect they constitute some of the avenues through which society ‘speaks back’ to science with the aim of producing social robustness of innovations suggested by the mode 2 diagnosis.

### *Contesting mode 2*

However, I have contested the implications drawn by the mode 2 proponents, who interpret the emergence of such new organisational forums as a sign that the borders between different societal domains are being erased or transgressed. On the contrary, I have argued that the societal subsystems continue to provide important, distinct horizons of meaning and guidance for action in modern society. Therefore, if public engagement processes are to contribute to the establishment of socially robust innovation, they must be able to understand what is particular to each of these domains, as well as how different modes of observing interact in specific contexts. They must develop the ability to operate in a poly-contextual fashion.

If public engagement procedures ignore such structural features of contemporary societies, they are likely to be considered irrelevant in their politico-cultural environment: they will achieve little resonance beyond the procedures themselves. This, I will argue, applies to all public engagement procedures, independently of their specific procedural design. As such, this perspective helps to identify important socio-structural commonalities, which can facilitate a systematic comparison of a range of different procedural designs in a meaningful manner.

### *Cross-nation differences*

An important addition to this criticism, however, is that the specific patterns of interaction between different societal domains may be institutionalised in quite different ways across national or sectoral contexts, and this is exactly what the concept of political culture in Jasanoff’s conception seeks to capture in a comparative fashion.

### *Systems and organisations*

On the one hand, the advantage of the approach suggested here compared to other currently influential conceptualisations of changes in science/society interaction lies in the enhanced sensitivity towards the interplay between continuities and changes. This is enabled through the distinction between societal subsystems as relatively stable discursive environments and organisations that may be more easily reconfigured. This provides a more complex set of conceptual tools compared to the dichotomous distinction between a mode 1 and a mode 2-like way of producing knowledge and legitimacy and similar claims about radical transformations in the relationship between science and society.

### *Persisting boundaries*

On the other hand, the systems theoretical approach facilitates conceptualisation and observation of distinct modes of observation affiliated with different societal and institutional contexts, rather than resorting to claims about ‘blurring boundaries’, which strikes me as unsatisfactory for both analytical and normative reasons. The image of blurring boundaries is at odds with how real world actors make sense of and operate in their respective environments, where boundaries between different modes of communication continue to designate (sometimes contested but nonetheless) important and meaningful distinctions.

### *Resonance*

The concept of resonance therefore plays a key role in conceptualising how these – possibly reconfigured – intersystemic couplings play out. My suggestion is that comparative research can help increase our understanding of the circumstances under which the kind of resonances that promote a social robustness of innovation can be nurtured (or not) through procedures of public engagement in particular contexts. This could be done by examining how



they interact with expectations and assumptions embedded in and constitutive of their respective politico-cultural contexts.

In conclusion of this discussion I shall briefly indicate some potential focal points for future research that follow from the theoretical perspective outlined here. If we take a more operational approach to the analytical dimensions of political culture suggested by Jasanoff – representation, participation and deliberation – we can say that they concern issues for which public engagement procedures must provide and justify *organisational* answers. However, the empirical multiplicity of experiences with public engagement processes suggests that there is no standard solution as to how this is done. Therefore, the following questions point towards some of the dimensions where public engagement procedures are likely to vary across politico-cultural contexts, and which may constitute stimulating avenues for comparative research:

#### *Institutional embedding*

Where and how are public engagement procedures anchored institutionally? How do their outputs feed into existing decision-making centres?

#### *Procedural design*

Which actors are included/excluded from participation and on what grounds? How is interaction organised and how are different roles defined and distributed?

#### *Discursive (or intersystemic) dynamic*

What are the communicative resources relied upon (e.g. scientific, political, economic, legal modes of observation etc.) and how do they condition each other?

By asking these kinds of questions in a comparative fashion – as in my suggestion – we might attain a better understanding of the strengths and weaknesses of different procedural designs for public engagement in *different contexts*, rather than assuming that social

robustness can be established in a similar fashion everywhere, as is (implicitly) suggested by the mode 2 diagnosis. Similarly, by comparing public engagement processes in their politico-cultural and historical settings, it will also be possible to examine more thoroughly if there is in fact convergence or lingering diversity in the manner in which contemporary societies seek to render techno-scientific innovation legitimate in the eyes of the public.

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