



Reducing the democratic deficit in institutional foresight programmes: A case for critical systems thinking in nanotechnology

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ABSTRACT

The democratic deficit (the 'deficit' hereafter) in present institutional Foresight ('Foresight' hereafter) lies in its participation regime. In this paper practical ways to reduce the deficit are proposed that ought to increase the responsiveness of Foresight programmes to society's values, concerns and expectations. The existence of the deficit is examined placing ever more emphasis on the need for the active participation by a balanced but wide spread of stakeholders who will help to shape the future of society through the practical scheme proposed. The notions of 'situations' and Critical Systems Heuristics (CSH) are combined into a metaphor to suggest how the deficit in Foresight might be reduced. The purpose is to ensure, as far as that is possible, that the process of participation is genuine, inclusive and effective: practical steps toward this are suggested. The subjective nature of the metaphors assists the interpretation of these suggestions. The notion of 'situations' and Critical Systems Heuristics (CSH) represents an attempt to provide a metaphorical foundation for inclusive Foresight. At their core, 'situations' and CSH consider that problem definitions, proposals for improvement, and evaluations of outcomes depend on prior judgements about the relevant system. The resulting framework that emerges from CSH is a set of boundary concepts usable as a checklist of critical boundary questions. The checklist may be grouped under four issues relating to sources of: (i) motivation, (ii) power, (iii) knowledge, and (iv) legitimization.

The current paper discusses the application of the 'situation' cum CSH metaphor for the case of nano-science, nano-technology and nano-artifacts that are being widely adopted in areas such as materials, ICTs, and medicine. As a result of the growing interest for nano-field, nano-artifacts are now reaching the consumer markets within a large number of branches. On the other hand there is a growing scepticism about the nano-field regarding the environmental and health risks of nano-artifacts along with the ethical and legal issues arising as a result of the widespread use of these products. A number of processes have been designed and implemented concerning the legal, ethical and social impacts of nano-sciences, -technologies, and -artifacts. The paper suggests that inclusive Foresight, reinforced with the principles of CSH, can be of use in the nano-field providing wider stakeholder representation during the research and development processes. Such processes will contribute to the development of more socially and environmentally responsive nano-artifacts.

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1. Institutional Foresight

Institutional Foresight programmes ('Foresight' hereafter) now occupy a prominent position in the minds of public policy makers. In the 1990s most of these programmes were driven by the economic mantra of technologically dependent competitiveness and its importance to national economies. Despite this belief, almost all Foresight implied wider dimensions

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stretching into social, ecological, political and value matters. Because of their overt techno-economic purpose Foresight has relied on the opinions of a relatively narrow body of technologically oriented people. The flaws arising from this widely recognised *exclusivity*, suggested that the processes used ought to be more *inclusive*, enabling a much wider cross section of people to take part, difficult though this may be. The gap between *exclusivity* and *inclusivity* is the source of the *democratic deficit*: how this may be reduced, through widening participation in public Foresight, is the purpose of this paper.

1.1. History

Current Foresight studies attempt to create collective anticipations, usually related to technology, of important influences that may shape the future of research and indirectly society. It is far from clear that the sponsors of Foresight studies, and those who execute them, have a particular model of what they expect of the outcome, even though 'implementation' is always stressed as an important element of the programme design. From their beginning in Japan in 1971 it was natural for Foresight studies to absorb many of the processes and methods used in technology forecasting, indeed initially the Japanese studies were called 'technology forecasts' and were based on US experience of the Delphi method. As a result, there are two general shapes to Foresight studies that flow from early decisions about their procedures and management structure. Naively, these two forms of consultation have been called 'narrow' and 'widespread.'

Narrow consultation is characterised by the appointed expert or advisory committee, which is expected to report to its sponsor urgently. It performs its task with either no or a minimum of consultation outside its own members and their capabilities; inclusivity is unlikely to be a concern. The underlying philosophy is of 'satisficing' as often the time scale for the work involved precludes any other approach. Satisficing should not be equated to slipshod investigation. Expert or advisory committees are frequently created for political purposes, in Foresight narrow consultation needs to be recognised as a possibility but one that is employed sparingly.

By contrast, widespread consultation requires a well-specified programme of considerable complication as described elsewhere [1] and may include an international element. Inclusivity is an option given that appropriate and acceptable processes can be put in place, but so far Foresight has depended on expert technological opinion where inclusivity has been interpreted as seeking opinions from a larger number of the typical experts. However, any form of inclusivity brings with it the need to identify a different and larger number of participants.

Practical experiments to widen participation in Foresight studies vary from extensions of conventional approaches to entirely new ones. Experiments such as the Futur programme [2] have revealed some of the problems that will have to be overcome for Foresight programmes to become inclusive. Further steps to create inclusive programmes have been outlined elsewhere [3]: none of their ideas have been used in practice and to that extent they are original. Many of their indications fall into the realm of behavioural science and the behavioural styles of participants, an area ignored in all Foresight studies until now. Sponsors will need to put much effort into understanding these behavioural matters and their role for inclusive Foresight to be achieved. The creation of new user-friendly ways of enabling participation, by all who wish to take part in every stage of a study, from defining its purpose to implementing the outcome then becomes a major challenge.

1.2. The case for inclusive Foresight

Widening the scope of consultation and making Foresight into a much wider social process, is prompted by (a) recognition of the restriction to participation in current Foresight (b) the lessons learned from the corporate sector regarding the benefits of stakeholder inclusion and (c) trends for increased inclusivity across all areas of policy making.

Inclusivity is a matter of creating *trust* across a wide range of communities in discussions of future developments, especially in science and technology. The objective ought to be to enable participation by a broad spectrum of people. To introduce inclusiveness will require a change in mindset by programme sponsors, organisers, practitioners, the direct participants and the audience to whom the outcome is directed. Indeed, the process has to be one in which experts and non-experts regard each other as equal but with different agendas and capabilities that each needs to understand. Bringing this mutual appreciation about will test communication and interpersonal social skills to their limit. In this sense inclusiveness is a matter of definition and process. Extending participation introduces specific management and process needs if Foresight programmes are to be extended into the social sphere without becoming chaotic [3].

Foresight ought to be concerned with three questions:

1. What is possible?
2. What is feasible?
3. What is desirable?

For inclusivity these three questions are inter-related in social, technical, economic, ecological, political and value/norm (acronym STEEPV) aspects of society. So far, Foresight has concentrated on the first two questions related to science and technology and has paid relatively little attention to the third. The case for inclusivity comes directly out of the need to recognise the following:

- The assumption that all technologies are desirable and that people possess an infinite '*plasticity*' toward the adoption of ever more invasive, complicated, if not complex technologies
- The lack of *trust* between all the parties involved, especially between the 'expert' community and the general public, which has undergone such a marked erosion in recent years with the shift towards a post-modern world

- A dissatisfaction with *secrecy* and *obfuscation*, particularly when policy makers adopt the posture of omni-competence in the face of issues that characteristically pose questions to science that *cannot be answered by science* and lie in classes 4 to 6 in Barker and Peters' classification described in [Box 1](#) where the complexity of the policy maker's dilemmas rises steeply from 4. onwards: these questions characterise *trans-science* [4].

These issues are discussed briefly in [Box 1](#) (below) and in greater depth in Loveridge and Street [3].

Throughout recent decades it has been presumed that people possess an infinite 'plasticity', a well known concept in brain science (see [6]), toward the adoption of ever more invasive technologies: this is now widely questioned. In an example of foresight in this connection, Loveridge [7] outlined the way that computer and communication technologies might evolve into 'information technology', with its widespread adoption throughout society, without much overt questioning of whether many of the possible uses and outcomes were feasible, wise and desirable.

In the 1950s outsiders to whatever policy making processes there were began to reject the notion of infinite plasticity toward the adoption of new technology. It was a time of immense confidence in science and technology, and their applications to improve wealth creation and the quality of life – a position supported politically throughout the ensuing 50 years. Formal rejection of the notion of infinite plasticity came in the late 1960s and early 1970s with the growth of technology assessment (TA) and the creation of the Office of Technology Assessment (OTA) in the USA, and the Programme Analysis Unit (PAU) in the UK. In this sense, the issue of inclusivity is not new.

1.3. Some challenges to inclusive Foresight

Creation of trust between all the parties involved is one of the major requirements of an effective Foresight programme, especially between the 'expert' community and the general public, where trust has been eroded by the recent shift towards a world in underlain increasingly by post-modern notions. Increased inclusivity in the Foresight process is one way in which this can be addressed and trust may be re-established, but the effort needed is likely to be considerable.

Scepticism about the role of science in policy making has not been limited to the *outsiders* referred to above. Weinberg [4] expressed his concerns in this context in a discussion of *trans-science* which he described as "... the deleterious side effects of technology, or the attempts to deal with social problems through the procedures of science – hang on the answers to questions that can be asked of science and yet *which cannot be answered by science*." Questions with these characteristics (see Barker and Peters [5], [Box 1](#)) have arisen consistently in recent years and have introduced *secrecy* and *obfuscation* by policy makers, providing another incentive for widening the scope and transparency of consultation and participation in Foresight.

All foresight has political dimensions simply because it is either agenda setting or is pounced upon as a means of prioritizing activities private and public. The practicalities of bridging the gap between Foresight and the public political sphere are not of concern here where the emphasis is on outlining a practical process for widening participation in Foresight in a polity that largely does not know Foresight exists and probably does not care whether it exists or not. The political machinations that follow Foresight are well enough known to be called 'common ground' and include the call for sponsors to 'champion' the outcome of Foresight to see its outcomes through the labyrinthine political undergrowth to some form of implementation. Indeed, the requirement for a 'championing department' is now common practice in the UK Government's Foresight activity. The political view of Foresight was revealed in a short, succinct article by the British politician Enoch Powell [8]: his view is universal, timeless and has never been surpassed even though the UK Government's current Foresight activity appears to bask in a more receptive

Box 1

Taxonomy of policy maker's dilemmas.

Barker and Peters' [5] taxonomy describes six levels of cognitive difficulty for public policy makers in terms of the policy field's character as follows:

1. Elaborate but not difficult detail
2. Situations involving complicated (but not complex) matters
3. Situations with technical difficulty but that are amenable to non-expert study
4. Problems with technical difficulty, complication and complexity requiring expert training for their comprehension
5. Technical situations bordering on the scientifically unknown and involving competing and conflicting scientific opinions
6. Situations where science has nothing to offer; the subject is unknown to science and there are no claims from experts

The first three enable study by non-expert policy and decision-makers; these fields should be amenable to inclusivity in technology foresight studies. In field 4 the situation becomes increasingly incomprehensible to the polity in general and in many senses to scientists too. To even touch on the next field (5) means that while an expert may be better at conjecturing about increasingly uncertain future science and technology the non-expert's view about *desirability* will be as important. The last of Barker and Peters fields (6) is clearly inaccessible even to the expert community who make up the committees that advise policy makers; the general public is now acutely aware of these situations. If inclusivity is to stretch into these important areas, great patience and extremely good communication skills will be needed.

climate. The more recent episode surrounding genetically modified organisms (GMO) is a practical example of Powell's view and of political meanderings. Nano-technology, as will be discussed later, lies in the same ground as GMOs.

2. Expectations of inclusive Foresight

The sheer practical arduousness of attempting to run inclusive Foresight in the way outlined below means that expectations of it need to be modest, but sufficiently attractive to make the effort worthwhile. There have been many attempts to get the polity to become involved in the management, if that is the correct term, of the directions taken by science, the element of desirability in the earlier quoted triple set of concerns Foresight needs to address. These attempts have included consensus conferences, citizen juries and mass surveys but these have attracted a small set of people and none of the procedures is free of the dominance of 'experts'. Similarly, because the present ideas are concerned with the practical achievement, with all its shortcomings, of inclusive Foresight, innovation research, with its concerns for the past, has little to offer to the practical intentions of inclusive Foresight. In addition, innovation research tends to deal in procedures and not the actions of individuals and their subjective opinions with appropriate probability measures. For these reasons the findings of innovation research do not feature in the practical proposals soon to be described. In this apparently bleak atmosphere what may be expected to of inclusive Foresight? It ought to:

- Create greater public awareness and understanding of new science and future technologies (attempts to so inform the public have so far been of limited success)
- Improve the anticipation of what are likely to be desirable uses of anticipated future technologies through public participation in:
 - 'Placing Foresight programmes in context and allowing participation in formulation ofLine their content'
 - Choosing the methods to be used to enable the expression of public opinion with all its vagaries of expression concerning what are and what are not desirable future situations
 - Prioritising the choices that have to be made among the outcomes of Foresight
- Avoid the assumption that people have infinite plasticity toward new technology
- Increase trust between policy makers, business and the general public, and consequently, reducing the number of occasions when products and services based on new technologies are rejected when they are launched or soon afterwards
- Create policy processes amenable to current and future issues within the characteristics of *trans-science* (Weinberg *ibid.*) that require direct public participation
- Help meet societal expectations of increased transparency and involvement in decision making.

How Inclusive Foresight would meet these expectations will be outlined in the following section.

2.1. Broadening the scope: more inclusive Foresight

All of the above expectations require contributions to Foresight to be made from a wider range of participants (than the conventional expert community), if a number of new features such as:

- New groups of stakeholders
- Mechanisms to cope with the demands of social inclusion
- Whether inclusivity should be local, national or international

are included in future programmes then who are the new groups of people who need to be included?

2.2. New groups of people to include

Inclusivity ought to mean wider participation in the formulation of Foresight and in designing the practical steps to be used, its scope and its methods, including the 'selection' of the stakeholders to represent participants from:

- Academic social research
- Trade Unions
- Issue groups including the Friends of the Earth, Greenpeace, the Intermediate Technology Development Group and other similar organisations
- Grass roots organisations
- Minority groups, such as women's organisations, ethnic minority groups, the disabled and many others
- Financial institutions of all kinds
- Consumer organisations and consumers
- Regional Development Agencies and Local Government
- Elected representatives from all levels
- The art world including language, music, theatre and film makers
- The media including broadcasting (radio and television) and the press in all its forms
- Industry organisations (e.g. CBI, Institute of Directors, Chambers of Commerce and their counterparts in countries other than the UK).

The essence ought to be to make it possible for anyone who wishes to take part to do so though that brings severe practical concerns in the running of the Foresight. It is to these that the following sections are directed.

2.3. Coping with social inclusion

Wider participation in Foresight faces severe but not insurmountable obstacles. Some obstacles are physical, such as how it can be done and how to cope with the additional workload. Others concern psychology and the credence the study sponsors and their managers give to subjective opinions expressed by participants from an ever-widening range of contributors. The modern distrust of experts and expert knowledge makes itself felt here. The public's realisation of the limitations of policy making is built unconsciously on the advance of a 'post-modern' philosophy [9] characterised by believing that:

- Nothing can be known with certainty — all previous foundations of theoretical knowledge have been shown to be unreliable
- History has no 'final causes', making any version of 'progress' impossible
- A new social and political agenda has emerged, giving increasing prominence to ecological concerns and to new social movements.

The conscious and subconscious influence of the post-modern mindset on inclusivity in Foresight is considerable: any practical process to enable inclusivity will need to take it into account.

2.4. Should inclusivity be local, national or international?

Foresight studies have so far been conceived for national or regional borders. The notions of 'sovereignty' and their influence nationally and locally have been strong and often claim the need for national or regional 'competitiveness.' In this context, inclusivity needs to create an appreciation of those wider matters that may influence a nation or a region; without this systemic appreciation, Foresight studies may be hopelessly misleading.

2.5. Characteristics of inclusive Foresight

As an initial hypothesis, to be inclusive Foresight needs to be:

- Investigative — it needs to be based on questioning of received wisdom; this is a form of 'due diligence'
- Integrative, acknowledging that inclusive foresight is:
 - Characterised by systems with interactions involving feedback, feed-forward and other aspects of systems behaviour
 - Likely to exhibit complexity
 - Likely to exhibit aspects of trans-science
 - Influenced by the dynamic balance between the forces of modernity and post-modernity
- Independent to enable: freedom of thought; freedom of access to people and information sources; and freedom of reporting
- Participatory enabling whoever wishes to take part to do so through processes that are: easily accessed; easy to use; and credible to Foresight sponsors and their audience
- Systemic in order to understand how systems work and behave. This will inform the profiles of stakeholders/experts/lay people to be involved in Foresight, and will portray their relationships.

3. How inclusive Foresight might be achieved

The steps that might be taken towards inclusive Foresight are:

- Establish a baseline from what has been attempted to make Foresight programmes more inclusive in recent years
- The policy (or political) requirements: i.e. the influence of public institutions
- To set out indicatively process needs and their associated practical requirements.

The FUTUR programme, which ran in Germany from 2001 to 2005, was the biggest departure from convention and was designed to broaden participation through allowing the shape of the study to evolve [2] as participation through the Internet reveals issues of importance. To summarise, the baseline from which inclusive Foresight will grow is fuzzy. All the experiments that have been made spread Foresight well beyond the conventional sphere of technology alone.

3.1. Policy requirements for inclusivity

For policy purposes the minimum conditions for inclusive Foresight then seem to be:

Participants:

1. The opportunity to participate by all who wish to and to contribute to as many themes as they wish
2. Acceptance of all participants as opinion givers — this raises issues for the tradition of expertise, as does 1 above
3. Greater opportunity for participation from all levels, ages and gender throughout the scientific and technology community, and society

4. Participants from the fields of ethics, theology, social theory, law, international relations, anthropology and the other social groups who have so far been less likely to participate, should be encouraged to do so

Issues in focus:

5. Admission of the social influence on the directions taken by science and technology from within and without the scientific and technology community
6. Greater attention to the question of desirability, as it lies at the heart of Foresight

Environment of knowledge development:

7. Trust between organisers and all participants, even among those whose opinions may not be deemed to be 'influential'
8. Establishment of a new balance between participants with special expertise and those who have investigative, integrative and synthesis capabilities.
9. Creation of an atmosphere in which the guiding principles of Foresight are clearly laid out so that individual participants feel that their participation is valued

Simplicity of participation and transparency of outcome:

10. The means of participating should not impede any individual wishing to take part; this will place special emphasis on the simplicity and directness of access to information and to the managing agency
11. The influence of inclusivity on the output of Foresight will need to be as clear as possible so that the study process is credible in the 'political' world of the sponsoring agency or institution.

As already remarked, science and technology have been the traditional focus for Foresight: even there inclusivity has not often been an important feature. The traditional hierarchies of science and technology have tended to dominate even where there have been specific efforts to widen participation. Study promoters have become increasingly uncomfortable with this situation. Conditions for inclusivity in science and technology need to address this concern. In 9 above, there is a concern for the psychology of *information overload*; this is why the evolutionary principle adopted in the German FUTUR programme is important. Public institutions already play an important role as programme sponsors. It will be important for them to promote inclusivity by making it an explicit requirement in the terms of reference of the studies that they promote.

3.2. Process needs and practical steps

There are four aspects that need to be considered:

- Behavioural aspects of the wider range of participants
- Methods and tools for promoting inclusivity
- Organizational and management aspects where inclusivity is specified
- Use of pilot projects.

3.2.1. Human behaviour and its influence in Foresight studies

The role of human behaviour in Foresight studies is usually ignored diminishing the understanding of the outcome. Inclusivity will widen the distribution of styles of behaviour so that the influence of this widened distribution needs some examination. Metaphorical and theoretical descriptions of what are known as behavioural typologies abound in the literature: many are too complex to implement in the scale and breadth envisaged in inclusive Foresight and this paper is not the place to give an extensive discussion them. What is needed is a typology that is easily understood, firmly based empirically and robust enough to meet the needs of inclusive Foresight. Two typologies, Maslow's and Mitchell's VALSTM1, which evolved from Maslow will now be described briefly as they form the basis of the ensuing discussion. The latter meets the three requirements just set out and has been widely used by SRIC-BI and many other organisations, and companies throughout the Europe and many other regions of the world in either its basic form (as described here) or in its later formats.

Maslow's hierarchy [10] was amongst the earliest behavioural typologies to be developed. Five behavioural types were identified as *survival, security, belonging, esteem and self-actualisation*. At SRI International, Mitchell (see [11]) and others, perceived deficiencies in Maslow's hierarchy and developed extensions of it in a bifurcated form called VALSTM1 (Fig. 1 and the Appendix A) which has a robust clarity and simplicity.

In his original hierarchy, Maslow indicated that *Esteem* has multiple features that led Mitchell to split *Esteem* into two new categories namely *Emulator* and *Achiever*. These two new categories emerge naturally from the characteristics of *Esteem* and survey work confirmed the appropriateness of the separation. However, there were also some discrepancies that led to the idea of a bifurcation above the *Belonger* level, with the two paths converging again at the highest level (*Integrated*). The new arm introduced lifestyles (*I-Am-Me, Experiential and Societally Conscious*) that have no direct correspondence with Maslow's work. The Appendix A sets out, necessarily in brief, the essential traits attributable to each of the groups in the hierarchy.

There is evidence that the participants in Foresight come from the left-hand arm of the VALS 1 typology: the presence of Societally Conscious people in this group of participants is an exception. The evidence for this lies in the age, occupation, gender and background of the majority of Foresight participants who have been middle- to late-middle aged, professional managers and scientists, male and university graduates. When asked to self-evaluate their own level of expertise, these participants are cautious

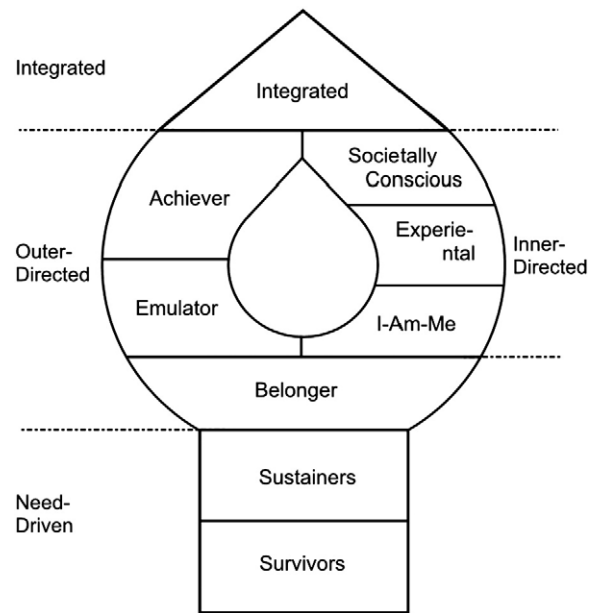


Fig. 1. Mitchell's VALS 1 behavioural typology. (Reproduced by courtesy of SRIC-Business Intelligence).

but usually rate themselves as 'familiar,' 'knowledgeable' or 'expert' in their chosen fields (the last two are the highest categories in a given scale of expertise [12] with the minority claiming the 'expert' category).

It is hypothesised that inclusivity will bring in participants from all regions of the typology, possibly with the exception of *Survivors*, while the number of *Sustainers* is likely to be small. Two issues emerge from inclusivity:

1. The dynamic properties of the VALS 1 typology itself. It is known that individuals move around the hierarchy with the passage of time and according to economic and other circumstances. Consequently, the circumstances prevailing at the time of a Foresight study can influence the outcome in ways that remain unknown.
2. Seeking opinions from a mixture of people from so many different levels in the typology will introduce new issues to be resolved to retain credibility between all the participants. The differences in characteristics between the current dominant group of participants (*Emulators*, *Achievers* and *Societally Conscious*) and the target groups (*Sustainers*, *Belongers*, *I-Am-Me*'s and *Experiential*'s) is large and likely to introduce many new factors into the day-to-day management of Foresight studies, including the processes used, and the eventual outcome. Not least among these will be the retention of credibility among all the participants; between them and the sponsor; and lastly, in the political sphere, which is the eventual destination of all Foresight. In the political sphere the implications of the distribution of behavioural styles will feed right through to prioritisation and the identity of key concerns. The clash here is likely to typify the strains between the modernist and post-modernist modes of thought and how that is expressed in the credibility of expert opinion. Foresight sponsors have the task of bridging the outcome into the political world so that they must ensure that inclusivity addresses the influence that the distribution of behavioural styles has on the study's credibility, outcome and the methods used in its conduct.

These behavioural influences are rarely discussed in Foresight studies though they are important in many respects, some of which have been discussed by Loveridge [13].

3.2.2. Methodological issues

The behavioural aspects of inclusivity also have implications for the methods used in Foresight: these will be discussed briefly under the headings of *expert consultation* and *widespread participation*.

• Expert consultation

By its nature, inclusivity runs counter to the conventions of the traditional expert consultation (or expert advisory committees) whether they are based on the extremely narrow interpretation of some expert committees or some wider processes. The notion underlying expert consultation is that the consultors select the consultees according to rules that may or (more often) may not be made public. Mostly, this means that those consulted are thought to be of such standing as to make the inquiry outcome credible to its sponsor. In this type of consultation, formal public enquiries of limited scope and invited workshops are the most frequently encountered processes used to extend the deliberations of the committee charged with the Foresight study. Inclusivity, in the sense used in this paper, is not likely to be part of the process.

- Widespread participation

Inclusivity explicitly needs widespread participation and, because of the breadth of the behavioural traits of those involved, participation will need to be enabled by *direct* and *user friendly* methods. Possible methods include taking part in:

- *Public opinion surveys based on:*
 - Telephone surveys
 - The Internet
 - Postal surveys
 - Public meetings
 - Public enquiries
 - Invited workshops
 - Interactive television
 - Videoconferencing
- *Electronic meetings or surveys based on:*
 - The Internet including VOIP
 - Asynchronous e-mail
 - Telephone conferencing
 - Consensus conferences
 - Social accounting and auditing.

Behavioural traits (see the VALS 1 hierarchy) will have a marked influence on which of these methods is the most effective in enabling inclusivity.

The contrast between the extremes of *narrow expert* and *widespread consultation* illustrates the simplicity of the first by comparison with the second and how this stems from its *exclusivity* in clear distinction to the *inclusive* nature of *widespread consultation*.

By providing through *widespread consultation* the freedom for all who wish to participate, Foresight programmes will become open to a far wider range of opinion than ever encountered before. While this is clearly the intention, management of the activity will need to deal with much greater volumes of raw opinion of highly variable content and quality. For programmes to be effective in promoting *inclusivity*, the management and programme structures need to be matched, a simple truth but not easy to specify.

3.2.3. Organization for inclusivity

Traditionally, Foresight programmes have been managed through a hierarchy of committees, in which the supra-committee is charged with overseeing the entire process and being responsible for reporting and, in some instances, implementing the outcome. Day-to-day management of the programme typically has been delegated to a management group with a defined remit, while individual committees work on specified topics, reporting the outcome upwards and in parallel to the management group and the supra-committee. These arrangements are entirely conventional management practice, but do they fit the purpose of inclusivity?

As indicated above Inclusive Foresight programmes will elicit a far wider range of opinion than ever encountered before and will require detailed rules to create the matching referred to: these rules will not be specified here, though they have been worked out privately.

3.2.4. Pilot studies

Non-traditional Foresight procedures need to be proved, to see if they are feasible and to establish, as far as that is possible, that the anticipated benefits and advantages of inclusivity actually accrue. Care needs to be taken in any pilot study that participation is *inclusive* and not self-selecting, though the initial stages might well benefit from a testing programme using a well-structured closed user group.

4. Grounding inclusive Foresight

The foregoing practical suggestions of the essentials of inclusive Foresight need some grounding beyond the simple expediency of practical achievement. There are two over-riding considerations (i) the achievement of *trust* between wide groups of people who have widely differing behavioural characteristics and (ii) the management of a process in which freedom and control need to be retained in balance. In the following discussion it is *suggested*, but no more than that, that a combination of the notion of 'situations' and *Critical Systems Heuristics* (CSH) may contain the seeds of grounding inclusive Foresight within the ambit of (i) and (ii) above.

The approach of CSH recognises that various stakeholders in society may see *situations* [14] in radically different ways because different stakeholder values and behavioural characteristics lead to different boundary judgements. In this way the complexities imposed in socio-cultural systems where, for example, conflicts and unequal power distribution occur, may be taken into account. The 'radical' view accepts that these stakeholders may be in a conflicting or confrontational relationship with each other and may be unequal in terms of their power [15], status and other behavioural characteristics relevant to (i) above.

CSH claims to recognise existing inequalities of wealth, status, power, authority, gender, race and sexual orientation in a situation: these are all behavioural components of participants in Foresight. CSH also seeks to give a voice in the decision making process to those who suffer the consequences. While Daellenbach [15] refers to ‘resolutions’ of such problems, it should be remembered that systems thinking grew out of von Bertalanffy’s recognition of the paucity of the reductionist approach to problem solving related to living systems. An element of systems thinking is the notion of *appreciation* [16] and its extension into situations [14] that can be ameliorated (but *not* solved), transforming a situation into another as an emergent cascade. For the management of inclusive Foresight situations are inevitable and their management is a strong feature of (ii) above. In this way inclusive Foresight will involve fundamental reforms and changes in its current social approach.

Ulrich [17–19] and more recently Dempster in her description of sympoiesis [20] extended systems thinking to provide a better understanding of the issues associated with determining system boundaries and the roles of values associated with the implementation and measurement of practical results. Ulrich concludes rather obviously that:

“The study context of application tends to affect citizens that have not been involved in the scientific justification of its propositions”

a key point already made with respect to inclusive Foresight.

In many ways CSH is a restatement of the cognitive aspects that have long been a central part of systems thinking that recognises that all problem definitions, proposals for improvement, and evaluations of outcomes depend on judgements about the whole system to be looked at and how that will be done. However, the term ‘problem’ should be replaced by ‘situation’ with all that implies.

CSH, like Foresight, differs from the deductive procedures of applied science that are concerned with well defined problems, by attempting to deal with soft and ill-defined situations. Critical thinking is then reflexive allowing debate about alternative assumptions. The latter is an essential feature as there is no single ‘right’ way to decide interventions in situations as their context and content will depend on behavioural characteristics including personal interests, opinions and value assumptions. Consequently, Ulrich [21] defines CSH as:

“a critical methodology for identifying and debating boundary judgements”.

However, debating boundary judgements is one thing: perception of the boundaries of a situation is another. It is here that Dempster’s notion of sympoiesis may be more powerful. Dempster describes sympoietic systems as ‘complex, self-organizing but collectively producing, boundaryless systems’ and that ‘sympoietic systems are homeorhetic, evolutionary, distributively controlled, unpredictable and adaptive’ [20]. Dempster’s proposition of a system with collectively produced, uncertain or fuzzy boundaries would be typical of any attempt to model a real-world unstructured and complex cascade of situations. The cascade’s fuzzy boundaries will be subject to intense philosophical debate that has much to learn from Dempster’s sympoiesis.

4.1. Evolution of a metaphor

Inclusive Foresight is or should be a heuristic process. Consequently, its metaphor then needs to:

- Identify boundaries for the heuristic as a judgmental process
- Assemble alternative systems contexts for appreciating dynamically a situation and its content, and means of ameliorating it as it evolves
- Challenge claims to knowledge, rationality or ‘improvement’ of a situation that rely on hidden boundary judgments or take them for granted in a compelling way.

The meaning of a metaphor in the present context is a figure of speech in which a word or phrase literally denoting one kind of object or idea is used in place of another to suggest a likeness or analogy between them. Here the metaphor is an analogy to what might unwisely be called a theory for inclusive Foresight. CSH offers a starting framework from which to begin to build a metaphor based on twelve categories of heuristics grouped into four categories of intention as shown in Fig. 2 (overleaf) [22]. These were described in greater depth by Ulrich [22] but have been modified here to be appropriate to the development of a metaphor for inclusive Foresight. There are some obvious linkages to behavioural matters.

The intentions of inclusive Foresight form the basis of a metaphor and can be described in the following way.

4.1.1. Motivation

1. Inclusivity ought to be serve as the way in which a wider source of opinion ought to be sought from at least a representative sample of the population.
2. The processes involved ought to be designed to enable participation, by this sample, to be accomplished easily, securely and with anonymity: the resulting database of aggregate opinion ought to be open to wide access without infringing or diminishing civil and personal liberty.
3. Measurement of an improvement in participation in Foresight should be simple and openly available displaying the extent to which inclusiveness is being achieved and the consequences of that for the way policy making proceeds.

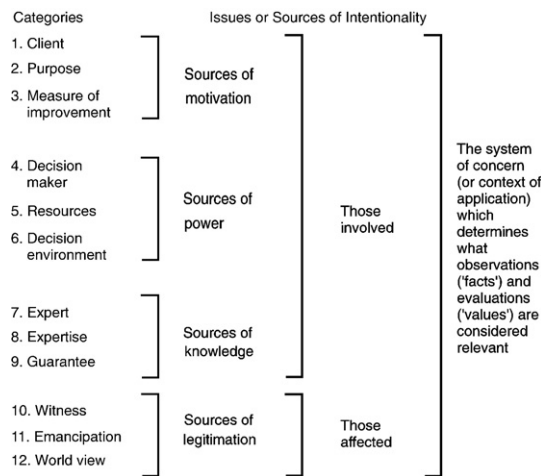


Fig. 2. Table of heuristic categorised in CSH. Source: [23].

4.1.2. Sources of power

4. The management process of inclusive Foresight ought to be open for all to see and ought to challenge or inhibit the propagation of vested interests.
5. The resources needed to enable inclusive Foresight, and other conditions of success, ought to be controlled by the managers of the programme for reasons of operational effectiveness.
6. The conditions under which the programme managers operate ought to include ways that enable any participant to challenge anonymously decisions relating to their participation, as the participant group will evolve rather than be selected as in current Foresight practice.

4.1.3. Sources of knowledge

7. The heuristic nature of inclusive Foresight places special emphasis on all opinions. Any participant may be considered by the management team and by other participants in the process, to have special insights, not necessarily based on conventional expert credentials. Any such participant ought then to be considered for continuing participation. If the participant is excluded, there ought to be a right of re-entry at any point after exclusion if it becomes clear, as the appreciation of the situation evolves, that their opinions have re-entrant value.
8. Knowledge, know-how or opinion relevant to the dynamics of the situation ought to be the judgemental criteria exercised by the programme managers with respect to the evolving population of participants.
9. The heuristic nature of inclusive foresight means that the implementation of proposals ought to be dynamic and relevant to the notion of amelioration in the context of a cascade of situations and not in the expectation of guarantees of improvement as both amelioration and improvement are relative terms.

4.1.4. Sources of legitimization

10. The population of participants in inclusive Foresight and their knowledge, know-how or opinion relevant to the dynamics of the situation ought to represent, within statistical limits, the interests of the entire population affected including those not involved in the inquiry or design process, including the handicapped, the unborn and the non-human (these latter groups are affected either explicitly or implicitly, immediately or prospectively, in all decisions made in the polity in creating the future, a feature pointed out in the 1970s).
11. The design of inclusive Foresight ought to incorporate ways of enabling those affected by its outcome to criticize and argue their special interests, through special representatives where necessary, when the outcome disadvantages them.
12. The context of legitimization of the visions of 'amelioration' of a situation is a cognitive process and ought to be recognized as such: its content ought to include the factors set out by Loveridge [14] and ought to involve the cognition of both those participating in the inclusive Foresight and those affected by it.

Ulrich provides a list of questions that can be used as a starting point for the assessment of the boundaries of the situation and to enable a systemic boundary critique. Each of Ulrich's questions has to be answered both in the IS and OUGHT mode as there are no definitive answers in boundary judgements. The partial selectivity involved in boundary setting needs to be made evident from multiple perspectives, so that its empirical and normative content can be identified and evaluated without any illusion of objectivity.

5. Foresight's democratic deficit and nano-artifacts

The root of Foresight's deficit lies in the extent of public opinion either accepts or rejects the desirability of nano-artifacts. Immediately this raises questions of inclusivity and exclusivity, and of the nature of what is colloquially, vaguely and incorrectly called 'nanotechnology'. The clash between the general notions of inclusivity and exclusivity, and how it might be ameliorated have been discussed earlier and forms the basis of the Motivation part of the inclusive Foresight metaphor. The Sources of Knowledge part of the metaphor draws attention to the use of the term nano-artifacts. An artifact is an artificial product, physical or non-physical, of any kind that depends on the systemic interaction between nano-science, nano-technology and the artifacts themselves for their evolution into desirable artifacts: this loop is illustrated in the Venn diagram (Fig. 3) where the ultimate goal is an artifact that lies in the unique part of the three intersecting sets that is common to all three.

Furthermore, the omnibus term 'nanotechnology' misleads the participants in any Foresight study into believing that they are confronting a homogeneous and coherent technology which is very far from the case. Nano-artifacts depend on the convergence of sets of sciences and technologies, elsewhere called genus sciences and technologies [23], of very different kinds for their evolution into feasible and (hopefully) desirable artifacts. The difference between nano-artifacts and their biotechnological counterparts is more extreme as will become clearer later even though biotechnological artifacts too require the convergence of sets of sciences and technologies for their evolution. It is the artifact design and production process (which includes services as artifacts) that links these aspects to the public and corporate worlds, a further component of the Sources of Knowledge part of the metaphor.

The Motivation and Power aspects of inclusive Foresight become more evident in the interaction between:

- The public and corporate worlds
- The public acceptance of nano-artifacts
- Public participation in Foresight.

Much of this interaction concerns the current drive toward regulation and codification of the research and technological development needed for the creation of desirable artifacts. There are parallels here with the events that surrounded the success of gene-splicing in the early 1970s. The Asilomar Conference [24] introduced the necessity for a moratorium on further gene research for a specified period: this was widely ignored by companies and in the end it was abandoned. It is almost certain that a similar fate will befall any similar attempt to halt or severely restrict the future evolution of nano-artifacts many of which are already on sale and widely accepted as desirable artifacts including high factor sun screens, tennis racquets reinforced with carbon nano-tubes, car body parts incorporating carbon nano-tubes, dendrimers and many other artifacts. Regulation, product liability, case law and patent law have long existed and though created for different circumstances will certainly apply to nano-artifacts. The influence of the EU's Code of Conduct (the Code hereafter) for nano-science, nano-technology and nano-artifacts is a further matter shaping the future situation surrounding the nano-field. The seven principles of the Code are:

- Precaution
- Inclusiveness though not in the sense used in this paper
- Integrity
- Better and constant vigilance to assess developments and effectiveness of governance
- Realising societal benefits
- Credibility and trust for good governance and openness to public scrutiny of risks and expectations
- Protection of fundamental rights in the absence of the precautionary principle through unavoidable situations.

The seven principles of the Code are well aligned the metaphor for inclusiveness as intended in this paper as a way of ameliorating the deficit.

Public acceptance of corporate activity is interlinked with public participation as intended in the metaphor. Each of the four categories in the metaphor is relevant to the interlinking between the public acceptance of corporate activity and public

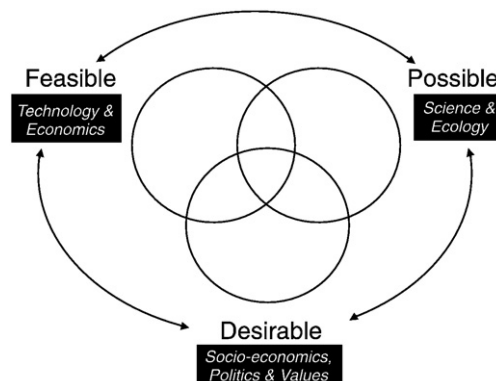


Fig. 3. Interaction between scientific possibility, technological feasibility and artifact desirability of a nano-artifact.

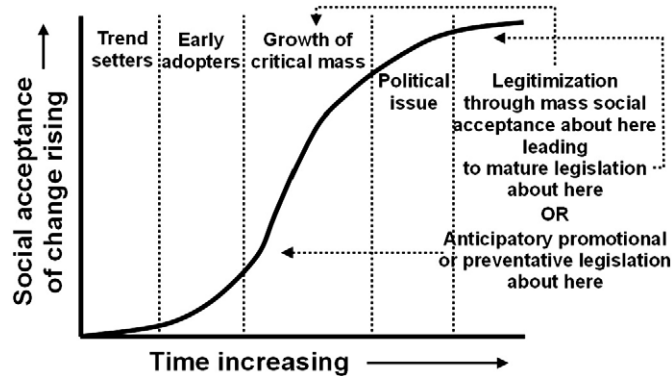


Fig. 4. Growth of a critical mass favouring public acceptance.

participation in Foresight relating to these issues. Corporate social responsibility (CSR); the global reporting initiative (GRI); corporate liabilities in a whole range of activities but especially health and safety, and environmental law; and patenting are major themes for Foresight relating to the dynamic evolution of nano-artifacts and the situations that arise as a result.

The spectrum of feasible and possible nano-artifacts is very wide. Foresight then needs to appreciate how public acceptance or rejection of nano-artifacts may shift according to the nature of the artifacts presented to the public. Public participation in Foresight is necessary for this kind of adaptive behaviour to occur. Consensus is not necessarily the best arbiter in many circumstances, particularly when it is forced say, through the processes of a consensus conference. Recognition of a distribution of opinions is probably of more use to a policy maker particularly when faced with situations involving levels five and six in Barker and Peters [5] taxonomy. The principles of precaution and parsimony are likely to be ever present in Foresight where public participation and public acceptance feature strongly in the content of the situation.

Critical to public acceptance is the growth of a critical mass of opinion favourable to any particular form of nano-artifact and its supporting sciences and technologies: this is a behavioural matter dwelt on earlier that is discussed here as legitimization. Fig. 4 illustrates the nature of the process. Foresight needs to follow how the critical mass evolves as this is a critical part of its context that follows from the kind of processes that enable public participation some of which featured in the earlier discussion of inclusiveness.

6. Epilogue

The paper has described a metaphor for inclusive Foresight rather than to be a definitive exposition of future situations and briefly sets out how the metaphor relates to nano-artifacts and their enabling sciences, and technologies. Underlying the discussion is the contention that, as practiced, institutional Foresight contains a democratic deficit characterised by exclusivity as the extent of public participation is restricted. The next step is to develop appropriate ways in which the metaphor for inclusive Foresight can be tested. Some of these steps have been described by Loveridge and Street [3] but much remains to be done capitalising wherever possible on the experience built up in the German Futur programme.

The future of nanotechnologies and their impacts on society require widespread participation in elucidating their acceptability in society. There are a number of attempts for deliberative change processes in the nano-field. By suggesting mechanisms to achieve inclusive Foresight the aim is to contribute to the discussions on the future of the nano-field. The creation of new user-friendly ways of enabling participation, by all who wish to take part in every stage of a study, from defining its purpose to implementing the outcome is a major objective in this process. Such process will contribute to the development of more socially and environmentally responsive nano-artifacts.

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Appendix A. A summary of the VALS™1 Lifestyle Hierarchy (with acknowledgements to Arnold Mitchell & SRI Consulting Business Intelligence (SRIC-BI))

Mitchell's original VALS 1 hierarchy was created at SRI International during the 1970s and has evolved since into its modern VALS™ format that is now owned and operated by SRI Consulting Business Intelligence (SRIC-BI). VALS is a consumer

psychographic segmentation system based on psychological characteristics and several demographic factors that correlate with consumer behaviour, hence the word psychographics. Further information can be found at www.sric-bi.com/VALS.

The original VALS (acronym for Values and Lifestyles) hierarchy is the version used and is summarised below.

The original Mitchell VALS 1 Hierarchy (see Fig. 1).

Need-driven people have very limited in resources (especially money and focus on survival. They are:

- *Survivors* – the most disadvantaged people in modern society
- *Sustainers* – struggle at the edge of poverty.

Outer-directed people live their lives in response to real or imagined signals perceived from others. Outer-directedness is a major psychological advance over being need-driven. The group includes:

- *Belongers* – who ‘fit in’ rather than ‘stand out’ and are generally comfortable middle class. They stick to the rules.
- *Emulators* – try to break into the higher levels by emulating an Achiever not realising that they do not have the physical or psychological make up to become one. They remain too imbued with the Belonger traits but are psychologically more advanced assuming more personal responsibility and being less inclined to ‘fit in’, but not able to ‘stand out’ in a substantive way.
- *Achievers* – affluent people; many leaders in business, the professions and government; competent, self-reliant and efficient, but tend to be materialistic, hard working, oriented toward fame and success. They defend the status quo of the economic system.

For *Inner-directeds* inner growth is a cardinal characteristic; these people lead their lives in accord with private needs and desires (inner values). It is hard to be Inner-directed without having internalised Outer-directedness, through exposure to it during childhood, adolescence or adulthood. Inner-directed people tend not to come from Need-driven or Inner-directed backgrounds. It seems that some degree of satiation, with the pleasures of external things, is necessary before the less visible attractions of inner development become attractive. The group includes:

- *I-Am-Me's* – a short-lived phase in changing from Outer- to Inner-directedness. Mostly people at this stage are young and very individualistic to the point of being narcissistic and exhibitionistic. Full of confusions and emotions they do not understand, people in this group tend to define themselves by their actions rather than their statements.
- *Experientials* – psychologically mature I-Am-Me's; earlier egocentricity fades, to include other people and many social issues. Direct experience and vigorous involvement are strongly desired in all their activities. Probably the most highly Inner-directed in the hierarchy and the most artistic and passionately involved with other people.
- *Societally-conscious* people have concerns beyond the self and others, to society as a whole – sometimes to include global issues, leading to a profound sense of responsibility; support conservation, environmentalism and the consumer movement, often becoming impassioned and knowledgeable activists about the world as they see it.

The Integrated people are a small, rare group at the highest point in the hierarchy who contrive to meld Outer-directed power with Inner-directed sensitivity. Mature psychologically, they are able to see the many sides of an issue and lead it if necessary or equally easily to play a secondary role when that is appropriate in their perception; usually possess a deep sense of the fittingness of things, a rare sense of judgement, that leads to self-assurance, self-actualisation, self-expression and a keen awareness of issues and sentiments, often with a world perspective. These are very unusual people.

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