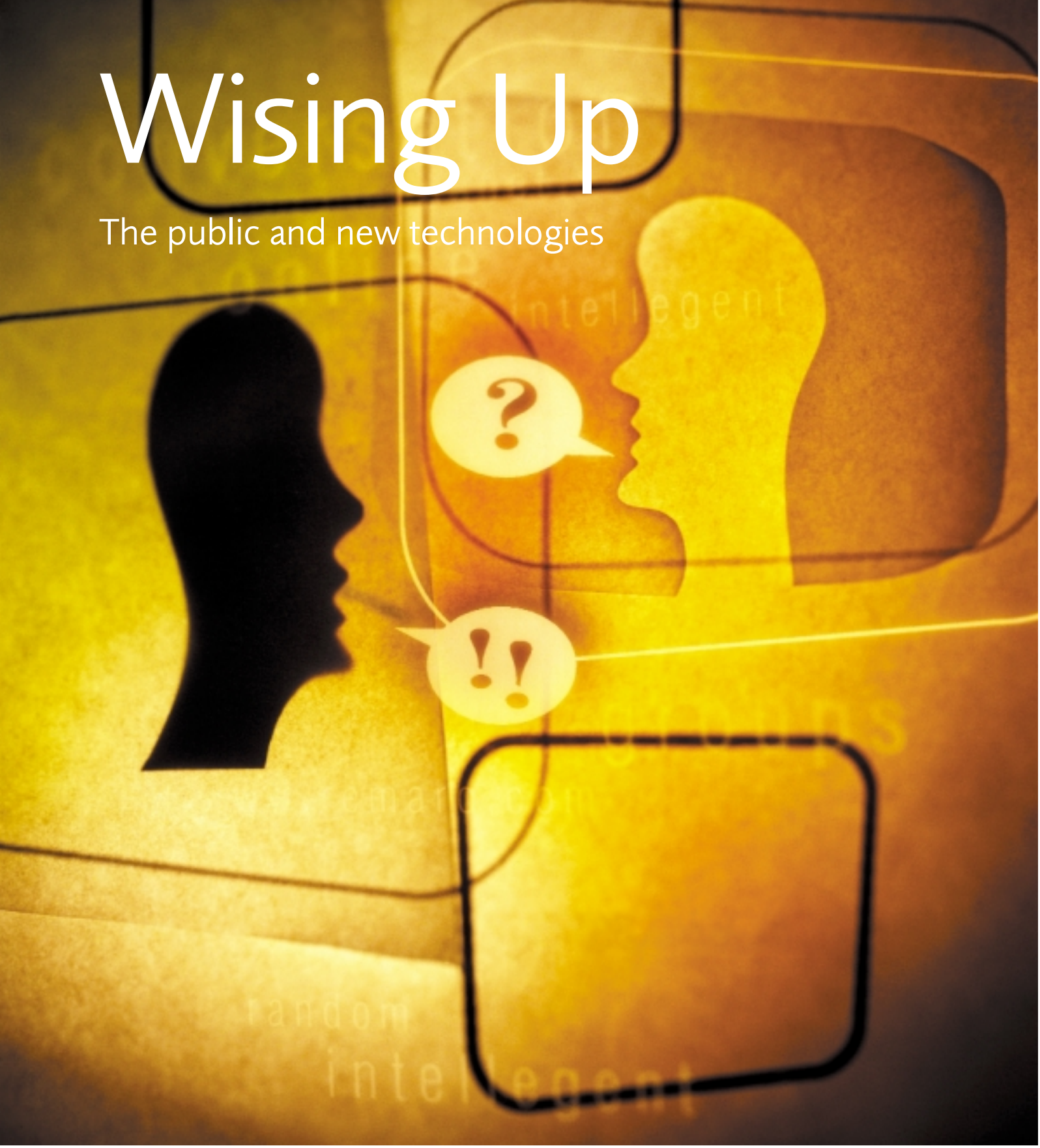
Wising Up

The public and new technologies



A research report by the Centre for the Study of Environmental Change, Lancaster University.

Robin Grove-White **Phil Macnaghten** **Brian Wynne**

November 2000

Wising Up

The public and new technologies

A research report by the Centre for the Study of Environmental Change, Lancaster University, with the support of Unilever and Green Alliance.

Robin Grove-White Phil Macnaghten Brian Wynne

November 2000

LANCASTER UNIVERSITY

Acknowledgments

‘ Where is the wisdom we
have lost in knowledge?

Where is the knowledge we
have lost in information?’

TS Eliot
Chorus 1 from 'The Rock'
Selected Poems
Penguin 1948

The authors are especially grateful for the advice, encouragement, and other assistance of Ian Christie, Christine Drury, Dorothy Mackenzie, and Rebecca Willis – as well as for related discussions over the years with colleagues such as Jacqui Burgess, Silvio Funtowicz, Sheila Jasanoff, Sue Mayer, Peter Simmons, Andy Stirling and Sue Weldon.

They also express thanks for the support in the 1990s of the Economic & Social Research Council, whose funding of CSEC's 'Science, Culture and the Environment' programmes helped foster development of some of the intellectual perspectives shaping the present study.

Design by Dragon
Printed by Royle Corporate Print

Copies of this document are available from:

The Centre for the Study of Environmental Change
Institute for Environment, Philosophy and Public Policy
Lancaster University
Lancaster
LA1 4YN

Tel	**+44 (0) 1524 592658**
Fax	**+44 (0) 1524 846339**
email	**csec@lancaster.ac.uk**

Contents

The research group

The Centre for the Study of Environmental Change (CSEC) is an inter-disciplinary Research Centre at Lancaster University, focusing on problems of contemporary environmental knowledge and policy development. It forms part of the University's Institute for Environment, Philosophy and Public Policy. Created in 1991, CSEC has a 5* research rating, and extensive social-science-based research programmes, with funding from such bodies as the Economic and Social Research Council (ESRC), the Health and Safety Executive, the European Environment Agency and a range of other bodies in the worlds of government, industry, and NGOs, in Britain and elsewhere.

Professor Robin Grove-White holds a chair in Environment and Society, and is Director of CSEC at Lancaster University. Formerly Director of the Council for the Protection of Rural England and a Forestry Commissioner, he is currently a member of the Government's Agriculture and Environment Biotechnology Commission, and Board Chair of Greenpeace UK.

Dr Phil Macnaghten is a Lecturer in CSEC. A social psychologist, he recently held a British Academy Post-Doctoral Research Fellowship, and was joint author (with Professors Grove-White and Wynne, and Dr Sue Mayer) of the 1997 CSEC study, *Uncertain World: Genetically Modified Organisms, Food and Public Attitudes in Britain*. He is co-author, with John Urry, of *Contested Natures* (Sage 1998).

Professor Brian Wynne holds a chair in Science Studies, and is Research Director of CSEC. Widely published as a sociologist of science, he has been a Board Member of the European Environment Agency, as well as a consultant to the European Commission, the UK Department of Health, and ESRC. He was recently the Special Adviser for the report of the House of Lords Science and Technology Select Committee, *Science and Society* (HMSO 2000).

Preface

"green alliance...

Green Alliance exists to encourage new ideas, promote dialogue and find constructive solutions to environmental challenges. *Wising Up* does all of this. It is an independent study which has flowed from a collaboration between business, academia and the environment movement, convened for Unilever by Green Alliance – the 'Contact Group'. The Group digs below the surface of corporate strategy and government policy, to look at the social and environmental implications of new technology and innovation. It facilitates research and dialogue, and explores new responses for business and government.

Green Alliance's work with the Contact Group forms part of our work programme on policy responses to environmental risk. Some of the most difficult environmental decisions that policy-makers face are those involving risk and scientific uncertainty – whether the risks of genetic modification, climate change or nuclear power. Green Alliance works with government and business to improve decision-making under risk, encouraging greater public involvement, a more precautionary approach, and a focus on the social implications of new technologies. *Wising Up*, with its exploration of people's reactions to such technologies, is a fascinating and important contribution to this debate.

Green Alliance is an independent charity. Its mission is to promote sustainable development by ensuring that the environment is at the heart of decision-making. Further information, including our report on policy responses to risk and scientific uncertainty, *Steps into Uncertainty*, can be found at *www.green-alliance.org.uk*.

Rebecca Willis, Green Alliance

Unilever's success depends on understanding consumers deeply and our growth depends on innovation for our leading brands that meet consumer needs in the societies in which they live. Deep insights mean paying attention not only to consumer product and service needs but also to the sophisticated way people evaluate new ideas and things in the light of experience they have as citizens. The public debate and experience of biosciences in the recent years, particularly in the UK, have increased the urgency of finding better ways forward. Understanding information needs will be a key part of the solution. This importance of consumer needs as citizens was highlighted in an earlier study by Lancaster University: *Uncertain World*. That study also indicated there was an important 'enabler' to be tackled concerning characteristics and perception of information.

Wising Up is an independent academic study by Lancaster University which Unilever has been pleased to sponsor. It has also benefited from the valuable exchange of ideas about what is needed that occurs in the NGO Contact Group that Unilever co-chairs with Green Alliance. The deeply illuminating insights of this UK study are challenging for businesses, NGOs, and policy makers alike. One implication of *Wising Up* is that developing good ways to talk about how we will manage the things we don't know is maybe as important as good, open and frank information about the benefits and risks we do fully understand.

New thinking is needed to overcome the current information difficulties which are focussed on bioscience, but have wider implications. The insights of this study will be valuable stimulus for that new thinking.

Christine Drury, Corporate Relations, Unilever

www.unilever.com

Executive summary

Background

- The proposed introduction of genetically modified (GM) crops and food precipitated acute political and scientific controversy, with far-reaching commercial implications, in the UK and other EU member states in the period 1998-2000.
- The present study was undertaken by the Centre for the Study of Environmental Change (CSEC) over the same period, as a follow-up to an earlier CSEC study, *Uncertain World*: *Genetically Modified Organisms, Food and Public Attitudes in Britain* (1997) – which is now acknowledged as having anticipated key social and political contours of the intense public debates surrounding GM technology in 1998-2000.

The study

- The immediate aim of the present study has been to derive lessons for industry, government and the media from the handling of the on-going GM rows – with a particular focus on the role of information provision by companies and regulators, in circumstances of public controversy about a new technology and its associated products.
- As the study progressed, the relevant range of issues broadened and deepened. Generic questions of a political-cultural kind arose, concerning the institutional handling of scientific *uncertainty* and *ignorance*. The different 'social constitutions' of particular technologies – that is, the distinctive values and social assumptions embedded in their development – were found to be of fundamental (though under-recognised) importance for understanding public responses.
- The research methods employed included interviews with 'information providers' and discussion groups with 'lay' people. The findings were interpreted through a perspective informed by a range of previous studies undertaken at CSEC.

Findings

- There is an urgent need for industry and government to initiate new patterns of interactive understanding between themselves and people at large, concerning the potential social implications of new technologies. Present methods of 'one-way' information provision are wholly inadequate for the task of addressing the human tensions and social dynamics likely to emerge in relation to new technologies and products over the coming decades.
- The recent preoccupation with one-way information provision needs to be understood in the context of wider moves towards greater 'transparency' and 'openness', as a claimed necessity of contemporary governance. Within this framework, 'information' is pictured by its providers as essentially positive and factual, to assist people's 'choices' and 'decisions'.

- However, the research suggests that controversies of the GM kind arise because of reasonable public concerns about areas where there is sensed to be no (or at least inadequate) knowledge – that is, around questions of *ignorance* or *uncertainty* (in regulatory contexts usually, but misleadingly, represented as reductionist scientific uncertainty). The information providers appeared to have no way of recognising, or even of conceptualising, how this issue might be handled in an 'information provision' context.
- The resulting de facto official denial of humanly significant dimensions of *uncertainty* or *ignorance* has been acting to foment, rather than to alleviate, public scepticism and mistrust, where doubts have existed. This suggests that reliance by industry and government on such strategies risks rebounding and making matters worse.
- In general, people do not 'decide' or 'make choices' vis-à-vis technologically complex products simply in the rationalistic fashion assumed by the information providers (working through to decisions in linear, calculative fashion). In many cases, they rely crucially on the judgement of trusted 'others', whether personal or institutional – for example, friends, NGOs, or, more superficially, brands.
- In many contexts, one-way information provision is experienced as useful. Nevertheless, people take it for granted that information provided by institutions will tend always to be framed to that institution's advantage. They allow for this, as well as for 'experience' of that institution's past performance, in their stances towards what they are being told, as well as triangulating it with other (perhaps equally partial) sources of understanding.
- Issues arising from different new technologies (and their associated products) are much more varied than has tended to be assumed in business planning or by academic economists. Different technologies may have wholly different implications one from another – for social relations, for regulatory integrity, for personal sense of security and agency, for retrievability under conditions of crisis, and for the social distribution of expertise. Such different 'social constitutions' of technologies have long been recognised in 'interpretative' corners of the social sciences, but the implications appear so far to have bypassed dominant official and industrial attention.
- A comparison between information technology (IT) and genetic modification (GM) illustrates such differences graphically *(Table A, page 32)*. Whilst the diversified consumer-interactive character of IT and its associated products has tended to be experienced as user-friendly, reassuring, and susceptible to effective regulatory oversight (notwithstanding the possibility of buried or latent problems of major kinds), GM's sensed patterns of oligopolistic ownership, technical opaqueness, and potentially irretrievable side-effects and unknowns appear to lead to a sharply different frame of understanding. In this sense, particular technologies may need in future to be understood not only as machines but also as social processes.

- Inflated expectations of the role of one-way information provision in circumstances of controversy appear also to reflect a deeper phenomenon. The continuing tendency within industry and government to favour a simplistic view of human beings as essentially 'consumers' (whether of products or services) is helping to perpetuate inappropriately simplistic 'market' models in areas of complex human interaction and judgement. On issues of technological risk and uncertainty, it is these latter areas which now demand far more informed and responsible understanding and action.
- Whilst recent initiatives by government – for example, the creation of the new Food Standards Agency, Human Genetics Commission and Agriculture and Environment Biotechnology Commission – are welcome, it is questionable whether they will have the resources or the authority to innovate on the scale required. A wider range of initiatives, in a wider range of technological spheres, is needed as a matter of urgency.

Prescriptions for action

A number of recommendations follow, for action within industry, government and the media:

- New forms of upstream social analysis of potential technological development should be integrated into companies' product development processes. This will require the incorporation of new forms of social and humanities expertise, to complement those of existing technical specialists.
- Marketing managers should be given new responsibilities to represent a richer range of human concerns in product development processes, both within companies and across industries.
- Marketing managers should develop more realistically modest expectations of one-way information, as an important, but nevertheless restricted, contribution to improved 'choices'.
- Companies should initiate programmes of experimental testing of the potential of the new deliberative mechanisms for interaction with publics, now being pioneered within local government and corners of academia.
- Government should adapt the existing 'Foresight' programme to reflect broader social needs in evaluating the social constitutions of new technologies (that is, the particular social values and assumptions individual technologies can be shown to embody), as part of the process of prior evaluation and R & D.
- The Cabinet Office should initiate a review and evaluation of the range of different social and market research techniques and approaches now being employed in relation to new technology and product development. The aim should be to explore conditions for the evolution of humanly richer and more responsive ways of understanding uncertainty, and of representing the potential social implications of particular innovations, at a stage early enough to guide (or even to restrict) their further development.

- Underpinning all of these various initiatives should be a clear commitment to processes of authentic interactive understanding, to extend and complement existing one-way-information-based approaches. The comparative strengths and limitations of the two approaches are summarised in Table B *(page 43)*.
- News media need to encourage mature discussion of the implications of uncertainties and unknowns surrounding new technologies and their insertion into everyday life – as necessary for constructive public debate.

Wider urgency and significance

- The escalating pace of scientific advance in areas such as the biosciences, bioinformatics, robotics, artificial intelligence and nanotechnology is giving rise to well-informed apprehensions in the US about the ability of existing political and regulatory systems to keep pace with their commercial development and diffusion (Joy 2000). The power and range of advances in such spheres is likely to present society shortly with new social and environmental challenges. This is the 'risk society' (Beck 1992) with a vengeance. The processes of innovation on which contemporary industrial economies depend are generating new patterns of 'manufactured risk', as unintended consequences of their 'positive' aspects. This makes the need for fresh approaches to the advance evaluation and social guidance of new technological developments an urgent responsibility of governments. The failures of both industry and governments to anticipate the 1998-2000 GM controversies in Britain and elsewhere provide a disturbing early warning of the need for immediate initiatives in this field.
- Increased attention at the earliest development stages to the 'social constitutions' of new technologies and products will also be increasingly important for the execution of the sustainable development policies and 'precautionary' environmental approaches to which governments like our own are now committed.

Chapter 1
Introduction

The controversies of the late 1990s surrounding genetically modified (GM) crops and foods in Europe have been on a scale without precedent in modern times. They have resulted in massive, even terminal, disruption to the plans of some of the world's largest companies. They have undermined previous confident expectations of politicians and regulators in industrial countries around the world. And they have reinforced public unease concerning the authority of science and scientists, in an era more dependent on the outputs of science than any that has preceded it.

Indeed, the recent GM upheavals might justifiably be seen as presaging a new stage in the relationships between industry and citizens in the modern industrial world.

But what practical implications flow from these events? Are similar crises of public confidence surrounding industrial innovation the likely shape of things to come? How might potential upheavals surrounding the development and marketing of new products be avoided, or at least mitigated, in the future? In short, what lessons should be learnt – by industry, by governments, by the media, by consultants in their many hues, and by society at large?

On information and the citizen

This study attempts to throw fresh light on issues arising from the recent GM crisis, and on some forms of response that may now be needed.

The immediate focus of the study is on information.

As the GM crisis grew in Britain during 1998 and 1999, more and more claims about the importance of information about such products were heard. Ministers and their advisers claimed there was a need to inform a supposedly uninformed public. Social surveys reported an apparent paucity of information, reflecting their attitude research with 'consumers'. And, in response, not only the major retailers and food manufacturers, but also scientific institutions, lobbying groups and trade associations of many kinds generated a veritable flood of brochures, leaflets, labels, call-lines, and other devices – all aimed at providing detailed information about GM processes and products.

Behind much of this lay an expectation amongst advocates of the new technology that more information about biotechnology would lead to increasingly willing public endorsement of GM foods. But this expected effect proved far from the case. Indeed, evidence mounted that the more information people received about GM products, the less inclined they became to buy them.

But it would be too crude to suggest that a drive towards improved commercial uptake has been the sole factor behind the impetus towards information provision on GM. There has also been a general and more disinterested assumption that widely distributed information has become a good in and of itself. Contemporary 'consumer society', it is widely believed, requires an ever-greater flow of information, so that its individual members are able to make sensible decisions and choices in an increasingly

complex world. 'Transparency' and 'openness' have assumed a supposedly indispensable role in responding to contemporary crises of public trust and authority. Surely the GM issue, with its surrounding novelties and perplexities, could be seen as simply a heightened instance of this more general social development?

It was against this background that the present study emerged.

Origins of the study

In 1995, several years in advance of the recent public controversies, the authors and their colleagues had identified major limitations in the regulatory framework surrounding GM developments in Britain (Mayer et al 1996). The findings were passed to government.

Subsequently, coinciding with the official National Biotechnology Conference in March 1997, CSEC published a major research report based on new field-work with the British public, *Uncertain World*: *Genetically Modified Organisms, Food, and Public Attitudes in Britain* (Grove-White et al 1997). This pointed for the first time in Britain to specific contours of intensifying, though at that stage still largely latent, tension surrounding British GM food and crop developments. In particular, *Uncertain World* highlighted patterns of burgeoning public unease and mistrust which the established scientifically reductionist framework of official political and regulatory oversight was failing to address – or, at that stage, even to acknowledge. The analysis noted the essentially reasonable character of public concerns, given evident limitations in the distinctive culture of 'sound science' institutionalised in Britain's regulatory framework for GM crops and foods. Indeed, this 'sound science' culture had been allowed not simply to inform the GM issue, but also to shape the very terms of public debate. Through an apparently embedded myopia, it seemed, the regulatory framework on which government relied was stoking up the likelihood of a major crisis of political authority in the near future.

It can be argued that the subsequent 1999 events amounted to an unambiguous vindication of this finding.

Recurrently, during the 1996-7 *Uncertain World* fieldwork, the researchers had found that members of the public referred to their own lack of detailed knowledge of biotechnology. Often, in conversation, this had expressed itself as a sense of being left in the dark – translating in turn into generalised calls for 'more information'.

But how literally were such calls to be taken? Reviewing the evidence as a whole, the researchers urged caution:

'*...Experience in other domains involving public safety suggests that calls for 'more information' beg important questions. What kinds of information are being requested here? Is quality of information more important than quantity? If so, who is to decide, and how – given that, by definition, those lacking information do not know what precisely it is they lack, and those possessing it do not know precisely what might be most useful to those lacking it (and indeed might be reluctant, for reasons of self-interest, to provide it if they did know)?*

Our interpretation... is that such calls need to be understood, in part at least, as further surrogates for the striking lack of trust in present regulatory frameworks expressed by many of the participants [in the focus groups]. The 'information' being called for might best be described as a call for 'experience that convinces me genuinely that I can trust the judgement and vision of the people and procedures governing decisions taken on my behalf', rather than as a call for more technical data about the technology itself.'

It is on this set of issues that the present study seeks to throw further light.

For the fact is, as controversy has continued to rage in the GM sphere, that provision of information has become seen increasingly as the most appropriate response to public concerns. Studies analysing the crisis, by and on behalf of government (MAFF/Sheffield 1999, OST 1999), have urged its deployment in new forms. So too have reports by companies, research institutes, and scientific institutions favouring the development, manufacture and distribution of biotechnology and its products (Nature 1999 (a), (b), Royal Society (1999), Nuffield (1999)).

Yet the earlier *Uncertain World* findings suggest that, pursued indiscriminately, such courses of action could well confuse matters still further. The stakes in the biotechnology sphere are now such that it is vital on everyone's behalf to understand more precisely what roles information can or cannot be expected realistically to play in circumstances like those in which political cultures like that of Britain have become embroiled.

What is it reasonable to expect of information about new technologies? And who should now be doing what – and why?

The research approach and method

Contemporary political expectations of information have been growing apace. Research in this sphere faces a constant problem of distinguishing myth from reality.

In a world of 'news management', 'spin', 'freedom of information', 'product information' and endless similar permutations, any notion of information pure and simple is an elusive one. 'The information society' and 'the knowledge economy' are increasingly familiar political concepts, offered as encapsulations of contemporary social reality, shaped by the escalating possibilities of information technology. But the terms beg a host of normative questions. The researcher seeking to analyse any one part of this matrix faces a maze.

Further familiar complexities of social research multiply these difficulties. The meanings of 'information' vary between organisations and end-users, and for the same actor across contexts, in ways which are rarely explicit or directly observable. Moreover, the factors influencing these meanings and the authority of particular bodies of information to different people are seldom obvious. So commentary on them by the social analyst must rest, necessarily, on his or her own provisional interpretation and experience. Indeed ultimately, the forum of validation or falsification of the resulting sociological arguments and findings is the less-than-perfectly-disciplined one of public and academic debate.

The research approach has thus had several elements.

First, the researchers undertook a series of interviews with information providers – that is, with professionals from a variety of vantage points within the overall information-provision field. More than 20 lengthy discussions with specialists from manufacturing industry, the retailing sector, and the worlds of NGO and government were undertaken, in an attempt to gain an initial over-arching sense of any shared assumptions (or conspicuous differences) governing such individuals' attitudes towards the strengths and limitations of increasing availability of information in the public domain. The findings from this phase are summarised in the first half of Chapter 2.

Second, after substantial reflection on the implications of the picture that had emerged in the first phase, a series of focus group discussions were held with members of the public. These were in two stages, each of the six groups being convened twice, with a substantial interval between the two stages, for reflection and evaluation. The focus of discussion in the groups was on people's experience in their daily lives of new products and new technologies, and how they felt about them. As distinctions emerged, it became natural to allow more focused discussion to emerge, in phase two, around the question of contrasts between experience of the two new technologies of which greatest expectations have been expressed in societies like our own – information technology and genetic modification.

A large body of material was generated from this field work, conducted in the first half of 1999. In reflecting upon it, the researchers drew on a body of insight from previous research, conducted over the past twenty years, on public sensibilities towards new technologies and their associated social relations, as well as their internalised familiarity with the work of a range of other scholars in the field, in this country and elsewhere in the world.

Whilst the intellectual orientation informing the analysis has combined, primarily, sociology-of-knowledge and social psychological perspectives – a conjunction similar to that which yielded the fruitful findings of *Uncertain World* – the study is a frankly interpretative one. The material generated during the empirical stages has been designed and used to generate insights – speculative, as well as analytical and prescriptive – on matters of social importance, the contours of which are still only beginning to become clear. Confidence in the intellectual robustness of this approach rests on the researchers' substantial body of previous ESRC experience (CSEC 1995, 1998) and international evaluation (ESRC 1997, 1999).

It should be added that the researchers have been helped considerably at several significant stages by discussions with practitioners at Unilever and Dragon. The conclusions however are entirely the researchers' own.

The report

In Chapter 2, the key findings from the interviews and focus groups are summarised. There then follow, in Chapter 3, a number of reflections on these findings and their possible significance for future policy and practice in the technology assessment field. Subsequently, in Chapter 4, a number of more specific prescriptions, for government, industry, NGOs, and society at large are offered.

Chapter 2
Key themes and findings

The 'information' question

What do people mean when they ask for 'more information' in relation to controversial new technologies or products? In what circumstances do they ask for such information? How do these demands relate to the new normative commitment to a culture of transparency in such domains? And how might those in positions of control or authority respond most effectively?

The empirical component of the study sought to throw light on these matters. However, as this stage progressed, it took on a life of its own. It became increasingly clear to the researchers that tensions apparently surrounding the issue of 'information' were reflections of wider problems of political culture in industrial democracies like Britain, albeit brought to prominence through the unprecedented rows about GM crops and foods in 1998-99.

This component of the work was undertaken between October 1998 and March 1999. It was in two parts.

First, a series of 20 interviews with information specialists from the worlds of manufacturing, retailing, government, and NGOs were undertaken. Initially, the purpose was to gain a picture of future information needs. But rapidly, a host of further-reaching questions opened up. How did professionals in the field, from a variety of points on the commercial and political spectrum, understand the very role and limitations of 'information provision' itself for public purposes? What common understandings did they share? What assumptions or expectations existed about the supposed recipients of the information, whether thought of as 'citizens' or as 'consumers'? And what tensions or differences of understanding prevailed within this very diverse professional community?

In the second stage, a range of discussion groups ('focus groups') from sample sections of the public were organised, with the purpose of eliciting clues as to people's experience of the utility or otherwise of 'information' in relation to new technologies or products within their direct experience. Two rounds of group discussions, involving the same individuals in each case, were convened. During the first round, information technology (IT) and genetic modification (GM) emerged as especially prominent in people's minds. So the second round pursued the experience of similarities and contrasts between these two domains in greater detail. This proved extremely fruitful.

A more detailed analytical commentary on the implications of the findings follows in Chapter 3 and suggested prescriptions for action in Chapter 4.

The interviews with specialists – findings

The interviews with the 20 professional specialists in information provision threw up a number of key findings. These may be summarised as follows:

1. Information provision was taken for granted by providers as a good thing

A number of different perspectives appear to have been combining around the desirability, or at least the unavoidability, of greater 'openness' and 'transparency' of information for the public.

'What we're saying is, "Look, if you have that concern, then you need the information so that you can act accordingly. It is up to the individual." I think that is the best we can do…'

(Corporate affairs manager, retailer)

'There has been a great deal of pressure for increased public access to information. Those behind it are interested in open government – the ability to obtain information that is held within government essentially by right. So one of the developments has been the progressive response to pressures for actually giving people more rights to information.'

(Recently-retired senior civil servant)

'The more the better. If you show you've got nothing to hide, then people will not be suspicious.'

(Public interest NGO director)

'The more the better. If you show you've got nothing to hide, then people will not be suspicious.'

2. People were seen as being in need of information, to enable them to make 'choices' and to participate in 'decisions'

The complexity of the contemporary world, and of the decisions and choices in which individuals were now understood to be involved daily, were argued to make increased availability of information – in both private and public domains – a necessity. This was associated with the rise of consumerism since the early 1980s, a development which had increased with the more general diminution of deference.

'Consumers are certainly hungry for information these days. I think our society has changed a bit here. It's come partly from the culture of the 1980s. I think before there was a feeling that the state would look after you, the state would decide, or industry would decide what's right. And now there is much more questioning: Does the state know best? Does industry? Does whoever?'

(Public affairs manager, manufacturer)

'I think we're not there yet, but it's almost an 'involve me' culture… I think people have that right… People are really saying, "Look, hold on, I want to be able to be sure that if I want to know I can find out"…'

(Regulatory affairs manager, manufacturer)

'We think you have a right to be kept informed'

(Corporate affairs manager, retailer)

An implication appeared to be that openness and provision of information would tend, ipso facto, to increase confidence – or at least to minimise distrust – between those purveying and those receiving the information in question.

'*We think you have a right to be kept informed.*'

3. Which facts were seen as appropriate for dissemination as 'information' was framed differently by different institutional 'interests'

Within a generally shared assumption that 'information provision' involved sharing of relevant 'facts', there was a striking degree of divergence over the sorts of facts which should be made available. Different institutional perspectives appeared to lead, unself-consciously, to different priorities in this regard.

'We sat down and said "We should actually sit down and talk to the consumer pressure groups rather than the ordinary person in the streets". So we talked to the consumer pressure groups first... and it was on that basis that we wrote the leaflet.'

(PR consultant to manufacturers)

'As life becomes more complicated, people start to encounter things that they don't feel are answered by what's on the pack; but we've now set up helplines, so you can telephone in and get an answer to your question. Immediately. The helpline number is clearly printed on the pack. So there's always a way out of the problem for people.'

(Market research manager, manufacturer)

'When [government] responds to any request for information, one of the questions it asks is "Well, how can this information be presented in a way which is going to help us in the process of supporting or pursuing or developing the policies in the ways that we want?"'

(Recently-retired senior civil servant)

Such responses appeared to take for granted an assumption that information offered for public consumption could be mediated, unproblematically, through the perspective of the particular institutional provider. It was assumed as uncontroversial that the information in question would be framed in ways which would reinforce the assumed role of the providing body. There was no sign of concern that such 'editorialising' might influence the perceived value of the information in the eyes of those at whom it was aimed, apparently because, from the perspective of the individuals interviewed, the normative value of 'the facts' in question was undiminished by any such tacit framings.

4. Information provision was seen implicitly as concerned with the conveying of 'facts' to those lacking them, rather than with the communication of unknowns or areas of ignorance

'Information' appeared to be understood as always adding to the store of public knowledge, rather than as pointing to absences of understanding.

'Scientific uncertainty is not for us as retailers to deal with, because either we believe what the regulatory authorities say or we don't.'

(Public affairs manager, retailer)

'*Where uncertainty's concerned, our job's to reduce confusion*'

'Where uncertainty's concerned, our job's to reduce confusion, to communicate the complexity of the science in clear and simple forms for the public…'

(PR consultant to manufacturer)

'You've all got to be singing from the same song-sheet. I think that's the problem. That's where I'd like to get to with these other organisations [i.e. retailers/manufacturers in the same product sphere] and say "Look, we've got to say something. You're in this boat with us. And what are we going to say?"'

(Market research manager, manufacturer)

This sense of information as the active and positive communication of nuggets of 'fact' was pervasive amongst all of the specialists interviewed, regardless of their particular positions on the industry–government–NGO spectrum.

5. Those interviewed appeared to find it surprisingly difficult to discuss, or even to conceptualise, issues of open-ended scientific *ignorance* or *uncertainty*

Over and above any (understandable) difficulties of presentation presented by issues of scientific uncertainty in marketing or wider political contexts, there was a striking absence in the overwhelming majority of interviewees of an adequate vocabulary or mode of discourse in which even to acknowledge such realities.

'The biggest problem is when scientists disagree… It's getting that balance between pushing forward the boundaries, the frontiers of science, without making so much damage, you know, that we are getting to do something irretrievable, 'let the genie out of the bottle'. I don't know how you get that balance, I really don't know. But I don't think the ordinary person in the street cares about it…'

(Corporate affairs adviser, retailer)

'I agree, we've not got crystal balls…'

(Government regulator)

'You assess your risk, your risk hazard, and do your risk assessment. Now, I cannot think of any other way of handling that risk. That's nothing to do with ethics, nothing to do with politics. But how else can you handle society?'

(Public affairs manager, manufacturer)

This lack of a way of discussing issues of *uncertainty* or *ignorance* in the context of information provision was strikingly consistent across most of those interviewed. There was minimal recognition that such matters might be significant for those on the receiving end. (The fundamental significance of this issue is explored further in Chapter 4.)

6. Legal requirements for information provision were seen as sometimes compromising 'real' public information needs

For some of those interviewed (especially retailers) there were tensions between legal obligations to provide 'label' information aimed at compliance with legal requirements, and what was felt to be appropriate for consumer enlightenment purposes.

'We shouldn't be putting anything on the label that doesn't allow you to take a decision. Now, unfortunately, much of the labelling legislation... has tended to go down the track of "What information can we put there that can be analysed by an enforcement officer, so that he can prosecute you if what you say isn't right?" Which is quite different!'

(Corporate affairs manager, retailer)

This tendency confirmed the extent to which, behind the apparent neutrality of information provision, institutional contingencies were an ever-present and influential force.

7. Information overload was seen as a mounting problem, but few ideas on how to address it were offered

'I think there's a danger... of information overload, which bears on the fact of who does the consumer trust.'

'I think there's a danger, a big danger of information overload, which bears on the fact of who does the consumer trust.'

(Corporate affairs manager, retailer)

'It turns out that the more and more information you have, for example, the smaller and smaller type, and therefore the less use it is to consumers.'

(Corporate affairs adviser, manufacturer)

Despite such tacit recognition of communication difficulties which might be associated with such overload, it was regarded as of secondary significance to the main business of purveying one's own information in the market place.

8. There was no indication that information provision might have relevance for public debate of technological innovation strategies

None of the specialists from either industry or government offered any recognition of a potential role for reciprocal information flow – from public to expert, as well as vice versa. In this respect there was a de facto gap between the views of those interviewed, and recommendations offered, for example, in the 1999 Office of Science and Technology *Public Consultation on the Biosciences* (OST 1999), or the 2000 *Science and Society* report of the House of Lords Select Committee on Science and Technology (HMSO 2000).

Conclusion

Overall, the Phase 1 interviews suggested a widely shared sense of commitment towards information provision as a growing and positive development in public and private sector exchanges in contemporary Britain. They also suggested however that this development may now be throwing up significant tensions and contradictions, particularly as regards the handling of unknowns, framing, and information 'saturation'. One specific problem concerned the provider's need to make bodies of information useful and relevant to the supposed needs of those at whom it was targeted, whilst at the same time maintaining the 'factual', 'objective' character of the information. Nevertheless, it was striking that all of the specialists interviewed saw information provision as having a positive contribution to make to the empowerment of individuals, as 'consumers' or (more unusually) as 'citizens', in the 'decisions' and 'choices' faced in everyday contemporary life.

Against this background, Phase 2 of the research used a series of focus groups with members of the public to explore the role of information in the specific context of people's experience of novel products and technologies in contemporary Britain.

The discussion groups – findings

The six focus groups, each of which met twice, yielded a range of insights into the ways in which 'information' associated with new products and technologies was being experienced in everyday contemporary life.

Some of the key findings were as follows:

9. Most people saw themselves as engaging with one or more new technologies through consumer products

There were wide variations in people's involvement with – and indeed awareness of – new technologies in everyday life.

'The pace has been unbelievable...'

(Young professionals group)

Information technology in a variety of different forms was mentioned most frequently. Mobile phones, the Internet, and digital televisions appear to be becoming increasingly features of everyday life. However, there were wide variations between groups. Changes in food technology – year-round availability of exotic fruits etc., developments in genetic modification (GM) and new preservatives – were also mentioned recurrently.

10. Individuals' responses to new technologies varied widely

'Technology-wise I'm a total techno-phobe. The only thing I use a lot is the mobile phone because it's cheaper than BT.'

(Singles group)

'Mobile phones, they're a scourge really… But I think they're very handy and it's only recently we've got one – and we wonder why we haven't got one before.'

(Empty nester group)

'You don't know what's going to be the next emerging technology… there's such a bewildering choice…'

(Young professionals group)

'You don't know what's going to be the next emerging technology… there's such a bewildering choice…'

Responses covered a range between the enthusiasm of technically literate Internet users, and the bewilderment and/or resentment of middle-aged 'empty nesters' unsettled by what was experienced as a relentless pace of change. Age appeared to be a significant variable in this context. Younger groups appeared more optimistic – excited by an apparent sense that technological innovation was tending to extend choice and opportunity. In older groups the focus tended to be more on disruptions to established patterns of work, home-life, and leisure practices flowing from the same innovations.

11. New information and communication technologies were becoming especially familiar

Whilst only a small minority of individuals considered themselves fluent in the technicalities of information technology products, there was a striking lack of inhibition amongst, for example, non-technical younger women about the potential usefulness, and fun, of such products.

'…the BT 1471 number has been useful recently… Just those little things make life a bit easier.'

(Mothers group)

'I fall somewhere in between because I was a total techno-phobe until about twelve months ago. But because of the way my job's gone I kind of had to get a computer at home and I had to start using the Internet and email... just proved to be a far more productive way of contacting clients or sending things to clients. Didn't kind of think, yippee, I've got to spend five hours on a computer. Today it's a far more effective way of working than the way I was working before...'

(Singles group)

There was general confidence that technical advice was available from friends or experts on such matters, as needs arose.

12. There was widespread suspicion of GM foods and of the motives of those promoting them, including government

Attitudes towards GM foods had hardened into scepticism and even hostility across all groups – particularly when compared with findings from the researchers' previous 1996-97 review. The more informed the individual about GM, the stronger the hostility appeared to be. Safety assurances by government and industry were decoded in the light of BSE and other analogous experiences, and it was assumed that government was actively (and inappropriately) promoting the technology.

'I think they've lost their trust in what people are telling them as well. You hear well, that's politicians, isn't it saying there's no evidence that... there was BSE, and that there's no evidence that genetically modified food will harm you...'

(Mothers group)

'There's people who you can't connect with, and you've got no kind of control over, driving that.'

'[Communication technologies] are going to be market led. It's whether these things get used and become popular. Biotechnology's got bugger all to do with that. There's people who you can't connect with, and you've got no kind of control over, driving that. Whereas I believe that technologies like those – digital technologies and the other categories that we used – can be consumer driven...'

(Singles group)

'Would you believe what a company like Monsanto told you?'

'Er, no. I think they'd tell you what they wanted you to know.'

(Empty nester group)

Moreover, GMOs were assumed by people in several of the groups to be already present in a number of processed foods, regardless of regulation.

There was a particularly striking contrast between the fluency and relative confidence with which people talked about information technologies and their negative reactions towards, and inarticulacy about, genetic modification.

Whilst, in all but the 'empty nester' group, developments in the IT arena tended to be seen as extending choice and opportunity, the reverse was the case with GM. By contrast with IT, GM was characterised recurrently as being imposed, and as inherently restrictive of choice. Both technologies were seen as being propelled forward by powerful lobbies and market forces, but the surrounding conditions were seen in different terms *(see below)*. Everybody seemed to have his or her own homely story about personal encounters with IT, frequently articulated with humour and energy.

By contrast, there appeared to be not only a lack of experience, but also even a lack of an available language, for discussing GM. In the IT case, manufacturer-consumer interactions were talked about as flexible and as apparently generating rapid responses to new needs. By contrast, GM was seen as inflexible and unresponsive to consumer desires – with any benefits seen as being largely for the producers.

13. Most people appeared to have a low sense of agency in relation to potential 'down-sides' of contemporary technologies – though contrasts were evident between IT and GM in this respect

Concerns were expressed in several groups about the wider social impacts of both IT and GM.

'You feel kind of overwhelmed and overtaken as an individual. A great wave of technology that's going on in front of you... There's a fear about who's controlling it all. Who's in control? I don't know.'

(Mothers group)

But the apparent pluralism and market-responsiveness of IT was seen as likely to mitigate the worst consequences – by contrast with GM, which was seen by some as having potentially irreversible side-effects not amenable to conventional market or political influences.

'The thing with IT is at the end of the day you've still got a degree of control.'

'I mean, the thing with IT is at the end of the day you've still got a degree of control. 'Cause firstly you don't have to buy it, and secondly once you buy it, you can do with it what you want to do with it. But the thing with foods generally and GM foods is you've got no control over it, because at the end of the day, you walk into a supermarket and you assume that what you're picking up is OK for you...'

(Young professionals group)

'I think they're [IT & GM] equally uncontrollable.

You can choose not to be on the Net, but if they decide to put something in bread or whatever you eat because it's fine, you can't control that. You can choose not to buy the bread but at the end of the day if it's in every one...

It's obviously not as difficult to regulate the Net as it is to regulate something like food, because, you know, if you produce some kind of genetically modified flower, you can't control where the pollen drops and then it could mutate with something else. But there's a kind of similar concern, that of the Net not being something you've got any mastery over, but obviously it's not as grave as trying to monitor what goes on with the food...'

(Fathers group)

14. As regards new products and technologies, previous experience of the producer or regulator in question, and related reports by trusted 'others', appeared to be the most trusted information sources

Tacitly, it seemed, positive or negative expectations of new products and technologies tended to be grounded in previous direct or indirect personal experience of the promoters in question. This again reinforced the contrast between IT and GM. Enthusiasm for the former, especially in the younger groups, relied on interpretation of the copiously available information thrown up by plural market forces (*see above*). This should not be read as implying a negation of 'expert' influences – rather, that when questions or problems arise individuals tend to turn to authentic 'trust' networks, rather than relying on impersonal 'outside' sources. This confirms earlier findings in *Uncertain World* that confidence in official regulatory bodies is more provisional and conditional, and hence potentially more brittle, than is often assumed within the policy world.

15. Published information about new products/technologies was routinely assumed to be biased in favour of the body providing it

There was a general assumption that product information provided by a company would be framed so as to advance that company's self interest. This was not seen as surprising:

'You always look to the bottom to see who sent you the information and if it's a supermarket who are in the process of selling food and want to make money – that's their line of thinking... It's just a marketing angle again, because they want to sell the food.'

(Mothers group)

'What you really want is truly independent advice and that's so difficult to come by, 'cos everyone's got an angle...'

(Internet group)

'What you really want is truly independent advice and that's so difficult to come by, 'cos everyone's got an angle…'

'As far as they're concerned [Greenpeace], they're looking at the bad sides only.'

Moreover, similar tendencies were felt to apply to government. Increasingly, government information was being 'spun' with government's own policy priorities to the fore.

'The words honest, government, and debate just aren't synonymous.'

(Singles group)

It was claimed that experience showed information from either private or public sources to be rarely unbiased or impartial.

16. People appeared to be as sceptical about news media and NGO motives, in relation to recent GM controversies, as about those of government and industry

Contrary to recent claims of industry and government spokesmen, there was little sign of uncritical public endorsement of news media or NGO hyperbole, where the safety or integrity of GM products was concerned.

'Well as far as newspapers are concerned, it's all about selling newspapers, isn't it? It doesn't really matter what the headline is...'

(Mothers group)

'As far as they're concerned [Greenpeace], they're looking at the bad sides only.'

(Fathers group)

Thus the recognition that public actors of any kind were selective in their claims about controversial new technologies/products extended well beyond government and industry alone. Nevertheless, there was appreciation that, in the recent GM rows, such media and NGO perspectives had contributed significantly to bringing the full range of issues into public view.

17. Despite dissatisfaction with present arrangements, people showed little enthusiasm for playing a more direct role in issues surrounding future technology choice and development

Whilst it was implied that the government had failed to play a sufficiently independent monitoring role over GM product developments, and that current arrangements for reflecting public values were inadequate, there was an apparent scepticism about the possibility of a greater public influence over such developments. This manifested itself in a striking lack of responsiveness across all of the groups, when suggestions for potential means of greater direct involvement in decisions were suggested by the group moderators. The assumption appeared to be that technological development took place in arenas outside wider public influence.

Further observations

Comparisons between the interviews (information specialists) and the group discussions suggest some highly significant contrasts:

- People in the focus groups tended not to 'choose' or 'decide' in the predictable, 'rational', step-by-step fashion assumed by the information specialists in the interviews.
- The professional preoccupation with information provision by the information specialists appeared to occlude recognition of the 'down-sides', 'unknowns', and other 'indeterminacies' surrounding new products/technologies referred to in the focus groups.
- People in the focus groups appeared more aware of routine selectivity and institutional bias in relation to information provision than was acknowledged generally by the information specialists. This awareness was used not to reject the information in question, but assist 'triangulation' of its significance, in relation to information from other (doubtless equally 'interested') sources.
- People in the focus groups were concerned that government should play a more active and independent role in oversight of new technologies and products, but, *pace* the apparent understanding of the information specialists, were sceptical about the authorities' inclination or capacity to do so.
- In contrast to the apparent assumption of most of the information specialists, a recurrent focus group concern about GM issues related to generic questions such as 'why are they doing it, and what for?'. Thus people appeared to assess new technologies not simply on the basis of their performance characteristics; their degree of confidence and trust rested also on their sense of the source of the technology and of the motives and aims sensed to lie behind its development.

In the chapter following, we explore further some implications of these and other differences of understanding and experience.

Chapter 3 Commentary: the role and limits of information

Landmark issues

The research for the present study tends to confirm the landmark political significance of the controversies which have surrounded the proposed introduction of GM foods and crops into the UK over the past two years. Wider concerns about the need for more adequate social assessment of new technologies have crystallised around the GM issue.

In this chapter, we reflect on key findings from the interviews and group discussions and suggest some possible implications for future practice by industry and government – particularly vis-à-vis the question of the role and limits of public information in relation to future potentially controversial technologies.

The recent GM controversies, we suggest, point to serious limitations in the intellectual tools and internalised models of understanding within British regulatory culture for engaging with matters of this kind. Indeed, we go further. The very institutional frameworks within which such issues are currently addressed appear to demand further review, beyond the changes announced by government in May 1999 (HMG 1999). The pace and character of technological innovation under circumstances of increasingly globalised free trade and competition now carry the strong possibility that the international GM upheavals, pitting citizens against governments and politically-significant multi-national corporations, could be the shape of things to come, unless appropriate lessons are learnt.

This, we argue, is the context in which the apparently widespread expectations of 'information' in cases of the GM kind need now to be considered, and potential prescriptions for future practice developed.

Good faith all round

The research provided copious evidence of the difficulty and open-endedness of the issues at stake. Not only were both information providers and citizens being invited to reflect on complex matters of technological innovation and distribution, but they were also having to engage with questions concerning democratic evaluation and technology-oversight in fast-changing circumstances for which recent historical experience provides little precedent.

Nevertheless, the good intentions of the information specialists interviewed were striking. They saw themselves as contributing creatively to processes of public enlightenment in a new and responsible fashion. But this very conviction appeared to rest on a relatively unquestioned assumption that information provision, in and of itself, constituted an enrichment of public discourse, in inherently unproblematic fashion.

In parallel, the tone and approach of most of the discussion group participants was measured and reasonable; people from a variety of socio-economic contexts and life-stages sought to grapple with largely unfamiliar issues in a calm and generally measured fashion. But equally striking was the apparent novelty of the idea that they, as individuals, might justifiably expect to have a role ('agency') as participants in decisions bearing on the wider social implications of technologies such as IT and GM.

Thus in both contexts, interviews and group discussions, we encountered a combination of enthusiasm for dialogue about new technology issues, and unexpectedly restricted disposition or resources for exploring the limitations of current approaches and oversight mechanisms.

How people experience 'information'

Those within industry or government whose role was to provide information tended to see themselves as enriching the body of available 'fact' on particular matters available to the public at large. Whilst at one level this seems uncontroversial, nevertheless it begged its own questions. Repeatedly in the interviews with providers, we encountered what appeared to be a tacit assumption by providers that people (characteristically referred to as 'consumers') reached judgements on the strength of 'facts' so deployed, issuing in 'choices' or 'decisions'. Providing information was thus assumed to constitute a straightforward extension of the body of propositional fact on which people at large were then able to draw.

However, the group discussions suggested that in practice a more complex reality prevailed. Particularly in areas where there was controversy (GM for example), people appeared to interpret information in the context of what they knew about its assumed source. What is more, they appeared frequently to have a shrewd if barely articulated sense of the motives and interests of the provider in question. Where this was absent, people worked hard to identify possible background 'interests' and 'purposes'. It was taken for granted that any information on offer was framed with such interests in mind. Any previous experience, direct or indirect, of the particular provider (supermarket, food manufacturer, chemical company, government regulator – and even news medium or NGO) was a crucial element in these judgements. Indeed, such experience was treated as a basic feature of the information itself, often in ways the provider in question could not appreciate or even imagine.

In the discussions, 'factual' leaflets, labels or advertisements tended automatically to be decoded in the light of such contextual realities – a reflex which (contrary to frequent official claims) applied as much to materials emanating from NGOs and news media, as to those from government, scientific, or industry bodies.

This is not to claim that all efforts at information provision should therefore be seen as pointless – rather, that the 'boundaries' of the information being communicated are not necessarily those assumed by the providers. Unsurprisingly, wherever possible, the focus groups confirmed that people tend routinely to decode information for its provenances, and to triangulate particular information 'packages' with data available from other sources felt to be relevant. In this context, 'body language' may be as important as substance – particularly when issues intuited to be of significance are effectively 'denied', by not being mentioned – as arguably occurred in the GM case.

It follows that in market contexts where there are multiple sources of information, people will tend to have more data to triangulate, and in less 'dense' contexts there will be greater dependency on fewer sources. Thus on the evidence of the focus group discussions, the presence or absence of such triangulation possibilities may have been contributing significantly to the relative confidence people appeared to feel about IT in its multiple uses and product manifestations, and to the scepticism and mistrust evinced towards (less diverse) GM products. This comparison is elaborated schematically in Table A *(page 32)*.

Information and institutional self-interest

The essential reasonableness of people's routine scepticism towards information (leaflets, labels, advertisements, etc.) from industry or government sources was underlined by a further clear finding: most information providers, including supposedly 'unbiased' government agencies or regulatory bodies, are necessarily selective in the materials they offer for public consideration, not least because they must reconcile needs for accuracy, clarity, and legal defensibility, with the necessity of not contradicting their own normative institutional priorities.

Thus, all information from institutional sources editorialises – and necessarily so. This is not to criticise the integrity of particular individuals within provider bodies. But it points to the dangers inherent in new 'Public Information Strategies' predicated on the 'naive' assumption that this or that provider body's authority can be relied upon to command automatic public trust and confidence.

Strikingly, implicit assumptions of such kinds are evident in the recommendations of two recent government-funded analyses of current British public responses to GM (MAFF/Sheffield 1998; Office of Science & Technology/MORI 1999). In both cases, following new qualitative and quantitative research into current public attitudes commissioned by key Whitehall bodies, government has been urged to step up campaigns of 'objective' information about GM, to reassure a concerned public that its anxieties about the technology are being addressed.

By contrast, a corollary of the discussion group findings is that both government and industry bodies may be continuing to misread the extent to which their own behaviours, even when aimed explicitly at reclaiming public confidence in the handling of GM, risk generating further perverse feedbacks in wider public understanding. The inadequate appreciation of the extent to which credibility of the source is a factor in public appraisal of information stands to compound current difficulties.

This relates also to a further dimension of public behaviour, much remarked upon in recent surveys of public attitudes – the apparent degree of 'trust' reposed by the public in NGOs as opposed to government and industry bodies on issues such as GM. If, as we have argued, people tend, intuitively as it were, to triangulate information from multiple sources in order to arrive at a provisional sense of how things stand in relation to particular sensitive issues, the same logic might be expected to apply in the political arena. We hypothesise that people, quite rationally, scan the political-regulatory arena to reassure themselves that a proper degree of pluralism and distribution of powers prevails, in arenas of controversy; it is the role of NGOs and news media as part of this matrix, rather than the qualities of such entities pure and simple, that people 'trust'. This implies a sense of the public consistent with that encountered in the focus groups – as tacitly aware of the contingencies surrounding expert knowledge or 'information', and hence conscious of the need for constant triangulation, challenge, and 'social' review.

Scientific uncertainty, ignorance, and the limits of 'information'

It appears from the interviews that there is a general, if tacit, assumption amongst providers that information communicates that which is known, in a positive sense. In no case was it seen as the task of the supermarket chain, chemical company, or government agency to communicate unknowns – areas of *uncertainty* or *scientific ignorance* – with respect to its products or responsibilities.

This points to a fundamental limitation of information provision in assisting public enlightenment on new technologies or products. In the case of GM for example, the present study, like its recent predecessors, has found that it is precisely the sensed dimensions of *uncertainty* or *ignorance* ('what we don't know, we don't know' – that is, the likelihood of unanticipated consequences) which have been giving rise to greatest public concern. And reasonably so, one might add. Yet, as reported in Chapter 2, the interviews suggest a pervasive absence of any adequate way even of conceptualising the 'ignorance' issue, let alone of communicating it, on the part of providers. This fact alone points to deficiencies in the model of public engagement in which information provision as a practice is embedded, where new technologies are concerned.

There is a deep cultural dislocation here, between typical 'expert' framings of salient knowledge and typical 'public' framings. Whilst the former tend to ask simply 'What are the risks?', the latter ask in addition, 'What might be the unanticipated effects? Who will be in charge of, and will take responsibility for, the responses to such surprises? And can we trust them?' It cannot be over-stressed that such public responses are a logical entailment of the gap between public understanding of recurrently present *ignorance* and *uncertainty*, and the exclusive focus on 'positive' knowledge within the official information culture of 'transparency' and 'openness'.

Again and again, public demands for 'the facts' or 'fuller information' about particular controversial products or processes have been patronised by official scientific advisers and spokesmen as misguided pleas for 'absolute certainty' that 'no risks exist'. In the situation described above, it may be more plausible to picture such public requests as entirely reasonable demands for frankness about the reality of unknowns or uncertainties – concerning issues about which there is effectively denial by the responsible bodies, and to which information provision, as presently construed, seems capable of making little constructive contribution.

The 'social constitutions' of new technologies

Plainly, it is far from the case that all, or even most, new technologies or products give rise to public concerns about *uncertainty* or *ignorance*.

For example, the research has revealed a sharp contrast in this respect between information technology (IT) in its proliferating consumer-product manifestations, and genetic modification (GM). Objectively, there might appear to be as many grounds for concern about the uncertainties and open-ended questions surrounding IT as have been voiced about GM. The potential for far-reaching social 'surprises' would seem, on the face of it, to be as great for the one as for the other.

Yet, for the most part, the discussions suggested that most people view the two technological domains rather differently. Why should this be? And what is its significance?

The answer seems to lie in the respective 'social constitutions' inherent in the two technologies as each has developed to date. The variety of IT product forms and their relative ease of everyday use and understanding – indeed IT's consumer-friendliness as it has developed over the past decade – are experienced as being in sharp contrast to the 'closed' and 'expert-driven' world of recent GM developments. In other words, the two technologies, though frequently claimed as equally 'modern', 'scientifically-based' and 'revolutionary' in their respective capacities to transform established patterns of industrial practice and behaviour, have markedly different social constitutions – differences which help account for their contrasting public receptions. Table A summarises some of these comparative features.

Table A The 'social constitutions' of information technology (IT) and genetic modification (GM): some perceived comparative features

Comparative dimensions	Information technology	Genetic modification
Consumer benefits	Visible, authentic, personal empowering.	Invisible, indirect/questionable, artificial.
Intrinsic hazard potential	External to body.	Internal to body.
Manufacturer-consumer	Flexible. Responsive via interactions.	Inflexible, unresponsive markets.
'Consumer' sense of agency/discrimination	Distributed knowledge/expertise. Wider.	Minimal distributed expertise. Personally remote.
Knowledge sources	Competitive markets. Informed social networks.	Restricted. 'Partisan', closed networks.
Industry structure	Plural, highly competitive. Multiple entrants.	Oligopolistic, faceless.
Political-regulatory frameworks	Visible. 'Familiar' patterns of liability/accountability. (Though problems coming?)	Invisible. Regulators (government) seen as compromised. Patterns of liability/accountability obscure/absent. Official 'denial'?
Nature of uncertainties/ ignorance	'Familiar' forms. Distributed professional expertises (law, engineering, finance, etc.). But 'globalising' unknowns.	Largely undefined, under acknowledged, long-term.
Public idioms	Dynamic, evolving, increasingly vernacular/shared.	'Expert', alien, opaque.
'Retrievability' in crisis	Shared social implication in retrievability, despite involuntary dependency.	Potentially unretrievable, imposed, pervasive. Public as 'bystanders'.

Table A illustrates a range of differences in the 'social constitutions' of current IT and GM – differences which, we suggest, cast useful light on the reasons for the widely varying public receptions of the two technologies in Britain. These distinctions are consistent with the contrasting responses encountered in the discussion groups.

Current British approaches to technology assessment – for example in the 'Foresight' programme, in statutory 'Environmental Impact Assessments' for various classes of industrial development, in regulatory frameworks surrounding the introduction of new consumer products, and under Town and Country Planning legislation – give little weight to such 'social' variances, focusing instead almost exclusively on a limited range of physical and other 'environmental' impacts.

Yet a finding from the present research is that variances of these less visible kinds can be seen to be crucial for the potential social 'digestibility' of particular new technologies. Despite the large literature (Winner 1977, Rip & Schot 1996), responses to public concerns by industry and government spokesmen/women during the recent GM controversies suggest the extent of official neglect of such perspectives.

By contrast, public responses show every sign of becoming increasingly sensitive to, and interventionist about, these dimensions. We suggest that the responses manifested in the recent GM rows have been shaped significantly by social attunement to such realities, and by intuited inferences about society's capabilities, or otherwise, for handling any associated problems.

If this is true, it carries significant implications for the future understanding of conditions under which new technologies and products can be expected to prove to be socially assimilable in industrial democracies like Britain. In Chapter 4, we make suggestions for procedures which might be adopted by industry and government with such new necessities in mind. The possibility of innovative forms of 'early warning' or 'filtering' system, grounded in finer-grained patterns of attunement to public sensibilities than have been apparent in recent controversies, requires close examination.

However, before moving to specific proposals, certain background implications of the present research findings should be considered. These relate particularly to the ways in which currently dominant vocabularies of public engagement, in which 'information provision' has been coming to occupy such a central place, are shaping – and indeed limiting – society's collective ability to reflect and act realistically upon such matters.

The perverse dominance of 'the consumer'

A key finding from *Uncertain World* concerned the increasingly pervasive tendency in public discourse – particularly as articulated from within industry and government – to conceptualise people routinely as 'consumers'. This, we found, was having corrosive effects both on people's legitimate wider sense of themselves as citizens, and on the ability of public authorities and industrial entrepreneurs to decipher the 'real' (relational, moral, socially interactive) character of public sensibilities in circumstances of recurrent controversy about industrial innovation. It was suggested (CSEC 1997) that such conceptualisations of public responses to GM exclusively in 'consumer' terms were tending systematically to obscure the reality that many people were reacting apprehensively to GM technology as a whole as 'citizens', rather than product-by-product as 'consumers' – in that they were responding to wider social implications and unknowns lying well outside the conventional nexus of 'market' issues.

Findings from the present research strongly reinforce this earlier conclusion. The tacit model of public engagement implied by the information providers in the interviews can be seen as going with the grain of precisely the restricted 'consumer' discourses exposed as misleading in *Uncertain World*. The tacit sense of human agency implied and prescriptively imposed was one in which individuals participate in the public domain through their individual 'choices' and 'decisions', independently of one another. In such a context, freer flows of 'information' are pictured characteristically as the sine qua non of 'informed choice'.

Not only does such a picture have the effect of reinforcing a particular limited conception of public involvement in issues of potential concern to society collectively, it also implicitly characterises political activity overwhelmingly in terms of a series of punctuated 'decisions', to which 'informed' individuals can contribute through discrete 'choices'. The result is to limit the public imagination about wider interpretations of what is at stake not only in the technology assessment issue, but also in the tacit social relations of 'information provision' as an increasingly pervasive commercial and political practice.

Why consumer individualism is socially misleading

A corollary of the 'Consumer-Choice-Information' model of public engagement is its grounding in what political scientists term assumptions of naive individualism (Macpherson 1962, Marquand 1988). Such assumptions imply that individuals form 'attitudes' in discrete isolation from other similarly self-contained individuals.

In reality, people's attitudes and values emerge and are sustained in relationship with others. This takes on immediate relevance in the present context in relation to the issue of 'trust'. The information providers in the interviews recurrently assumed that increased availability of information, contributing to the formation of judgements by individuals, would thereby contribute to the building of trust between 'consumer' and provider. However, as indicated in the analysis of the focus groups in Chapter 3, this overlooks the fact that trust relations are built on experience over time. The naive individualist assumptions about human nature implicit in the 'Consumer-Choice-Information' model lose sight of this everyday reality.

In the same way, the inability of those interviewed to represent in 'information' terms the important reality of scientific *uncertainty* or *ignorance* (in this case in the GM domain) appeared to reflect a similarly impoverished conceptualisation of routine human experience. The fact is, contrary to repeatedly emphasised conventional wisdom in scientific circles, people live constantly with uncertainties and lack of control of many kinds, whether or not there is reassurance to be drawn from the surrounding social relations. Where uncertainties are general – as is generally the case about the future for most of us, for example – people make their own accommodations. Where uncertainties are unevenly experienced, those affected adapt differentially through a variety of familiar strategems (scepticism, jokes, etc.).

Overall, it is a reality of human experience that honesty about unknowns and areas of lack of control is intrinsic to all resilient social relations of trust. People need and expect to be able to make social preparations for unknowns, surprises, and the uncontrolled, as a routine feature of everyday life. It follows that publicly influential institutions or individuals who appear not to recognise such realities are experienced as inherently suspect. For precisely this reason, the information providers interviewed in the present study, and the tacit model of public engagement they were reflecting implicitly, could be seen to be reinforcing the corrosion of public trust in the GM domain.

Professionalised communication and the issue of 'trust'

To conclude this commentary, it is relevant to highlight a growing difficulty surrounding improved 'expert' understanding of the dynamics outlined to this point. This difficulty arises from the growing professionalisation of information management and communication in today's world of 'spin' and 'brand'.

As institutionalised in this fashion, 'communication' relates overwhelmingly to the projection of deliberate, explicit propositional knowledge ('the facts', as seen from particular perspectives – see above). But in parallel, as our commentary on the focus groups has shown, people are able increasingly to 'read' and 'interpret' such communication products in the light of a host of subtler and more indirect clues, most crucially based on experience of the provider bodies themselves. The intensification of information in this instrumentalised form is thus tending to generate perverse social dynamics of its own – dynamics which, the present research suggests, are feeding ever-more intense public scepticism, rather than generating the increased confidence and respect aspired to so earnestly.

This may reflect a deeper current misconception about the relationship between information provision and trust. As explained in Chapter 2, the assumption frequently encountered in the interviews of information specialists was that improved transparency and openness could be expected ipso facto to lead to increased trust. But implicit in this expectation was frequently a further, unacknowledged, assumption – that the trust generated thereby would leave the information providers still essentially in control.

It is not hard to see the fallacy here. Picturing trust as contributing to the goal of restored control, through the instrumental propagation of information, actually implies a negation of the authentic spirit of trust relations themselves. The risk is that, unless approached in more appropriate fashion, such one-way information provision may actually aggravate an already serious situation.

It may be suggested instead that what should be central in the new relationships between industry, government and publics is less the direct pursuit of trust as 'the goal', than the more active cultivation of the true conditions from which trust can emerge – the patient shared construction of patterns of genuine honesty, humility, accountability, and mutual respect between institutions and publics.

The social commentator Barbara Mistzal observes:

'*...My view is that trust becomes a more urgent and central concern in today's contingent, uncertain and global conditions. It does not propose a vision of politics and of human life as resting upon trust, but instead attempts to look at modern societies and their problems from the perspective of the quality of social relationships rather than in terms of goal-achievement or performance of the system.*'

What appears to be at stake is the need for a shift in the very texture of modern public policy culture, in the novel circumstances global society now faces.

In the final chapter, some specific prescriptions for ways forward are suggested.

Chapter 4 Who should now do what? The development of 'interactive understanding'

This concluding chapter looks ahead, with some practical suggestions for possible initiatives by both industry and government, in response to the overall research findings outlined in Chapters 2 and 3.

The central requirement is for industry and government to make rapid progress towards the development of processes for authentic two-way 'Interactive Understanding' with wider publics. Such an approach is inspired by a sharply different vision of the relationships between communication, learning and legitimate authority to that which has tended to prevail in Britain hitherto.

Learning from the GM crisis

The 1999-2000 controversies around GM crops and foods need to be understood as a significant historical watershed in the interactions of 'publics' around the world with technological innovation. Igniting with remarkably spontaneous cohesion in Europe, there has been an unprecedentedly rapid and comprehensive rejection, for the present at least, of an entire class of consumer products rooted in contemporary scientific advance.

Yet, as the 1997 study, *Uncertain World*, confirmed, years before the events in question took place, the gaps between the broad scope of most people's then-latent concerns about GMs, and the narrow scientifically-reductionist horizons of the British GM regulatory framework, were present to be observed, given the will. A crisis was in the offing. It was just a matter of when.

So what is the way forward? How can industry, government and wider society learn from what has happened? Who should now do what?

Opening the technology 'black box'

The GM saga suggests that the most acute challenges, under foreseeable conditions of global industrial competition and deregulation, are faced by those companies who rely most on applications of technological innovation in consumer markets, and on the governments and international agencies entrusted with 'governing' them in the wider public interest.

As the comparison in the last chapter between IT and GM has argued *(Table A)*, technologies and the products they spawn tend to differ not only in the 'consumer' benefits they are claimed to offer, but also in the associated 'social constitutions' expressed through their large-scale diffusion into society. Yet, routinely in late-modern industrial societies, the implications of this latter fact remain unexamined until such product development processes are far advanced – through eleventh-hour quantified risk assessments, environmental impact assessments, public inquiries, planning and pollution control conditions, and the like. Thus, overwhelmingly, societies' evaluation processes for such innovations, however large the potential implications, occur only at late stages in development cycles – by which time the companies in question tend to be committed, ineluctably, to the technologies or products in question. What is more (as the case of the

British Government's initial stance on GM in 1999-2000 illustrates), where perceived national economic advantage is at stake, governments themselves become promoters, and may be increasingly reluctant to subject technologies to too rigorous regulation, unless pressures of acute public controversy require otherwise.

There is a large 'Technology Assessment' literature on the implications of these tendencies and ways in which they might be addressed (eg Winner 1977, Rip & Schot 1996, Cambrosio & Limoges 1991). There is also some, albeit uneven and undistinguished, political experience in a number of countries in devising improved institutional responses – for example through the (significantly, now-defunct) US Congressional 'Office of Technology Assessment', Britain's erratically funded 'Parliamentary Office of Science and Technology' and 'Foresight' Programmes, and, more happily, Scandinavian bodies such as Denmark's 'Office of Technology', Norway's legislative 'Fourth Hurdle', and the like (Joss et al. 1999, Kass 2000).

Factors in addition to the recent GM traumas now point to the need for both private and public sectors to revisit these matters as a matter of urgency. Contemporary social research points to a waning of public confidence in the capacity of governments fully to represent wider public interests under new global economic conditions. Whilst controversies of the GM kind can currently be argued to be the exception rather than the rule, the speed of impending commercial development and market exploitation of fields such as bioinformatics, robotics, artificial intelligence and nanotechnology gives serious cause for concern (Joy 2000). The speed with which these emergent technologies are likely to synergise, producing new self-replicating entities with major environmental and social implications, calls for fresh regulatory innovation.

It is reasonable to hypothesise the likelihood of increasingly unpredictable popular reactions to such new technologies and their as yet uncharted implications, unless more convincing forms of advance evaluation can be devised. Hence, there is a pressing need for industry actively to encourage the development and implementation of imaginative new procedures and practices.

'Information' and the product development process

In most contemporary multi-national companies, new product developments emerge largely through interactions between scientists, technologists and marketing executives. New initiatives tend to be developed on the strategic assumption that, if a product or technology can be designed to fit a perceived niche in a relevant consumer market, people ('consumers') can then be encouraged to buy it, through the dissemination of appropriate information about its benefits.

In many consumer markets, such processes work uncontroversially. But the GM case signals their mounting limitations. For example, where there is latent public unease about the surrounding processes of regulatory oversight, or concern about the likelihood of uncertainties or unknowns in relation to the product in question, more public information will not be enough. Indeed, the reverse may apply. Insistence by a company or government regulator that its information embraces all that it is necessary to know about such products – effectively, the 'body language' message of the behaviour of GM food product manufacturers and supermarkets in 1998-1999 – risks actively reinforcing disquiet, rather than allaying it, with potentially destabilising consequences.

Moreover, the reality is that, on present trends, many of the most dynamic industrial innovation processes in the period ahead will be designed to harness developments at the frontiers of molecular biology and chemistry – so that issues of scientific *uncertainty* and *ignorance* can be expected to present themselves with increasing frequency in consumer marketplaces monitored by ever-more watchful NGOs and consumer watchdogs. The variability of international 'risk' contexts will act to compromise controls, whilst the global networking of NGOs and other interests will intensify processes of critique and challenge to institutionalised authority. Since this will be happening at a time when governments and international institutions are already struggling to keep pace with the continuing shifts in public sensibilities towards authority, as a consequence of accelerating cultural changes induced by globalisation (Castells 1996, Giddens 1999, Beck 1999), the urgency of industry's need for fresh approaches can hardly be overstated.

From 'information' to 'interactive understanding'

What is needed is for the innovation process itself to take far earlier account of human social and cultural realities, in developing initiatives in the real world circumstances of the early 21st century.

This suggests a need for two prior acknowledgments on the part of industry and government.

First, there is a need to internalise of a revised understanding of people – as people first and 'consumers' second. Such an obvious truth should hardly need underlining. Yet, the dominant public discourse of 'consumerism', and of (often trivial) 'choice' as a normative model of democracy, has now spread its reductionist influence into far-flung corners of public life (health, education, etc.). In the process it has obscured from everyday recognition the significance of a range of human social dynamics lying outside the world of market transactions. Of course, in certain contexts, it is right and useful to conceptualise people as 'consumers'. People's patterns of activity in shopping – and some social – contexts can be represented appropriately in these terms. However, the increasingly pervasive conceptualisation of people as 'consumers' not simply of products, but also of social and even political services, has the effect of undermining recognition of the extent to which most social judgements and values are intensely human-relational – in the process helping elevate (one-way) information and 'transparency' to their misleading position of authority as palliatives in situations of difficulty. But note. This is not an argument against information provision and transparency per se. Rather, it is an argument for reconceptualisation of the framework within which these important practices are advanced.

Second, as a corollary, there is a need for a shift from the understanding of technologies and their associated products as 'tools', to an understanding of them as 'social processes'. By this is meant that, as summarised illustratively in Table A, different technologies, when actuated in the real world, embody different sets of social relations, each with distinctive socially transformative implications in their contexts of application (think of the car, the telephone, the television). Conventional practice – implicit in most regulatory cultures – is to treat technologies as if they were simply machines, bearing with them potential physical impacts (pollution, land use, aesthetic, etc.), but devoid of implications for social identity and relationships meriting advance reflection and analysis. Hence, again, intensified flows of information have tended to be pictured as an unproblematic palliative,

when problems of public controversy arise. However, as Chapters 2 and 3 have suggested, in a growing number of controversial cases this approach risks compounding mistrust and scepticism.

Hence, the most immediate practical need is to incorporate more socially sensitive antennae into the very processes of technological innovation, before irrevocable commitments are made. This calls for the development of new patterns of 'Interactive Understanding' between industry and the publics it aims to serve.

Before suggesting what this might mean in practice, one crucial qualification should be underlined. Interaction and dialogue with the public should not be conceived on the assumption that fully-formed, intrinsically coherent public attitudes, opinions or wishes about new technologies already exist 'out there'. The point of such dialogue should be to engage in mutual learning and exploration, about hitherto taken-for-granted assumptions, boundaries, and categorisations. This requires a new spirit of humility by 'experts', in relation both to their own internalised assumptions, and to their relations with wider 'lay' understandings. What is needed is the nurturing of fresh forms of moral and intellectual insight and commitment, in terms which may be largely unfamiliar within both industry and government.

As Table A has suggested, innovative interactions can be expected to bring to light 'social' properties at odds with previously assumed relationships and responsibilities, albeit advanced under the justification of 'freedom of choice'. Increasingly, new technologies have the potential for radical transformations of human social identity in unforeseen ways. Dimensions of these kinds, and the social choices they imply, need to be more openly and realistically addressed, at a stage when options are still genuinely open.

'Interactive understanding' in practice

Industry – technology and product development

1. **Expertise** – Companies should ensure, at the earliest technology and product development stages, a broadening of the range of expertise employed, to ensure that state-of-the-art appreciation of potentially relevant social and cultural dynamics is built into discussion of their strategic upstream technical choices and commitments. This implies a need for full management involvement at an early stage to help set and inform the overall strategies within which scientists and technologists operate.

Marketing

2. **Human reality** – There is an urgent need to move beyond current conceptualisations of market research as properly focused simply on individual 'consumer' psychology and behaviour, to embrace the significance of deeper human social realities and relationships, in line with emerging understandings in the humanities and 'interpretative' social sciences.

This has at least three implications for action:

(i) Marketing specialists should be given a specific responsibility to be sensitive to a richer range of human concerns – 'citizen' as well as 'consumer' – in product development, through the development of improved advance attunement to social forces and trajectories shaping public responses to technologically innovative products.

(ii) Marketing specialists should also act as a 'second stage screen', before the point at which specific technologies reach the stage of potential development into marketable products.

(iii) More effective communication and discussion need to be initiated by marketing specialists across companies within specific industries, in relation to the wider social implications of potential new technologies.

Communication

3. **Communication** – Managers need to be more realistic about the limits, as much as the strengths, of one-way 'information' about controversial products or technologies. People's increasingly hard-eyed realism concerning the necessarily selective character of public information – as encountered during the present study – should alert companies to the need for a more realistic tone in their own information offerings. Expectations should be more modest. Thus one-way information should be offered not as definitive (as was frequently the case in materials offered by supermarket chains in response to the recent GM crisis), but rather as reflecting one particular informed perspective amongst many, with areas of uncertainty acknowledged. One-way information presented deliberately to assist a sophisticated public's processes of independent 'triangulation' stands a better chance of gaining respect than privileged claims to superior understanding. Conceived in this more limited way, information and transparency have a major role to play.

Senior management

4. **Reflection** – Companies should actively foster reflection at senior management levels on more sensitive, socially and culturally informed understanding of human responses to accelerating contemporary economic and cultural change.

5. **Experiment** – Senior management should also initiate two-way experiments employing the growing range of deliberative processes for 'qualitative' interaction with an increasingly pluralised 'public' on wider issues of citizen concern. A number of these are now being pioneered in academia and local government – with a view to generating richer, more ethically informed understandings of priorities and preoccupations developing within society at large.

6. **Wider discussion** – Senior managements need to be increasingly proactive in stimulating, with relevant NGO and academic interaction, dispassionate social debate of issues such as potential tensions surrounding the growing private sector ownership of research in contemporary polities; and the need for new forms of openness about, and shared decisions concerning, scientific uncertainties and ignorance in technological developments.

7. **Global dimensions** – Networks of senior managers in particular technological sectors across the globe should also recognise the emergence of an urgent new range of social responsibilities, arising from the waning capacity of nation states as units of political responsibility and agency. These responsibilities are arising particularly from the increasingly symbiotic relationships of the commercial sector with contemporary science and technology. Such networks need to foster new ways of cultivating open and intelligent public discussion of the implications of these developments across national boundaries – for example, the ethical and regulatory impacts of trade liberalisation, where risks and other deleterious consequences are distributed unevenly across international space. This will not be comfortable. Nor should it be, given the importance of the issues at stake, and the range of actors involved. In the absence of initiatives of this kind (the present research suggests), public disrespect for governments and industrial self-interest seems likely to grow.

Government

8. **Foresight** – Relevant government departments should give priority to adapting the current technology 'Foresight' programme, to incorporate a wider range of culturally-informed insights into the potential social dynamics of technological change. Such adaptation is an especially urgent need, given the evident failure of the established 'Foresight' programme to anticipate recent massive public rejection of GM foods and crops.

9. **Mechanisms** – New mechanisms need to be created for more genuinely inclusive domestic social debate about technology choices, building on current institutional experiments by social scientists, local authorities, and (prospectively) the new Biotechnology Commissions. This should include experimentation with new forms of openness about uncertainty and lack of control in respect of particular potentially beneficial technologies.

10. **Research review** – The Cabinet Office should initiate, perhaps through the Economic and Social Research Council, a cross-sectoral review of currently dominant social research and 'intelligence-gathering' methods in the public domain – involving commercial market researchers, social survey consultants, and academic social scientists – with a view to improving society's overall social intelligence about human to different dimensions of technological change.

Media

11. **Openness about unknowns** – News media should encourage mature discussion of the implications of uncertainties and unknowns surrounding new technologies and their insertion into everyday life. In recent years, aggressive media pressure on politicians and scientists has often led to exaggerated official assurances of safety and control. In discussing the implications of new technologies, the open acknowledgement of unknowns – social, cultural, scientific, environmental – needs to be encouraged as legitimate and necessary for constructive public debate.

Informing all of these various initiatives should be a clear recognition, underpinned by analyses like that in the present report, of the need to stimulate new patterns of two-way social debate and insight around issues of technological development and market communication, to complement and extend the one-way patterns which have tended to prevail hitherto. Relevant differences are summarised in the table following *(Table B)*.

Table B Two approaches to market communication

Comparative dimension	Information	Interactive understanding
Scope of knowledge considered relevant	'Facts'.	'Social meanings' of technologies.
Direction of communication	One-way. Expert to lay.	Two-way, exploratory.
Implicit characterisation of people	Highly individualised 'consumers'.	Citizens engaged in constant social 'triangulation'.
Implicit model of public's understanding	Deficient.	Discriminating, grounded in own or trusted others' experience.
Sensitivity to 'unknowns'	Poor.	Potentially good.
Predictive power	Minimal.	Sensitive.
'Intelligence' advantages	Aids 'decisions' and background triangulation.	Potential for minimising friction at source.
'Intelligence' disadvantages	Selective, one-way.	Need to select appropriate variables for each case.

Selected bibliography

Beck, U. 1992	*Risk Society; Towards a New Modernity* London, Sage.
Beck, U. 1999	*World Risk Society* Cambridge, Polity Press.
Cambrosio, A. & Limoges, C. 1991	*'Controversies as Governing Processes in Technology Assessment',* in Technology Analysis and Strategic Management 3 (4), 377-396.
Castells, M. 1996	*The Rise of Network Society* Oxford, Blackwell.
CSEC, 1995	*Science, Culture and the Environment (I)* report to ESRC. Lancaster, CSEC.
CSEC, 1998	*Science, Culture and the Environment (2)* report to ESRC. Lancaster, CSEC.
ESRC, 1997	*Independent peer reviews of CSEC's research programme (I)* unpublished. Swindon, ESRC.
ESRC, 1999	*Independent peer reviews of CSEC's research programme (2)* unpublished. Swindon, ESRC.
ESRC, 1999	*The Politics of GM Foods* Swindon, ESRC.
EEA, 1999	*The State of the European Environment at the turn of the century* Copenhagen, European Environment Agency.
Green Alliance, 2000	*Steps into Uncertainty: Handling Risks and Uncertainty in Environmental Policy-making* London, Green Alliance.
Giddens, A. 1999	*Runaway World: How Globalisation is Re-shaping Our World* London, Profile Books.
Grove-White, R. MacNaghten, P. Mayer, S. & Wynne, B. 1997	*Uncertain World: Genetically Modified Organisms, Food and Public Attitudes in Britain* Lancaster, CSEC.
HMG, 1999	*The Advisory and Regulatory Framework for Biotechnology: Report from the Government's Review* London, Cabinet Office/Office of Science & Technology.
HMSO, 2000	*Science and Society* Report of the House of Lords Select Committee on Science and Technology. London, HMSO.
Joss, S. et al. 1999	*Special Issue on 'Public Participation in Science and Technology',* in Science and Public Policy (October).
Joy, W. 2000	*'Why The Future Doesn't Need Us',* in Wired (April).
Kass, G. 2000	*'Public Debate on Science and Technology: Issues for Legislators'* in Science and Public Policy (October).
MAFF/Sheffield, 1999	*Public Attitudes on Biotechnology report* unpublished. Ministry of Agriculture, Fisheries and Food.

Macnaghten, P. & Urry, J. 1998 — *Contested Natures* London, Sage.

Macpherson, C. 1962 — *The Political Theory of Possessive Individualism* Oxford, Clarendon.

Marquand, D. 1988 — *The Unprincipled Society* London, Fontana.

Mayer, S. et al 1996 — *Uncertainty, precaution and decision making: the release of genetically modified organisms into the environment* GEC Programme Briefing No 8. Swindon, ESRC.

Misztal, B. 1996 — *Trust in Modern Societies: The Search for the Bases of Social Order* Cambridge, Polity Press.

Nature, 1999 — *'GM foods debate needs a recipe for restoring trust'* Vol 398, No 6079, p639.

Nuffield, 1999 — *Genetically Modified Crops: the ethical and social issues* London, Nuffield Foundation.

OST, 1999 — *Public Consultation on Biotechnology Regulation* London, OST.

Rip, A. Misa, J. & Schot, J. 1996 — *Managing Technology and Society: The approach of Constructive Technology Assessment* London, Pinter.

RCEP, 1998 — *Setting Environmental Standards* 21st report of the Royal Commission on Environmental Pollution London, HMSO.

Royal Society, 1999 — *Genetically Modified Plants for Food Use* London, Royal Society.

Winner, L. 1977 — *Autonomous Technology: Technics Out of Control as a Theme in Political Thought* Cambridge, Mass, MIT Press.