

# HSE futures scenario building

The future of health and safety in 2017

Prepared by **Infinite Futures**  
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This report describes the processes, output, and participant evaluations of a scenario-building project completed for the Horizon Scanning function of the Health and Safety Executive. The scenario process incorporated critical issues of change derived from 28 interviews of HSE policy-makers and outside experts. Participants in a two-day scenario-building workshop chose drivers of change from among these issues, and created a framework defining four different possible futures for health and safety in the UK in 2017. The scenario process also incorporated the emerging changes identified by horizon scanning as 'hot topics' for health and safety. Results from the workshop were written up in two formats:

- 'research scenarios' that include supporting evidence such as reference to other government agency foresight research and scenarios; and
- 'workshop scenarios' that present the key ideas in a vivid but compressed format to generate group dialogue.

As a test of their efficacy in generating policy discussion and ideas, the scenarios were deployed twice:

- at the HSE Horizon Scanning Conference in November 2006 to spark wide-ranging discussion of possible challenges facing the HSE; and
- in a subsequent wind-tunnelling workshop to demonstrate how scenarios can be used to consider specific policies in the face of potential change.

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## EXECUTIVE SUMMARY

Horizon scanning uncovers emerging issues of change. Change renders some habits and hardware obsolete while creating opportunities for new patterns of life and innovations. This dynamic can be productive, but it also destabilises and magnifies uncertainty. Horizon scanning offers a useful radar for identifying areas of approaching uncertainty, but making sense of change requires a different tool. For strategic thinking, that tool is scenario building. This report presents the results of the Health and Safety Executive's (HSE) pilot project in assessing horizon scanning data via a participative scenario process.

The HSE wished to create plausible scenarios that depicted a range of possibilities for workplace health and safety in Great Britain in 2017 – a ten-year time horizon. These scenarios are not predictions, or even forecasts; they are stories and descriptions that explore possible future outcomes and thus inform strategic conversations. Two primary sources of data fed into the scenario building process: the 'hot topics' gathered by the HSE's Horizon Scanning team, and critical issues of change identified in a series of twenty-eight interviews. The project team also cited evidence drawn from related scanning work by the Office of Science and Innovation's Horizon Scanning Centre (now in the Department for Innovation, Universities and Skills), and issues identified within relevant scenarios from other government agencies and related organisations.

The issue interviews were conducted with HSE staff, other relevant UK government agencies, and outside experts from academia and related private and non-profit organisations. During the interviews, the respondents were asked to think broadly about critical issues of emerging change. Interview questions asked people to consider not only optimistic and pessimistic outcomes for health and safety in the workplace over the next ten years, but also what needed to change to create positive outcomes, and what critical information and critical activities would be required. The in-depth responses resulted in an issues 'workbook' containing hundreds of issues.

From among the interview results the HSE project team chose twenty-six critical issues of change to inform the scenario building in this pilot project. The issues chosen fell into seven broad categories: 1) *culture and society*, e.g. dependency, social exclusion, the changing nature of the family, the blurring of home and work; 2) *demographics*, e.g. ageing, diversity, increases in the partially able workforce; 3) *technology/science*, e.g. the change in disruptive technologies – as illustrated by many of the horizon scanning team's 'hot topics'; 4) *environment*, especially climate-change-related shifts in legislation, regulation, and energy provision; 5) *economics*, e.g. the 'hour-glass' economy, changing work structures, decentralisation, and outsourcing; 6) *politics*, e.g. joined-up government, attitudes to risk and blame, and the changing nature of democracy; and 7) *globalisation*, e.g. offshoring, capital and competition, migration, and conflict.

These twenty-six issues provided the starting point for building the scenarios. After review and discussion, the twenty-six were prioritised by importance and uncertainty. Several issues were clustered, and two critical uncertainties emerged as primary drivers describing possible futures for health and safety: 1) are public attitudes towards risk those of personal responsibility, or of the 'blame culture'? and 2) will the UK increase its competitiveness in the global economy?

These two uncertainties were used to construct a scenario cross, around which four scenarios were built.

The scenarios were presented at HSE's first Horizon Scanning conference in London in November 2006, where they were used in a scenario incasting exercise.

In December 2006 the scenarios were used in an internal HSE workshop in a wind-tunnelling exercise, the aim of which was to demonstrate potential uses of scenarios.

# 1. HSE FUTURES PROJECT DESIGN

## 1.1 INTRODUCTION

### 1.1.1 Project Background

Britain's Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) are tasked with protecting people's health and safety by ensuring that risks in the changing workplace are properly controlled. In order to assess risks emerging from change and innovation, the Health and Safety Executive established a Horizon Scanning system, overseen by the Horizon Scanning Intelligence Group (HSIG). The Horizon Scanning team, located in the Health and Safety Laboratory (HSL), draws on the expertise of specialists within the HSE staff, particularly in the Corporate Topic Groups. The 'informed customer' for this scanning activity at the time of this project was the HSE Strategy Division.

Having initiated a robust, interdisciplinary scanning process, the next step in strategic foresight is linking scan data – emerging issues of change – with their potential policy implications. Scenario thinking allows people to explore possible future environments via stories that vividly express the potential impacts of emerging change. These stories create a shared language within the organisational culture that facilitates common understanding of strategic possibilities, opportunities, and threats. Thus the HSIG called for a scenario building project as the logical next step following scanning in building HSE foresight capacity.

The project as designed included three required processes and outputs:

1. Scenarios for 2017, clearly generated from horizon scanning data, and relevant to strategic planning within the Health and Safety Executive. This process includes:
  - a. Review of scanning data;
  - b. Interviews to map stakeholder assumptions and perspectives on change;
  - c. Scenario building, consisting of a participatory workshop and scenario write-up and illustration;
  - d. Horizon Scanning Conference participation;
  - e. Wind-tunnelling HSE policy issues using scenarios; and
  - f. Ongoing engagement with the horizon scanning data and scenarios.
2. Involvement of a wide variety of HSE staff and, where possible, HSE stakeholders in the scenario building and foresight activities.
3. Process knowledge management and coaching to increase HSE Horizon Scanning staff scenario building and foresight capacity.

The following pages describe the processes, the outputs, and the participant evaluations of this scenario building effort.

## 1.2 Scenario Building, Horizon Scanning, and Foresight

Scenario building – also called scenario planning or scenario thinking – is a technique widely used in both corporate and policy settings to enhance management of uncertainty. People have attempted to manage the uncertainty in their lives since the dawn of time; the I Ching and the Oracle at Delphi are both technologies designed to reduce uncertainty, no matter our opinion of their effectiveness. Bacon and Newton opened the door to more robust predictive tools in applying mathematics to closed, linear systems. Physics' ability to predict outcomes in known physical systems seemed to promise an end to uncertainty – until Heisenberg pointed out that whatever we observe we change, often in unpredictable ways.

The situation is even more difficult when we are attempting to predict living behaviour; ballistic trajectories and orbits are simple systems compared to the complications of life. The rise of systems science in the twentieth century gave us the paradigms of chaos and complexity. The first assures us that not all chaotic behaviour is random; close inspection of even turbulent systems reveals patterns of outcomes. Furthermore, living systems have the gift of adapting to turbulence. Out of our complex ability to adapt to changing circumstance, we create innovative ways of producing, consuming, organising, communicating and living with each other.

With these shifts in prevailing scientific paradigm from reductionism to systems thinking and from predicting single outcomes to mapping outcome patterns, the business of managing uncertainty changed as well. Foresight and futures research are no longer about predicting, but rather about forecasting, extrapolating, exploring, and managing uncertainty through dialogue and action. Peter Drucker famously said that the best way to predict the future is to create it. Scenario thinking assists that strategy by sparking discussion and dialogue about potential futures, exploring bands of possibility that may then be monitored for emerging probability – and evaluated for preferability. Corporations such as Royal Dutch Shell, Pfizer Pharmaceuticals, Swiss Re, and Unilever have all used scenario planning, as have government agencies including the Department of Trade and Industry, the National Health Service, the Corporation of London, the Scottish Executive, and the European Union.

Consider scenario thinking to be a robust form of contingency planning. All of us engage implicitly in scenario thinking every day. Take home insurance as an example – it is a strategy to manage the uncertainties of potential house damage. Fire, flood, theft, and vandalism are all possible futures for our homes. We hope they are not very probable futures. But explicitly acknowledging their possibility expands our strategic options. We can buy insurance to repair possible damage. We can respond even more proactively; we can install fire alarms. Thinking even further ahead, we can avoid buying a home in a flood plain. We can install security systems or join a neighbourhood watch scheme. But we must first have imagined the future possibilities before we can imagine the strategies to forestall them.

Scenarios are not limited to threat assessment. They also help us spot opportunities. Emerging technologies in green energy supply, sustainable construction, ubiquitous computing, and home communications and media systems offer today's homeowner dazzling visions of future 'eco-friendly smart homes'. But we must first be aware of those oncoming changes in order to build them into a scenario of home renovation – a scenario that increases the future resale value of our home considerably.

This illustrates integrated foresight. Horizon scanning enhances our awareness of emerging change. From the changes scanning identifies, we create stories of alternative possible futures, or scenarios. The scenarios in turn help us spot emerging opportunities as well as threats. We then lever those opportunities into strategies to create the futures we prefer.

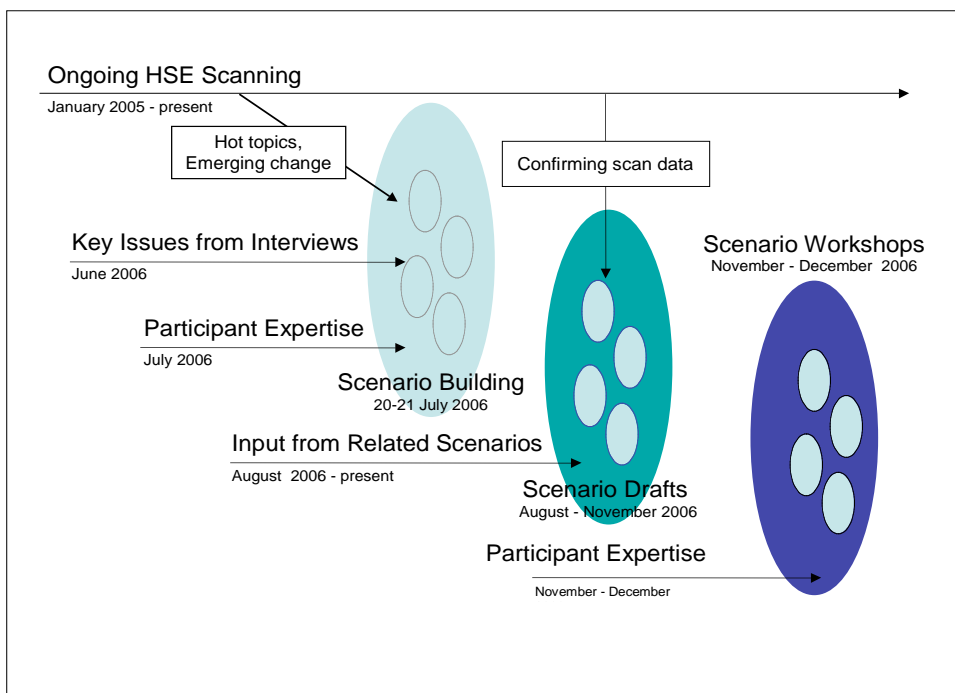
## **1.2 PROCESS DESIGN**

### **1.2.1 Design Overview**

The research project began with a design meeting on 15 May 2006. The project immediately faced a challenge of compression. The ideal scenario process begins with issue interviews, followed by a series of issues workshops that let participants whittle the issues identified in the interviews down to the most critical potential drivers of change. This short-list of change drivers then feeds into a two-day workshop. During the workshop participants refine the drivers, choosing two to create a four-cell matrix defining boundary spaces of strategic

uncertainty. Further research and additional workshops to add detail to the scenarios often follow the initial scenario definition workshop.

The project schedule required presenting the draft scenarios to the HSIG in October in order to plan their debut at the HSE Horizon Scanning Conference in November. The realistic limitations on assembling workshop participants in August confined the issues interviews to June, with time for only a single scenario-building workshop in late July, leaving August and September to write the scenario narratives. Thus the July workshop needed to serve two purposes: enable participants to engage with the critical issues for the first time, and also to build the basic framework for the scenarios. Compressing the process risked lack of clarity in the drivers, but the team considered the trade-off worthwhile to hit the October deadline.



**Figure 1** HSE Futures project timeline and data

As depicted in Figure 1, the project was designed to maximize the flow of evidence into the scenarios from multiple sources. HSE’s horizon scanning data as of May 2006 kick-started the process; the interview issues defined the scenarios; and workshop participants added their expertise and insights. The scenario drafts drew on both ongoing scanning and related scenarios by other organisations as additional evidence. The paragraphs below introduce the four principle phases of the project. The chapters that follow explain each in detail.

### 1.2.2 Issue Interviews

The project design called for approximately twenty ‘issue interviews’ with HSE policy-makers, topical experts, and leaders in related agencies and organisations. The interviews were designed to elicit respondents’ insights regarding emerging change, critical issues, positive and negative outcomes, and actions to create positive change. The team opted to use the ‘Seven Questions’ interview protocol (see Section 2.1.2), with which SAMI Consulting has extensive experience. Each interview was conducted with both an interviewer and a scribe, to ensure complete transcripts. To achieve the goal of building HSE staff capacity in foresight, HSE staff initially

took scribe roles while learning the interview technique, and then took the interview roles in later sessions.

### **1.2.3 Scenario Building**

The team designed a two-day scenario-building workshop for twenty-five participants (including the HSE horizon scanning staff). HSE had requested use of the ‘drivers matrix’ scenario approach popularised by Peter Schwartz in *The Art of the Long View*, clarified by Kees van der Heijden in *Scenarios: The Art of Strategic Conversation* and *The Sixth Sense*, and documented by case studies in Gill Ringland’s series of books on scenario use. This process creates scenarios from drivers of change whose outcomes are both highly important and highly uncertain. The issues interviews provided the pool of potential drivers for scenario participants to evaluate. The horizon scanning team’s ‘hot topics’ provided further data to flesh out the scenario framework defined by the drivers matrix. Participants then brainstormed specific details – timelines, future events, winners/losers – and closed the workshop by briefly discussing possible implications for health and safety generally, and the HSE.

Scenarios are based on documented evidence of emerging change. As they are usually expressed as stories about the future, the links to that evidence are not always clear. The project design addressed this by specifying the creation of two sets of scenario narratives: 1) extended scenario descriptions that included citations and references to emerging change – the ‘research scenarios’; and 2) shorter, more vivid descriptions suitable for quick review during participative work – the ‘workshop scenarios.’ The ‘research scenarios’ were drafted based on the scenario brainstorming output, augmented by foresight data. They were then reviewed by the scenario building participants. The more vivid ‘workshop scenarios’ were then extracted from the research scenarios. The entire project team contributed to expressing the shorter ‘workshop scenarios’ to ensure they would provoke discussion relevant to health and safety in the workplace.

### **1.2.4 Scenario Incasting: Holistic Approach**

HSE’s Horizon Scanning Conference, held on 30 November 2006, provided a venue to debut the scenarios with a wide range of stakeholders. The project team seized this opportunity to test the workshop scenarios with a participative exercise. The Horizon Scanning Conference was broadly targeted to health and safety, workplace, worker, business, government, and academic participants. To capture a broad range of issues and questions, the team used an ‘incasting’ exercise. Incasting asks participants to consider the scenario as a whole, and then imagine what particular issues might arise in that future context for their topic – in this case, health and safety in the workplace. The technique provoked lively discussions and enabled an initial mapping of both emerging concerns and opportunities.

### **1.2.5 Wind Tunnelling: Analytic Approach**

The final project activity was a smaller, in-house workshop for 20 HSE staff. This focussed on ‘wind tunnelling’, using scenarios to check the robustness of policy ideas across a variety of future environments. As a pilot exercise, the team chose eight policy options to analyse using the scenarios, as well as several issues that emerged from the plenary discussion at the HS Conference. Cross-scenario comparison of policy feasibility produced evaluations of ‘accepted’, ‘denied’, ‘contingent’, ‘mixed’, and ‘unclassifiable.’ Participants then focused on the ‘accepted’ decisions to brainstorm a ten-year goal for that policy, and relevant preparatory activities.

## 2. ISSUE INTERVIEWS

### 2.1 PROCESS

#### 2.1.1 Choosing Respondents

Issue interviews have two key purposes: 1) gathering insights from within HSE on critical changes it faces; and 2) gathering alternative perspectives and insights from a wider view. Among scenario planners, respondents chosen to contribute a wider view are colloquially referred to as ‘remarkable people’ (RPs). They are remarkable primarily in working outside HSE’s organisational culture and its filters; they see the world differently and ask different questions from HSE staff. While remarkable people also operate within institutional cultures that come with their own cultural filters, they are different filters. When possible, RPs are also chosen for their expertise in fast-moving areas of change relevant to the scenario focus, and for their ability to think ‘out of the box.’ Combining this external perspective with HSE’s internal perspective creates a greater depth of perceptual field – a parallax view of change.

To tap that wider view, the project team identified experts, leaders, and planners from academia and research as well as from relevant government, private, and non-profit organisations. The resulting pool of respondents offered gender, cultural, and professional diversity. In addition to HSE itself, organisations represented included trade unions, government science advisors, futures consultancies, academic research centres, and non-profits focussed on health, workplace safety, and rehabilitation.

#### 2.1.2 Interview Protocol

The team agreed that resources (both time and funding) allowed for twenty interviews involving SAMI staff supported by HSL personnel, and supplementary interviews (subject to time limits) performed by HSL personnel only. All interviews used the ‘Seven Questions’ technique and followed the protocol described below. The key elements were:

- All interviews were unattributable.
- Names of respondents were kept only on a master set of scripts, controlled by Infinite Futures/SAMI and the horizon scanning team.
- The respondents controlled the interview and told us what they thought was important in the agreed context.
- Interviewers avoided ‘leading the witness’. While they did ask supplementary questions to draw out further evidence, every effort was made not to ‘shape the evidence’ for the respondents.
- After initial pleasantries and agreeing that the interview would take approximately 1½ hours, interviews began with agreement on the topic and on the horizon of enquiry.
- “May we agree that our topic is ‘the shape of society and government and its impact on health and safety’?” “May we agree to think towards 2017 and even beyond?”
- Before starting on the ‘Seven Questions,’ interviewers broke the ice by asking, “What do you see as the main issues affecting the shape of society and government, and its impact on health and safety, by 2017?”
- Respondents brought out 3 to 4 issues that were then developed in dialogue to provide a basis for the ‘Seven Questions’. This start gave respondents a chance to order their thoughts before the interview probed more deeply.
- The interview process then continued with the ‘Seven Questions’:

1. **Clairvoyant:** If you could spend some time with someone who knew the outcome, a clairvoyant or an oracle, if one existed, what would you want to know? I.e., what are the critical issues?
  2. **An optimistic outcome:** Optimistic but realistic. What would be a good outcome and what would be the signs?
  3. **A pessimistic outcome:** How could the environment change to make things more difficult? What could go wrong?
  4. **The internal situation:** What needs to change if your optimistic outcome is to be realised?
  5. **Looking back:** Looking back 10 years, what successes can we build on and what failures can we learn from?
  6. **Looking forward:** What decisions need to be made in the near term to achieve the desired long-term outcome?
  7. **The Epitaph:** If you had a mandate, without constraints, what more would you need to do?
- After the 'Epitaph', interviewers asked respondents if they wished to add any further thoughts. At this point, the scribes were also asked if they wished to raise any questions arising from the interview material.
  - The interviews concluded with thanks to the respondent and an invitation to comment on the process. If there were any reference to specific documents in the interviews, the interviewer requested copies, or details of where to find copies.

Each interviewer was assisted by a scribe (note-taker). This assistance enabled the interviewer to maintain eye contact with respondents and to follow their path of thinking closely. Interviewers could also more easily interject supplementary questions to develop ideas and expand the evidence, without breaking the 'stream of consciousness' of the respondents. Any significant points emerging from the interviews were highlighted in passing, as were any areas where further evidence or corroboration was needed.

## 2. OUTPUT

### 2.1 Creating the 'Natural Agenda'

As the process unfolded, the total pool of respondents grew to twenty-eight. The resulting interviews generated over 250 pages of transcripts. When interviewers and scribes finished writing up their notes, they exchanged them to reconcile any inconsistencies, and agreed upon a final script. This was expressed in short paragraphs, each containing material on one issue, and allowed gaps for coding the script for entry into the interview issues database. The coding was done using a 'trial agenda' - themes that emerged from the earliest interviews. This was refined with subsequent interviews into a 'natural agenda' that articulated the pattern of major themes encompassed by the interviews. When scripts were agreed, they were forwarded to Adrian Davies, the Interview Coordinator for analysis and coding.

The primary level and first sub-level of the 'natural agenda' are listed below. 'External World' and 'Internal World' refer to the external context of the organisation – HSE – and its internal condition.

- External World
  - Economics
  - Government and politics
  - Infrastructure
  - Culture and society
  - Geography
- Market Interface
  - Markets
  - Competitors/partners
  - Market segments
  - Marketing
- Internal World
  - Structure
  - Culture
  - Competences
  - Resources.

The complete ‘natural agenda’ offers much greater granularity, coding responses into a variety of secondary sub-levels in addition to the categories listed here.

Coded scripts were then passed to Ann Hargreaves of SAMI who loaded them into a database, distributing each coded section into the ‘natural agenda’. This clustering put the evidence into a more organised, and hence more usable, format. It also ensured that the ‘workbook’ into which interviews were consolidated contained no connection to specific respondents. The ‘workbook’ is the basic record of the evidence gathered during the interviews. Interview responses are grouped under the headings of the ‘natural agenda’, which serves as an index for easy access. The ‘workbook’ is of great value in preparing for, and running workshops, as well as a valuable source of reference for training and other work. Key quotable issues in the ‘workbook’ material are also useful in illustrating issues of change for reports or other documents. These extracted quotes can also help in the naming of the consequent scenarios. A list of interviewees is given at Appendix 1.

## 2.2 Identifying Critical Issues

The issues workbook is a rich starting point for policy discussions. So rich that the research team began its analysis by acknowledging that a single scenario building project was insufficient to address all the issues the workbook contained. The team reviewed the interview output, highlighting the obvious gaps, major trends, and possible paradigm shifts. Of the critical issues and questions, the team chose twenty-six for participants to consider in the scenario building workshop.

### *Gaps*

Some issues that the research team expected would surface did not. For example, if China continues economic growth at 10% per year, it will be three times bigger than it is now in ten years, with huge impacts on global economy and global workforce and implications for the UK workplace; no one mentioned this. As the respondent pool did not include educators, issues of the future of education, schools, and e-learning and e-training did not arise. Nor was an emerging shift to a more female-centric world mentioned.

Gaps also occurred in discussing health and safety. None of the respondents spoke of private or voluntary sector involvement in health and safety. Yet this could increase steadily over the next

ten years with the increase in private sector activity generally. Very little was mentioned vis-à-vis dependency – people staying at home and living off the state – yet if disability is not addressed, the percentage of dependency in the population could grow.

With regard to HSE specifically, the interviews contained little detail about customers or duty holders. Some respondents did mention that HSE was going through a cultural change and re-framing some stakeholders as clients and customers, but those comments were very general. Finally, it was interesting how few international comparisons were made. To what extent do we link and liaise with other countries in regarding health and safety competencies, procedures, and regulations? Is there a worldwide basis for health and safety standards? Is health and safety a source of competitiveness? What opportunities exist for HSE to go out and spread the health and safety message internationally? How much data do we have as to whether an effective health and safety structure actually translates to higher economic competitiveness? These gaps in the issue coverage point are all potential weak signals of emerging change. They point to areas where further horizon scanning research may prove useful.

### *Trends*

The interviews also uncovered what respondents felt were strong trends, or certainties. One obvious trend is the growth of older workers in the workforce. Patterns of work are changing as well. More and more people work on short contracts or are self-employed, and could be inadequately protected with regard to health and safety at work. The increase in disability is increasing emphasis on rehabilitation, but could also result in a shift from rehabilitation to accommodation of workers who are chronically disabled. Another trend is the growing emphasis on health rather than accident prevention. This will change HSE's role in workplace health, e.g., rather than focusing on stress, focusing on well-being. Each of these trends could contribute detail in the scenario building process, emerging in every scenario, but unfolding differently in each.

### *Potential Paradigm Shifts*

Currently our mental model of a typical workforce assumes healthy workers. In the future, that model may no longer apply. Ageing, stress, and health epidemics such as obesity suggest that much of the workforce will suffer health difficulties at least some of the time. Another current operating assumption is that the workforce is literate and numerate. As communications and media become increasingly pervasive, immersive, and intelligent, literate and numerate workers may represent a decreasing percentage of the future workforce. Finally, the risk exists that price pressures in the economic system may actually drive standards down, and more and more companies will see health and safety as a burden in an ever-more competitive global market.

### *Critical Issues and Questions*

The project team (Infinite Futures/SAMI/HSL staff) reviewed the workbook and highlighted the following major issues as a starting point for this first HSE scenarios exercise. The quotes included are excerpts from the interviews; the ideas expressed may be provocative or controversial, but they were articulated to start discussions: they are **not** HSE policy. **The numbers merely identify each issue, they do not indicate priority.**

***Culture/society:***

1. Happiness/well-being: more health, less accident prevention: "...in 10 years time, I will be surprised if the overwhelming majority of medium to large employers don't have much more coherent strategies ... providing real support and encouragement for staff to engage in leisure activities which are conducive to well-being."
2. Dependency and self-reliance: "To what extent are people taking the initiative in managing their health and well-being; how much have they wanted to do this, rather than being compelled to...?"
3. Social exclusion or inclusion: "A good outcome would be a dramatic reduction in the number of people who are socially excluded. ... we've still got a stubborn number of households in the UK where nobody works."
4. Changing nature of the living unit, i.e., family: "There is a different dynamic around life, family life and the structure of society, single people, and care for the elderly. There will be very different challenges for people in terms of where their responsibilities lie."
5. Blurring of work, e.g., in home/working patterns: "Home/tele-working is on the increase together with the more flexible use of time and a blurring of the interface between work and non-work time."

***Demographics:***

6. Ageing and its impacts on the working population: "What shape will society and the future workforce be? There will be lots more older people. What unknown health conditions could affect them in the workplace?"
7. Diversity of ethnicity and gender: "Racial equality is not just about black or Asian anymore, it is becoming increasingly more diverse. There are a growing number of ethnic groups. A large number of migrants now come from non-Commonwealth countries. ...What about women? That is one of the key dramatic changes in the labour market. We can expect to see more, but there are still barriers, a glass ceiling, entrenched attitudes."
8. Increase in partially able workforce (changing model of 'average' or 'uniform' employee): "...organisations will have to accommodate the needs of the older workforce - manage experienced frailty". This is not too much of a problem as frailty is an extrapolation of disability. ... Society's understanding of disability is already happening. If you need staff enough and value their experience then you will accommodate them."

***Technology / science:***

9. Increase in disruptive technologies: "There may be health scares around new materials – chemicals, individual nano-materials that might be transported to parts of the body not reached by other substances. Carbon nano-tubes don't seem to be as much of a problem as some say – they are difficult to disperse in air. We hope to have the methodologies to cope in time. Changes in regulation might be needed to control new materials – this is under debate in the EU and the US at present. We need to spot any new dangers early."

***Environment:***

10. Effect of climate change on legislation and regulation, changes in energy provision, and their effect on work and working environment: "How will we manage global warming and what will be the knock on effects in terms of health and safety? We need to understand the workplace implications of the new technologies that will come in. There might be numerous wind turbines on the work site, which help with sustainable energy, but are workers exposed to a new noise source?"

### ***Economics:***

11. 'Hour-glass' economy: rising skills gap and lack of middle-range jobs; increased number of degree-holders: "Intensive middle jobs will be cut out and the focus will be the top and bottom, the 'hour-glass' economy. The factors behind this are young people staying in education, older workers still leaving employment early, employers not tuned into retaining them."
12. Shift to services and niche manufacturing: "Great Britain will be moving rapidly from a post industrial society towards a 3rd level – the knowledge society, based on IT. ... We're primarily a service economy. We need to move upmarket in manufacturing – technical innovation must be first priority."
13. Changing work structures with more flexible, part-time, multiple jobs, short-term contracts – 'precarious work': "...huge amounts of contracting and sub-contracting and it is difficult to find out who is working for whom. Family companies have pretty much gone. Globalisation and takeovers will have an impact on workers, people have multiple careers, they move on more, they change work more. ...There is no longer an expectation of having a 'job for life' and the service sector has a different range of risks and hazards, with, e.g., more movement between jobs and people having multiple jobs."
14. Decentralisation of the economy, including increased entrepreneurship and SMEs: "Our approach to entrepreneurship is more accommodating now. Traditionally it was seen as an inferior activity, but now it is seen as a good activity."
15. Outsourcing and the effect of the move from public sector to private and voluntary sector, and from large companies to small companies: "There is a continuing move away from large organisations and for more outsourcing of services, together with increasing home-working (i.e. working at home or using home as a base to work from)."
16. The role of an effective health and safety regime on competitiveness: "If the UK is under financial pressure, then there could be pressure to resist more expensive (i.e. safer) ways of doing things. Firms could have to justify health and safety in economic terms, e.g. 'Good Health is Good Business'. There could be conflict if other countries don't comply. ... An optimistic outcome would be that HSE is seen as an enabler that adds value to GB plc – health and safety is a collateral benefit alongside other risks of businesses."
17. Trades unions and employers' organisations: "? The influence of trade unions is unpredictable – where are they going? There is a large proportion of non-union labour in the workforce – small companies, contingent work arrangements."

### ***Politics:***

18. Joined-up government – central, local, regional: "There has been too much 'working in silos' among different departments and agencies, which has led to the perception that government is not 'joined-up' at a central level, although there is a feeling that local government operates more effectively in this respect."
19. Attitudes to risk (blame, litigation), including public and political attitudes to health and safety: "A change in societal attitudes to risk will have taken place such that there is more ownership of Health, Safety (and Well-being) and these issues will have been integrated into standard management practices, alongside and with a similar priority to, e.g., financial control."
20. Attitudes to privacy, e.g., medical monitoring/invasive monitoring: shifting attitudes to ownership and security of personal and business data, and demands for regulation of privacy.
21. Regulation/deregulation vs. the role of enlightened self-interest (EU, CSR, GHGB): "In terms of regulations – [we could] end up with multiple standards so have to cherry pick as an organisation. Greater emphasis on self-regulation to enable industry to thrive, or a

mixed approach - recognition for organisations doing well, harsher approach to organisations not doing enough. “Persuade people to do the right thing.”

22. Changing nature of democracy, e.g., increase in lobby and special interest groups facilitated by ICT and declining trust in institutions: “...growing societal disenfranchisement from politics and governance. Leads to single issue politics, which distort priorities and expectations, make it difficult to take broad views.”

***Globalisation:***

23. Off-shoring and its effects on the nature of work in Britain: “There is a question over where the balance may be struck over free trade in goods and in people (i.e. will jobs move or will people migrate?)”
24. Capital, competition and effects on UK plc (cost pressures): “Our unique selling points are not cheap labour, not necessarily high skills, but entrepreneurship and education. [vs.] ...An inexorable requirement to drive down costs for competitive reasons, resulting in, e.g. sub-contracting, extra layers of communication down the supply chain.”
25. Migration and effects on UK working population: “Currently the majority of immigrants are from Eastern Europe, I don’t know who they will be in the future, I don’t know if this will die down and there will be an influx from elsewhere. It will depend on what happens over the next 10 years; wars could lead to more immigrants coming to the UK. ...That is an issue, whether or not we ghettoise the workforce in terms of ethnic origin. But health outcomes are undeniably worse for those people, and it's not actually much to do with occupational risk, in a sense of risk of hazards, but it's more about more complicated factors like psychology, control, sense of empowerment people have over the health outcomes, and so on.”
26. Conflict/war on terrorism, etc. and effects on stability: “Other major instabilities occur such as economic upheaval, war and conflict, without having civilised means of resolution – triggers could be e.g. crises in energy, food and water supplies...[re:] global terror, in terms of the break-up of Eastern Europe and the problems in the Middle East. Insecurity is rife. The government's solution to this global uncertainty seems to be to arm oneself with nuclear capabilities, rather than grapple with it. What is the ultimate direction?”

These twenty-six issues are weighted more towards society, culture, politics, economics, and global change than towards the environment or scientific and technological innovation. The single technological issue, ‘disruptive technologies,’ refers to the cluster of highly transformative innovations emerging in nanotechnologies, biotechnologies, information technologies, and cognitive technologies. The HSE horizon scan’s ‘hot topics’ (see the next chapter) present specific examples of emerging disruptive technologies. The twenty-six issues chosen thus provided an appropriate human balance to the more technological focus of the ‘hot topics’.

### **3. EVALUATION**

The project design did not call for formal evaluation by the respondents of the interview process. In hindsight, that would have been useful. The issue interviews do not merely gather data, although that is their primary purpose. They also serve to engage colleagues and stakeholders with the horizon scanning and scenario building processes within HSE. Explicitly asking respondents whether the interview engaged their interest in HSE’s horizon scanning and scenario efforts would have been informative.

On an informal basis, the interviewers and scribes reported that the responses were generally of high quality, demonstrating the broad thinking that HSE sought, and highlighting interesting

areas for future research. Respondents mentioned that they found the foresight perspective and questions interesting, and appreciated the formal opportunity to reflect on big issues. They enjoyed the interview and looked forward to project results. The interviews helped to create a positive, interested word-of-mouth buzz about the project.

### 3. SCENARIO BUILDING

#### 3.1 PROCESS

##### 3.1.1 Workshop Activities

The HSE Futures scenario-building workshop was held in Bootle on 21-22 July 2006. Twenty-five participants attended, of whom 22 were HSE staff and three people were from another agency, business, or academia. The workshop had three goals:

1. Acquaint people with the HSE Horizon Scan and the emerging changes it identifies;
2. Review and discuss critical issues facing health and safety in the workplace;
3. Build scenarios to help HSE and stakeholders think through possible outcomes generated by the convergence of critical issues and emerging changes.

The workshop activities included presentations on the critical issues and the 'hot topics' of emerging change, plenary discussions, and small group work. The scenario building itself focussed on ten-year futures for health and safety in UK workplaces generally, rather than on futures for the HSE itself. Specific process steps are described below.

##### *Basic Process*

The workshop began with an introduction to the project by Geoff Brown, and an introduction to the workshop process and agenda by Gill Ringland of SAMI Consulting. Peter Ellwood of the HSE Horizon Scanning Team then introduced the twenty-six critical issues identified in the issue interviews. The remainder of day one was devoted to four analytic tasks applied to the twenty-six critical issues:

1. Working in syndicates to identify any critical omissions from the list, and then refining it to a maximum of fifteen high priority issues;
2. Meeting in plenary to synthesise output from the syndicates into a master list of fifteen high priority issues for the future of health and safety;
3. Working in syndicates to sort the master list of fifteen issues onto a matrix of importance and uncertainty (see Figure 2); and

	More Important		
More Certain	Strong trends and drivers. You need to plan for these. Forecasting Units track these.	Scenarios are built from uncertainties in this box, plus emerging issues and strong trends.	More UNCERTAIN
	Context shapers. These need to be monitored.	Occasional review.	
	Less Important		

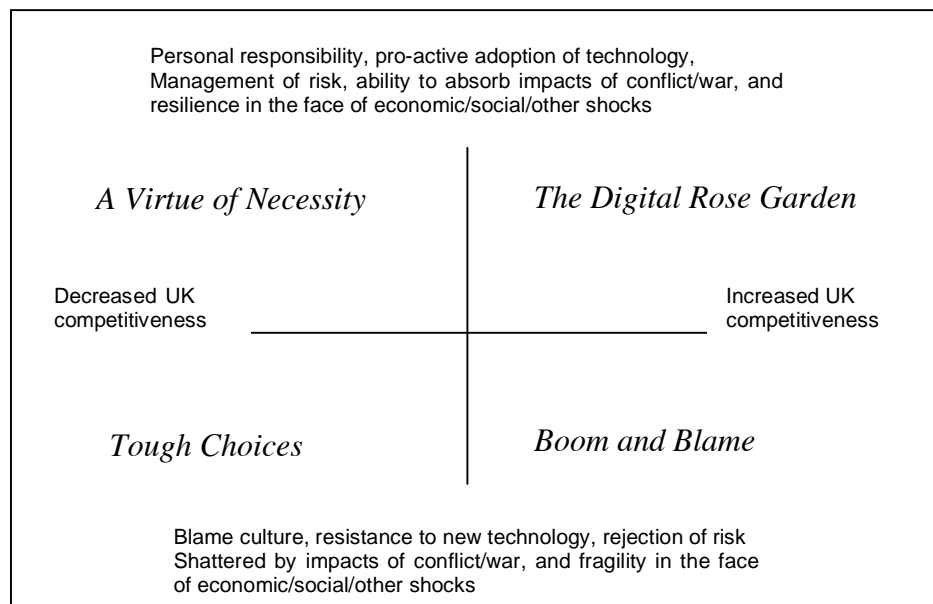
**Figure 2** Scenario issues matrix

- Meeting in plenary to synthesise output from the syndicates into two critical questions to form the scenario cross – the basic framework that defines the outcome spaces of the four futures.

As a result of this process, participants identified a cluster of related issues resulting in the following two questions:

- Are public attitudes towards risk that of personal responsibility or of the ‘blame culture’? This cluster also included attitudes towards adoption of technology, ability to absorb impacts from conflicts and resilience in the face of economic, social, or other shocks.
- Will the UK increase its competitiveness in the global economy? This cluster also linked to harmonisation of regulations, numbers of the differently abled in employment, incorporation of migrants, vitality of the enterprise culture, expectations of well-being, and social cohesion.

Opposite possible outcomes of these two questions created the four arms of the scenario cross (see Figure 3).



**Figure 3** Scenario cross and scenario titles

Owing to lack of space, Figure 3 does not specifically list the other issues clustered with ‘UK competitiveness’, but participants did consider those issues during their discussions.

Day two began with a review of the previous day’s work followed by a brief exercise with the group as a whole to name the four scenarios. The working titles proposed were ‘*The Rose Garden*’ (now ‘*The Digital Rose Garden*’), ‘*Boom and Blame*,’ ‘*The Road to Nowhere*’ (now ‘*Tough Choices*’), and ‘*Strength in Weakness*’ (now ‘*A Virtue of Necessity*’). The working titles helped to focus the scenario elaboration work by highlighting a core characteristic of each scenario.

Peter Ellwood then presented the sixteen ‘hot topics’ resulting from HSE’s horizon scanning research to date. Those topics are explained in greater detail in the section below. As emerging issues of potentially disruptive change, they helped create truly dialogue-provoking scenarios. Participants were encouraged to add them into their assigned scenario following the rule of logical consistency – imagining how the particular hot topic might contribute to, amplify, or otherwise fit into the future they were describing.

The scenarios were built in syndicates. Each syndicate was prompted for details about their future by a series of questions:

- How is 2017 different from 2006?
  - In the UK, in politics, the economy, society, technology, or the environment?
  - Globally, in politics, the economy, society, technology, or the environment?
- What events, innovations, value shifts, etc. would need to occur for this scenario to happen? Create a timeline: 2007-2009-2011-2013-2015-2017.
- Pick at least two of the hot topics and describe how they have influenced conditions in 2017 in this scenario.
- What would the crisis wild card be – the Piper Alpha/BSE/Kings Cross – in this scenario?
- Who are the winners and losers in this scenario? Personalise it, e.g. a female office worker; self-employed builder; seasonal migrant worker; differently abled clerk...

These questions elicited a vivid array of details about life in the four alternative futures. Each syndicate was then asked to prepare a ten-minute presentation describing their scenario – a news report from their future. The workshop closed with the presentations from each syndicate, after which participants discussed what each scenario implied for health and safety generally, and the HSE in particular.

### ***HSE ‘Hot Topics’***

Presenting and using HSE Horizon Scanning data was a key goal of the workshop. The Horizon Scan contributed sixteen ‘hot topics’ of emerging change to the scenario building exercise. All sixteen could potentially create challenging political, economic, environmental, and social impacts. That is, the issue is not so much *if* they will happen, as *how* they will happen. The scenarios create spaces to explore how these changes will emerge into daily life given different social, economic, and political conditions. Workshop participants had the freedom to build the topics into scenarios as they saw fit.

The sixteen ‘hot topics’ include:

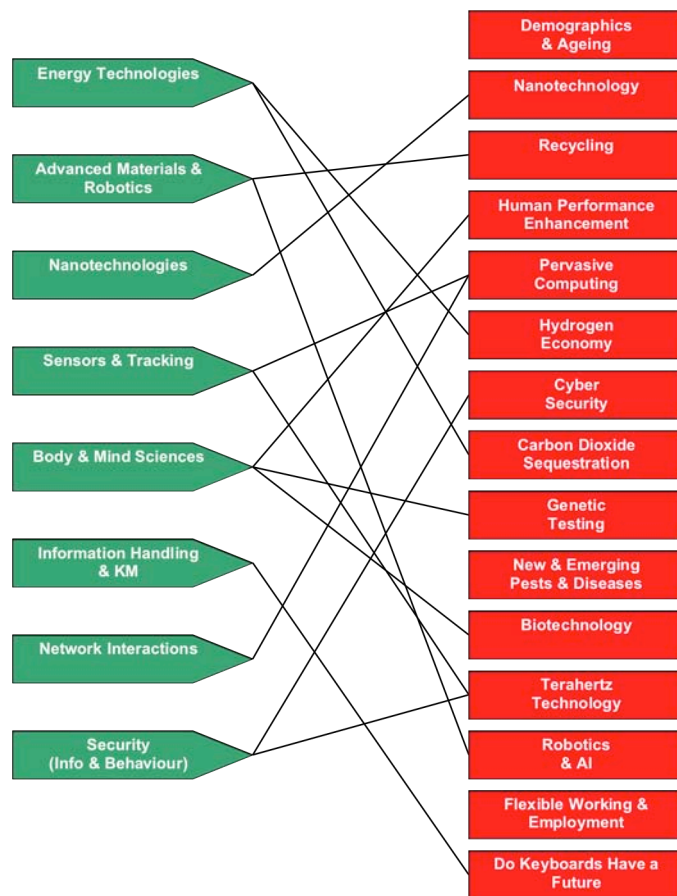
- *Demographics and Ageing*: Changes, especially as they affect workplace issues, in population, ageing, gender, workforce by sector and occupation, ethnicity and migration, working patterns, housing and living patterns and the shape of industry.
- *Nanotechnology*: The design and manufacture of materials on the ‘nano’ scale (i.e., at sizes down to 1 billionth of a metre) have massive potential for application: sunscreens, anti-microbial coatings, self-cleaning windows and additives to improve the efficiency of diesel engines are all examples of products already on the market that incorporate nanotechnology.
- *Recycling*: The value shift towards sustainability encourages manufacturers and consumers to adopt a ‘cradle to grave’ attitude to waste minimisation. This could lead to a significant expansion in recycling activities, e.g. increased recycling of car components, plastics and electronic goods.

- *Human Performance Enhancement (HPE)*: Augmenting the capabilities of the human body using technologies including:
  - *Bionics*: exoskeletons, arms, hands, eyes, some controlled by thought;
  - *Body or brain implants*: laboratory-grown or artificial hearts, lungs, etc.;
  - *Brain implanted chips* to control computers and robotic arms;
  - *Cognitive enhancing drugs* such as modafinil (to improve concentration, memory, wakefulness and decision making); and
  - *Genomics*: gene therapy, stem cells, xenotransplantation, ageing studies.
 These innovations augur an emerging era of technologically-mediated increases in human potential.
- *Pervasive Computing*: The concept of integrating computers into the environment such that people can interact with them more seamlessly. Also known as ‘ubiquitous computing’ or ‘ambient intelligence.’ Current examples include the use of Radio Frequency Identification (RFID) tags and GPS systems in vehicles.
- *Hydrogen Economy*: A ‘fuel chain’ that transforms a primary energy source to generate hydrogen for fuel cells. These in turn provide power for a range of stationary or vehicle applications.
- *Cyber Security*: Attacks on IT systems by hackers, disgruntled employees and criminals are commonplace but are to date mostly being carried out for monetary gain. Increasingly similar threats exist to the safety of industrial processes from breaches in the security of safety-critical control systems.
- *Carbon Dioxide (CO<sub>2</sub>) Sequestration*: The current UK target calls for reducing CO<sub>2</sub> emissions by 60% by 2050. One option is to capture the gas at the point of generation (mainly during power generation from fossil fuels and during the manufacture of steel and cement) and then to store the gas underground.
- *Obesity*: the ‘obesity epidemic’ in the UK and other developed economies brought on by the increasing consumption of high calorie foods and reduced levels of exercise.
- *Genetic Testing*: Currently Britain has no law to prevent employers using genetic test results to decide who gets a job or pension. Genetic tests for susceptibility to occupational illness are being developed and a few have been used in UK and US workplaces, even though the tests are not yet thought to be accurate or reliable enough to predict whether an individual is at risk.
- *New and Emerging Pests and Diseases*: The emergence of new ‘pests’ in the form of flora and fauna or diseases (human or animal), which were previously rare or unknown in the UK. These could appear as a result of various external factors including climate change and the increasing migration and transport of people, livestock and food products.
- *Biotechnology*: The large-scale exploitation of microorganisms to produce pharmaceuticals, feedstuffs or other valuable metabolites, including:
  - *Gene Therapy*: the potential to treat inherited disorders, cancer and some genetic diseases by explicit manipulation of living genomes;
  - *RNAi*: Gene silencing technology offering the potential to treat genetic disease;
  - *Biopharming*: the use of genetically transformed crop plants and livestock animals to produce valuable compounds, especially pharmaceuticals;
  - *Synthetic Biology*: the re-writing of the genetic code of DNA to create or recreate microorganisms from scratch; and
  - *Stem Cells*: re-engineering stem cells to create therapies to treat disease.
- *Terahertz Technology*: This exploits the region of the electromagnetic spectrum between the Infrared and Microwave frequency ranges using relatively cheap, coherent (laser) sources and detectors. As it can non-harmfully penetrate a wide range of materials, it creates commercial opportunities particularly in medical imaging and security.

- *Robots and Artificial Intelligence (AI)*: The wider application of complex software and robotic systems to act as assistants to workers and in closer proximity to workers.
- *Flexible Working and Employment Patterns*: Increased adoption of flexible work and employment patterns (i.e. time flexibility, telework, and contractual flexibility).
- *Do Keyboards Have a Future?* Increasing use of voice-recognition software, virtual (laser projected) keyboards, and non-keyboard input devices like touch screens and gestural technologies.

These ‘hot topics’ are defined in greater detail in ‘Current Issues: health and safety in the changing workplace’, HSE’s horizon scanning briefing paper.

HSE’s horizon scanning data, and the ‘Current Issues’ summary, are linked to and corroborated by scanning databases in other UK government agencies, chief among them the Delta Scan of the Office of Science and Innovation’s Horizon Scanning Centre (OSI/HSC). Figure 4 maps the connections between the eight science and technology clusters derived from OSI/HSC’s Sigma and Delta Scans. The Sigma Scan is a quality-assured synthesis of existing national and international scanning work. The Delta Scan is a synthesis of key science and technology issues collected from over 200 scientists in the UK and USA. These key emerging science and technology clusters have the potential, over the period from 2015-2020, to transform the delivery of public services; challenge society; and/or affect wealth creation. Both Sigma and Delta Scan data, including the eight key clusters, have been integrated into HSE scanning data and the scenarios.



**Figure 4** OSI/HSC’s 8 S&T themes and HSE’s “Current Issues”

### 3.1.2 Drafting the Research Scenarios

Drafting the research scenarios was a multi-layered process, beginning with synthesising and elaborating the ideas and details generated by each syndicate to create a coherent narrative. As they were drafted, citations of confirming data were added, as were links to relevant scenarios generated by other organisations. Depth and structure were added to the emerging story by drawing upon the perspectives of systems thinking, ethnography, and even integral philosophy. What feedback loops were driving the creation of each scenario? How do the resulting changes affect not only actions and infrastructures, but also deep structures like worldview, values, and identity?

This deep dive into the scenario ideas generated by workshop participants rendered a more accurate view of each scenario's core characteristic, resulting in adjustments to three of the names. 'The Rose Garden,' while undoubtedly rosy, is mostly so for the generation of digital natives, and thus became 'The Digital Rose Garden.' 'Strength in Weakness' describes people generating economic revival by creative response to challenges, and thus became 'A Virtue of Necessity.' Finally, the dark 'Road to Nowhere' focuses on the difficult trade-offs necessary in situations of straitened resources, and thus became 'Tough Choices.'

The research scenarios for this project each begin with a brief overview of conditions in 2017 and the historical changes that created them. They then explore how life is different in the future in greater detail:<sup>1</sup>

- What concepts, ideas and paradigms define the world around us?
- How do we relate to each other – what are the social structures and relationships that link people and organisations?
- How do we connect with each other – what technologies connect people, places and things?
- What are the processes and technologies through which we create goods and services?
- How do we consume goods and services – how do we acquire and use them?

Each scenario ends by focussing on the changing workplace, and changed health and safety issues. The complete research scenarios are available as Appendix 2 of this report.

### 3.1.3 Drafting the Workshop Scenarios

With the rich details of the research scenarios in hand, compiling more vivid versions for use in participatory workshops began. These more vivid scenarios are less detailed by design; they must be quick to read in workshop settings, and leave holes for the imagination to fill. The project team all contributed to this effort, generating short 'news editorials', headlines, example companies, characters' quotes, and core values. In addition, the following details were provided in brief for each scenario, to allow comparison across the four:

- Attitudes to personal responsibility;
- Social structure;
- Demographic patterns;
- Use of ICT and pervasive computing;
- Economic structures;
- Consumption patterns;
- Attitudes towards the environment;
- Workplace characteristics; and
- Health and safety context.

These workshop scenarios are brief, illustrated, and easy to read within five or ten minutes. They are presented in Appendix 3.

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<sup>1</sup> This organisational scheme is adapted from Global Foresight Associates' "EthnoFutures Scanning Framework," devised by Michele Bowman and Kaipō Lum. This framework proposes organising scan data based on its point of impact on society, rather than on the origin point of the change. Michelle Bowman and Wendy Schultz, "Best Practices in Environmental Scanning: The World Beyond Steep," presentation at the World Future Society, Chicago, 30 July 2005.

## 3.2 OUTPUT

### 3.2.1 Overview

Remember, scenarios are **not** predictions of the future. They are vivid stories about **possible** futures. They help us **explore** the boundaries of **uncertainty** defined by specified drivers of change. They are used by organisations to develop and implement plans for the future. Scenarios written for interactive exercises are typically brief, depicted in personal rather than institutional anecdotes, and salted with humour (laughter aids impact and memory). But these are best based on research scenarios - longer narratives, depicted in broader terms. The summaries offered below are extracts from the longer research scenarios.

### 3.2.2 The Digital Rose Garden

#### *Overview*

Britain has harnessed the creativity of its diverse society to service both the economy and the environment. This renewed, cohesive spirit of innovation looks likely to create the ‘Roaring Twenties’ of the 21st century. A bumper crop of new businesses has energised the national economy. Graduates in the sciences and mathematics are partnering with the best in British design, generating economic value in biosciences, materials sciences, and nanotechnology, and attracting a brain gain internationally. Expert youth are working with experienced seniors on the real millennium challenges: global climate change, poverty, and sustainability.

British employees are staying at home, and so are Britain’s businesses. Offshoring is declining; as the BRICs (Brazil, Russia, India and China) and emerging economies increase their wealth and the salaries paid their workers, the comparative advantage of overseas labour has declined. Increasing international standardisation of regulations has also raised overseas operating costs, particularly in comparison to the leaner, rationalised regulatory framework in the UK.

Individuals are channelling their inner Edmund Hillary – or, more appropriately, their inner Kevin Warwick (pioneer in the human-machine interface; he embedded a microchip in his arm). It’s the age of cool explorers and new adventures; risks are acknowledged, weighed, and managed in cooperative public-private partnerships that enable a continuous stream of responsible innovation. This heightened comfort with managing risks heightens comfort with transformative technologies on an individual level as well; history may come to know this new ‘Roaring Twenties’ as the ‘Transhumanist Twenties’. Human performance enhancements, both pharmacological and bionic, are popular lifestyle design choices, especially among extreme sports enthusiasts. Britain’s next decade will transform its economy and environment for the better, but how will history judge the increasing transformation of humans themselves?

#### *Health and Safety in the changing workplace*

Workers no longer face a simple blurring between the workplace and the home. Wrestling with the challenges that blurring presents to work/life balance is relatively straightforward. Instead, the immersive computing and media environment through which everyone now moves has created a blurring between the workplace and everywhere – and everything – else. Mobile phones are embedded in sunglasses, so videoconferences can find you in Devon. Worse, an age of ‘peer production’ means people ‘work’ even as consumers.

The emphasis on local manufacturing and short-haul delivery drove most companies to decentralise their offices. Smart software puts resources where they are needed with minimal miles travelled. The same software helps employees cooperate to reduce resource consumption in both work and leisure. While offices are smaller and local, they are consistent in their design,

amenities, and operations, facilitating consistent regulatory compliance across a company's establishments.

People think differently about risk and safety now, in what analysts call "a return to a more rational view." It is a world away from the legal micromanagement of personal risk that so characterised concerns about the 'compensation culture' a dozen years before. More funds and time are now invested in informing the public about the potential risks, costs, and benefits of new technologies, products and services. Over the decade from 2007-2017, the efforts of public agencies and others to manage risk and enable informed use of common sense have paid off.

The last ten years have seen a proliferation of health and safety consultants with expertise in different sectors – hardly surprising, given what seems like the almost weekly emergence of new areas of innovative production. It's a scientific and technological conveyor belt and the challenge now is for public agencies, consultants and others to agree what the risks actually are, and how they should be managed and communicated consistently. To compound the problem, the variety of software and hardware systems now marketed to assist both businesses and private individuals in managing health and safety is skyrocketing. If historical business patterns hold, however, the 20s should see a consolidation of smaller H&S hardware and software firms and a rationalization of that market.

### ***Winners and Losers***

It's a booming economy and winners abound. New lifestyle products and services have revolutionized leisure further from even the heady days of 2007 and Nintendo's Wii. Huge steps forward in health biosciences hardware and software have allowed improvements in many conditions and have made healthy, active ageing the norm.

Employment is at an all-time high, especially employment of previously marginalised workers like the elderly and the differently abled. More economic centres exist, and they are more widely distributed throughout the country. The environment itself is both benefiting from increased accountability, and returning those benefits; with the increase in 'low-carbon-cost at-home holidays', Preston by the Sea and the 'Devon Riviera' exemplify the revitalisation of the British seaside resort – even given the risk of climate-change-intensified storms and storm surge.

The losers are insurance companies who see customers opting for lower levels of coverage. The increased understanding of relative risk makes people less litigious. With more food grown at home and a greater emphasis on 'buying British' to conserve transport fuel use and its carbon cost, import/export companies are also under pressure. The less well educated are marginalised, as they are less able to navigate the landscape of informed choice. Immigrants suffer a similar problem for a different reason; different cultural filters may make it difficult for them to assess risks adequately in the British environment. Finally, people who are unnerved by the emerging future of transhumanism and want to reject it may well find themselves marginalised.

### **3.2.3 Boom and Blame**

#### ***Overview***

The global economy of 2017 is a dog-eat-dog arena. Privatisation is up, and the market is free. Britain has a history of economic success and is relatively strong today, but how stable is that strength? People are worried about the future. What compounds the worry is the cost to the environment of maintaining economic vitality. Remember sustainability? It has taken a back seat to aggressive growth strategies, among them the loosening of environmental and health

regulations. Companies are offshoring production to reduce costs. They are also offshoring waste to minimise disposal and remediation expenses. While British investors are moving aggressively into emerging markets, foreign investors are snatching up vulnerable UK companies.

Society prizes competition and assertiveness. Economic and social pressures to enhance business productivity mean that business owners have a vested interest in the wellness of employees. Companies now genetically profile prospective employees as a matter of course, and provide subcutaneous RFID wellness/environment sensors to assist employees in maintaining peak health and peak productivity. The economic value of proving 'clean genes' has produced a new extended family as a knock-on effect; genealogy has replaced sudoku, and relatives who find each other using online genealogy software often meet to discuss medical histories and stay to socialise.

The public mood is increasingly laissez-faire. Government is expected to be less intrusive in the business sector and less intrusive in private lives. The corollary is erosion of social safety nets. Influential commentators are focusing on what they call an increasingly polarized society, with privileged enclaves and ghettoised communities. But the tide of communitarianism seems to be rising; more voters are voicing dissatisfaction with rising crime and the growing indigent population.

### ***Health and Safety in the changing workplace***

Manufacturing has mostly been outsourced and offshored. The workplace today is the office more than the factory floor. Where businesses have consolidated, the work environments are standardised for the sake of efficiency of supply and training. But shifts are longer; pressure to produce keeps workers at their desks well into the evening. Life has lost out to work in the battle for work/life balance.

At first corporate genetic profiling was used to identify workers particularly sensitive to chemicals and substances used in innovative materials production. The increasing sophistication of genomic analysis allowed companies to evaluate candidates' fit to corporate culture in terms of metabolism, personality, and vulnerability to stress. These screening programs are the first step in corporate HR support for the use of human performance enhancement (HPE) drugs and technologies by employees. Company cafes offer an array of sanctioned HPE drugs, and corporate training includes instruction in their use. Monitoring and screening employees' behaviour and health at work and at home permits the HR team to monitor staff productivity. It's all about additional competitive edge. ("Maintaining productivity is a 24/7/365 endeavour!")

But issues of trust, privacy, and liability are still rife, and the tightest corporate cyber-security can be found firewalling the HR health sensor nets. Initially employees accepted intrusive 'chipping' because in a buyers' market for labour they had little choice. Of course, there were also economic incentives in the form of reduced insurance premiums and a higher salary scale. Most people now acknowledge the physical benefits.

In FTSE 100 companies, employers view worker health and fitness as a strategic resource ensuring high productivity. Successful employees guard their health as a resource with concrete salary implications. These perspectives render genetic profiling and subcutaneous RFID health sensors non-controversial. In free market conditions, the insurance industry drives health and safety, spurred on by litigation. Consumer health issues and public safety are as big a priority as workplace safety.

Stress is the top health issue among the employed as hazards from the more traditional industries have reduced. Worsening air quality coupled with stress-depressed immune systems has caused a resurgence in respiratory infections.

Obesity is on the decline among the haves, more because it is perceived as unproductive and uncompetitive than specifically for health reasons. The chronically under- and unemployed – whose ranks currently equal 20% of the potential workforce – remain the hotspot of the lingering obesity epidemic.

### ***Winners and Losers***

In the competitive, privatised landscape of 2017, skilled workers have an advantage. Likewise, physical disability is overlooked in the balance with education, expertise, and essential good health, so it is a win for the differently abled. Healthcare professionals also win, as their salaries increase, although competition for work is stiffer – but so it is for everyone.

Guaranteeing consistent productivity is key. Thus long-term ill health – physical or mental – is a significant disadvantage in the employment market. Inadequately prepared school leavers cannot compete in this market.

### **3.2.4 Tough Choices**

#### ***Overview***

The present is a landscape littered with tough choices; the future seems nasty and brutish. Any comparative advantage that Europe once enjoyed on the global economic stage has evaporated. The declining economy drove the best and brightest of the young overseas searching for well-paid careers. Innovation has slowed as a result. Unemployment is high while at the same time low-end jobs go begging. More and more often those jobs are filled by migrant workers or illegal aliens.

Social divides and alienation have amplified from the millennium on. Rising resentments generated more litigation and ambulance chasing as people strive to blame someone else for their grievances. Disaffected youth join gangs that split community turf. News from urban neighbourhoods looks like coverage of civil war – local riots are common, and local policing is tougher in response.

Sweeping deregulation across Europe was hoped to jump-start the economy. The only result so far is an increase in air, soil, and water pollution. The grey and black economies have certainly been growing – but that trend preceded deregulation, as organised crime disregards regulations in any case.

While still free at the point of delivery, the NHS is under tremendous pressure. Private health insurance is expensive but those that can afford it, pay. Analysts worry that the UK is on the brink of complete societal breakdown; new data suggests increased malnutrition and declining life expectancy.

#### ***Health and Safety in the changing workplace***

The health divide grows wider; there's not enough work and for those at work, precious little well-being. The priority for people is to have at least one job, particularly a job that may offer the holy grail of perks such as a pension and private health insurance. Accusations of the

'nanny state' have long since withered on the vine of history – no one expects the state to nanny anybody anymore. It's a competitive and cut-throat society. Each looks out for number one.

Businesses are struggling and cutting costs. The average workplace, whether a manufacturing floor or a business office, is showing signs of wear and tear with little hope for renovation or updating in the near future. Old machinery, worn flooring, jury-rigged wiring and over-taxed ventilation and exhaust systems combine to create health hazards and the potential for accidents. Employers are juggling resource costs, staffing costs, and the need for capital improvement, and health and safety considerations often lose out in the trade-off.

In a stripped down regulatory structure, safety at work rather than health is the priority for employees. People know that health is important – the campaigns of a decade before hit their targets – but why worry about long term health when an accident at work may strike you first? Already, the media are referring to Britain's accident epidemic, an epidemic that is amplifying litigation, as injured parties look for means to punish offending employers and obtain financial redress. Too often their litigation goes nowhere – employers can't or won't pay and the will isn't there to make them do so. But some high profile cases against organisations with deep pockets succeed and this encourages a 'have a go' mentality. So individuals still over-eat, drink too much, and smoke, but are more prepared to lay the fault at the feet of the marketing people, brewers, and cigarette manufacturers.

Stress, pollution, and street violence have reached heights not seen for thirty years. Under-reporting of health and safety failures in the workplace is rife – and the system in any case lacks the resources for anything more than low-level interventions and the investigation of serious incidents. Given the dominance of the black market, huge numbers of workers fall outside those regulatory regimes that remain.

### ***Winners and Losers***

The new barons of the black economy are definitely benefiting from the 'Wild West' environment of stripped down regulations. The boundaries between the legal and black markets are narrowing. Street peddlers selling cheap knock-offs are seeing higher growth than the high street stores. Those few companies willing to play fast and loose with the remaining laws and regulations can match organized crime in generating wealth. A flexible ethical and moral framework is a competitive advantage in this environment.

Longer-term economic recovery is emerging where CEOs have retrenched, making strategic trade-offs among staff numbers, capital improvement, and workplace standards. Improved workplace health and safety standards are attracting better staff and avoiding lawsuits. With consumers retrenching as well, discount retailers and wholesale clubs are forecasting some improvement in consumer purchasing.

Youth bright enough and with sufficient initiative to scout out opportunities overseas are coping, if not benefiting.

Basic research is suffering, as is higher education generally; resources are scarce and business foundations have much less money than in past. Older people find themselves in dire straits as public programs evaporate and even their pension payments decline. Other populations in need are also suffering, with incapacity benefits sharply curtailed. Recent immigrants, whether legal or illegal, have a particularly hard time.

### **3.2.5 A Virtue of Necessity**

#### *Overview*

Britain now resembles one great seaside town. More and more UK communities – even cities – consist of older people, needing services more than consumer goods. The local economy provides the services, and while goods are imported, consumers now buy for durability and extended use-life. As traditional industries declined young workers started out-migrating and looking elsewhere for employment. With fewer people supporting more elderly people and large corporations relocating to Asia, the economy contracted. Entrepreneurial activities are smaller in scope; more business initiatives are local, resulting in less wealth generation nationally.

The gap between haves and have-nots has widened. Society as a whole has looked for ways to retrench. Increasingly, people are choosing to reject consumerism in favour of a shift towards increased self-sufficiency. Those who remain form, in one sense, more tightly knit communities, which are more focussed on self-reliance than the communities of 2006. While this certainly means a gain for sustainability, it is more the self-reliance of the war garden than the eco-tribe. Nonetheless, the avalanche of data confirming global warming did accelerate the growth of environmental values, as did social and business strategies pioneered by change organisations such as Clinton’s Global Initiatives in 2006.

People now take greater responsibility for their own well-being and for the well-being of their environment. What bodes well for a future revitalisation of UK competitiveness is a national mood of adventure. Britons are responding to the current challenges with resilience and creativity, working together to innovate and create new businesses and renew their communities.

#### *Health and Safety in the changing workplace*

Britain has fewer large industries and large corporations that standardise office practices and environments throughout their branches. The proliferation of small businesses, local businesses, and at-home businesses creates widely varying work environments. The line between work and home continues to erode. The increased value placed on achieving work/life balance is countered by labour demands and many people’s need to work two jobs, or one job in conjunction with elder care or self-sufficiency tasks. Work at home allows more seamless integration of elder care, but it also lowers productivity owing to the distraction quotient.

One emerging reason for optimism, however, is the increasing trend for small businesses to share office space and support staff, leveraging dynamically administered resources to function more efficiently and parsimoniously. Implementing ‘green office’ design is also easier when resources are shared. Less waste and lower operating costs allow these office cooperatives to invest more in creating a healthy workplace environment.

With regard to health and safety, fear and uncertainty have driven people to think, “If I don’t do it for myself, no-one else will do it for me.” It’s a brave new world of personal responsibility, driven as much by galloping technological process and the emergence of increasingly complex health and safety issues as from any increase in individual or social enlightenment. Detection and prevention of ill health causal factors is the key. Health agencies are moving into the roles of coaches and advisors. They provide resources that enable people to take responsibility for their own well-being more effectively.

Immersive monitoring systems and ‘wellness webs’ allow more efficient monitoring of health and stress indicators throughout an individual’s day. Businesses and employees who can afford the system find that it not only aids productivity, but reduces employee health costs. As a result, the bell curve of workplace health and safety has widened and flattened; we see more exemplary practices, but also more reports of businesses attempting to fly under the regulatory radar to save costs.

Many businesses have simply cut and run. Recession-induced pressures on profit margins increased the offshoring of innovation, R&D, and production by those who could afford it. Offshoring was welcomed by some environmental campaign groups, though by no means all, as a means of protecting Britain’s natural environment from experimental or industrial disasters. The sluggish economy did create some bargains for overseas buyers, with some British companies going cheaply. However, their new overseas owners tended to bring their own attitudes and approaches to health and safety issues. In some sectors this mattered little; in others, a lot.

### ***Winners and Losers***

The winners in 2017 are the self-sufficient, high-tech, green micro-energy producers and consumers in the wealthier rural communities. Landowners in those communities have benefited from the increased demand for land for the self-sufficient lifestyle. Pensioners who can afford the supportive technology are better off, as are those who belong to support networks or have either successful or devoted children on whom they can rely. Private security companies are succeeding, as are small businesses developing wellness products or services, especially those that are locally unique. Digital media and experience economy entrepreneurs are beginning to re-establish a name for British design. In politics, proportional representation has created a lively, if fragmented arena for special interest groups – and political extremists.

But the losers are too often the young and working age adults, especially those with minimal education whose traditional industrial jobs are disappearing. Pensioners whose children out-migrate and who lack the resources or support networks suffer from the erosion of public assistance. While 2017 contains the potential for new growth, it is still for too many an era of struggle.

### **3.2.6 Commonalities and Contrasts**

The review of the HSE ‘hot topics,’ above, pointed out that the issue is not so much *if* they will happen, as *how* they will happen. One use of the four scenarios is comparing how innovations or structural changes might play out in the different future environments they portray. A good example of this is ‘pervasive computing.’ Pervasive telecommunications and media, ubiquitous computing, and RFID/nano ‘smart dust’ sensors are certainties; an immersive media and computing environment will exist in all four scenarios. The critical difference will be why and how those systems are used, and who has access to them:

- In ‘The Digital Rose Garden,’ pervasive computing creates a seamless, immersive digital data/media environment that overlays the real world and that everyone accesses constantly.
- In ‘Boom and Blame,’ a more limited version allows total lifestyle, environment, and performance monitoring by companies via implants tracking working wellness and productivity.
- In ‘Tough Choices,’ pervasive computing is a luxury of the wealthy; government uses RFID implants to track felons, and gangmasters use them as ‘inventory tags’ for migrant workers. Everybody else gets by with cell phones.

- In ‘A Virtue of Necessity,’ people use pervasive computing to link family and local community, and for environmental and health monitoring and problem detection; it eases home care and enables telemedicine for seniors.

Extrapolating how impact patterns of a specific detail will vary across the four scenarios is also known as ‘incasting.’ Given a set of clearly defined scenarios, this exercise can be used to explore alternative outcomes for almost any issue or innovation. The table below offers two more examples: human performance enhancement (HPE), and sustainability.

**Table 1** Comparing Human Performance Enhancement and sustainability outcomes across the four scenarios

<b>Scenario</b>	<b>HPE</b>	<b>Sustainability</b>
The Digital Rose Garden	Used for extreme sports pursuits and as a lifestyle choice.	‘Green de luxe’: <b>sustainability</b> for design elegance and parsimony of system solutions
Boom and Blame	HPE drugs distributed by companies as a key competitive edge enhancing worker productivity.	‘Success first, <b>sustainability</b> later’: only a wealthy, expanding economy can afford sustainability -- the ‘trickle down’ approach.
Tough Choices	Used by organised crime elements; distributed to illegal workers by gangmasters to extend work hours.	‘ <b>Conserving</b> to cope’: no available capital to invest in green retrofitting or entrepreneurial initiatives.
A Virtue of Necessity	Used to cope with the demands of multiple jobs and senior care responsibilities.	‘Shabby green’: <b>sustainability</b> forced by economic limitations -- don’t have much so you don’t use much: reduce, re-use, recycle.

As HSE’s Horizon Scanning continues to identify emerging issues of change, the four scenarios can help explore their possible impacts and outcome patterns.

### 3.3 EVALUATION

The project aimed to involve HSE staff and stakeholders in joint foresight activities. Creating a positive experience for participants would in turn help foster a foresight culture within HSE. Participant reviews of the scenario building workshop were positive. Over 70% rated the content ‘good’ or ‘excellent’ with respect to the 26 major issues from interviews; the ‘hot topics’; developing the scenarios; and presenting the scenarios and brainstorming health and safety issues. When asked if they felt they understood scenarios better as a result of the workshop, 23% responded with a 5, ‘completely’; 71% with a 4; and 6% with a 3, on a 1-5 scale where 1 equalled ‘not at all’ and 5 equalled ‘completely’. When asked if they thought the session was interesting and worthwhile (using the same 1-5 scale), 50% responded with a 5, ‘completely’; 44% with a 4; and 6% with a 3.

Written comments included the following:

- “...a very valuable exercise which was extremely enjoyable to participate in...”
- “...would like to do it all again with my fuller understanding of the process now!”
- “I must admit I wondered what this was all about and was a little sceptical at first. I finished a strong supporter and thought it was worthwhile and well organised.”

- “I greatly enjoyed the workshop and found it a valuable introduction to the concept of scenarios. I feel the process has considerable potential and will help HSE teams to develop a long-range view and ensure that we are ready to meet future challenges.”

The feedback did point out some perceived weaknesses in the content, as well as strengths of the process, e.g.

- “Hot topics were largely about technological developments - whereas societal and managerial (psychosocial) practices are of equal if not greater importance.”
- “I thought that the contributions captured in debate after each presentation were useful in augmenting each scenario descriptions, therefore making them more realistic.”

The most serious weakness was perceived to be the time constraint. As the team anticipated when designing the project, compressing so many tasks into one scenario workshop, even if two days long, was frustrating to participants. The process was successful in provoking thoughtful dialogue and people wanted more time for in-depth discussion and to clarify both the interrelationships among issues and the issue priorities. Comments that reflect this frustration included:

- “...would have been better if we had had a bit more time for discussion - also hindered by some people having left early...”
- “I felt this was a bit rushed and we came up with scenario axes that some of us felt were not quite right...”
- “...One of the axes appeared to reflect two different issues. Also the axes we ended up with reflected different concepts that made the work on the next day more difficult not to say impossible...”

This demonstrates the need for stand-alone issues workshops to digest the wealth of data generated by the issues interviews. More time for discussion and analysis of the complex issues raised by the interviews would enable the creation of more concise and consistent scenario axes.



## 4. SCENARIO INCASTING: HOLISTIC APPROACH

### 4.1 PROCESS

#### 4.1.1 Context: The HSE Horizon Scanning Conference

HSE's first horizon scanning conference – *Horizon Scanning: health and safety in the changing workplace* – was held at the DTI Conference Centre in London on 30 November 2006. The primary aims of the workshop were to:

- Work with others in identifying and exploring the key new and emerging risks for the health and safety system
- Explore the policy implications, for regulators and others, of these new and emerging risks.
- Support and contribute to the Wider Implications of Science and Technology (WIST) Programme, led by the Office of Science and Innovation.
- Broaden the 'horizon scanning for health and safety' community.

About 100 delegates from government, industry and academia met to hear a range of invited speakers and to work with HSE's newly completed *Scenarios for the health and safety system in 2017*.

The exercise set for delegates was Scenario Incasting, a holistic approach to working with scenarios in which groups are asked to imagine the specific details of a possible future based on a more general scenario description.

#### 4.1.2. Activity Instructions

After a brief introduction to the scenario building process, delegates were split into six breakout groups, each of which was asked to work with one scenario. Two groups worked with A Virtue of Necessity, two with Boom and Blame, and one each with Tough Choices and The Digital Rose Garden. Each group was assisted by a facilitator and a scribe.

#### *Ground rules*

Delegates were given five minutes to read a two-page summary of their scenario. They were then asked to split into twos or threes to discuss the following questions:

- What does this scenario imply for health and safety in your organisation or profession?
- What does this scenario imply for stakeholders in the health and safety system and what should they be doing to prepare for this future?

After about ten minutes a group discussion was initiated in which the issues raised were discussed and delegates produced a list of key issues to report back to the plenary session.

### 4.2 OUTPUT

#### 4.2.1 Scenario Discussions

The following points were reported back from the breakout groups.

### ***A Virtue of Necessity***

Groups 1 and 5

- Importance of education; teaching children now about health and safety
- Communicating and influencing ...
- ...and identifying the key stakeholders
- More local-based regulation; greater role for LA activity; and for local support networks
- Training in safety as well as health
- With SMEs, fiscal incentives rather than sanctions – changing behaviour
- H&S merges with Environment – one hit, high impact, integrated intervention
- Fitness for work – standards for fitness given changes in ageing, generational lifestyle differences

### ***A Digital Rose Garden***

Group 2

- Choice vs coercion (you have no choice in this scenario) – growth in mental health issues
- Polarisation of society – wills/will nots – some will opt out → dual approach from HSE, both guardian/enforcer vs advisor, plus more education re risk management
- Changing relationships – blurring of work and home, which requires HSE to abandon distinction between occupational and public health. Also requires a more holistic focus on well-being, and closer relationship between occupational health and the social services.

### ***Boom and Blame***

Groups 3 and 6

- From regulation to litigation – from criminal courts to civil courts
- Individual – has more responsibility, but less freedom
- ‘Karoshi’ – STRESS – working until you drop
- Quality of life ”bloody awful”
- Major accidents due to loss of expertise, competitive insularity – risks due to holes in expertise → major accident potential
- Implications for surveillance of workers/workplace – could be used for regulation tool by HSE
- Can HSE regulate the rate of change?

### ***Tough Choices***

Group 4

- Fewer resources for health and safety – but it’s declining in priority anyway – the focus shifts to enforcement
- Less compliance, conformance – less insurance

- Big risks to the social progress of the last 30 years, especially in disability rights and health and safety – the ‘social scrapheap’
- Lower standards at work leading to lower standards at work (a downward spiral)
- Storing up trouble for the next 30 years – e.g. asbestos No. 2
- Fewer big global H&S champions among companies
- Higher accident rates all round.

### ***Common Themes***

The following common themes were identified from the group feedback:

Education – informing and preparing the next generation of stakeholders about emerging risks, sensible risk management and communicating risks, in an environment where public attitudes to risk and responsibility may have been influenced by debate and action on public health issues such as obesity, technological advancement and climate change.

Role and nature of regulation – reviewing the regulatory framework, assessing its adequacy for controlling changing risks in the changing workplace, where the latter is quite likely to be subject to the interdependent but not necessarily mutually compatible impacts of, for example, demographic change, human performance enhancement and new ways of ‘real-time’ monitoring of workplace/worker health.

Crossovers and blurring – not just between, for example, occupational health, public health and common health issues, but between the work and the home; between health, safety and environment issues; between national and local priorities for health and safety; between privacy and monitoring at work; and between national security and personal liberty considerations – all of which may be influenced by developments in issues such as recycling, pervasive computing and the impact of environmental legislation.

Division and competition – not just between the haves and have-nots but, for example, between environmental and health and safety issues, between national and local priorities, large and small organisation priorities, work and home, technological advances and morality/ethics (for instance, with reference to the employment of those who may be genetically predisposed to certain occupational diseases, or in biotechnologies).

Continuing links to well-being – building upon the ‘good jobs, good health’ agenda, developing Health Work and Well-being, in an environment of changing demographics, flexible and/or precarious working and shifting employment patterns and increased workplace monitoring (whether for productivity or health reasons).

### **4.2.2 Plenary Discussion**

The report back from the breakout groups was provided by Dr Schultz, and was followed by a Panel Session chaired by Jonathan Rees and featuring:

Patrick McDonald – HSE Chief Scientist

Pam Hurley - Managing Director, Tosca Consulting

Lisa Fowlie – President, Institution of Occupational Safety and Health

Mark Du Val – Director of Policy, Local Authority Coordinators of Regulatory Services

This provided a further opportunity for delegates to draw out and discuss topics of relevance. Key issues that emerged included:

- Work related road safety and the role of the regulator;
- Separating the enforcer and the regulator;
- Blurring of work and home, for example in causation of musculoskeletal disorders – the role for ‘systems thinking’;
- Disabilities and developments in ensuring equality in the workplace;
- Merging of Health & Safety and Environment disciplines;
- The barrier the tax regime imposes on back to work initiatives;
- The role of education in sensible risk management;
- The role of trades unions in well-being management;
- Health and safety and the role of small businesses;
- Developments in Corporate Social Responsibility and their potential for impact on work related risk management; and
- Is there the political will to act on issues thrown up by horizon scanning?

### **4.3 EVALUATION**

Delegates were each asked to complete an evaluation questionnaire.

Overall feedback on this event was positive, with the vast majority of attendees rating it as good or excellent. The mix of those with experience of horizon scanning and those without was about even, but again the majority learned something new. The most commonly mentioned benefit was the variety of stakeholders and interest groups represented and the opportunity to network.

Looking to the future, most attendees indicated that they would provide feedback to colleagues about the event, while a small number went so far to indicate they would like to develop their own scenarios.

The scenarios session itself produced the most diverse feedback, ranging from “not differentiated sufficiently” to “entirely credible, almost here today”. Having said that, the majority of attendees reported that they found the scenarios “thought provoking”. From HSE’s perspective, outputs from the discussion groups on the scenarios really enriched our findings and will be of great value both in informing the final versions of the scenarios and in helping HSE continue to take forward this work.

Finally, looking to future engagement, there was a high degree of interest in a quarterly newsletter.

## 5. WIND TUNNELLING: ANALYTIC APPROACH

### 5.1 PROCESS

#### 5.1.1 Context

An alternative to the holistic approach to the use of scenarios, which was used at the November conference, is wind-tunnelling, or the analytic approach. With this approach, scenarios are used to test specific policy ideas or proposals.

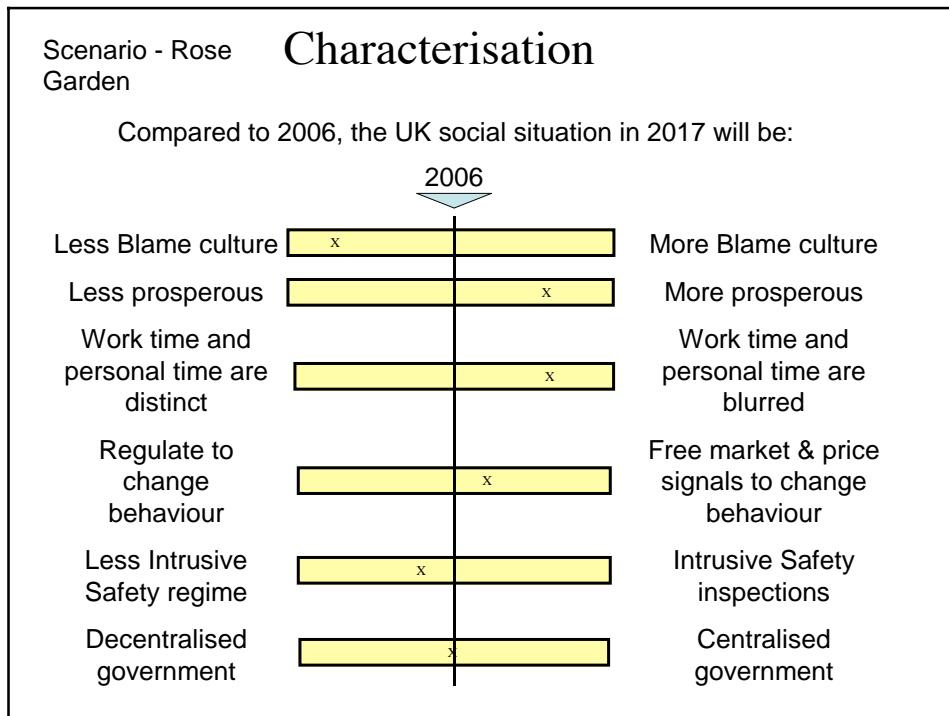
A workshop was held on 7 December 2006, attended by 22 members of HSE staff and facilitated by the Infinite Futures/SAMI team.

The purpose of the workshop was not to produce any definitive conclusions on specific issues, but to demonstrate the principles behind wind-tunnelling. Therefore a range of issues was considered and this report does not go into the detail of the deliberations on particular issues. To do so on the basis of such a short session could give misleading impressions of future directions and so this report concentrates mainly on the methodology.

#### 5.1.2 Activity Instructions

##### *First Exercise – Review the Scenarios*

In the first exercise delegates reviewed a set of elements common to all scenarios and considered their implications for HSE strategy. They were asked to indicate on a Characterisation Chart (an example of which is shown in Figure 5) the anticipated situation in 2017 in their scenario with regard to various parameters. They were also asked to identify key indicators for each scenario, i.e. clues that a particular scenario might be developing.



**Figure 5** Scenario Characterisation Chart

## Key Scenario Indicators

The following key scenario indicators were identified for each scenario.

### *The Digital Rose Garden*

- Reduction in economic gap between rich and poor
- Low carbon footprint – increase in green products/technologies etc
- Accelerated adoption of technology

### *Boom and Blame*

- Structural differences; mergers; consolidation of services; locally – chief executives and ?
- Increasing stress – cited as a cause of work absences, more people working long hours and more poverty at the bottom.

### *Tough Choices*

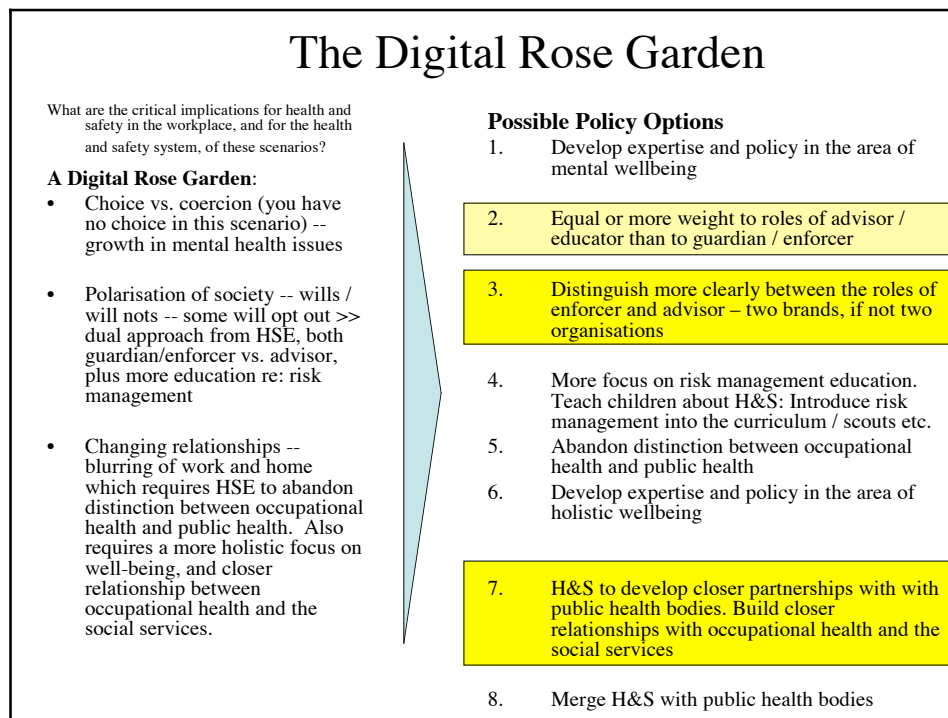
- Rise of the spiv
- Organised crime/black market

### *A Virtue of Necessity*

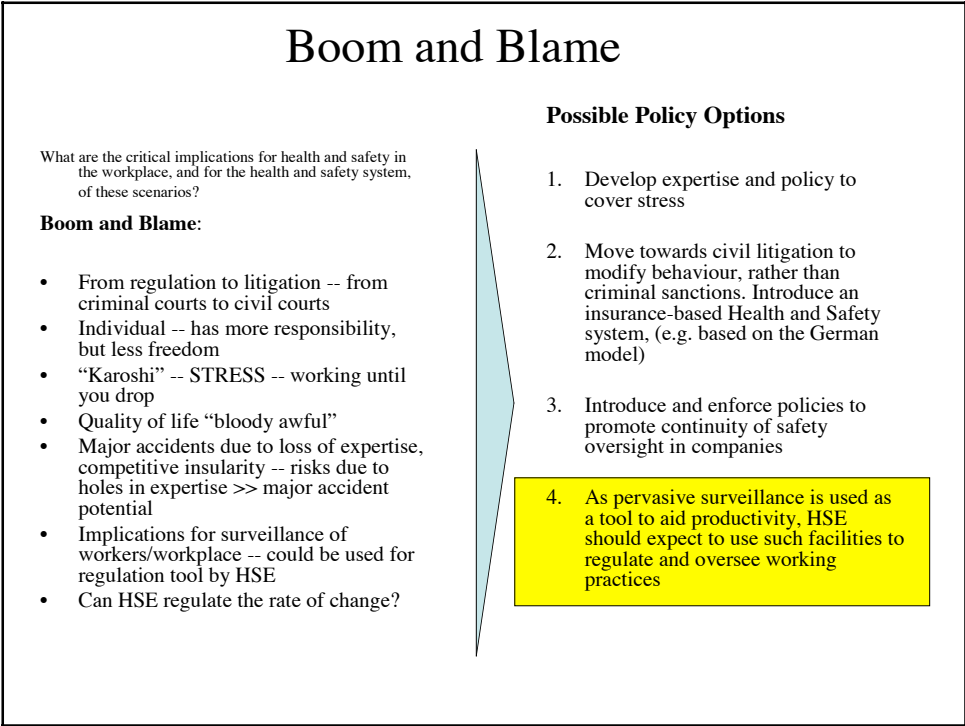
- Romanians flood to Ireland

## Second Exercise – Wind-Tunnelling Conference Outputs

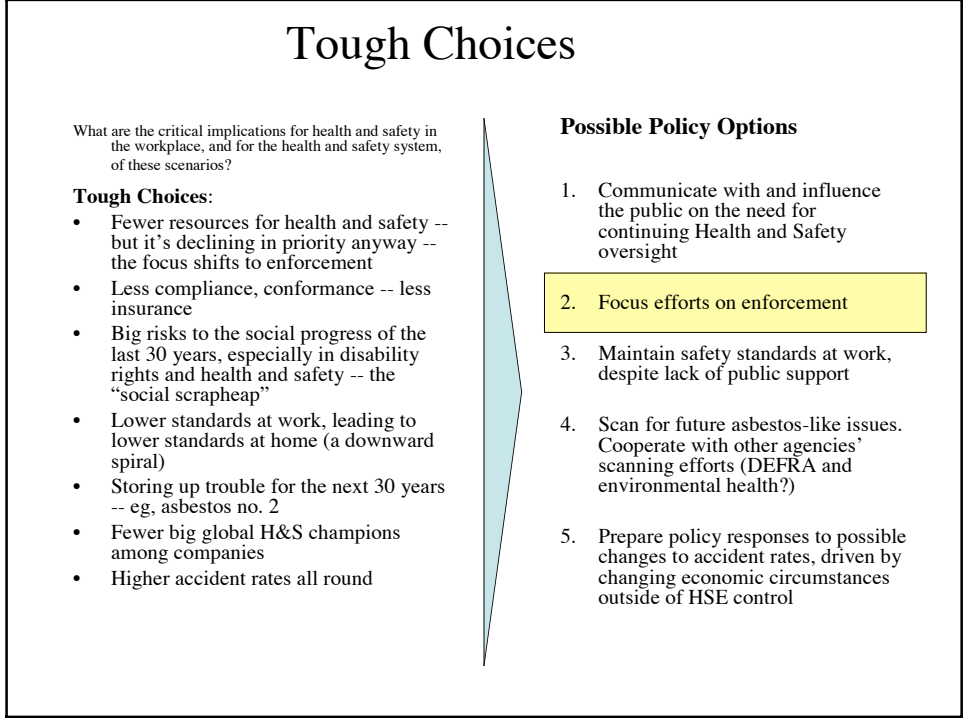
In this exercise, delegates were asked to consider various policy options arising from the findings of the November conference. Figures 6 to 9 below list the findings from the conference for each scenario, alongside possible policy options. It is important to stress at this point that the policy options listed were produced by the project team, not HSE policy makers. They were selected for the purposes of this exercise only and do not necessarily reflect any policy that HSE might consider in the future. The policy options selected for the workshop are highlighted.



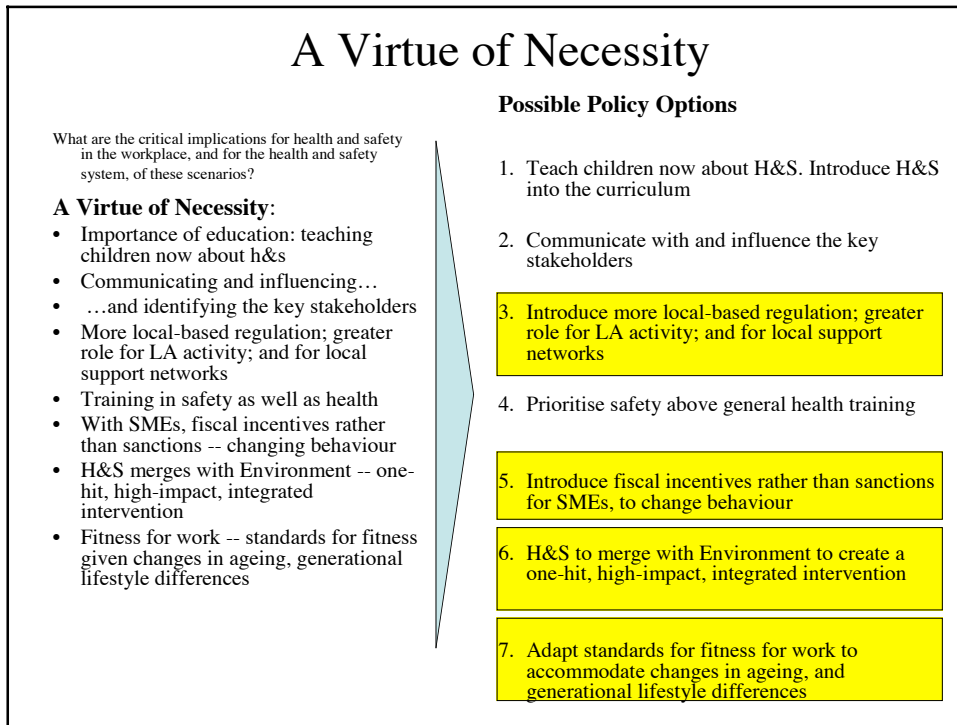
**Figure 6** Policy options for 'A Digital Rose Garden'



**Figure 7** Policy options for ‘Boom and Blame’







**Figure 8** Policy options for ‘Tough Choices’



**Figure 9** Policy options for 'A Virtue of Necessity'

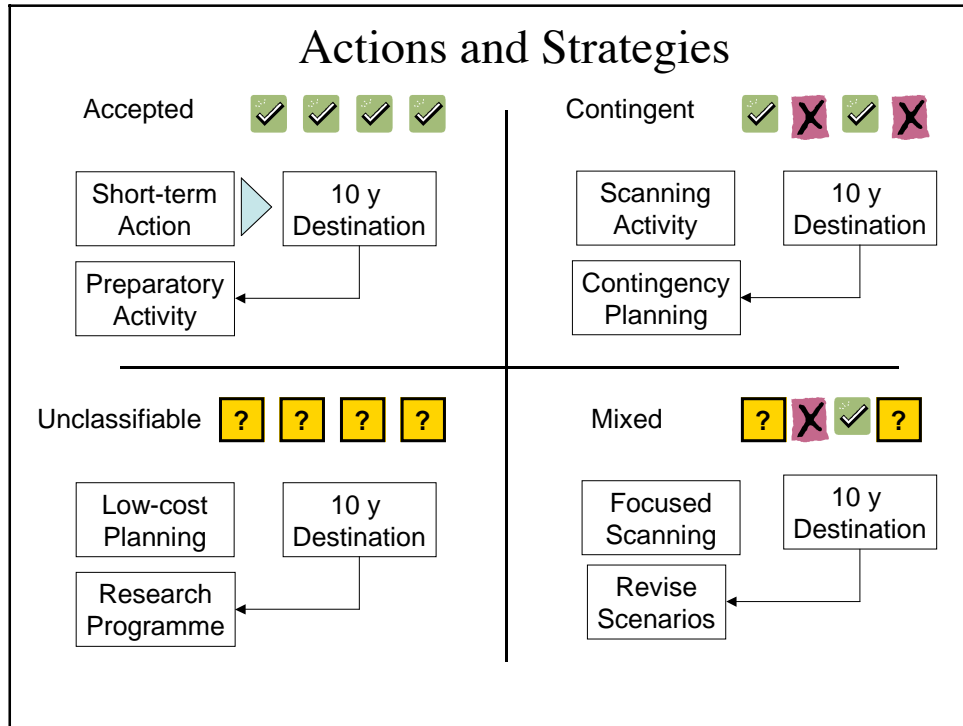
In the first part of the wind-tunnelling exercise, delegates were asked to work through two initiatives per syndicate with the aim of classifying them as success, failure, contingent or unclassifiable. This was done using a simple score card, shown in Figure 10, in which the viability of a course of action in each scenario is considered.

### Wind Tunnelling – Example

Policy Option	10 year Destination	Virtue of Necessity	Rose Garden	Boom Blame	Tough Choices
Focus efforts on enforcement	Become an Enforcement Organisation				
Equal or more weight to roles of advisor / educator than to guardian / enforcer					

**Figure 10** Wind-tunnelling score card

The second part of the exercise required delegates to 'flesh out' successful or accepted and contingent initiatives as follows. Figure 11 shows the various outcomes of the wind-tunnelling exercise and the actions that could follow each outcome.



**Figure 11** Actions and strategies following wind-tunnelling

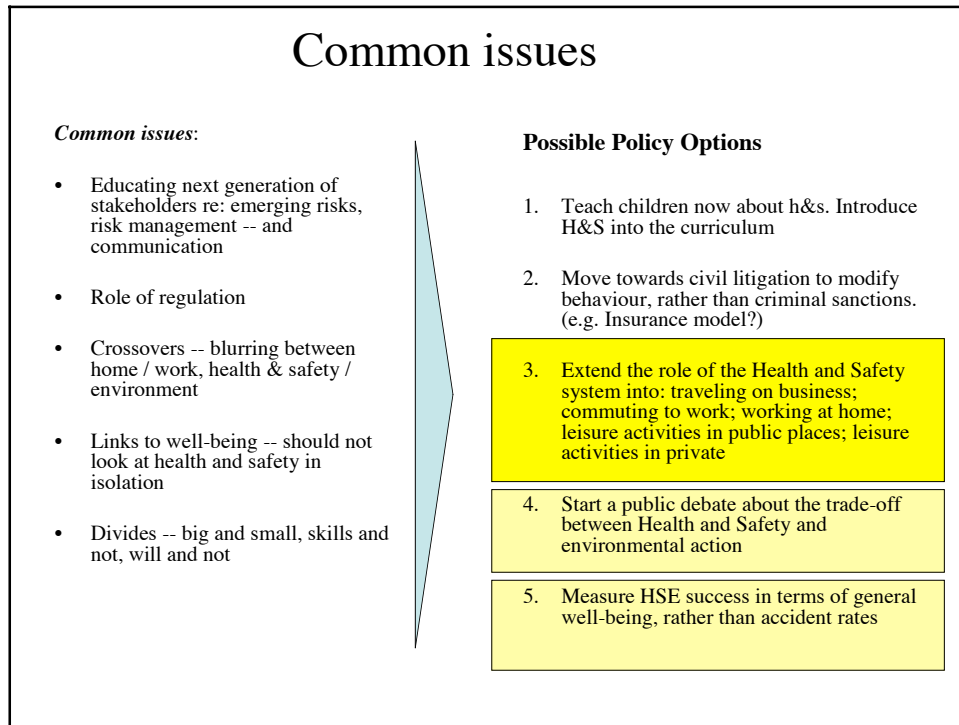
These are as follows:

- Accepted initiatives: Describe the policy initiative as a set of short, medium and long term commitments. Add short term actions needed to prepare for medium and long term decisions.
- Contingent initiatives: Develop and outline a decision tree for contingent decisions. Specify monitoring programme for decision indicators (e.g. the Key Scenario Indicators identified earlier). Consider any low-cost preparatory work that could or should be done even before a decision to commit is made.
- Unclassifiable initiatives: Describe a research programme needed to reach a decision.

***Third Exercise – Develop and Test Own Policy Proposals***

In the third exercise delegates were invited to repeat the second exercise, but using policy proposals not considered so far, using as source material:

- The Horizon Scanning Hot Topics List (Section 3.1.1)
- Issues from the Interview Workbook (Section 2.2)
- The November Conference Output Common Issues (shown below in Figure 12)



**Figure 12** Common issues from November conference

## 5.2 EVALUATION

Delegates were asked to complete an evaluation questionnaire. Overall the response was positive, with 91% of delegates reporting ‘Good’ to the question on whether the event met their expectations.

Most delegates found the instructions clear and that the sessions helped them picture the scenarios clearly and helped them expand their thinking on the policy approaches considered in the groups. They welcomed the opportunity to engage with colleagues and to acquire a greater understanding of scenarios and how they can be used.

Individual comments received included:

On the process –

“The way the issue to be tested is framed is crucial. Too bland or unspecific an issue could produce a bland response.”

“This was interesting in that the views on what we were wind-tunnelling varied – was it HSE action and how we could influence things, or was it a wider action that may influence a policy or activity?”

“It is difficult to picture how these scenarios might ‘pan out’ but the notion of thinking ahead and planning policy considerations is very clear in my mind following the exercise.”

“Not enough time for the exercise.”

“I think it would have been better to concentrate on one initiative and do it in more detail. There wasn’t really time to discuss the topics and come to a considered view about the scoring.”

On future actions –

“Encourage HSE to engage with DWP at a more senior level to extol the virtues of the approach.”

On possible future topics –

“The project looking at the ‘footprint’ of HSE i.e. its geographical locations.”

“How HSE can influence H/S systems and awareness at school level [8-15 yr?] What novel ways can HSE use to persuade school authorities and children to accept that H/S is a key learning skill and competence for the future world of work?”



## 6. NEXT STEPS

### 6.1 DISSEMINATION WITHIN HSE

Why engage in scanning and foresight? The flow of new ideas builds flexibility into an organisation, creates a learning culture, and encourages innovation. You can't force people to look ahead – but most do welcome the opportunity for reflective and creative thought. Start by involving those who are most interested in exploring the future, and build positive word-of-mouth. Encourage that with robust foresight tools, a clear evidence trail, and conclusions that are both thought provoking and concrete in their implications.

Keep the scenarios alive. Create a menu of ways you might use them for different audiences. This could include:

- Use the scenarios yourselves: as new 'hot topics' arise, imagine how they might emerge in each of the four futures, and what questions, challenges, or opportunities they would create.
- Present examples of incasting or wind tunnelling output in the scanning newsletter, highlighting interesting applications of the scenarios to specific issues and questions.
- Offer half-day, on-site "scan and scenarios" workshops to specific teams within HSE. Do mini-interviews by phone with participants first to determine what issues they think are critical, and use those to focus presentations and scenario exercises.
- Explore values: ask people to choose what they most like and most deplore in each scenario and use the resulting discussion to articulate and fine-tune a preferred future for health and safety in the workplace, and HSE's role in assuring that.
- Update the scenarios: change changes, and so should the scenarios. Monitor the news for events that match the scenario patterns, potentially confirming them, altering them, or rendering them obsolete.

Using the scenarios in a variety of activities and settings will allow you to evaluate how they can most effectively contribute to a culture of foresight within the HSE.

### 6.2 DISSEMINATION EXTERNALLY

The Horizon Scanning Conference generated a lot of interest both in HSE's Horizon Scanning efforts, and in the scenarios. This needs to be built on by:

- Producing a Horizon Scanning Newsletter.
- Using the scenarios to engage with HSE's stakeholders, for example, by running short workshops.
- Continuing to expand the range of short form reports on hot topics.
- Promoting the scenarios through the OSI FAN Club (Future Analysts Network).

### 6.3 ONGOING FORESIGHT

The scenarios have brought together much of the information gathered in the first eighteen months of the operation of HSE's new horizon scanning system. They can be used now to guide future scanning activities.

Now that the scanning groundwork has been carried out and that new topics may well not surface so frequently, it may be appropriate to turn the focus of activity towards dissemination

of the findings at the expense of scanning, although scanning does, of course, need to be continued.

## APPENDIX 1: INTERVIEWEES

Professor Raymond Agius, Professor of Occupational and Environmental Medicine, University of Manchester  
Dr Janet Asherson, Head of Policy, CBI  
Dr Andrew Auty, Managing Director, Re: Liability (Oxford) Ltd  
Stephan Bevan, Director of Research, The Work Foundation  
Gary Booton, Director of Health, Safety and Environment, EEF The Manufacturers' Organisation  
Bill Callaghan, Chair, Health and Safety Commission  
Sandra Caldwell, Director Field Operations, HSE  
Kären Clayton, Head of Process Safety Corporate Topic Group, HSE  
Mike Cross, Head of Operations, Construction Division NW, HSE  
Dr Andrew Curran, Director Health Improvement Group, Health and Safety Laboratory, HSE  
Dr Paul Davies, formerly Head of Hazardous Installations and Chief Scientist, HSE  
Dr Brian Fullam, Head Corporate Science and Knowledge Unit, HSE  
Rory Heap, Disability Rights Commission  
Professor Sir David King, Government Chief Scientific Adviser  
Keith Montague, formerly development Director, CIRIA  
Kevin Myers, Head Hazardous Installations Directorate, HSE  
Michael Parkes, Head of Environmental Health and Trading Standards, Sandwell MBC  
Professor Monder Ram, Professor of Small Business, De Montfort University  
Jonathan Rees, Deputy Director General, HSE  
Kevin Ross, Director of Legal Services and Enforcement, Commission for Racial Equality  
Dr Robert Turner, Head of Occupational Hygiene Specialist Group, HSE  
David Wallington, Group Safety Adviser, BT  
Professor David Walters, Seafarers International Research Centre, University of Cardiff and TUC Chair of the Working Environment  
Lawrence Waterman, Chair of Sypol and Head of Health and Safety, Olympic Delivery Authority  
Dr Angela Wilkinson, Director, Scenarios and Futures Research, James Martin Institute, Said Business School, University of Oxford  
Jerry Williams, Head of Human Factors Group, Health and Safety Laboratory, HSE  
Jane Willis, Strategic Programme Director, HSE  
Richard Worsley, Director, The Tomorrow Project



## APPENDIX 2: FULL SCENARIOS

The full or research scenarios for this project each begin with a brief overview of conditions in 2017 and the historical changes that created them. They then explore how life is different in the future in greater detail:

- What concepts, ideas and paradigms define the world around us?
- How do we relate to each other – what are the social structures and relationships that link people and organisations?
- How do we connect with each other – what technologies connect people, places and things?
- What are the processes and technologies through which we create goods and services?
- How do we consume goods and services – how do we acquire and use them?

Each scenario ends by focussing on the changing workplace, and changed health and safety issues.



## HSE Scenario Project: The Digital Rose Garden

### Introduction:

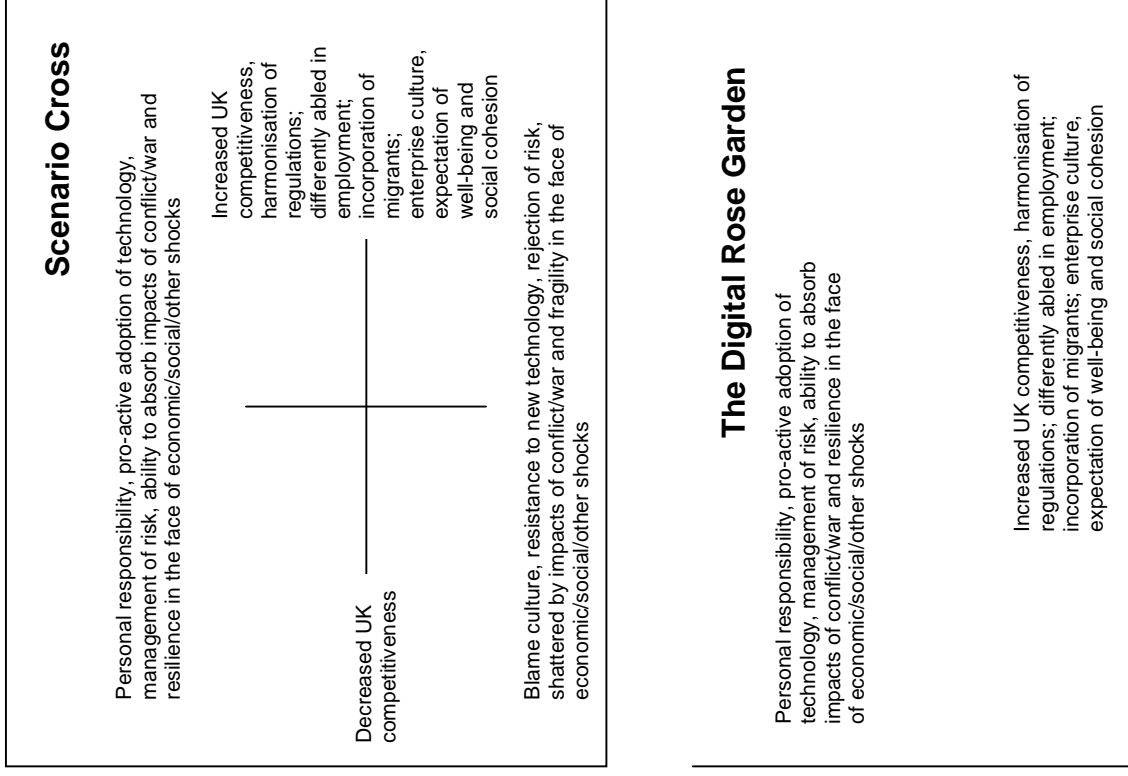
This scenario is one of a set of four comprising HSE's Scenarios for the Future of Health and Safety in 2017. The scenarios resulted from discussions and group work during a scenario-building workshop (20-21 July 2006) hosted by HSE's Horizon Scanning team as part of a wider scenario-planning project. Participants prioritised change issues and created the 'scenario cross' to the right that provided the logical framework for the four scenarios. The time horizon targeted was 2017. This scenario, 'The Digital Rose Garden', is driven by increased personal responsibility and increased risk tolerance combined with increased UK competitiveness in the global political economy (illustrated lower right).

Scenarios are not predictions of the future - they are vivid stories about possible futures. They help us explore the boundaries of uncertainty defined by specified drivers of change. Scenarios written for interactive exercises are typically brief, depicted in personal rather than institutional anecdotes, and salted with humour (laughter aids impact and memory). But these are best based on research scenarios: longer narratives, depicted in broader terms. The research scenario for 'The Digital Rose Garden' begins with a brief overview of conditions in 2017 and the historical changes that created them. It then explores how life is different in this future in greater detail:

- What concepts, ideas and paradigms **define** the world around us?
- How do we **relate** to each other – what are the social structures and relationships that link people and organisations?
- How do we **connect** with each other -- what technologies connect people, places and things?
- What are the processes and technologies through which we **create** goods and services?
- How do we **consume** goods and services – how do we acquire and use them?

The scenario finishes by focusing on the changing workplace, and changed health and safety issues.

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## ‘The Digital Rose Garden’

### Overview

*As the 20<sup>th</sup> century ended, analysts wrote ‘2020’ forecasts, scenarios, and visions – for cities, provinces, and countries; for companies, agencies, and entire sectors; and for species, ecosystems, and planetary dynamics. From the vantage of 2017 – within hailing distance of 2020 –*

Britain has harnessed the creativity of its diverse society in service to both the economy and the environment. This renewed, cohesive spirit of innovation looks likely to create the ‘Roaring Twenties’ of the 21<sup>st</sup> century. A bumper crop of new businesses has energised the national economy. Graduates in the sciences and mathematics are partnering with the best in British design, generating economic value in biosciences, materials sciences, and nanotechnology, and attracting a brain gain internationally. Expert youth are working with experienced seniors on the real millennium challenges: global climate change, poverty, and sustainability.

British employees are staying at home, and so are Britain’s businesses. Offshoring is declining – as BRICs (Brazil, Russia, India and China) and emerging economies increase their wealth and the salaries paid to their workers, the comparative advantage of overseas labour has declined. Increasing international standardisation of

regulations has also raised overseas operating costs, particularly in comparison to the leaner, rationalised regulatory framework in the UK.

People are channelling their inner Edmund Hillary – or, more appropriately, their inner Kevin Warwick (pioneer in the human-machine interface; he embedded a microchip in his arm). It’s the age of cool explorers and new adventures; risks are acknowledged, weighed, and managed in cooperative public-private partnerships that enable a continuous stream of responsible innovation. This heightened comfort with managing risks heightens comfort with transformative technologies on an individual level as well; history may come to know this new ‘Roaring Twenties’ as the ‘Transhumanist Twenties’. Britain’s next decade will transform its economy and environment for the better, but how will history judge the increasing transformation of humans themselves?

### Recent History (2007 – 2017)

**2007:** Attitudes towards risk were in flux at the beginning of the 21<sup>st</sup> century. Generation X and Millennials both exhibited a love of risk with their penchant for ‘extreme’ sports like snowboarding, base jumping, free running, or

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zorbing.<sup>ii</sup> An emerging generational value shift embraced the conscious management of risk by individuals.

This was accelerated by advances in human performance enhancement and bionic technologies. The line between rehabilitative prosthetics and human augmentation was blurring, as evidenced by the similarity between Otto Bock's spring-based prosthetic foot and Poweriser spring stilts.<sup>iii</sup> If extreme activities risked physical damage, but the resulting rebuild of your body improved it beyond its 'natural' levels of ability, what was the downside?

The downside was the uncertainty surrounding the long-term effects on individuals of such 'rebuids'. Yet many pressed ahead anyway. This was widely interpreted as a sign that private individuals were increasingly prepared to manage risks for themselves. This contributed to the growing erosion of the so-called 'Nanny State' worldview.

Excitement about the still untapped potential of the new biotechnologies and biosciences snapped public patience with the more aggressive elements of the animal rights lobby. There was widespread support for policies to preserve the pharmaceutical industry and aggressively support the UK's biosciences sector, both academic and private.

**2009:** In spring of 2009, West Nile Virus crossed British borders, with over 30 cases identified within a week. The outbreak was swiftly contained, with no fatalities,

highlighting once more the strength of the UK's biosciences sector, and the effective 'tripod' partnership strategy linking health and biosciences academics, the health industry, and the public health agencies.

**2011:** The significant environmental breakthrough of the early 21<sup>st</sup> century was political rather than scientific: The USA signed the Kyoto accords. Initiatives to address global climate change and its impacts finally had both teeth and resources.

China's economic momentum suffered a hiccup after the August 2011 political meltdown in Beijing. Devolution to greater regional autonomy slowed business growth as political and economic power structures reconfigured.

**2013:** A joint government and insurance consortium analysis of risk behaviour introduces the 'Safe as Houses' campaign. This sought to educate technologically enhanced people about the relative risk of expecting too much from their 'technological enhancement' when carrying out common activities: carrying shopping, DIY and leisure pursuits such as jogging and gym.

**2015:** With China bouncing back economically from the restructuring of 2011, Chinese policy-makers and businesses look abroad for assistance in regularising health and safety standards, protocols, and regulations. HSE wins the contract to develop and launch an 'HSE for China' by leveraging its track record and expertise.

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growing up.<sup>iv</sup> The public demands transparency of information, but rejects alarmism.

As a result, open debate and engagement about new technologies and emerging health and safety issues characterise policy formulation. The corollary in the private sphere is a heightened acknowledgement of personal and organisational responsibility and accountability. An explicitly stated moral response to decision-taking and impact assessment is now highly valued in brand strategy. Fair trade, sustainability, and corporate social responsibility are essential elements of success in business. Both the public and private sectors see working in partnership as key to achieving transparent accountability. This increased public and private sector transparency has widened the pool of early adopters. People are now more likely to embrace innovations perceived as beneficial, such as expert-system-based and robotic healthcare, gene therapy, and even health and safety products arising from nanotechnology.

The global scientific and policy consensus that climate change is upon us demonstrates international confidence in climate models. More generally, it demonstrates how deeply rooted the systems perspective has become in science, policy, and business. More and more insights and innovations emerge from concepts based on chaotic system behaviour or intelligent agents and self-organising complex adaptive systems.

**2017:** The UK's global strength in nanotechnology research and design bears fruit as Nanomed Plc's research division announces still more breakthroughs in cancer detection and prevention.

In the past decade, personal augmentation and human performance enhancement have given an entirely new twist to 'marginalisation' and 'differently-abled'. The 31 October 2017 "100% organic human bean" demonstration in Hyde Park was organised by a backlash movement celebrating the joys of simplicity (remaining augmentation-free), and has created a public debate on the responsible design of future humans.

### **In-Depth Exploration**

**Define:** *what concepts, ideas, paradigms, and values define this world?*

Pundits have suggested that experts finally exhausted the public's ability to absorb the 'warning of the week': "Butter's bad for you - use margarine!" "The trans-fats in margarine are bad for you - use olive oil!" Out of the absurdities has emerged the age of the considered rational response: "Cleanliness may be next to godliness, but we survived childhood without all those antibacterial cleansers; all things in moderation". Kids are allowed to fall out of trees; the occasional scuff or bruise is part of

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**Relate:** *how do people relate to each other – what are the social structures and relationships that link people and organisations?*

People are more politically engaged. The **government** is currently reaping the benefits of increased public respect for institutions, specifically leveraging the power of self-organising groups to address complex challenges. A decade of social networking amplified by web resources like LinkedIn, MySpace, and LiveJournal created a complex web of personal interconnections across diverse populations. The inclusiveness of online communities with regard to previously marginalised groups like the elderly, the differently abled, and ethnic communities is reflected in real life by increased social cohesion.

Consequently, today's policy arena sees far fewer single-issue campaigns. In addition, the consensus on climate change proved a unifying challenge that catalysed increasing public support of sustainability. The resulting 'War on Carbon' helps focus policy priorities among politicians, civil servants, and constituents.

**Global** relationships have achieved a new balance, as economies outside the West grow and strengthen, particularly those of Brazil, Russia, India, and China (BRIC). Financial and legal services are more global and more liberalised (WTO), and are a substantial share of global GDP. This convergence of economies worldwide is

vastly expanding the global middle class, meaning more potential consumers, and more potential tourists. Closer to home, Britain's links within the EU have strengthened.

British **society** has reduced the have-have not gap, but not eradicated it entirely. The wealth divide still follows the education divide, although with increasing prosperity more public resources are being invested in education to address that issue. The generation gap is being rapidly erased by the trend in 'vigorous ageing'; more sophisticated healthcare, a greater understanding of the ageing process, and human performance enhancement have swelled the over-65 workforce. This also means the average disposable income for over-65s has increased considerably.

In addition, advanced gerontology and assistive technologies enable greater independence even for frail seniors. Home health systems interconnected with local clinics and hospitals allow OAPs to remain home longer, and make it easier for children to care for their parents themselves. Real estate agents report a boom in granny flats and demographers concur that the number of multi-generational homes is increasing. The generations are closer knit within **families**, and the families are more closely tied to their interest groups and social networks, creating entirely new forms of extended families.

Our relationship with the **environment** has changed. Global climate change is now a given, which throws

issues of sustainability into stark relief. Schoolchildren are taught to consider the impact of lifestyle choices on their ecological footprint. The government is discussing restricting carbon use by instituting carbon ration cards and carbon lotteries for both individuals and organisations. The upside is an enhanced sense of connection to the national landscape and the global biosphere. Britain is growing perceptibly warmer and wetter, and seaside towns – like Southport – are increasingly under flood threat.

**Connect:** *how do we connect with each other -- what technologies connect people, places, and things?*

This may be the first generation that finds themselves thinking, “Grandma would call my kids cyborgs.” Kevin Warwick<sup>v</sup> of Reading University was the first person to embed a microchip into his nervous system – although he didn’t originate the idea – and once we’d chipped jewellery and clothes, skin was the next obvious layer.

In the first years of the 21<sup>st</sup> century, software mashups created new products by layering and interconnecting existing software and databases in new ways.<sup>vi</sup> This was paralleled by hardware mashups - the seamless web of computing, communications, media, and gaming devices that were embedded in cars, clothes, jewellery, contact lenses, and finally, ourselves. Individuals can walk down the High Street in real life and in virtual life

simultaneously, switching between their physical selves and their various avatars from one conversation and one data stream to the next.

Second Life<sup>vii</sup> ceased to be merely a social and games environment on 5 April 2010, when the several Far East nations opened digital embassies there.<sup>viii</sup> Offices and real-world income-generating businesses had been thriving for years prior to that. The blurring of boundaries between the real and digital worlds has imploded the boundaries between politics, work, family life, leisure, art, and spirituality. This generation of digital neo-romantics sees no distinction between life and art.

**Create:** *what are the processes and technologies through which we create goods and services?*

The new processes of design and production are based on the convergence of the biosciences and the material sciences, and on the connection between genetic engineering and nanotechnology. ‘Biomimicry’, popularised by Janine Benyus’ book of the same name, is a staple of industrial design, drawing inspiration for new products and even services from nature.<sup>ix</sup> The UK’s intellectual resources in biosciences, material sciences, nanotech, and design have given UK companies a decisive edge in this sector. The ‘bionano boom’ recalls the dotcom boom of the late 90’s; inventors and entrepreneurs are creating biosciences and materials

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sciences start-ups with an end-goal of buy-out by a larger company. Large companies are in turn creating more skunkworks; acting as angels to small entrepreneurs; and partnering with universities. Getting customers involved via 'peer production' strategies turbo-charges creativity by layering multiple perspectives.<sup>x</sup> All these strategies enliven the UK's enterprise culture and make Britain the workplace of choice for global 'knowledge nomads'.<sup>xi</sup>

At the same time, accountability and corporate social responsibility are critical in attracting customers. How something is created, its ecological footprint, and its 'cradle-to-cradle' lifeplan, are major selling points. Customers consider the quality of the process as important as the quality of the final product or service. The use of RFID chips on all consumables enables auto-recycling and more efficient re-use, as well as efficient tracking for pollution and waste-monitoring purposes. As a bonus it increases security for customers since ownership data is easy to add post-purchase.

Manufacturing in Britain has stabilised after the rocky road to enhancing its processes for sustainability and re-positioning to capture the lead in the bionano/design markets. With the looming threat of carbon rationing, companies keep an eye on transport miles associated with their products. This has reduced offshoring and encouraged local manufacturing and delivery of goods. As a result, UK agriculture is experiencing something of a renaissance.

**Consume:** *how do we consume goods and services – how do we acquire and use them?*

Environmental values have put paid to 'shop 'till you drop'; instead we have a generation of 'mod your bod' cyber-tribals. They grew up thinking tattoos and piercings were chic. The fact that the tattoos now contain digital ink, and the navel rings sport wifi RFID chips, is simply a bonus. The newest generation is extremely comfortable with augmentation, whether cognitive augmentation via smart software, metabolic and synaptic augmentation via HPE drugs, or physical augmentation via embedded microprocessors and bionics.

And it's not just the young - more seniors are augmenting as well. Bionics – technological augmentation – reduce physical frailty, or the perception of personal physical frailty. Similarly, augmented cognition via software or HPE drugs reduces mental frailty. Both enable extended independence. One was referred to the growing community of augmented OAPs as 'high-tech wrinklies'. While humorists joke about wind-powered zimmer frames, prosthetic manufacturers have begun to market hydrogen-fuel-cell-powered exoskeletons instead. They assist movement in a wider range of circumstances than, say, Segways – which have also become popular with the senior set now that the price has dropped.

Consumers have downshifted. Hyperconsumption of goods is no longer popular; it is nearly considered a vice.

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What people do consume avidly is experience, whether actual or virtual; their own or other people's; as live events, interactive games, or as expressed in blogs, podcasts, or other media. Experience addicts and the adrenalin junkies are constantly looking for new combinations of extreme sports or games, and entertaining combinations of sports and peer-produced entertainment. Risks are made explicit, and relative costs for varying risks are a transparent choice: "James got quotes to repair his gutter: £500 with scaffolding, £50 if he holds the ladder for the workman and gambles on the liability."

Lowering your ecological footprint is the new way to get ahead of the Joneses. The effect on the UK leisure industry has been skyrocketing interest in the 'Devon Riviera' as well as rediscovery of other jewels of the British natural environment.<sup>xii</sup>

### **Focus on the Changing Workplace**

Workers no longer face a simple blurring between the workplace and the home. Wrestling with the challenges that that presents to your work/life balance is relatively straightforward. Instead, the immersive computing and media mesh through which everyone now moves has created a blurring between the workplace and *everywhere* – *and everything – else*. Mobile phones are embedded in sunglasses, so videoconferences can find you in Devon.

Worse, an age of 'peer production' means people work even as consumers.

The emphasis on local manufacturing and short-haul delivery drove most companies to decentralise their offices. Smart software puts resources where they are needed with minimal miles travelled. The same software helps employees cooperate to reduce resource consumption in both work and leisure. While offices are smaller and local, they are consistent in their design, amenities, and operations, enabling consistent regulatory compliance across a company's establishments.<sup>xiii</sup>

### **Health and Safety Issues**

People think differently about risk and safety now, in what analysts call "a return to a more rational view." It is a world away from the legal micromanagement of personal risk that so characterised concerns about the 'compensation culture' a dozen years before. More funds and time are now invested in informing the public about the potential risks, costs, and benefits of new technologies, products and services. The efforts of public agencies and others over the past decade on managing risk have paid off. Of course, with technology developing at its current pace this public view can't be assumed to be forever lasting. It could in time swing back to the bad old days.

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A simplified regulatory structure requires greater personal judgement. Relying on informed choice to navigate health and safety risks requires more transparent information of regulatory structures as well as risks. Streamlining the health and safety regulatory structure opened space for more flexible responses to health and safety issues and made it easier to achieve consistency with international health and safety regulations beyond the EU. As a result, overseas contract possibilities have blossomed for the HSE as an expert resource.

The last ten years have seen a proliferation of health and safety consultants with expertise in different sectors - hardly surprising, given what seems like the almost weekly emergence of new areas of production. It's a scientific and technological conveyor belt of innovation and the challenge now is for public agencies, consultants and others to agree what the risks actually are, how these risks should be managed and finally, how the resultant messages should be communicated. To compound the problem, the variety of software and hardware systems now marketed to assist both businesses and private individuals in managing health and safety seems to be growing exponentially. If historical business patterns hold, however, the 2020s should see a consolidation of smaller H&S hardware and software firms and a rationalisation of that market.

## Winners and Losers

Winners abound – or so it would seem. New lifestyle products and services have revolutionised leisure further from even the heady days of 2007 and PlayStation 3, and huge steps forward in health biosciences hardware and software have made healthy, active ageing the norm.

Employment is at an all-time high, especially employment of previously marginalised workers like the elderly and the differently abled. More economic centres exist, and they are more widely distributed throughout the country. The environment itself is both benefiting from increased accountability, and returning those benefits; with the increase in 'low-carbon-cost at-home holidays', Preston by the Sea and the 'Devon Riviera' exemplify the revitalisation of the British seaside town – even while the risk rises of climate-change-intensified storms and storm surge.

The losers are insurance companies who see customers opting for lower levels of coverage. The increased understanding of relative risk makes people less litigious. With more food grown at home and a greater emphasis on 'buying British' to conserve transport fuel use and its carbon cost, import/export companies are also under pressure. The less well educated also lose, as they are less able to navigate the landscape of informed choice. Immigrants suffer a similar problem for a different reason; different cultural filters may make it difficult for them to

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assess risks adequately in the British environment. Finally, people who are unnerved by the emerging future

of transhumanism and want to reject it may well find themselves marginalised.

## References and Resources:

Foresight and scenarios resources which offer confirming evidence and insights for the HSE scenarios:

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  - 2003 -- [http://www.iff.org/docs/SR-797\\_Map\\_of\\_decade.pdf](http://www.iff.org/docs/SR-797_Map_of_decade.pdf) (accessed 15 September 2006).
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- The Workplace Intelligence Unit / DTI, “The Future of Work” scenarios, available at: [http://www.workplaceintelligence.co.uk/uploads/files/dti\\_future\\_of\\_work.pdf](http://www.workplaceintelligence.co.uk/uploads/files/dti_future_of_work.pdf) (accessed 15 September 2006).

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<sup>i</sup> This organisational scheme is adapted from Global Foresight Associates’ “EthnoFutures Scanning Framework,” devised by Michelle Bowman and Kaipo Lum. Michelle Bowman and Wendy Schultz, “Best Practices in Environmental Scanning: The World Beyond Steep,” presentation at the World Future Society, Chicago, 30 July 2005.

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- ii Snowboarding and base jumping have become familiar; free running and its predecessor, parkour, are related activities mixing running and acrobatics as a means to traverse an urban landscape; zorbing involves rolling down landscapes encased in a large plastic ball (think human-sized gerbil playball). Information and links on all three are available at Wikipedia; see:
- Parkour: <http://en.wikipedia.org/wiki/Parkour> (accessed 22 September 2006);
  - Free running: [http://en.wikipedia.org/wiki/Free\\_running](http://en.wikipedia.org/wiki/Free_running) (accessed 22 September 2006) -- see also Channel Four's "Jump London" page at: [http://www.channel4.com/entertainment/tv/microsites/J/jump\\_london/](http://www.channel4.com/entertainment/tv/microsites/J/jump_london/) (accessed 22 September 2006).
  - Zorbing: <http://en.wikipedia.org/wiki/Zorbing> (accessed 22 September 2006).
- iii Information on innovative prosthetic feet is available at: <http://www.spectrum.ieee.org/print/2189> (accessed 22 September 2006); information on Powerisers is available at: <http://eng.poweriser.co.kr/company/preface.html> (accessed 22 September 2006).
- iv For example, see the steadily rising popularity of Wendy Mogel's book, *The Blessings of a Skinned Knee: Using Jewish Teachings to Raise Self-Reliant Children* (Penguin, 30 October 2001). Related article in the New York Times, Sunday 1 October 2006, available at: <http://www.nytimes.com/2006/10/01/magazine/01parenting.html?th=&adxnml=1&emc=th&adxnml=1159697045--uXjoT2mm1/fqIz0Vz6zQ> (accessed 1 October 2006).
- v See information available at: <http://www.kevinwarwick.org/> (accessed 22 September 2006).
- vi Zillow is one example, combining Google Earth with local real estate tax appraisal databases to create an interactive, online mapping of neighborhood house values as an aid to sellers deliberating on feasible house prices. Zillow can be experienced at: <http://www.zillow.com/> (accessed 22 September 2006).
- vii See the Business Week article on Second Life, and related material, here: [http://www.businessweek.com/magazine/content/06\\_18/b3982001.htm](http://www.businessweek.com/magazine/content/06_18/b3982001.htm) (accessed 22 September 2006).
- viii Fouts, Joshua S. "Public Diplomacy and National Images: Theory and Practice," in *Public Diplomacy and the Korea Foundation: Past, Present, and Future*, proceedings of the Conference to Commemorate the 15<sup>th</sup> Anniversary of the Korea Foundation, September 2006; pages 29-32.
- ix Benyus, Janine. *Biomimicry: Innovation Inspired by Nature*. Harper Perennial, 1 September 2002.
- x See Anderson, Chris, "People power," in WIRED Issue 14.07, July 2006, available at: <http://www.wired.com/wired/archive/14.07/people.html> (accessed 15 September 2006).
- xi Office of Science and Technology, "Foresight: Drugs Futures 2025? The Scenarios," scenario 4: High Performance, p.11.
- xii The Workplace Intelligence Unit/DTI, "The Future of Work" scenarios, "Good Intentions" scenario, pp. 19-23.
- xiii Ibid.

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## HSE Scenario Project: Boom and Blame

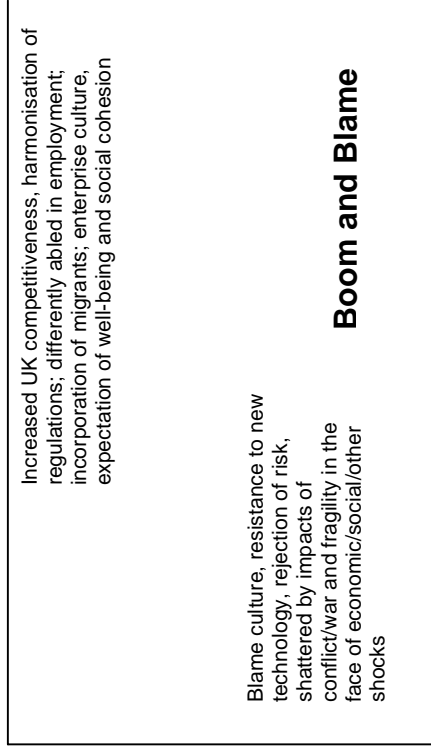
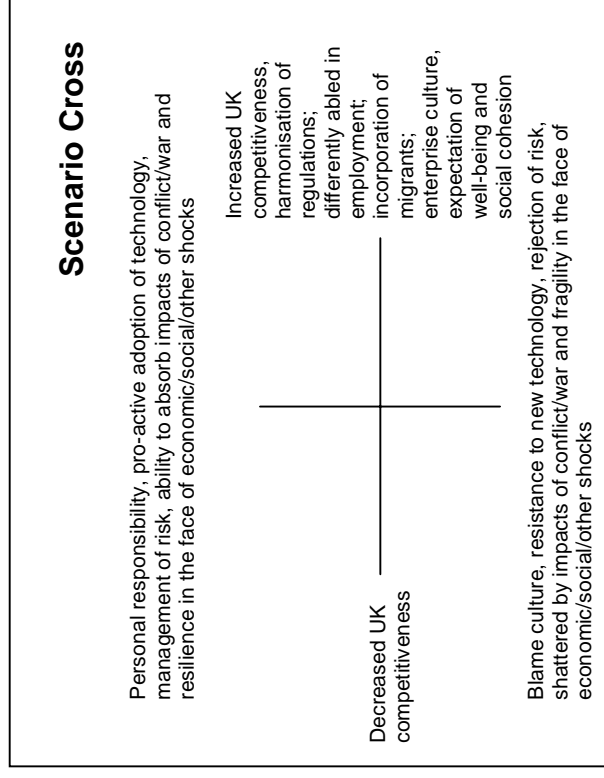
### Introduction:

This scenario is one of a set of four comprising HSE's Scenarios for the Future of Health and Safety in 2017. The scenarios resulted from discussions and group work during a scenario-building workshop (20-21 July 2006) hosted by HSE's Horizon Scanning team as part of a wider scenario-planning project. Participants prioritised change issues and created the 'scenario cross' to the right that provided the logical framework for four scenarios. The time horizon targeted was 2017. This scenario, 'Boom and Blame', is driven by decreased personal responsibility – a 'blame culture' – and decreased risk tolerance combined with increased UK competitiveness in the global political economy.

Scenarios are not predictions of the future - they are vivid stories about possible futures. They help us explore the boundaries of uncertainty defined by specified drivers of change. Scenarios written for interactive exercises are typically brief, depicted in personal rather than institutional anecdotes, and salted with humour (laughter aids impact and memory). But these are best based on research scenarios: longer narratives, depicted in broader terms. The research scenario for 'Boom and Blame' begins with a brief overview of conditions in 2017 and the historical changes which created them. It then explores how life is different in this future in greater detail:<sup>1</sup>

- What concepts, ideas and paradigms **define** the world around us?
- How do we **relate** to each other – what are the social structures and relationships that link people and organisations?
- How do we **connect** with each other -- what technologies connect people, places and things?
- What are the processes and technologies through which we **create** goods and services?
- How do we **consume** goods and services – how do we acquire and use them?

The scenario finishes by focusing on the changing workplace, and changed health and safety issues.



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## ‘Boom and Blame’

### Overview

*As the 20<sup>th</sup> century ended, analysts wrote ‘2020’ forecasts, scenarios, and visions – for cities, provinces, and countries; for companies, agencies, and entire sectors; and for species, ecosystems, and planetary dynamics. From the vantage of 2017 – within hailing distance of 2020 –*

The global economy of 2017 is a dog-eat-dog arena. In the UK privatisation is up, and the market is free. Britain has a history of economic success and is relatively strong today, but how stable is that strength? People are worried about the future. What compounds the worry is the cost to the environment of maintaining economic vitality. Remember sustainability? It has taken a back seat to aggressive growth strategies, among them the loosening of environmental and health regulations. Companies are offshoring production to reduce costs. They are also offshoring waste to minimise disposal and remediation expenses. While British investors are moving aggressively into emerging markets, foreign investors are snatching up vulnerable UK companies.

Society prizes competition and assertiveness. Economic and social pressures to enhance business productivity mean that business owners have a vested interest in the wellness of employees. Companies now genetically profile prospective employees as a matter of course, and provide subcutaneous RFID wellness/environment sensors to assist employees in maintaining peak health and peak productivity. The economic value of proving ‘clean genes’ has produced a new extended family as a knock-on effect; genealogy has

become popular, and relatives who find each other using online genealogy software often meet to discuss medical histories and stay to socialise.

The public mood is increasingly laissez-faire. Government is expected to be less intrusive in the business sector and less intrusive in private lives. The corollary is erosion of social safety nets. Influential commentators are focusing in on what they see as an ever-polarised society, with privileged enclaves and ghettoised communities. But the tide of communitarianism, long in ebb, seems to be rising; more voters are voicing dissatisfaction with rising crime and the growing indigent population.

### Recent History (2007 – 2017)

**2009:** Trust between economic partners begins to unravel as several EU member states opt for ‘associate member’ status; the extra pressures on the Euro see the British pound soar. Cheap holidays are offset by ever-louder roars from the beast of inflation, still caged but rattling the bars with ever increasing vigour.

**2011:** On 22 November 2011, the ban on using genetic information expired, and insurers competed fiercely for ownership of genetic databases. Access to genetic profiles of insurance customers radically changed the insurance model; insurance became much cheaper for some, more expensive for most, and unobtainable for the few.<sup>ii</sup>

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**2013:** The erosion of multi-lateralism continued in the early part of this decade as some EU members opted for membership of the North American Free Trade Agreement. Cooperation definitely lost out to competition internationally as the emerging economies scrambled for ever-scarcer resources against the established economies.

This competition for resources impacted on all. The 'water tax' was applied to those without water meters. New duties on cars fuelled by solely by petrol were introduced. And car tax was fixed according to both miles travelled and time of travel. Hitch-hikers reappeared at Britain's slip roads. Many risked stopping to give them a lift - the expectation was that they would contribute to the cost of fuel; it wasn't uncommon to pick up someone en route to a business meeting.

The skills of hackers and cyber-attackers reached new heights. A consortium announced millions in cash prizes for anyone able to devise a foolproof means to 'track the hack' following the 'FTSE 100 Blackout' of 21 July 2013. This cut electricity to the UK's top 100 companies, stopping production lines and overheating insufficiently air-conditioned server farms, with knock-on impacts on over 1,000 subsidiary firms.

**2015:** A consortium of UK companies sponsored the 'Worker Wellness Headstart' programme, offering financial incentives for parents in their employ to have babies genetically profiled at birth. Social analysts commented that this might create a 'new aristocracy' of those families whose genetic evaluations indicate consistently good health.

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In a related story, the same consortium's 'Worker Wellness Now' programme met with runaway success. This initiative offered an information pack and HR staff training for companies wishing to implant employees with subcutaneous RFID sensors to monitor environmental stressors, health, and productivity. Originally, employees were offered incentives for adopting the implants. They are now seen as luxury benefits; all personal health technologies are valued.

**2017:** In early February, over 1,200 senior managers in companies across the UK took ill. The 'Executive Epidemic' was finally traced to infected RFID implants.

### **In-Depth Exploration**

**Define:** *what concepts, ideas, paradigms, and values define this world?*

21<sup>st</sup> Century Britain has unleashed the market. Competition is the primary value, and economic apex predators are widely admired. Privatisation is considered the most effective model to achieve organisational efficiencies. When done right, of course; it is acknowledged that some of the 20<sup>th</sup> century privatisation experiments had serious structural flaws. In 2017 the ideal organisation has a lean balance sheet, and externalises costs as an explicit strategy. Corporate social responsibility now means how much a business has contributed to enriching the nation as a whole, its immediate environs, and its stockholders.

People do acknowledge the real challenges the world faces. The ten straight years of increasingly warm Septembers illustrated the growing impacts of climate change. The private sector has simply concluded that addressing such a massive problem requires generating income on a massive scale. Fixing big problems costs big money. Consequently, maintaining the UK's economic vitality is a priority.

The contradiction built into this worldview is still a point of public debate; keeping costs low to increase profits inevitably generates a tragedy of the commons that amplifies the environmental problems people are generating wealth to solve. The backlash has encouraged a militant environmentalist fifth column.

Society values education more than ever – and competitive sports (for the mindset). Both are seen as essential to maintaining Britain in the forefront of the world economy. Chronic underinvestment in education means that over 85% of large corporations offer not just in-house training, but in-house schooling. Most of these corporations are lobbying the government to renovate the national education system: this is not a cost they want to bear indefinitely.

Concepts of equality have shifted. People no longer talk about inequality relating to race/disability/age, and the gender balance has now shifted in favour of women. Inequality is primarily due to health/genetic predispositions. In keeping with public expectations, the Government has refused to legislate on this.

Attitudes towards immigration have also changed, as skilled workers in the manufacturing sector are forced to emigrate in search of work. Immigrants with good health profiles are welcomed.

**Relate:** *how do people relate to each other – what are the social structures and relationships that link people and organisations?*

**Government** in 2017 is much less intrusive. While good for business, that stance is believed to generate social crises. Safety nets for the unemployed and under-employed, the elderly and children have eroded over the past decade. Discontent is rising over the extent to which this creates mini-humanitarian disasters in pockets throughout Britain.

The UK has supported free trade within trade blocks and EU protectionism. The European Commission has lost much of its power. The way forward for the 'new Europe' of the post World War Two years now seems very unclear.

**Globally**, the free market continues to throw sparks. People caught on the wrong side of the global wealth divide have moved beyond simmering resentment to explosive anger and matching militancy. The resource divide, exemplified by global water shortages, exacerbates this. Strategic alliances with organised cyber-crime allow hackers to cause global disruption via digital networks.

**Society** is more divided. Prizing competition legitimises the wealthy and recreates the Victorian notion of the 'undeserving poor'. Urban architecture enshrines the

'success' gap in the fortified garden walls of privileged enclaves and the blasted commons of the new ghettos.

Consolidation of the British economy around traditional knowledge economy and experience economy sectors – finances, business services, technical expertise, and tourism – has widened the 'success gap'. Manufacturing jobs are disappearing and the job market increasingly demands advanced education. Industrial skills have lost value, and fiscal wizardry, strategic research, and technical understanding are the order of the day. The **labour** market has polarised between high-level knowledge jobs and low-level service jobs. Skilled blue-collar workers are looking abroad for positions and Britain is losing labour to emigration. The increased employment and retention of older workers has closed out job opportunities for the young. Society is labour rich, but increasingly skills poor in expertise critical for the knowledge economy.

Girls continued to outperform boys in schools, and with greater academic achievements became more sought after in the workplace. The focus of employers on education and knowledge left many young men at a disadvantage in the jobs market and unemployment within this group has risen.

Women also continue to live longer than men. In an economy reliant on older workers, this means young female workers are replacing employees who die in post, resulting in businesses dominated by women.

As unemployment rose among young men, so did resentment, crime and urban unrest characterised by a

burgeoning gang culture. Employers are increasingly reluctant to employ young men whose postcode reveals a 'certain' area. The government has proposed compulsory national 'gap year' service as a possible solution.

Employers genetically profile employees as a matter of course. Genealogy has boomed as a result. **Families** are investing time and money in tracing all the branches of their family tree. Far-flung relatives meet to map their health profiles and socialise, revitalising the extended family for very 21<sup>st</sup> century reasons. People who want children pay more attention to DNA profiles and combinatorics in choosing spouses.

Global climate change is visibly etched on the **environment**. Summers are warmer and longer, and heat waves more common. Coasts and estuaries suffer from more, and more extreme, storms. Flooding patterns have changed and redrawn the risk map for construction. Building regulations have been adjusted as a result. Unfortunately, more water from storms often means less water to drink as seawater intrudes on water tables. Pollution levels are also higher in the wake of government deregulation and looser controls.

**Connect:** *how do we connect with each other – what technologies connect people, places, and things?*

Competition in the 24/7/365 economy requires ubiquitous computing. The pervasive, 'always on' telecoms/computer net creates an immersive, round-the-clock work environment. To help employees manage stress and

maintain health in this turbo-charged atmosphere, companies distribute 'digital burrs' – small RFID sensors that attach to clothes, hair, or equipment to monitor health, environmental factors, and safety.<sup>iii</sup> They connect to corporate HR systems, insurance databases, and what remains of the public A&E response infrastructure. Larger companies require subcutaneous sensor implants during the full tenure of employment.<sup>iv</sup>

The most popular social networking programs of this decade are genealogical search-and-chat communities. The most sought-after luxury business software is a digital clone, which stands between the user and this high-stress immersive environment, filtering data-streams for the highest-priority input.

There has been a reversal of the trend to live far from the workplace because of longer working hours, security concerns and fuel costs. Transport companies deliver improvements for short-distance trains (within the 'have' enclaves at least). Journey times are drastically cut and delays for commuters become a thing of the past (people do not want to waste a second of their time).

**Create:** *what are the processes and technologies through which we create goods and services?*

In global terms, the UK is a fast adopter and innovator. Business is booming in finances, business services, technical expertise, and tourism. Foreign ownership among the FTSE 100 companies has increased over the last decade. The government works to enhance this competitive

edge through an ever-light regulatory touch; reducing taxes on fuels and privatising services. Business is contributing too through taking up the slack to tighten the skills gap; in-house training has become in-house schooling; educational programs are now common in large businesses.

The intense focus on cyber-security has hobbled open source communities and peer-produced software. 'Mash up' media are all but interdicted; business has demanded much more stringent and comprehensive prosecution of data and media piracy.

White goods and small consumer goods are imported. 'Made in the UK' now applies primarily to services and ephemera. Enterprises are larger. Successful small companies grow; unsuccessful small companies are absorbed by larger enterprises. The trend of neighbourhood 'mom and pop' storefronts disappearing continued. Looking at tourism as an example, hotel chains are buying up local B&B's to create national B&B brands. They have homogenised the guesthouse experience in service to economies of scale and in aid of raising quality standards. Some small enterprises achieve efficiency while maintaining a unique brand via consortia agreements with similar businesses.

**Consume:** *how do we consume goods and services – how do we acquire and use them?*

High street shops are suffering: the employed have not enough time to shop for non-essential goods, and the unemployed not enough money. In response, more and

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more retailers use their brick-and-mortar shops as displays for merchandise that is actually sold on line (“Window shop and then shop on Windows Internet Explorer”). Another popular strategy is the ‘express shop’ – store redesigns aimed at ten-minute turnover of customers with a purchase. These rely on databases with customer sizes, preferences, and previous purchases interlinked with financial data. Chip readers in doors recognise the customer and relay their data to the nearest available salesperson’s datapad. This allows the sales staff to link customer requests to available preferred stock in seconds. With size (including height, weight, and measurements)<sup>v</sup> already correlated to the item, people don’t even try clothing on anymore.<sup>vi</sup>

There has been growth in personal physical security services too, as a result of polarisation of society and increasing militancy of the ‘have-nots’. Security is no longer something that the government provides, so the market for this is growing (both in terms of new technologies and security guards). Sometimes this is provided by employers, but generally it is something that individuals need to procure for themselves. Services are acquired from one of the major security providers, who ensure quality and vetting of staff.

With regard to environmentalism and resource use, the anti-carbon lobby won. Britain has built more nuclear power plants to assure domestic electrical supply. Subsidies on biofuels have reduced fuel prices, making goods transport less expensive. More cars are on the roads, although many corporate workers use public transport because they can continue working on the way in or out of the office. Other public environmental initiatives must now operate in the

black. Community recycling programs still exist, but are now taxed to cover operating costs.

### **Focus on the Changing Workplace**

Manufacturing has mostly been outsourced and offshored. The workplace today is the office more than the factory floor. This considerably reduces worries about major workplace hazards. Where businesses have consolidated, the work environments are standardised for the sake of efficiency of supply and training. But shifts are longer; pressure to produce keeps workers at their desks well into the evening.

At first corporate genetic profiling was used to identify workers particularly sensitive to chemicals and substances used in innovative materials production. The increasing sophistication of genomic analysis allowed companies to evaluate candidates’ fit to corporate culture in terms of metabolism, personality, and vulnerability to stress. Genomic evaluation has created new social gaps as screening for health and longevity is used for insurance, pension schemes, and benefits, all adjusted according to people’s expected lifespan.

These screening programs are the first step in corporate HR support for the use of human performance enhancement drugs and technologies by employees. Company cafes offer an array of sanctioned HPE drugs, and corporate training includes instruction in their use. It also includes instruction in using RFID/nano health sensors to monitor productivity, environmental stressors, metabolism, and overall health. Monitoring and screening employees’ behaviour and health

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at work and at home lets the HR team monitor staff productivity. It's all about additional competitive edge. ("Maintaining productivity is a 24/7/365 endeavour!")

But issues of trust, privacy, and liability are still rife, and the tightest corporate cyber-security can be found firewalling the HR health sensor nets. Initially employees accepted intrusive 'chipping' because in a buyers' market for labour they had little choice. Of course, there were also economic incentives in the form of reduced insurance premiums and a higher salary scale. Most people now acknowledge the physical benefits.

The sensors do actually improve health maintenance. They are designed to be preventative, focused on enhancing wellbeing. Personal sensors have become a luxury the 'haves' wished they had – and the 'haves' wished they had control over. People rely on chips to monitor their health, which distances responsibility for health and environmental risks from individuals themselves.

Life has lost to work in the battle for work/life balance. Pervasive computing allows work almost anywhere, but corporate security and privacy concerns mean most employees still work in the office, where greater security can be assured. This produces staggered rush hour traffic, and shifts it to a band between 8 and 10 pm.

More competition among companies means more competition within companies; employees battle for higher paying positions and suffer higher stress as a result.

Corporations and businesses are cutting back on worker amenities, although so far productivity concerns have preserved health-related perks like company fitness centres.

### **Health and Safety Issues**

In FTSE 100 companies, employers view worker health and fitness as a strategic resource ensuring high productivity. Successful employees guard their health as a resource with concrete salary implications. These perspectives render genetic profiling and subcutaneous RFID health sensors non-controversial. In free market conditions, the insurance industry drives health and safety, spurred on by litigation. Consumer health issues and public safety are as big a priority as workplace safety.

The concept of sensible risk is now forgotten. With genetic profiling and the power of insurance companies, people and organisations are seeking more and more control. Risk assessment is replaced by risk prevention, as the higher end of society (i.e. the 'haves') demands all risks are stamped out as soon as they materialise.

Stress is the top health issue among the employed. Worsening air quality coupled with stress-depressed immune systems has caused a resurgence in respiratory infections.

Obesity is on the decline among the 'haves', more because it is perceived as unproductive and uncompetitive than specifically for health reasons. The chronically under- and unemployed – whose ranks currently equal 20% of the

potential workforce – remain the hotspot of the lingering obesity epidemic.

Growth in the knowledge economy has shifted the focus firmly in the direction of health. Stress and musculoskeletal problems are the main focus. But employers use preventative measures (including new technology) in conjunction with genetic profiling, so only those indicating inherent longevity and good health benefit. Other employees suffering from these problems will join the ever-increasing ranks of the 'have-nots' as employers do not see investment in prevention as worthwhile.

### Winners and Losers

In the competitive, privatised landscape of 2017, skilled workers and female workers have an advantage. Likewise, physical disability is overlooked in the balance with education, expertise, and essential good health, so it is a win for the differently abled. Healthcare professionals also win, as their salaries increase, although competition for work is stiffer – but so it is for everyone.

Guaranteeing consistent productivity is key. Thus long-term ill health – physical or mental – is a significant disadvantage in the employment market.

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<sup>i</sup> This organisational scheme is adapted from Global Foresight Associates’ ‘EthnoFutures Scanning Framework,’ devised by Michelle Bowman and Kaipo Lum. Michelle Bowman and Wendy Schultz, “Best Practices in Environmental Scanning: The World Beyond Steep,” presentation at the World Future Society, Chicago, 30 July 2005.

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<sup>iii</sup> Fitzgerald, Ronan, “Follow you, follow me,” *The Guardian*, Thursday, 14 September 2006.

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## HSE Scenario Project: Tough Choices

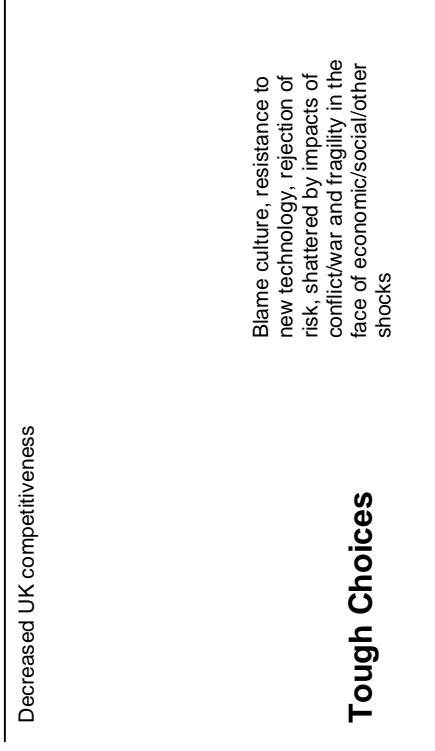
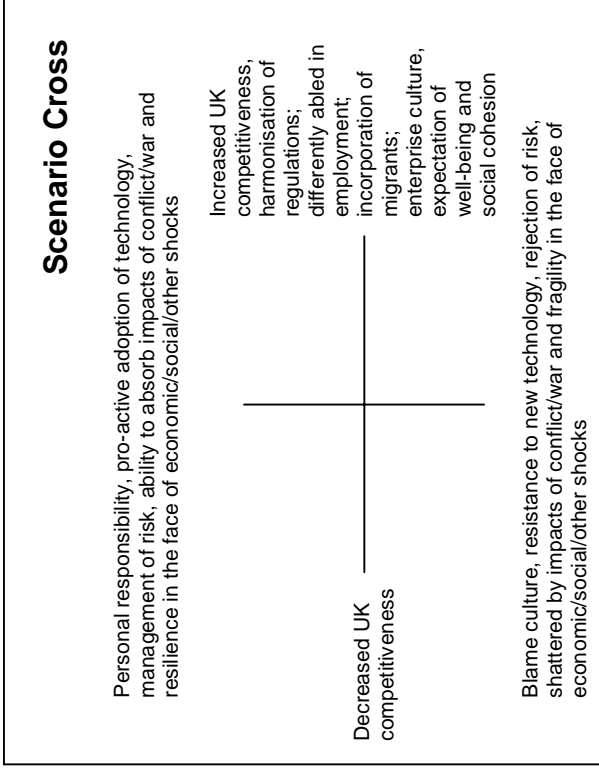
### Introduction:

This scenario is one of a set of four comprising HSE’s Scenarios for the Future of Health and Safety in 2017. The scenarios resulted from discussions and group work during a scenario building workshop (20-21 July 2006) hosted by the HSE’s Horizon Scanning team as part of a wider scenario planning project. Participants prioritised change issues and created the ‘scenario cross’ to the right that provided the logical framework for four scenarios. The time horizon targeted was 2017. This scenario, ‘Tough Choices’, is driven by decreased personal responsibility – a ‘blame culture’ – and decreased risk tolerance combined with decreased UK competitiveness in the global political economy.

Scenarios are not predictions of the future – they are vivid stories about possible futures. They help us explore the boundaries of uncertainty defined by specified drivers of change. Scenarios written for interactive exercises are typically brief, depicted in personal rather than institutional anecdotes, and salted with humour (laughter aids impact and memory). But these are best based on research scenarios: longer narratives, depicted in broader terms. The research scenario for ‘Tough Choices’ begins with a brief overview of conditions in 2017 and the historical changes that created them. It then explores how life is different in this future in greater detail:

- What concepts, ideas and paradigms **define** the world around us?
- How do we **relate** to each other – what are the social structures and relationships that link people and organisations?
- How do we **connect** with each other -- what technologies connect people, places and things?
- What are the processes and technologies through which we **create** goods and services?
- How do we **consume** goods and services – how do we acquire and use them?

The scenario finishes by focusing on the changing workplace, and changed health and safety issues.



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## ‘Tough Choices’

### Overview

*As the 20<sup>th</sup> century ended, analysts wrote ‘2020’ forecasts, scenarios, and visions – for cities, provinces, and countries; for companies, agencies, and entire sectors; and for species, ecosystems, and planetary dynamics. From the vantage of 2017 – within hailing distance of 2020 –*

The present is a landscape littered with tough choices; the future seems nasty and brutish. Any comparative advantage that Europe once enjoyed on the global economic stage has evaporated. The declining economy drove the best and brightest of the young overseas searching for well-paid careers. Innovation has slowed as a result. Unemployment is high while at the same time low-end jobs go begging. More and more often those jobs are filled by migrant workers or illegal aliens.

Social divides and alienation have amplified from the millennium on. Rising resentments generated more litigation as people strove to blame someone else for their grievances. Disaffected youth join gangs that split community turf. News from urban neighbourhoods looks like coverage of civil war – local riots are common, and local policing is tougher in response.

Sweeping deregulation across Europe was hoped to jump-start the economy. The only result so far is an increase in air, soil, and water pollution. The grey and black economies have certainly been growing – but that trend preceded de-

regulation, as organised crime disregards regulations in any case.

While still free at the point of delivery, the NHS is under tremendous pressure. Private health insurance is expensive but those that can afford it, pay. Analysts worry that the UK is on the brink of complete societal breakdown; new data suggests increased malnutrition and declining life expectancy.

### Recent History (2007 – 2017)

**2007:** Society as a whole was growing increasingly litigious. While not matching US levels, more and more companies were coping with class and group actions.<sup>ii</sup> UK companies also increasingly found themselves in court actions with regard to regulatory infractions. Business leaders decried what they saw as the excessively complex UK regulatory environment.

Attempts to reprioritise the sciences and mathematics within the UK educational system showed mixed results. The first year of the experimental program focusing maths and sciences GCSEs on questions drawn from daily life maintained student interest, but did not demonstrate whether they were adequately prepared to continue science studies post-16.

Towards the end of 2007, the EU economy slowed.

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**2008:** Record levels of immigration into the UK from eastern Europe continued.<sup>iii</sup> Increasing public unease with the situation may have contributed to the growth of the right-wing in government; candidates were proposing to consider immigration controls in addition to simplifying the regulatory environment for business.

**2009:** As the first decade of the 21<sup>st</sup> century came to an end, the powerhouse economies in Middle East, South Asia, and East Asia came into their own. EU competitiveness and growth sagged in comparison. Thus began the UK 'youth drain'. More and more highly qualified graduates began to look abroad for interesting careers.

Domestically, the numbers and varieties of youth gangs in UK communities increased. Analysts suggested a connection with the economic slowdown and rising unemployment. Rising levels of conflict, on the other hand, were attributed to cultural clashes among long-time locals and various new immigrant groups.

**2010:** By 2010 the European economic hiccup was revealing itself as a major stumble. The UK was not immune, and business' ability to adapt and innovate was hampered by an increasing talent drought in the sciences, mathematics, and engineering. The influx of immigrants and migrant workers continued, along with an increased incidence of illegal work gangs. New ghetto areas emerged in UK cities, and the grey and black economies blossomed.

**2011:** An already pressured NHS found itself unable to cope with the additional burden of immigrant and migrant worker health problems. Epidemiologists tracked a jump in TB and contagious diseases centred in depressed urban neighbourhoods. Communities were polarised by fear, primarily across cultural lines, when long-time residents blamed immigrants for bringing the infections with them. The public blamed the government as well for failing to control the tide of immigration. This particular crisis was simply a symptom of the polarisation of society as a whole due to a deepening economic divide.

**2012:** The TB crisis of 2012 finally put the NHS into full-blown arrest: it simply lacked the resources to treat everyone infected, or even to identify who all the infected were.

On the economic front, innovation continued to slow, and employment fell overall. The resulting drop in government revenue coupled with continued stresses on government services forced cutbacks. Health benefits were curtailed; unemployment and incapacity benefits programmes were reduced; and old-age pensions suffered their first cut.

**2014:** More and more small businesses were driven to dubious hiring practices in an effort to stay competitive. This in turn encouraged gangmasters to procure ever cheaper labour pools and the November accident in Liverpool was commonly referred to as an 'industrial Morecambe Bay'. Autopsies unveiled the appalling detail that the gangmasters in question had injected the workers with subcutaneous RFID 'inventory tags'.

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Health officials noted the rise in mumps, measles and rubella with resignation; stresses on NHS resulted in the collapse of anything like an effective vaccination regime.

**2017:** “It’s official; it’s deflation!” Britain’s consumer spending falls to its lowest point in thirty years. What we need, pundits declared, is incentives to borrow and build in order to jumpstart the economy. Public outrage over the economic crisis was further fuelled by a series of interviews conducted by BBC of pensioners on the headline.

### **In-Depth Exploration**

**Define:** *what concepts, ideas, paradigms, and values define this world?*

People have become more inward looking. In straitened financial times, the priority is on personal challenges, not global challenges. Individuals’ primary loyalty is to themselves. Daily life both at work and at home has become a series of difficult trade-offs. Most people see conservation as the best coping mechanism, conserving their energy, their time, their money, and even their social contacts. Life involves careful rationing and allocation of limited resources. Getting ahead is a distant dream; little excess exists for anything much beyond maintaining their status quo. Society’s operational model might as well be, “if you can’t gain ground, at least don’t lose any.”

Society as a whole is more insular, seeing outsiders as competitors for scarce resources. Adventure is a luxury, as is having a choice about work/life balance. People are chafing within their economic constraints. Resentment is rife, and an increasingly aggrieved public finds it easier and easier to complain via the courts. Litigation is the new ‘property ladder’, just another tactic for getting ahead.

**Relate:** *how do people relate to each other – what are the social structures and relationships that link people and organisations?*

Over the last decade pressure on **government** services and agencies has grown while tax revenues have slowly eroded. The inevitable cutbacks reduced services and benefits. People can rely on government assistance in fewer and fewer areas of their lives. Political initiatives pruning regulatory structures have had the same result vis-à-vis business.

Europe’s role in the **global** economy has ebbed. Britain’s historical connections with South and East Asia now seem to function primarily as a convenient conduit by which Asian investors buy out British companies, and attract young British workers. Even with a sluggish economy, however, Britain still offers more opportunities than many of its eastern European neighbours, so while the best and brightest in Britain head east, eastern Europeans hungry for opportunity head west to the UK. Organised crime networks hungry for opportunity have also moved onto British soil while

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maintaining their connections and activities in home bases throughout Europe.

People worry a lot more about security in their neighbourhoods and **communities**. Increased youth violence both contributes to and results from increased ethnic tension between long-term residents and new immigrants, whether legal or illegal. As a result, the police are the one branch of government expanding, and have increased their presence in communities throughout Britain. That presence is tougher than it was in years past, as both the youth violence and the illegal immigrants are often symptoms of the underlying encroachment of international organised crime.

The 'every one for themselves' environment has drawn a close line around immediate **families**. The erosion of middle class expectations, not to mention discretionary income, leaves little excess to aid extended relations. Where young people have found jobs overseas, they often send funds home and assist their brothers and sisters in finding work as well. It typifies the tough choices of this environment: live with your family and struggle to make ends meet, or scatter the family over the globe and get ahead?

Global warming has rendered the natural **environment** increasingly unpredictable. Uncertain temperature and weather patterns make agriculture more of a gamble, and extreme storms accompanied by heightened storm surge damage coastal infrastructure. The environmentalists made their case successfully, and everyone acknowledges the link between the high-carbon lifestyle and global warming. But

most people grumble that most of the fault can be laid at America's doorstep, and it's not like any of us have any spare change for retrofitting our lifestyles with green consumer goods, now do we? People do conserve energy and resources as much as they can, but in this economy, the rationale is cost-saving, not environmental correctness.

**Connect:** *how do we connect with each other – what technologies connect people, places, and things?*

The 'digital divide' that pundits warned about ten years ago has widened and transformed. It's no longer a question of whether people own a home computer and have Internet access: with the advent of pervasive computing, society now faces a 'real world' – 'digital reality' divide. The wealthy have pervasive computing and communication networks, living immersed in an 'always on' information environment of ambient intelligence. Everybody else is stuck in an analogue world, having to make do with turn-of-the-21<sup>st</sup>-century ICT systems.

Mobile phones continued their Moore's Law march towards increasing capacity and capabilities, and so have become the poor person's portable information environment. Internet connection, GPS capability, and interaction with other personal computing and entertainment appliances all became cheap enough to include in basic service packages.

As usual, kids are applying those capabilities creatively. The new craze in urban free run orienteering combines free running with more traditional orienteering, with checkpoints

digitally administered via GPS and internet-enabled mobile phones. Of course, youth gangs are also using mobile phones creatively to coordinate their activities; gang wars often begin with coordinated 'flashmob' violence.

The physical infrastructure of connection is decaying. Roads, bridges, rails, air terminals – all need refurbishment now to maintain safe operating conditions, and the funds for capital improvement simply aren't there. Even communications networks need consistent re-investment to assure unbroken service, and continued economic depression will make that difficult. With each year of wear on these basic systems, accidents increase, feeding the litigation frenzy. And the more extreme weather generated by global warming will only accelerate that wear and tear.

**Create:** *what are the processes and technologies through which we create goods and services?*

The UK labour market has become a push me-pull you of emigration and immigration. Businesses have downsized to cut costs and increase productivity. Competition for the best jobs is hot, and disappointed candidates with great CVs look elsewhere in the world.<sup>iv</sup> Lower down the employment ladder, people are elbowing each other aside for jobs with long-term health and pension benefits.

Even with high unemployment, seasonal and low-end jobs go begging. That need is answered by EU immigrants eager to get a toe on the economic ladder, even at the low end. Unfortunately, the need has also been answered by

unscrupulous gangmasters and organised crime.<sup>v</sup> Stories erupt in the news on a regular basis about the abuse of migrant workers and the illegal import of labour.

Revenue pies are shrinking and resources are increasingly limited for individuals, for companies, and for the government. Belt-tightening is the rule of the day. With limited capital and resources to gamble on new endeavours, investors shy away from risky innovations. This conservatism has slowed the UK's vigorous financial services sector.

The era of traditional industry and manufacturing was fading at the turn of the millennium. Massive transitions are difficult, and the transition to the digital experience economy is no different. With a wealth of intellectual capital, the UK should have been first off the starting block in melding new materials sciences, design, and media into an economic transformation. Where did Britain's economy stumble? The UK's capacity to create snagged on a legacy of under-investment in basic infrastructure and education, compounded by increasing public wariness of innovative technologies as potentially disruptive.

**Consume:** *how do we consume goods and services – how do we acquire and use them?*

Both consumer spending and saving are at the lowest ebb for thirty years. People are purchasing fewer goods, and purchasing less expensive goods. They are buying cheap, buying knock-offs, and buying in bulk. Sales of speciality and

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organic foods have fallen. Consumers are no longer aiming for the best; they are aiming instead for the most affordable.

This means sales in high street shops have dropped, and that high-end supermarkets are losing to low-end chains. Direct marketing via the Internet is also popular, as is eBay. Street peddlers have seen a startling rise in sales in their clientele, and the grey market, the used market, and the black market are all growing, in contrast to the rest of the economy. This of course has its hazards for the consumer, as these goods tend to lack active warranties.

Once acquired, people use their purchases – whether clothing, appliances, or consumables – with a greater eye to their longevity. Deflation has transformed the consumer lifestyle into a conserver lifestyle, where people have less and what they have they use more gently and repair rather than replace. It is, of course, this lowered demand that itself reinforces deflation: the vicious circle of lowered demand decreasing production, lowering revenues, triggering job cutbacks, and depressing demand even further.

### **Health and Safety in the Changing Workplace**

The health divide grows wider: there's not enough work and for those at work, precious little well-being. The priority for people is to have at least one job, particularly a job that may offer the holy grail of perks such as a pension and private health insurance. Accusations of the 'nanny state' have long since withered on the vine of history – no one expects the

state to nanny anybody anymore. It's a competitive and contentious society. Each looks out for number one.

Businesses are struggling and cutting expenses. The average workplace, whether a manufacturing floor or a business office, is showing signs of wear and tear with little hope for renovation or updating in the near future. Old machinery, worn flooring, jerry-rigged wiring and over-taxed ventilation and exhaust systems combine to create health hazards and the potential for accidents. Employers are juggling resource costs, staffing costs, and the need for capital improvement, and health and safety considerations often lose out among other trade-offs. With public infrastructure in a similar state, the health and safety hazards are hardly less when employees leave work.

In a stripped down regulatory structure, safety at work is the priority. People know that health is important – the campaigns of a decade before hit their targets – but why worry about long-term health when an accident at work may strike you first? Already, the media are referring to Britain's accident epidemic, an epidemic that is amplifying litigation, as injured parties look for means to punish offending employers and obtain financial redress. Too often their litigation goes nowhere – employers can't or won't pay and the will isn't there to make them do so. But some high profile cases against organisations with deep pockets succeed and others are encouraged to have a go. So individuals still over-eat, drink too much, and smoke, but are more prepared to lay the fault at the feet of marketers, brewers, and cigarette manufacturers.

Stress, pollution, and street violence have reached heights not seen for thirty years. Underreporting of health and safety failures in the workplace is rife – and the system in any case lacks the resources for anything more than low-level interventions and the investigation of serious incidents. Given the dominance of the black market, huge numbers of workers fall outside those regulatory regimes that remain.

### Winners and Losers

The new barons of the black economy are definitely benefiting from the ‘Wild West’ environment of stripped-down regulations. The boundaries between the legal and black markets are narrowing. Street peddlers selling cheap knock-offs are seeing higher growth in sales than the high street stores. Those few companies willing to play fast and loose with the remaining laws and regulations can match organized crime in generating wealth. A flexible ethical and moral framework is a competitive advantage in this environment.

Longer-term economic recovery is emerging where CEOs have retrenched, making strategic trade-offs among staff numbers, capital improvement, and workplace standards. Improved workplace health and safety standards are attracting better staff and avoiding lawsuits. With consumers retrenching as well, discount retailers and wholesale clubs are forecasting some improvement in consumer purchasing.

Youth bright enough and with sufficient initiative to scout out opportunities overseas are coping, if not benefiting.

Basic research is suffering, as is higher education generally: resources are scarce and business foundations have much less money than in past. Older people find themselves in dire straits as public programs evaporate and even their pension payments decline. Other populations in need are also suffering, with incapacity and other benefits sharply curtailed. Recent immigrants, whether legal or illegal, have a particularly hard time, as government has few assistive services to facilitate their assimilation into British society.

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<sup>ii</sup> See the report by Fulbright and Jaworski, “Fulbright Launches Its Third Annual Litigation Trends Survey Finding,” 10 October 2006, available at: [http://www.fulbright.com/index.cfm?fuseaction=news.detail&site\\_id=286&article\\_id=5789](http://www.fulbright.com/index.cfm?fuseaction=news.detail&site_id=286&article_id=5789) (accessed 10 October 2006).

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## HSE Scenario Project: A Virtue of Necessity

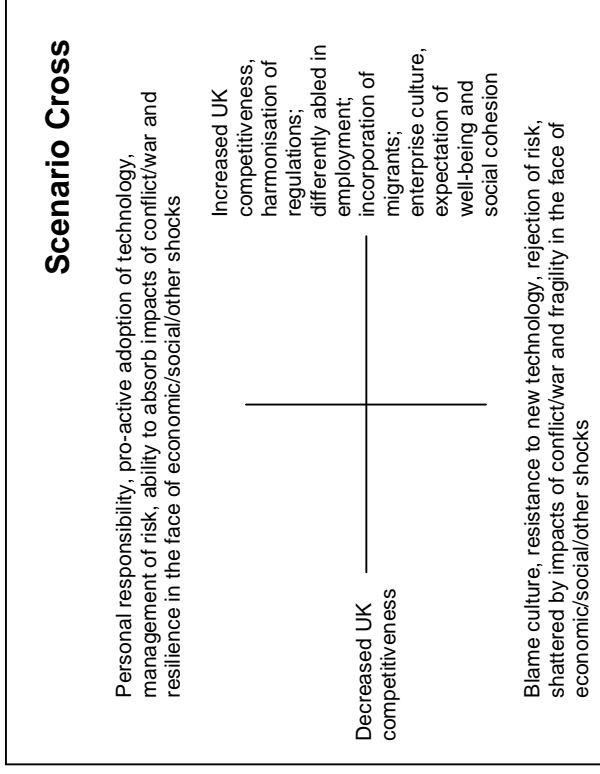
### Introduction:

This scenario is one of a set of four comprising HSE's Scenarios for the Future of Health and Safety in 2017. The scenarios resulted from discussions and group work during a scenario-building workshop (20-21 July 2006) hosted by HSE's Horizon Scanning team as part of a wider scenario-planning project. Participants prioritised change issues and created the 'scenario cross' to the right that provided the logical framework for the four scenarios. The time horizon targeted was 2017. This scenario, 'A Virtue of Necessity', is driven by increased personal responsibility and increased risk tolerance combined with decreased UK competitiveness in the global political economy (illustrated lower right).

Scenarios are not predictions of the future - they are vivid stories about possible futures. They help us explore the boundaries of uncertainty defined by specified drivers of change. Scenarios written for interactive exercises are typically brief, depicted in personal rather than institutional anecdotes, and salted with humour (laughter aids impact and memory). But these are best based on research scenarios: longer narratives, depicted in broader terms. This research scenario for 'A Virtue of Necessity' begins with a brief overview of conditions in 2017 and the historical changes that created them. It then explores how life is different in this future in greater detail:

- What concepts, ideas and paradigms **define** the world around us?
- How do we **relate** to each other – what are the social structures and relationships that link people and organisations?
- How do we **connect** with each other - what technologies connect people, places and things?
- What are the processes and technologies through which we **create** goods and services?
- How do we **consume** goods and services – how do we acquire and use them?

The scenario finishes by focusing on the changing workplace, and changed health and safety issues.



### A Virtue of Necessity

Personal responsibility, pro-active adoption of technology, management of risk, ability to absorb impacts of conflict/war and resilience in the face of economic/social/other shocks

Decreased UK competitiveness

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## ‘A Virtue of Necessity’

### Overview

*As the 20<sup>th</sup> century ended, analysts wrote ‘2020’ forecasts, scenarios, and visions – for cities, provinces, and countries; for companies, agencies, and entire sectors; and for species, ecosystems, and planetary dynamics. From the vantage of 2017 – within hailing distance of 2020 –*

Britain now resembles one great seaside town. More and more UK communities – even cities – consist of older people, needing services more than consumer goods. The local economy provides the services, and while goods are imported, consumers now buy for durability and extended use life. As traditional industries declined, young workers started emigrating and looking elsewhere for employment. With fewer people supporting more elderly and large corporations relocating to Asia, the economy contracted. Entrepreneurial activities are smaller in scope; more business initiatives are local, resulting in less wealth generation nationally.

The gap between ‘haves’ and ‘have-nots’ has widened. Society as a whole has looked for ways to re-trench. Increasingly, people are choosing to reject consumerism in favour of a shift towards increased self-sufficiency. Those who remain form, in one sense, more tightly knit communities, which are more focused on self-reliance than the communities of 2007. While this certainly means a gain for sustainability, it is more the self-reliance of the war garden than the eco-tribe. Nonetheless, the avalanche of data confirming global warming did accelerate the growth of

environmental values, as did social and business strategies pioneered by change organisations such as Clinton’s Global Initiatives in 2006.

People now take greater responsibility for their own well-being and for the well-being of their environment. What bodes well for a future revitalisation of UK competitiveness is a national mood of adventure: Britons are responding to the current challenges with resilience and creativity, working together to innovate and create new businesses and renew their communities.

### Recent History (2007 – 2017)

**2007:** Outsourcing was a sensitive issue even before the millennium, but primarily for manufacturing. Even in 2007, many innovative industries were moving to cheaper locales. Others were relocating their research and development centres to the BRIC (Brazil, Russia, India and China) countries. This strategy offered the competitive advantage of a highly educated workforce available at a significant cost savings, given currency and cost of living differences. It also put production closer to the Chinese consumer. With the growth of distance learning, education centres began a similar relocation. Increasingly the best engineering and science schools came to be in Asia, as demand for science and technology degrees in the UK eroded.<sup>ii</sup>

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As the decade progressed, it became clear UK businesses had insufficiently addressed the market opportunities emerging in Asia. While British businesses were strong in many sectors, other businesses were simply better. Emerging economies produced basic consumer goods more cheaply; South Korea and India were showing signs of outperforming the UK in both information hardware and software production.

**2009:** In a bid to increase both efficiency and sustainability, Government efforts to push conservation and recycling redoubled. The 25% recycling target was hit early, in 2009. Public opinion increasingly supported sustainability initiatives, but the growing self-interest in personal well-being and a comfortable environment seemed to erode entrepreneurial activities in 20<sup>th</sup> century industries. Public concern about climate change hit a new high with Britain's first cases of West Nile Virus. The government did respond effectively to the subsequent cluster of infections, and there were no fatalities, but the crisis did damage public confidence in their day-to-day environment as healthy.

**2011:** By the 2011 Parliamentary elections, more and more special interest parties were vying for seats. The political heat generated demonstrations, race riots and civil disobedience. Special interest groups lobbied to expand lifestyle pharmaceuticals as well, creating our modern 'super-athletes' with over the counter human performance enhancement regimes. In a surprise move for the usually conservative International Olympic Committee, the proposal for the first Human Performance Enhanced Olympics, mirroring the Paralympics, was passed.

**2013:** The heat generated by the 2011 election smoulders on, singeing UK and European business communities. The pound fell, imports soared and exports suffered. The spectre of stagflation, long thought to have been eradicated, loomed once more as the economy contracted, with only the economic success of the Olympics keeping that particular dragon at bay. Anti-regulatory feelings in business and industrial sectors surged. Special interest lobbying for the UK to pull out of the EU intensified. On a positive note, the Olympics also spurred a resurgence of interest in sports, fitness, and physical pursuits. Linked with the growing focus on personal wellness, this lifestyle shift put paid to the obesity epidemic.

**2015:** Duty on biofuels was removed as public concern on climate change continued to spiral – and in a related development, Britain's environmental campaigners won their first seats in Parliament. More hotspots erupted on the global stage; in response to the social dislocation and conflict in the Caucasus, calls grew for the introduction of compulsory one-year public service for young adults, in either a military support or humanitarian capacity.

**2017:** The UK begins its move into the experience economy with a focus on the technologies and activities of wellness. British inventors create breakthroughs in embedded computing (human-machine interface) and augmented cognition; bionic heart components; and human performance enhancement biochemicals. British designers leverage the UK's diverse cultural heritage and environmental richness in

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a green approach to sustainability and health: aesthetic asceticism.

necessity of sustainable living. The current economic constraints merely underline that.

### **In-Depth Exploration**

**Define:** *what concepts, ideas, paradigms, and values define this world?*

People focus more on quality of life, on both individual and environmental levels. Achieving and maintaining that quality is widely considered a matter of personal responsibility; the challenge is at once too personal and local, and too complex and pervasive for governments to address effectively. Rather than relying on the government as their trusted agent, individuals rely on themselves.<sup>iii</sup> But not themselves alone; people have internalised the paradigms of self-organising complexity and open source communities from 21<sup>st</sup> century science and software. Organising support groups, political action groups, and necessary resources – whether locally, nationally, or globally – is simple reflex.

And it's a necessary reflex, as too many people scramble to make ends meet. The scarcity mindset fused with environmental concerns in a backlash against the throwaway consumer culture. People are making do with “reduce, reuse, recycle,” a worldview made efficient and even sociable with eBay and Freecycle. It's the new war garden in the global economic and environmental battle zone. This shift is sufficiently pervasive that planned obsolescence may become illegal by 2020, not merely a target of consumer ire. Every new stream of environmental data supports the

**Relate:** *how do people relate to each other – what are the social structures and relationships that link people and organisations?*

**Government** resources are pressured by ageing, of both the populace and the infrastructure. Taxes have risen in the last decade, but with a slack economy, the revenue pie hasn't kept pace with crises. Both national agencies and local authorities struggle to reprioritise among equally critical needs. Research and development funds were shifted to prop up pension funds; educational and youth programs lost out to senior care. An increased sense of personal and community responsibility replaced the ‘anti-hoody’ and ASBO campaigns of ten years ago with a technologically-enhanced, socially networked version of ‘neighbourhood watch’. While a saving for government, the downside is unequal community security, as wealthier neighbourhoods hire private security companies, as well as a disquieting emergence of vigilantism. The latter has also contributed to the increase in fringe political groups capturing Parliamentary seats.

**Global relationships** have re-focused: The Pacific Era dawned in the 2010s. India, China, South Korea, Singapore and other Asian countries are the new gravity wells of the global economy, and of global geopolitics as well. British businesses are still playing catch-up in Asian markets vis-à-vis other Western economies, after starting too slowly off the

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block. In 2017 the UK is not globally competitive either in the industrial, service, or information sectors. Britain's economic revival is, instead, being built by experience economy entrepreneurs focused on mind/body/spirit products and services for the high-tech, high-touch consumers of 2020.

Britain's ageing **society** is an unbalanced society. The younger generation are serfs to their seniors, not only in tax support, but in direct income contributions as well. In the current climate of economic uncertainty, young adults head into maturity saddled with educational and consumer debt. And not merely financial debts: many carry a 'health debt' generated by the stress of caring for their parents and working multiple jobs to cover expenses. The emerging youth drain to Asia comes as no surprise, as young workers opt for higher paying jobs overseas. It takes them away from their families, but they rationalise that the enhanced financial support they can offer balances their absence.

With the youth drain taking a significant percentage of the skilled under-forties overseas, more OAPs are organising self-help and support networks. Elder volunteerism is growing, which has the double benefit of providing local communities a volunteer pool of experienced labour, and also keeping the elderly active and socially engaged.

In short, in the last decade the British **family** has both imploded and exploded. Taking personal responsibility for the well-being of their parents and relatives has pushed some families into more cohesive, close-knit structures that are in turn tied more closely into local social and community

networks. On the other hand, some families have 'exploded', going global, with younger members tracking economic hotspots internationally. Even these families, however, remain virtually tight-knit, with family intranets featuring private web-cams and ambient health sensors enabling kids to keep a constant eye on their parents' well-being – and vice versa.

**Connect:** *how do we connect with each other - what technologies connect people, places, and things?*

Little distinction exists now between media and personal communications, between a cell phone, an Internet terminal, and a home theatre. The pervasive global wifi mesh of ubiquitous computing means that one Chinese schoolgirl's videoblog mash up of live concert footage, original animation, and cell-phone-captured commentary is a UK viewer's indie documentary. Expat workers overseas can catch the global and Mumbai evening news roundup over dinner, seamlessly intercut with live webcam footage of Mum and Grandma having lunch in the garden in Buxton.

Cheap, widely available sensor tags and buttons are linked to wifi networks. Home health monitoring – your body and your life as a bioscience project – is becoming common. The growth in home health telemedicine has been a boon for those who can afford the system. It reduces costs and increases the sense of security for the elderly wishing to extend their independence. These systems also provide home environmental telemonitoring, enabling homeowners to monitor not just environmental conditions – air quality and

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contamination, water quality, local allergen count, and UV conditions – but also levels of resource use in their homes. Homeowners can micro-manage their ecological footprint on a daily, hourly, or minute-by-minute basis.

The same sensor tags have increased the sense of community security, as more neighbourhoods use them to monitor suspected local ne'er-do-wells. Inevitably, this ASBO replacement has spawned an underground market in sensor tag hacking.

**Create:** *what are the processes and technologies through which we create goods and services?*

The post-recession **economy** of 2017 features fewer jobs and higher unemployment. Labour is shifting into new sectors – and emigrating to the Asian economic nexus. This creates a vicious circle; as British companies lose skilled labour locally, they outsource innovation and production to Asia as well. The more companies locate their exciting jobs overseas, the more skilled workers look overseas for positions – where they compete against often better-educated foreign workers.

British entrepreneurs have turned to the experience economy to revitalise growth. New ventures combine the strengths of those historical resources that support UK tourism – and UK film and theatre – with Britain's aesthetic strengths in arts and design. Small business owners have focussed on the new growth market for green mind/body/spirit products, catering to the heightened interest

in personal wellness. Retreats, spa breaks, and 'whole person' life management classes integrate not only eco-friendly health products, but also regional organic speciality foods. Locally unique and sustainable 'neo-crafts' fit well with tourism and the culture trade. As local production contributes to their intrinsic value, these businesses cannot by definition be outsourced. These emerging signs of economic revitalisation are promising, but the local eco-wellness sector is limited by its strength as a community-based activity. It remains too small to replace the industrial sector income Britain has lost.

Larger initiatives are emerging where green responsibility links to high technology. UK venture capital has supported local design of 'smart environment' whole health systems. These apply self-organising system designs to pervasive sensor networks that link home health monitoring systems with mobile heart/stress monitors and work environment monitors. This immersive 'wellness web' allows employees and small businesses to work together to ensure worker health from home to office and back again.

**Consume:** *how do we consume goods and services – how do we acquire and use them?*

Britons are consuming less per person with each passing year. 2017 may go on record as the year the throwaway culture ended. People try to make the most of all their belongings, encouraging manufacturers to stress easy repair and the hardware equivalent of 'mash ups' - mix and match appliance components. This trend has made eBay and

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Freecycle more popular than many high street chains. People are also literally consuming less: the obesity epidemic has peaked. The immersive media exposure to the exhilaration of fitness exemplified by Olympic athletes helped. In addition, the new HPE Olympics publicly demonstrated the human performance innovations that can aid willpower alone in helping individuals achieve that 'new svelte you'. Finally, rising environmental awareness made consumers not only more likely to ask what was in food, but also to ask what the environmental and social consequences of food production were. The Oxfam 'compare these dinners' ad campaign for their continuing work in famine-prone African regions resonated with many, especially after Sir Jamie Oliver's riveting special broadcast underlining the problem.

Water shortages are much less common. Enhanced environmental awareness means greater care in water usage at the tap. It also produced a special interest group that pressured the government to raise fines for water utilities that allowed more than 5% system leakage to continue more than three months. Parsimony is all in basic resource use. Consumers are also supporting a new scheme to tap the more than 300 years' worth of coal still underground via gasification, which does not require miners. Biofuels have seen explosive growth since the catalyst innovations earlier in the decade; alternative fuels are displacing petrol in personal transport.

## Focus on the Changing Workplace

Britain has fewer large industries and large corporations that standardise office practices and environments throughout their branches. The proliferation of small businesses, local businesses, and at-home businesses creates widely varying work environments. The line between work and home continues to erode. The increased value placed on achieving work/life balance is countered by labour needs and many people's need to work two jobs, or one job in conjunction with elder care or self-sufficiency tasks. Work at home allows more seamless integration of elder care, but it also lowers productivity due to the distraction quotient.

One emerging reason for optimism, however, is the increasing trend for small businesses to share office space and support staff, leveraging dynamically administered resources to function more efficiently and parsimoniously.<sup>iv</sup> Implementing 'green office' design is also easier when resources are shared. Less waste and lower operating costs allow these office cooperatives to invest more in creating a healthy workplace environment.

## Health and Safety

With regard to health and safety, fear and uncertainty have driven people to think, "If I don't do it for myself, no-one else will do it for me." It's a brave new world of personal responsibility, driven as much by galloping technological progress as from any increase in individual or social enlightenment. Detection and prevention of ill-health causal

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factors is the key. Health agencies are moving into the roles of coaches and advisors. They provide resources that enable people to take responsibility for their own well-being more effectively.

Immersive monitoring systems and 'wellness webs' allow more efficient monitoring of health and stress indicators throughout an individual's day. Businesses and employees who can afford the system find that it not only aids productivity, but also reduces employee health costs. As a result, the bell curve of workplace health and safety has widened and flattened; we see more exemplary practices, but also more reports of small businesses attempting to fly under the regulatory radar to save costs.

Many businesses have simply cut and run. Recession-induced pressures on profit margins increased the offshoring of innovation, R&D, and production by those who could afford it. This was welcomed by some environmental campaign groups, though by no means all, as a means of protecting Britain's natural environment from experimental or industrial disasters. The sluggish economy did create some bargains for overseas buyers, with British companies going cheaply. However, their new overseas owners tended to bring their own attitudes and approaches to health and safety issues. In some sectors this mattered little; in others, a lot.

## Winners and Losers

The winners in 2017 are the self-sufficient, high-tech, green micro-energy producers and consumers in the wealthier rural communities. Landowners in those communities have benefited from the increased demand for land for the self-sufficient lifestyle. Pensioners who can afford the supportive technology are better off, as are those who belong to support networks or have either successful or devoted children on whom they can rely. Private security companies are succeeding, as are small businesses developing wellness products or services, especially those that are locally unique. Digital media and experience economy entrepreneurs are beginning to re-establish a name for British design. In politics, proportional representation has created a lively, if fragmented arena for special interest groups – and political extremists.

But the losers are too often the young and working age adults, especially those with minimal education whose traditional industrial jobs are disappearing. Pensioners whose children emigrate and who lack the resources or support networks suffer from the erosion of public assistance. While 2017 contains the potential for new growth, it is still for too many an era of struggle.

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## References and Resources:

Foresight and scenarios resources which offer confirming evidence and insights for the HSE scenarios:

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<sup>i</sup> This organisational scheme is adapted from Global Foresight Associates’ ‘EthnoFutures Scanning Framework,’ devised by Michelle Bowman and Kaipo Lum. This framework proposes organising scan data based on its point of impact on society, rather than on the origin point of the change. See Michelle Bowman and Wendy Schultz, “Best Practices in Environmental Scanning: The World Beyond Steep,” presentation at the World Future Society, Chicago, 30 July 2005.

<sup>ii</sup> Sir Gareth Roberts, “SET for Success,” available at: [http://www.hm-treasury.gov.uk/documents/enterprise\\_and\\_productivity/research\\_and\\_enterprise/ent\\_res\\_roberts.cfm](http://www.hm-treasury.gov.uk/documents/enterprise_and_productivity/research_and_enterprise/ent_res_roberts.cfm) (accessed 15 September 2006).  
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<sup>iii</sup> Institute for the Future, “Map of the Decade 2003.”

<sup>iv</sup> Orange Future Enterprise Coalition, “Scenarios of Work and Technology in 2016: Scenario 4: Mutual Worlds,” p. 11.



## **APPENDIX 3: SHORT FORM SCENARIOS**

The short form or workshop scenarios are brief, illustrated and easy to read in five or ten minutes; they are designed for use in workshops.



# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## The Digital Rose Garden health and safety in the changing workplace

Leading article – **Global Financial Tribune:**

WiMax immersive edition – 1 December 2017

It's official. Yesterday's report from Work, Life and World tells us so. The roaring 1920s are back. And where do we go to taste the energy and innovation of those boom years of old? Well, believe it or not, to work.

The world of work is very different now from even five years ago. Technologies have advanced more in the last ten years than in the previous one hundred. Pervasive computing, immersive communications, biotechnologies, nanotechnologies, and new materials are transforming production, offices, homes, our relationships, even ourselves. We are all explorers now: and we'll take a little risk along the way. As for work-life balance, what about it? To quote last year's Productivity Consortium's ad campaign 'Work? Life? It's all living!'

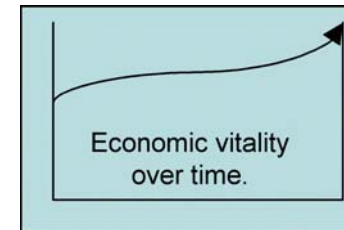
We work 'glocally' – in small, high tech outfits doing global business – so where we work barely matters at all. Why should it when immersive communications – witness last week's videophone sunglasses launch – can take you anywhere in the world in an instant? So we work at home or rent a desk at the neighbourhood office down the road. 'Factories' are cleaner, greener, self-monitoring, self-repairing.

Yes, it's great to be at work as we near the roaring 2020s. Or it is if you're one of the 50% working in the brave, new, risk-embracing world of biotechnology and innovation. For the rest of us, it's not all good news.

We worry about keeping pace with developments and about what happens when systems collapse; we can build virtual friendships on-line but nothing really compensates for a chat at the coffee machine; and increasingly, we wonder if human performance enhancement technologies, both bionic and personality improving, are turning us into something else, something almost trans-human.

Others see a divide between those who work within the innovation dynamo and those who do not. Manufacturing jobs, contrary to predictions, are still very much around, albeit transformed by intelligent infrastructure. Building continues apace, particularly as the 2018 World Cup approaches and as docks are expanded to meet our ever-increasing import needs. These jobs can't be done at home. And neither can some of the new jobs – sorting rubbish by hand for recycling may not be the most glamorous of occupations but over 150,000 of us now do it. In social occupations, we still need policemen to patrol our high streets – vastly changed as chain stores move online – and we still need carers for the elderly: with life expectancy now at 93 years and rising, we'll need many more in the future.

The changing workplace has transformed the lives of millions for the better; for others, not at all; and some, for the worse. We're heading for the roaring 2020s – but it's not yet all coming up roses.



### KEY FEATURES OF THIS WORLD

STRONG, INCREASING UK COMPETITIVENESS  
ECONOMIC BOOMTIME  
CULTURE OF PARTNERED RESPONSIBILITY  
INTER-CONNECTED SOCIETY  
SUSTAINABILITY: EFFICIENT, ELEGANT DESIGN  
LOW-FOOTPRINT CONSUMPTION  
IMMERSIVE COMPUTING & MEDIA  
WORKPLACE IS EVERYWHERE



# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## The Digital Rose Garden health and safety in the changing workplace

### VALUES

- First loyalties to digital social network and communities of interest;
- Value exploration and creativity;
- Focus on transcending the life / work conflict.

### HEADLINES

“Work? Life? It’s all living!”  
The roaring 1920s are back.  
Virtuality Dependence tops sick note list.  
Brain-Enhancing Drugs Boost Productivity  
UK Brain Gain Boosts Innovation  
Family sue over care home bionic suit accident  
1 GB-wide broadband in 50% of UK homes  
UK Net Hub down 2 hours after net attack; hackers get 10-year jail term  
Tonight I’m gonna party ‘cos I’m 99!

### QUOTES AND METAPHORS

“Green de luxe”: eco-design is elegant and parsimonious.  
Not ‘shop ‘til you drop’ but ‘mod your bod’;  
The changing workplace has changed the lives of millions for the better

Worker SUE (Ex Air Host): “I’m gutted I lost my job to a robot, but now I work as a virtual holiday rep in Third Life/Westworld.”

Business Owner NEILL (of high tech company Limb Assistive Devices, LADs): “Demand for our bionic limbs remains high and is rising now we’ve introduced a new leasing system for seniors.”

Employee representative TED: “I’m working closely with various Government agencies looking at the many ethical issues associated with the use of Human Performance Enhancement technologies in the workplace.”

Local authority employee RAHEEMA: “I just don’t know who is working and who is not.”

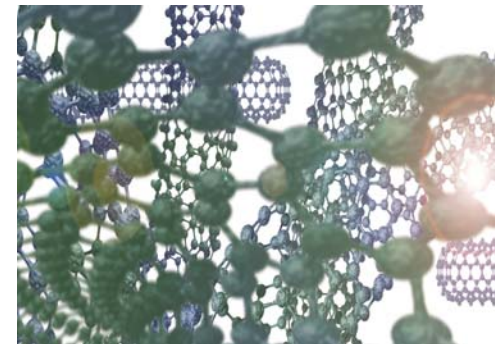
Health and safety representative STEVE: “WiFi remote safety inspections are a breeze, but we’re dealing with ever increasing incidences of VRA (Virtual Reality Addiction).”

### ADMIRER PEOPLE

Ray Kurzweil  
Philip Rosedale

### A THRIVING COMPANY

An SME with a small staff mixing locals and ‘knowledge nomads’, producing biomimetic clothing designs using genetically tailored bioluminescent textiles for the global market.



\* These scenarios are intended to stimulate thought. They are in no way predictions of the future and do not represent HSE views on how the future may develop.

# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## The Digital Rose Garden health and safety in the changing workplace

### Partnered Responsibility

- Pro-active adoption of technology, management of risk a partnership among individuals, business, and government;
- Ability to absorb impacts of conflict/war, resilience in face of economic/social/ other shocks.

### Inter-Connected Society

- People are more politically engaged and unified – act in partnership with government;
- Generations are more closely knit, and families are more inter-knit with interest groups: the cyber-extended family;
- An enhanced sense of connection to, and responsibility for, the national landscape and global environment.

### Immersive Computing

- Seamless, immersive digital data/media environment (telecoms and computing networks; Wifi / RFID);
- Overlays the real world and everyone accesses it constantly.

### Economic Boomtime

Increased UK competitiveness

- Harmonisation of regulations; differently abled in employment; incorporation of migrants; enterprise culture, expectation of well-being, and social cohesion.

### A New Global Balance

- Globalised capital and BRIC economic strength;
- Partnerships as emerging economies strengthen and move to centre stage;
- UK Economy booming, generating innovative goods and services;
- Labour force growing – ‘Knowledge nomads’ in-migrating: UK is the place to be;
- Offsets ageing of UK society;
- Business initiatives succeed;
- Innovations based on biosciences, materials sciences, design expertise – linked to CSR; small, nimble, global enterprises.

### Low-Footprint Consumption

- Avid consumers of experience, not consumer goods – but buy high quality when they buy;
- Designer food – but eco-friendly;
- Value parsimonious design resulting in resource conservation;
- Low footprint holidays: Devon Riviera;
- Beyond health to HPE (Human Performance Enhancement) and augmentation;
- But still widespread obesity.

### Sustainability Works

- Sustainability for design elegance and parsimony of system solutions;
- Embrace technology innovation, but take responsibility for impacts.

### Workplace is Everywhere

- Transformative high tech;
- “Glocal”: small enterprises do business globally;
- Workplace has exploded and been absorbed: it’s everywhere;
- Biosciences, new materials;
- Ever more rapid technological advances as pace of change outstrips development of social values, e.g., ethics.

### Health and Safety Implicit

- Workplace stressors/risks: stress from over-immersion;
- Home stressors/risks: over-augmentation; over-reliance on cyber social networks;
- Leisure stressors/risks: adrenalin overload;
- Attitude to H&S: a matter of exceeding congenital potential;
- H&S infrastructure: in partnership with peers and government; H&S built in at design phase, more automated H&S monitoring and control;
- Extent of regulatory structure: HIGH

# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## Boom and Blame health and safety in the changing workplace

Leading article – **The Competitive Intelligencer:**  
from our database to your mobile PDA –  
1 December 2017

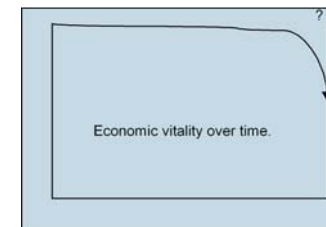
Welcome, businesses of the world! A LSE economic survey has confirmed the UK as the world's most supportive business environment. Low taxes and a minimal regulatory environment entice the world's businesses to the UK free market. And in our 24/7/365 world, Britain needs to remain strongly competitive – the current economic woes of those nations that failed to keep pace with change are a daily reminder to us to do so. The world's climate may be getting warmer, but the world's markets are incandescent.

We've worked hard to become early adopters and rapid adapters. We made the most of our strengths, and business is booming in finances, business services, competitive intelligence, technical expertise, and a smaller but more competitive tourist industry. Enterprises are larger: our successful small companies have grown; less competitive companies are absorbed by larger firms. Large chunks of manufacturing have been outsourced, offshored or automated.

The job for life has gone and with it, many of the old bonds of employer loyalty. Average tenure in post has slipped to 4 years. Most workers, across all sectors, are on short, fixed-term contracts. Being dismissed is nothing unusual. It's just something that happens.

Biosciences have transformed teamwork and HR – companies can now evaluate candidates' fit to corporate culture in terms of metabolism, personality, and vulnerability to workplace environments and stress. Health regimes can be tailored to our individual genetic profile, and supported by a wide array of sanctioned performance enhancement medicines. The latest new-hire perk, the HealthNano implantable health sensor, helps employees monitor their own health stats as well as productivity. For the individual, it's preventative health care – for the company, it's additional competitive edge. And it helps keep our 1 million workers aged over 65 healthy and at work. We can't afford to lose them from the labour market – nor their skills.

Of course, more competition among companies means more competition within companies. We know life is losing to work under these conditions – while we can work anywhere, corporate security and privacy concerns keep most of us at the office, and at the office late: evening rush hour now falls between 8 and 10 pm. Yes, we're still competitive, but how long can Britain's workforce keep up this white-hot pace before blowing a collective gasket?



### KEY FEATURES OF THIS WORLD

STRONG UK COMPETITIVENESS  
ECONOMIC SUCCESS - CAN IT CONTINUE?  
BLAME CULTURE  
COMPETITIVE SOCIETY  
STRONG CONSUMPTION  
SUSTAINABILITY DELAYED  
HIGH-TECH WORKPLACE | GENETIC IDs  
INVASIVE COMPUTING

# Horizon Scanning: health and safety in the changing workplace

## Breakout Groups

## Boom and Blame health and safety in the changing workplace

### VALUES

- First loyalties to current company or organisation;
- Value competition and winning;
- Focus on work.

### HEADLINES

- They're Watching While You Work....
- Nuclear Power 1: Renewables 0
- Deregulate To Accumulate
- Newsagents' collective sue over paper cuts
- ASBOs Reach Record High
- 'Phish and Chips': RFID scam; consumers hit
- 'Workplace pressures linked to alcohol abuse' says health advisor
- Obesity: Britain tops EU league

### QUOTES AND METAPHORS

- "There is no society, there are only individuals."
- "Success first, sustainability later."
- "Maintaining productivity is a 24/7/365 endeavour!"

### PEOPLE

Worker SUE (MultiSource Energy): "I work all the hours God sends and more, but it's not so bad because we've got pills to help us along."

Lawyer NEILL: "Genetic profiling saves my new materials clients a packet."

Employee representative TED: "Health and Safety takes up way more time than pay issues."

Local authority employee RAHEEMA: "Health and Safety? Least of my problems."

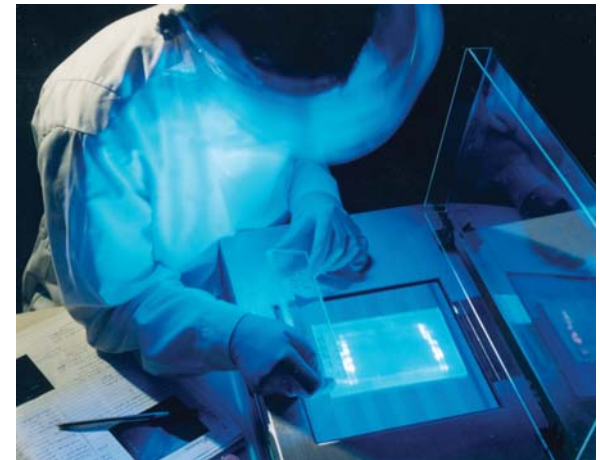
Ex health and safety representative now working for Health and Safety Insurance (HSI) STEVE: "The new Health and Safety accreditation scheme is a winner."

### ADMIRED PEOPLE

Gordon Gekko  
J R Ewing

### A THRIVING COMPANY

A large corporation offering global investment and trading services, including competitive intelligence.



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# Horizon Scanning: health and safety in the changing workplace

## Breakout Groups

## Boom and Blame health and safety in the changing workplace

### Blame Culture

- Resistance to new technology,
- Rejection of risk,
- Shattered by impacts of conflict/war;
- Fragility in face of economic/social/other shocks.

### Competitive Society

- Ageing UK/European demographic;
- Widespread obesity;
- New focus on extended biological family as genetic health mapping gains importance.

### Invasive Computing

- Pervasive computing (seamless, immersive telecoms and computing networks; Wifi/RFID) monitors productivity;
- Total lifestyle, environment, and performance monitoring by companies via implants tracking working wellness and productivity.

### Economic Success

Increased UK competitiveness

- Harmonisation of regulations; differently-abled in employment; incorporation of migrants; enterprise culture, expectation of well-being, and social cohesion;

### A world of globalised capital

- BRIC economic strength;

- Global free market amplifies economic divide: UK economy holding steady,
- Large enterprises;
- Focused on finances, business services, expertise, and tourism;
- Government intrudes much less – regulatory structures are reduced and the market is free;
- Knowledge workers staying home; skilled blue collar out-migrating;

### Business Adapt

- Initiatives known for rapid adoption and adaptation more than innovation;
- UK label on services and ephemera.

### Growing Consumption

- Who has time to shop? 'fastgoods';
- Conspicuous consumption still fashionable;
- Foods healthier – must enhance productivity;
- Nuclear power; fuel subsidies, no support for environmental initiatives;
- What leisure?

### Sustainability Delayed

- Only stable, surplus generating economy can afford sustainability;

- Less consideration for the environment, leading to worsening conditions;
- Technology: adopt and adapt – let someone else pay for R&D, and externalise the impacts where possible.

### High-Tech Workplace

- High tech for productivity;
- Big enterprises working globally;
- Workplace standardisation and limited company-sponsored augmentation for competitive advantage;
- Financial sectors, technical services, expertise, and tourism
- Deregulating to generate wealth to fix environment; BUT
- Deregulation adds to environmental damage.

### Health and Safety only for Productivity

- Workplace stressors/risks: high pressure to compete successfully;
- Home stressors/risks: lack of home/down time;
- Leisure stressors/risks: insufficient leisure;
- Attitude to H&S: necessary to maintain productivity;
- H&S infrastructure: based within company; government involvement minimal – increased role for insurance companies;
- Extent of regulatory structure: MINIMAL

# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## Tough Choices health and safety in the changing workplace

Leading article – **The Economist** –  
1 December 2017

We're calling it: the recession is now a slump. Asset price deflation has spilled over into a general deflation, which low interest rates cannot correct. Chunks of our cities decay as organisations outsource and migrate. We've watched public agencies, NGOs, and big business cut costs and re-trench. The health infrastructure is creaking, pensioners are job-hunting with the vigour of school leavers and in some cities, gangs clash over turf. Climate change has lost out to battling international organised crime as the new global challenge.

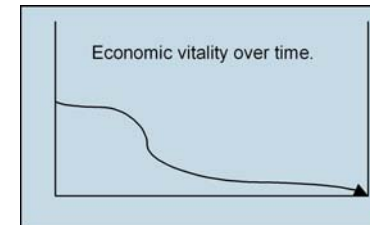
The world of work has changed. Competition for the best jobs is hot, and disappointed candidates with great CVs are looking elsewhere in the world. Elsewhere, people are elbowing each other aside for jobs with long-term health and pension benefits. Yet even with high unemployment, some seasonal and labour intensive jobs go begging.

In the workplace itself, the picture has changed. With shrinking revenues, 'shabbily genteel' now describes too many British workplaces. Reports show that old machinery, worn flooring, improvised wiring and over-taxed ventilation and exhaust systems are common. Advanced automation and intelligent systems installed just five years ago aren't getting the updates they need.

It's no surprise that accident rates are up – as are insurance claims.

Yet in many ways, Britain's employers and workers have proved remarkably adaptable. Short term contracts, part time working and creative shift patterns have kept many a business afloat; and the older worker – who may have skills, both technical and inter-personal, that many employers now consider lost – is valued more highly than ever before. Over 1 million workers are aged 65 or over. The challenge is to enable them to continue to keep working.

Britain is not a country in collapse. Flexible employers, adaptable employees and continued business endeavours, even in these troubled times, provide hope. But we face at present a landscape littered with tough choices and a future of tougher challenges. It's time for action.



### KEY FEATURES OF THIS WORLD

DECREASED EU COMPETITIVENESS  
ECONOMIC STAGNATION  
BLAME CULTURE  
FRAGMENTING SOCIETY  
REDUCED CONSUMPTION  
SUSTAINABILITY BY COPING  
PERVASIVE COMPUTING A LUXURY  
WORKPLACES CHEAP AND SHABBY



# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## Tough Choices health and safety in the changing workplace

### VALUES

- First loyalties to self;
- Value security;
- Wish for the luxury of choice regarding work/life balance;

### HEADLINES

Monetary Policy Committee stands firm – lower interest rates must wait.  
Fourth anniversary of the great crash.  
When will the bear market end?  
Prices fell another 3% last year  
“Where’s the aid we were promised?” say bankers.  
Infections in warehouse linked to tag-chip implants  
Crime levels reach 10-year high

### QUOTES AND METAPHORS

“Tough choices require tough resolve.”

Factory Worker SUE: “I’ve just started my third job this year, I don’t know how long it will last. The pay’s not great, but I’ll get a pound extra an hour if I agree to wear a productivity tag.”

Business Owner NEILL: “Health and what? It’s a luxury I can’t afford!”

Employee representative TED: “I’m flat out. And companies switch management so often it’s hard to keep track of who you’re dealing with...”

Local authority representative RAHEEMA: “I sometimes feel like I’m fighting a losing battle. People don’t seem to listen the way they used to...”

Health and safety representative STEVE: “I’m banging my head against a brick wall. How can I improve health and safety when I barely know what people are doing or where they work?”

### ADMIRED PEOPLE

Arthur Daley  
Private Walker

### EXAMPLE COMPANY

A medium-sized corporation working within the UK and EU, producing small electrical appliances and struggling to remain competitive.



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# Horizon Scanning: health and safety in the changing workplace

## Breakout Groups

## Tough Choices health and safety in the changing workplace

### Blame Culture

- Resistance to new technology;
- Rejection of risk;
- Shattered by impacts of conflict/war;
- Fragility in face of economic/ social/other shocks.

### Fragmenting Society

- As pressures on government increase, government programmes are increasingly undependable;
- Europe moving towards the wings of the global stage – seen as a fertile field for organised crime activities;
- Worried about personal and economic security, people draw a close line around near relatives - the new nuclear family.

### Unfavourable Demographics

- Ageing UK/European societies;
- Widespread obesity;
- Skilled labour out-migrating if possible.

### Computing Only For The Rich

- Seamless, immersive telecoms and computing networks are a luxury for the wealthy;
- Increased technological monitoring of people using RFID tags;
- Everybody else gets by with cell phones.

### Economic Stagnation

- Decreased UK competitiveness;
- Globalised capital and BRIC economic strength;
- Labour competing hard for one good job;
- Companies tempted to use moonlight labour;
- Few business initiatives;
- Belt-tightening, retrenchment, cost-cutting.

### Reduced Consumption

- Consumption at lowest ebb in thirty years;
- Consumers buy cheap goods, knock-offs, most affordable in all categories;
- Drop in expensive imported foods, speciality foods, organic foods;
- Conserve resource use to lower bills;
- Travel curtailed -- leisure at home;
- DIY health and wellness.

### Sustainability by Coping

- No available capital to invest in retro fitting or entrepreneurial initiatives;
- Technology: can't afford the R&D – or ameliorating any negative impacts;
- Resource degradation increases, but with straitened resources, there's not much we can do.

### Workplaces Cheap and Shabby

- Outmoded high technology, no renovation of infrastructure;
- Medium-sized enterprises operating mainly in Europe;
- Workplace increasingly shabby, worn, and a hazard;

### Health and Safety Circumvented

- Workplace stressors/risks: worn office and infrastructure;
- Home stressors/risks: unwarranted goods, lack of home repair, stress from juggling conflicting priorities;
- Leisure stressors/risks: limited; hazards of worn-out infrastructure;
- Attitude to H&S: problems are other people's fault;
- H&S infrastructure: individual responsibility, with some limited government advice;
- Extent of regulatory structure: **Who cares? Circumvention.**

# Horizon Scanning: health and safety in the changing workplace

Breakout  
Groups

## A Virtue of Necessity health and safety in the changing workplace

Leading article – **Sustainability Times:**

Local edition – 1 December 2017

WiMax immersive edition – 1 December 2017

The latest figures are in: going green and staying local have fertilised a dormant economy. Britain is becoming a beacon for high tech sustainability in our technically astonishing world. But it is also a nation with huge demands on its public services, particularly health provision and elderly care. The have/have not gap has widened. Yet the march of change continues.

Take the world of work. In some ways, it's similar to that of ten years ago. Manufacturing still exists. There are still large corporations – mostly with overseas owners and notwithstanding those that relocated overseas, taking many skilled workers with them. And the health and care sector remains by far the largest employer. Yet in other ways the world of work is very different.

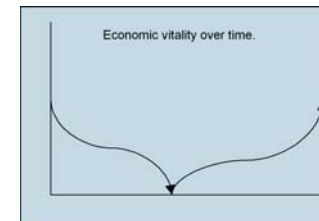
Society has re-trenched. More people have shifted from consumerism to self-sufficiency – it is a warmer world, after all. It's been a gain for sustainability – and, it seems, for revived competitiveness, as people re-create businesses from a unique local and green perspective.

More and more of us work for small companies – in a workplace as likely to be a 'flat pack' office in your boss's back garden as it is an office block. More and more small businesses are sharing office space, production machinery and support staff – using software to allocate

resources dynamically among several businesses, lowering costs and reducing waste. Given our concerns about climate change, this office 'co-op' may well be just a cycle ride away. And new industries are emerging that recycle, repair and 'make do'. The 'We Can Fix It' franchise is flourishing.

Of course, declining birth rates and a slowdown in immigration mean it's more important than ever to keep workers safe and healthy – particularly those 1 million workers aged over 65. This is achievable - technological progress has been blamed for increasingly complex health and safety issues but at least we have the ability to track workers' health and stress indicators throughout the day. Or at least we do if your employer can afford the RFID monitor tag systems. It's often those workers who need them most that can't have them – those in care professions, for example, or people working shifts and juggling child (and parent) care responsibilities.

So how do we keep our workers safe and well as the world of work changes? No one pretends it's easy. But it's essential. Our economy – and the future care needs of all of us – may depend on it...



### KEY FEATURES OF THIS WORLD

REVIVING UK COMPETITIVENESS

THE ECONOMICS OF RECOVERY

CULTURE OF PERSONAL RESPONSIBILITY

CLOSE-KNIT SOCIETY

SUSTAINABLE CONSUMPTION

“SHABBY GREEN” SUSTAINABILITY

PERVASIVE COMPUTING

GREENING OF WORKPLACES

# Horizon Scanning: health and safety in the changing workplace

## Breakout Groups

## A Virtue of Necessity health and safety in the changing workplace

### VALUES

- First loyalties to family and local community;
- Value balance and wellness;
- Focus on life over work.

### HEADLINES

- DIY Nation: "Can you fix it?" ... "Yes we can!!"
- Carbon taxes to go up again
- "Get off our backs!" say workers and management
- Golden Oldies aim to create the Good Life
- Oranges and Lemons, from Brighton...and Melons!
- Torquay beats Torremolinos! Record visitors to seaside town...
- Public backs Governments 4Rs campaign: 'Remember Reduce Re-use Recycle'
- Community spirit echoes post-World War II attitude

### QUOTES AND METAPHORS

- "Shabby Green" is the new black;
- A Nation of Tinkerers and Eco-Friendly Gardeners

### PEOPLE

Worker SUE: "It's tough holding down 3 jobs, but at least I can check on my Gran round the corner on my mobile videophone and webcam ...it's 5 years old now but it still works OK."

Businessman NEILL (Local Biofuel Producer): "I've had a low sugar beet harvest this year so prices are high but sales are still holding up."

Employee representative TED: "Membership's stable, but people seem to rely on local social networks for support."

Local authority employee RAHEEMA: "I'm worked off my feet trying to keep tags on all the local businesses springing up."

Health and safety representative STEVE: "I spend most of my time dealing with bad backs, what with all the local food producers."

### ADMIRED PEOPLE

Trevor Bayliss  
Charlie Dimmock

### A THRIVING COMPANY

An SME focused on local markets, specialising in organic botanicals for nearby B&Bs and spas.



\* These scenarios are intended to stimulate thought. They are in no way predictions of the future and do not represent HSE views on how the future may develop.

# Horizon Scanning: health and safety in the changing workplace

## Breakout Groups

## A Virtue of Necessity health and safety in the changing workplace

### Personal Responsibility

- Pro-active adoption of technology, management of risk;
- Ability to absorb impacts of conflict / war;
- Resilience in face of economic / social / other shocks.

### Close-Knit Society

- People use social networking to form tightly knit special interest groups and enclaves;
- Families closer knit, but sometimes far-flung – children out-migrated for jobs;
- Government focuses on elderly, health detection and prevention; role of coach.

### Unfavourable Demographics

- Ageing UK / European societies;
- Widespread obesity, but not increasing;
- Skilled labour out-migrating if possible.

### Pervasive Computing

- Seamless, immersive telecoms and computing networks; Wifi / RFID;
- Used to link family and local community, for environmental and health monitoring and problem detection; eases home care and enables telemedicine for elderly.

### The Economics of Recovery

- Decreased UK competitiveness;
- Dawn of the Pacific Era;
- Globalised capital and BRIC economic strength;
- UK economy is recovering, but resources are still limited;
- Working in small local businesses and caring for parents, family;
- Business initiatives are typically local, unique, ecological, experiential.

### Sustainable Consumption

- Consumption low but rebounding;
- Consumers buy durable, efficient goods, easy to repair, modular, re-usable;
- Purchasing more locally grown food, doing without imports – and eating less;
- Travel and leisure local and community-based;
- Focus on fitness, some use of HPE (Human Performance Enhancement).

### “Shabby Green” Sustainability

- Forced by economic limitations – don't have much so you don't use much – innovations help;
- Assess health and environmental impacts of technology before adopting.

### Greening of Workplaces

- High tech for green health;
- Enclaves, mini-networks;
- Increased workspace diversity (more small local businesses, fewer large corporate offices, more home working);
- Less industry, more organic and speciality agriculture, destination / experience / wellness businesses;
- Increased personal responsibility and green values; BUT
- Increased pressures for cost reduction can lead to increased regulatory avoidance.

### Health and Safety in Moderation

- Workplace stressors / risks: more manual jobs; increase in 'traditional' injuries;
- Home stressors / risks: too much responsibility for family;
- Leisure stressors/risks: minimal;
- Attitude to H&S: individual responsibility;
- H&S infrastructure: government as coach; self-organised support networks;
- Extent of regulatory structure: MODERATE.

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Horizon Scanning Centre, Department for Innovation, Universities and Skills:

- □ Sigma Scan [www.sigmascan.org](http://www.sigmascan.org)
- □ Delta Scan [www.deltascan.org](http://www.deltascan.org)



## 8. GLOSSARY: FORESIGHT TERMS

*Confirming hit:* a scan hit that provides additional evidence that an original scan hit could develop into a full-blown trend (see *scan hit*).

*Driver:* development producing major change; may be an emerging issue, a trend, or a megatrend (see *megatrend*).

*Effects:* this term loosely encompasses all the linked changes that change itself causes: mapping the effects of change in essence looks not just at the result of the cue ball striking the racked balls, but at the subsequent results of the balls in motion as they rebound off the table walls and each other. As differentiated from *impacts*: this term, on the other hand, loosely encompasses how all the players involved feel about the effects of the cue ball striking the racked balls. The "impacts" of change are our evaluations of all the effects of change - and thus vary from person to person.

*Emerging issue:* a source of change -- the first case; the original idea or invention; the watershed event; the social outlier expressing a new value - that is, a sign of change that exists presently in only a few scattered instances, which might multiply into enough data points to constitute a trend. You might say that an emerging issue is a trend with only one or two cases,

*Environmental scanning:* see horizon scanning.

*Foresight:* see futures studies.

*"Future present:"* a clumsy term to describe the time described in images of the future: the present-day of the future any image describes, or the future considered as if we were living in it now, with our present as its past.

*Futures studies:* a trans-disciplinary, systems-science-based approach to analysing patterns of change in the past; identifying trends of change in the present; and extrapolating alternative scenarios of possible outcomes in the future; in order to help people create the future they most desire.

*Horizon scanning:* the research strategy of reviewing a broad range of information sources across all fields of investigation (STEEP / EPISTLE / PESTLEC) in order to glean data about emerging sources of change; also known as *environmental scanning*.

*Image of the future:* an imaginary description (in any format or media) of a possible future outcome for a given item of interest: a person, a community, an organization, nation, society, bioregion, planet, etc. An infinite number of possible images of the future exist. This futures concept is related to the notion in physics of alternate universes.

*Megatrend / metatrend:* commonly used to indicate a widespread (i.e., more than one country) trend of major impact, composed of sub-trends that in themselves are capable of major impacts. More precisely, a cluster of related trends which reinforce each other and together form a 'super-trend', of which the best example is perhaps globalisation: the cluster of related trends in production, infrastructure development and linkage, labour mobility, capital mobility, worldwide IT capabilities, etc., all of which tend to reinforce each other's growth through a complex system of interrelationships allowing feedback and feedforward.

*Scan source:* a documentable source of information about change; may be published (newsletter, journal, magazine, conference proceedings, book, newspaper); online (website, weblog, e-journal, bulletin board, discussion group); broadcast (TV, radio); or live (focus group, conference, interview, personal conversation), as long as it is documentable.

*Scan hit:* a datum (fact) providing information about an emerging issue, trend, or driver of change. Ideally, a scan hit identifies an emerging issue that is objectively new even to experts, confirms or is confirmed by additional scan hits, and that has been identified in time for social dialogue, impact assessment, and policy formation.

*Scenario:* a technical term usually used to describe an image of the future deliberately crafted for planning or foresight purposes. It should be rooted in identifiable trends or emerging issues data extrapolated and organized using an explicit theory of social change. It should describe how changes created the particular future present out of the past, and offer a vivid, provocative,

accessible picture of how the future present differs from today. Scenarios are often evaluated in terms of plausibility and probability; they should contain both opportunities and threats – they are statements of *possible* future outcomes.

*Scenario building*: the process of combining data about change – trends, drivers, emerging issues, and their potential impacts – into a coherent, logically consistent narrative describing the world at a specified future time. Many different approaches exist, of which the following are a few examples:

- *Matrix*: popularised by Peter Schwartz in *The Art of the Long View*, also thought of as the approach used at Shell Oil and the Global Business Network. Essentially, chooses two highly important but highly uncertain trends or emerging issues to act as “drivers” of change, and creates a 2X2 matrix by expressing each driver as a continuum between two antithetical outcomes. The scenarios are created in the four spaces defined by the opposite ends of the two continua.
- *FAR/futures table*: developed by R. Rhyne (1981), the Field Anomaly Relaxation approach to generating futures chooses relevant trends and emerging issues of change, forecasts a range of potential outcome values for each, and then allows the creation of internally consistent scenarios by creating a comparative table which allows checking each potential outcome of each variable against all the others, scoring for contradiction. Scenarios are generated by choosing those clusters of trend outcomes that do not contradict each other.
- *Dialogue*: an approach used by Sociovision and refined by Joop de Vries which explores potential outcomes of drivers, trends, and emerging issues by means of a facilitated dialogue, resulting in group mapping of potential outcomes and expression of the metaphors and future images which provide organising motifs for clusters of outcomes.
- *Diversity*: an approach developed at the Hawaii Research Center for Futures Studies, which focuses on creating scenarios depicting medium- to long-term futures (at least one generation out). Three to five emerging issues from different STEEP categories are used to generate potential impacts and cross-impacts; these details are woven into a narrative depicting a possible future which is maximally diverse from the present.
- *Parameter*: developed at SRI International and documented by Thomas Mandel, this approach assumes four archetypal scenario outcomes – upside, downside, transformational, and wildcard – and creates scenarios by extrapolating possible upside, downside, transformational, and wildcard outcomes for each trend or emerging issue chosen as relevant.

*Seed(s) of change*: see *emerging issue*.

*Trend*: a pattern of change over time in some variable of interest. Having trend data for some variable implies multiple instances of that variable. For example, one revolution in Africa is an event; two or three revolutions would call for comparative case studies; fifteen revolutions in countries in Africa within five years would constitute a trend. One of the most obvious, and largest trends, is the increase in world population. A potentially even larger trend, but much less obvious -- or even agreed upon -- would be the gradual warming of the Earth's atmosphere. Another is the continuing decline in the cost of microchips and consequently of computers.

*Weak signal*: see *emerging issue*.

*Wild cards*: low probability but high impact changes – like a global plague, or the invention of table-top fusion – usually described as events rather than gradually unfolding changes. NOTE: they may be very positive, very negative, or mixed in effects and impacts.

*Variable*: a quantifiable subject of study, the value of which can change over time.

*Vision*: a technical term used to describe an image of the future that articulates an individual's or group's most closely held values, most cherished ideals, and most preferred goals in a positive statement of a preferred future outcome.

# HSE futures scenario building

## The future of health and safety in 2017

This report describes the processes, output, and participant evaluations of a scenario-building project completed for the Horizon Scanning function of the Health and Safety Executive. The scenario process incorporated critical issues of change derived from 28 interviews of HSE policy-makers and outside experts. Participants in a two-day scenario-building workshop chose drivers of change from among these issues, and created a framework defining four different possible futures for health and safety in the UK in 2017. The scenario process also incorporated the emerging changes identified by horizon scanning as 'hot topics' for health and safety. Results from the workshop were written up in two formats:

- 'research scenarios' that include supporting evidence such as reference to other government agency foresight research and scenarios; and
- 'workshop scenarios' that present the key ideas in a vivid but compressed format to generate group dialogue.

As a test of their efficacy in generating policy discussion and ideas, the scenarios were deployed twice:

- at the HSE Horizon Scanning Conference in November 2006 to spark wide-ranging discussion of possible challenges facing the HSE; and
- in a subsequent wind-tunnelling workshop to demonstrate how scenarios can be used to consider specific policies in the face of potential change.

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