Introduction

The Foresight initiative, launched in 1994, aims to bring together companies, universities and other research organisations on future orientated development in order to improve the long term competitiveness of British industry. This is an activity which this country has been singularly unsuccessful at sustaining in the past, partly perhaps from mutual ignorance and suspicion, partly from a fear that if ideas are shared others will steal them. Meanwhile, other countries with no such inhibitions are benefiting from the sharing of information, whether nationally or internationally.

Foresight began with 16 independent panels set up to explore opportunities in different sectors of the economy. A Sensors Action Group produced a report in November 1997 which was launched at a Sira conference. It made a number of recommendations for action. This was followed last November with a further conference called by Sira, which focused on three specific areas where collaborative action could be undertaken. The proposed actions following from the conference are reviewed below, but first I asked Professor Richard Brook, chief executive of Sira (Plate 1), for his opinion of the Foresight programme as he had experienced it so far.

"Foresight clearly has its detractors", said Brook. "On the other hand I personally think that the process of getting people to think about the future, and to look at where they and others in the UK should be going can't help but be valuable. You can criticise it for taking people's time when their biggest concern is simply surviving. They may also see it as irrelevant because of the way takeovers are changing the industrial scenery.

"But experience shows that by and large those companies that do plan their way forward are more successful than those that don't, so UK Ltd must do something like this if we are to capitalise on what we are good at. It's one of those exercises where what changes is people's attitudes and approaches, and that's quite difficult to audit if you are looking for a tangible outcome. The government is set about changing our culture over a period of 20-30 years."

The danger now, as Brook sees it, is that we may fall once more into the trap of rejecting an initiative because it has not shown results after two or three years. If we do that, we shall repeat all the mistakes of the past.

Foresight launches three sensor programmes

Jack Hollingum

Features

The government-sponsored Foresight programme, begun four years ago with the aim of bringing together industrial companies with academic and research organisations to improve the competitiveness of the British economy, has now entered a second round of activity focusing on developing its range of tasks. In the area of sensing technology three themes are being taken up for collaboration by Sira during the coming year: industry and the environment; security and observation; and Earth observation. Last November Sira sponsored a conference to introduce these themes and recently Professor Richard Brook, Director of Sira, and Anne Burns, Technology Marketing Manager, talked to Jack Hollingum about the way ahead.

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Abstract

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Has there been progress so far? “If you look at it on a 20-30-year time scale, yes, I think we are making progress. People are talking about these things. The government, it seems to me, is taking a much more enthusiastic and entrepreneurial approach to backing science and technology. But the real thing we must do is to stick with it. We must have sustained efforts over periods of ten years, not just three years.”

Industry and the environment

Each of the three topics under review was introduced by a speaker during the morning plenary session of last November’s conference, and the separate afternoon sessions made decisions on the way ahead. Dr David Strachan, head of Measurement in the Technology Group at Shell Research, introduced the subject of collaborations in industry and the environment. Businesses wanted to make money, he said, but they also had to satisfy their employees and other stakeholders, as well as environmental groups.

Instrumentation had an important role in characterising emissions to demonstrate areas for improvement, in monitoring emissions to aid process or plant control, and in demonstrating compliance with permitted levels of emission. A difficulty, particularly for smaller firms, was the high cost of instrumentation, and innovation in instrumentation was hindered by the complexities of the supplier-user network and the restructuring trends in manufacturing and process industries.

Strachan listed a number of priority initiatives which were taken up during the afternoon session, which followed up Sira’s proposal for an Industry and the Environment Intelligence Group (IEIG). This group will bring together industries that have a high environmental impact and instrument manufacturers and “experts”, to identify the state of the art in key monitoring areas, and to disseminate information on new instrumentation and best practice. The group will also consider the demands of current and potential legislation and standards, and promote the UK’s expertise in sensor systems and environmental monitoring.

Membership of the IEIG will be cross-sectoral to encourage the spread of ideas and best practice between industries, and will include:

- users of instrumentation in industries whose activities have significant environmental impact;
- manufacturers of instrumentation serving these markets;
- researchers carrying out relevant work on novel sensor systems or environmental monitoring.

The meeting also proposed the setting up of two demonstrators, and a study of toxicity measurement investigating novel ways of defining and measuring toxicity, online and continuously. One of the demonstrators would be a decision support system for water users, which could integrate the financial and technical variables involved in water use. The other was to provide intelligent monitoring of gas burners, using low-cost (possibly off the shelf) sensors and intelligent data analysis to characterise burner performance. A second stage of this project might integrate the data with knowledge of the process to devise a control strategy for the most efficient use of burners.

Security and observation

Dr Michael Taylor, director of Technology Operations in the Metropolitan Police Service (Plate 2), introduced the session on Collaborations in Security and Safety Observation, reporting on a meeting last summer between groups interested in security. Closed circuit television cameras are now widely used in shops, shopping malls and other public places.
all over the country as an aid to crime management, and are generally popular with the public, but CCTV systems are still relatively "dumb", as Plates 3 and 4 indicate. It should be possible to analyse behaviour patterns. We should be able to detect contraband and improve image integrity, and there are other techniques of biometrics which could be improved (some of which were reported in the last issue of Sensor Review). One problem in particular is that of the attention span of operators watching a monitor for misdemeanours.

The afternoon session proposed the implementation of five projects.

**Project 1. Standards, methodologies and metrics for evaluating the introduction of new technologies into Security and Safety Observation Systems**

Introducing new technology into any environment always has associated risks, and when the technologies and environments are as diverse as those covered by these systems, then justifying taking the risks is a difficult task. Much effort is being directed into establishing "best practice" for implementing existing technology, but standards that help reduce risk often lag behind technical requirements.
development. The potential impact of new technologies must be assessed objectively if the opportunities they offer are to be realised.

The aim of this first project is to propose a structured approach to assessing the impact of new technology within the developing Security and Safety Observation environment. This will be achieved with consideration to existing “best practice”, standards, methodologies and metrics while allowing for new developments in these areas.

Using a phased project approach, the first element of the project would prove the feasibility of taking a structured approach to knowledge management within the Security and Safety Observation domain. This will be achieved by development and scenario demonstration of a domain model, using commercially available tools. On successful completion of phase one, the final element would concentrate on building into the model the depth of knowledge required to demonstrate the effectiveness of such a tool.

Project 2. Integrated intelligent information management system
Operator performance is crucial to the success of Security and Safety Observation systems. Even the best specified system will fail to perform if the human operator, or its interface to the operator, is ineffective. Technology can help in this area by filtering the high volume of incoming information and focusing the operator’s attention on the most important events. Many commercial systems attempt to address this issue by providing “intelligent” tools intended to aid the observer. Most of these systems are proprietary and rely on the original supplier to support and extend the system.

By assessing the effectiveness of new technologies to manage and process existing image data, a suitable demonstrator would enable new sources of information, such as RF radio and data tags to be introduced and their effects rapidly evaluated.

This project aims to develop an Integrated Information Management system to aid the evaluation and rapid introduction of new tools and technologies. By providing a system with a layer of abstraction from existing systems, the demonstrator need not interfere with the day to day operation of the Security and Safety Observation system. This would allow direct comparison with existing techniques and working practices. The project would take the development of demonstrators to the proof of concept stage. At this point it will be shown that the system is capable of configuration for particular applications, and that their inclusion in existing installations would be beneficial.

The proof of concept system will consist of a configurable and extendable software and hardware tool kit developed for use on cost effective standard platforms using standard development tools. Primary development work will concentrate on the layer of abstraction necessary for minimising problems, regarding standard software and hardware interfaces to existing systems.

Projects 3, 4 and 5. Demonstrator projects
This group of projects will focus on three application areas where community safety, crime reduction and in particular burglary bring to the fore quality of life issues. The exemplars identified for demonstration include:

- town centres – crime reduction;
- high crime estates – community safety and crime reduction;
- remote site monitoring – safety.

For each exemplar an application problem analysis will be performed, which will include the metrics required to establish success criteria. This process will lead to the selection of appropriate technologies. Implementing these technologies through the system developed in Project 2 will enable assessment of the impact of technology on the application, thus providing case studies to justify uptake.
Earth observation

The wide range of interest in this EO technology is indicated by the variety of organizations which had been represented at a meeting in July 1998, ranging from AEA Technology to HM Customs and Excise to North West Water. The presentation at the morning session of the November conference was given by Eur. Ing. George Ferrier, principal surveyor at Lloyd’s Register. Remote sensing was needed for monitoring, understanding, management and utilisation of natural resources and the environment, and Ferrier pointed out that observation might be carried out through satellite instrumentation, with instruments in aircraft, or by land-based instrumentation. Potential uses were extremely wide, taking in such large-area operations as monitoring the state of the environment, monitoring changes in land use, monitoring the use of pesticides, constructing area maps and setting insurance on flood areas, but having special importance for some in the detection of smuggling.

Because of the diversity of potential applications and science driven origins of much of the technology the present situation was that there was no strong civil market pull, and the supply-user network was very complex. Ferrier listed a number of priority initiatives, which were taken up during the afternoon session, when it was agreed that there had to be a significant improvement in awareness of the relevant science and technology, project opportunities and potential end user needs.

The best way to encourage greater cohesion, according to the final report, was to form demonstrator project partnerships between relevant players at each stage of the supply chain. User interest would be stimulated by dissemination of results from appropriate demonstrators aimed at particular end user needs.

Several actions are required to overcome the barriers to the use of EO technology. The main thrust will be to establish improved communication between players. A map of the stakeholder interests and capabilities will be produced to provide clear knowledge of the services that each organisation can provide and to highlight organizations that should be involved.

Sector based interest groups of end users who can benefit from advances in EO must be federated in a framework capable of leveraging investment from the principal funding organizations. This project will involve formation of an “intelligence programme” to promote and co-ordinate a variety of activities with industrial and public sector backing.

EO demonstrator

Until now, as indicated above, civil applications of EO have been very limited. Satellite missions have been driven by the advancement of science rather than tailored to commercial needs. The task of publicising and marketing the capabilities of EO has fallen to the data supply interpretation community, which is composed largely of small companies which do not have the resources to supply tailored solutions or to promote technology transfer activities to raise commercial awareness. To accelerate the adoption of EO it is essential to widen the community of potential end users who are convinced of its capability.

The best mechanism for stimulating interest is a demonstrator project aimed at a typical and challenging need. Construction of a suitable demonstrator would require the identification of a particular application of commercial importance, and a collaborative project involving the appropriate partner organizations. It is foreseen that this would involve contributions from a satellite operator, ground segment support, data supply interpreters, systems integrators and end users.

This project could form part of the proposed BNSC programme to develop small satellite missions and exploit the UK’s position as a world leader in micro-satellite technology. One of the objectives of this programme is to promote the use of small satellites for commercial benefit. Small satellites can be manufactured relatively quickly, cheaply and create better user focus by having dedicated missions. EO could form the basis of a mission provided that a flagship application can be defined. The eventual goal of the programme would be to incorporate EO data from a small satellite mission in a decision support demonstrator system aimed at a commercial need.

The project will aim to bring together all the contributors to the supply of satellite data, from satellite operators, through ground segment and data suppliers, and in particular to locate potential end users and their applications. An essential first step will be to contact as many prospective end-user organizations as possible, and to challenge each of them to articulate a menu of their needs. A list of commercially beneficial applications will be defined, applications will be assessed and a demonstrator project formulated. Success at this stage could lead to increased commercial interest and a user-driven small satellite mission.