

**Strategic Review of the  
UK National Measurement System (NMS)  
April – December 2005**

**Annex H**

**The Impact of the NMS**

**PA Review 1999**

1. The last major review of the NMS, carried out by PA Consulting in 1999, looked at the rationale and economic benefits of the NMS. It quantified impact from a macro-economic perspective and concluded that measurement knowledge contributed, typically in the UK and other developed economies, around 25% of growth or 0.8% of GDP per annum over the post war period, or £5 billion at 1999 values.

**Econometrics Study 2005**

2. Unlike the PA Review methodology, this is a cross section study, that is, it uses a snapshot of business innovation and its correlation with measurement intensity, and not a time based assessment of the role of measurement in determining productivity growth, as is often done for the role of technology in economic and productivity growth.

3. Measurement knowledge can be usefully seen as part of the codified technological infrastructure that supports business. As such it is closely related to, and in many cases an integral part of, the system of written technical standards. It has been estimated that at least 30% on average of standards directly reference a measurement or testing result or technique. A recent study carried out for the DTI found that standards make a major contribution to innovation and productivity growth through their role in knowledge diffusion and take up. [See DTI Economics paper 12].

4. A complementary study by the same team of economists estimated the impact of NMS-generated knowledge on the propensity of firms in the economy to invest in or achieve innovation in the market place and on the extent of that innovation. The results confirm that the extent of access to, and take up of, measurement services and knowledge has a correlation with business innovation propensity and intensity, especially product innovation. The study tracks the use of established measurement knowledge and its diffusion, via technical standards

and in the direct and indirect demand for measurement services provided by the NMIs, through the so-called 'fan out' (fan shaped diffusion) of measurement services via major uses in the instrument manufacturers and the UKAS accredited measurement laboratories.

### **Direct Business Interaction with the NMS**

5. A survey-based evaluation carried out in November 2005 identified the commercial and financial benefits attained by firms that worked directly with NMS labs to obtain advice, guidance and specific technical knowledge for product and process innovations. A proportion of respondents were able to quantify the profit resulting from these interactions and these can be grossed up, on reasonable assumption, to economy-wide impact estimates and give a value of £712 million. For 60%, traceability was critical to their business. 45% said that measurement was increasingly important for their business. A similar 45%, active users who 'pick and mix' NMS services, found that the NMS provides significant business benefits. The NMS adds value by:

- Facilitating innovation – the NMIs have a reputation as 'leading edge' where measurement needs are new and different;
- Reducing the development risks – reduces time to market;
- Being a knowledge resource – the NMIs are problem solvers particularly for measurement businesses (such as instrumentation manufacturers), who then help measurement users and create a supply chain effect;
- Providing networking benefits through the NMI metrology clubs, for instance.

6. A similar grossing up of benefit to that done for the profit estimate suggested that the total number of customers who have benefited from new NMS-assisted products or processes, as cited by respondents in the survey, is 19,500.

### **Bibliometric studies**

7. A significant remit of the NMS is to undertake measurement research and to generate new knowledge. In a sense this element can be classified with the Research Base expenditure managed by OST, Research Councils and the HE Funding councils. As such, established and recognised bibliometric indicators are appropriate for assessing the quality and the potential economic value of measurement research. These include the quantity of publications and their quality, as assessed by the number of citations.

8. A review of the NMIs' NMS-based scientific publications and their citations was carried out in 2003. It showed that the NMIs had published a total of about 1400 papers in scientific journals, with a citation rate mostly above the average expected for the journals used. The level of co-authorship with other organisations was typical of other UK research institutions and in the case of NPL was mainly with leading UK research groups or prestigious sister organisations overseas, with Imperial College as the most frequent collaborator but PTB and NIST also significant. In contrast to NPL and LGC, NEL staff made more use of papers to specialised conferences as outlets for their research.

9. This data indicates that the research from the NMS labs finds outlets in scientific literature and that there is some collaboration with leading institutions. However, given the share of the NMS budget spent on research, and the increasing importance attached to the production of leading edge measurement knowledge and its use in the DTI technology strategy, there appears to be scope for raising further the profile of the NMS labs in scientific publishing. This impression is confirmed by a recent bibliometric analysis of the relative international position of the UK NMIs in publishing in a wider set of scientific journals.

### **Knowledge Transfer - Trade Press Bibliometrics 2005**

10. This new study tested the idea that publishing measurement results in trade and technical journals (as well as in scientific journals) could be a more direct form of knowledge transfer to industrial and commercial users. The main results showed that a relatively small number of articles (about 40) had been published by the NMIs. Even for this relatively small sample it was easily calculated that, after eliminating repeat publications in the same journals, the potential readership of these articles was some 183,000, across a range of industries and technology areas. The authors of the study concluded that there was scope for increasing use of this means of NMS knowledge dissemination.

### **Basic outputs**

11. There are also some straightforward volume indicators for the application of measurement knowledge in business and public sector activities that give a general indication of the value to the economy:

- UKAS provides accreditation to around 342 calibration labs and 1161 testing and inspection bodies.

- The aggregate costs of formal accreditation to these firms can be judged from UKAS turnover, which was around £7.3 million in 1999/00.
- The calibration laboratories issued around 600,000 UKAS authorised calibration certificates and around 10 times as many non-UKAS calibration certificates in 1999, mostly to SMEs.
- A lower bound for the costs to industry from accredited calibration organisations alone would be around £360 million.
- The number of testing episodes is difficult to quantify but is likely to run into many hundreds of millions with a cost of similar magnitude.
- Evidence from NMSD (1999) suggests that there are 130 million tests carried out in the UK National Health Service alone, at an estimated cost of £1.3 billion per annum. Testing in industrial application is likely to be many times greater.
- A way of quantifying a lower bound to industrial benefits is to note that the size of sales of measurement and testing apparatus was around £4.5 billion in 1998 with net trade of around £1 billion.
- Total sales in the UK instrumentation industry, which has a high measurement requirement, were in excess of £9.2 billion in the same year.

NMS Review Team  
February 2005