



Insights

Beyond measurement

Open Innovation

Philips research services discuss the value of supporting global innovation

The value of research

NPL looks at ways a value scorecard can improve the understanding of research impact

Success in efficiency

Brian Bowsher reflects on the successes of a collaborative approach to government outsourcing

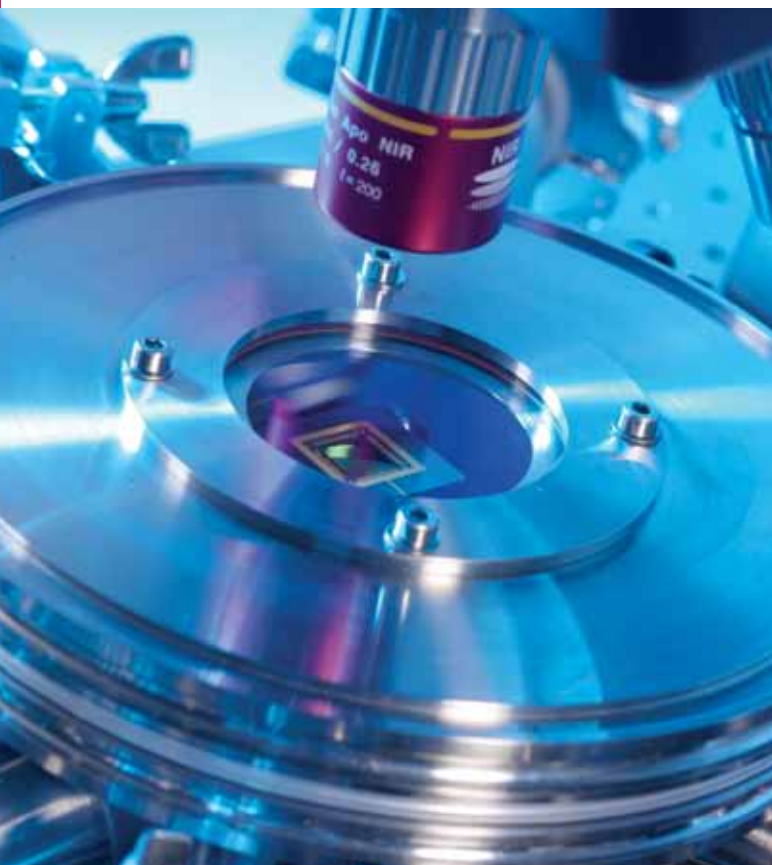
Bringing science to life



Welcome to the NPL's Insights - beyond measurement

The UK has a powerful innovation ecosystem and with NPL's core mission to deliver economic prosperity and improved quality of life we are always looking to new ways to use our science and technology knowledge to deliver these goals. NPL's Insights publication will explore topics over time looking at how the science and technology community in the UK can come together to deliver world class science that can change the way we live our lives and do business, influence government funding and policies while continuing to deliver value for money on the government and tax payers' investment.

For our first edition, we consider whether Open Innovation is more than just a popular phrase of the moment and how understanding research investment can facilitate the longevity of research programmes while delivering tangible impact and benefits to business and the UK economy.



4 Open innovation to accelerate ideas to market

NPL speaks with Philips' High Tech Campus to see how one of the world's most successful companies is helping others accelerate innovation

8 Making innovation happen

Jane Gate discusses how NPL's expertise in running knowledge networks will help AIRTO grow membership and influence and lobby government for the RTO community

10 Measuring the impact of knowledge transfer

Tim Jones outlines how knowledge transfer impact can be better measured to show the value of research funding for research institutes

14 Setting new standards

Brian Bowsher NPL MD outlines how more effective and efficient collaboration between industry, academia and government can ensure that the UK continues to be a competitive player in global research

Open innovation to accelerate ideas to market

Philips Innovation Services (PInS) uses its 40 years of innovation expertise to support thousands of Philips and non-Philips projects every year. Its campus in Eindhoven provides high tech companies with access to state-of-the-art testing facilities and world-leading expertise to help develop its products. Leo Poll of Philips MiPlaza looks at the Philips approach to Open Innovation and how their investment research facilities are helping companies globally to succeed.





Our message to companies innovating now is that if you can't find a certain capability to progress your work then don't presume it doesn't exist



Open innovation thrives from access to technology and expertise. PInS provides both, through

700

highly trained staff

30%

have PhDs, and

40%

a bachelor degree or engineering qualification - open access labs,

15,000

electronic instruments,

19,000m²

of labs and

9,500 m²

of clean rooms (the largest in Europe).

NPL visited Philips' High Tech Campus in Eindhoven to see how one of the world's most successful companies is helping others to accelerate its innovations.

Sprawled across a 1km² site in Eindhoven is Philips' High Tech Campus. It sits at the heart of the Netherlands' Brainport region, named as the world's most intelligent community in 2011 by US thinktank the Intelligent Community Forum.

Housed within the campus is Philips Innovation Services. This combines Philips' experience of successfully developing new products with the principles of open innovation to help companies quickly accelerate ideas into products to be manufactured.

Many innovation initiatives exist to drive growth and development. Philips Innovation Services is different due to its heritage and expertise covering more than 60 competences, including industry consultancy. It is a service organisation with more than 40 years' innovation experience and supports thousands of Philips and non-Philips projects a year, big and small.

"We see Philips Innovation Services as the oil that makes the machinery of innovation move more efficiently," says Gerjan van de Walle, the Business Development Manager at Philips Innovation Services. "It is an innovation eco-system that is open, accessible and practical."

What does Philips mean by 'open innovation'? "It's been fashionable for the last 10 years," continues Gerjan. "But companies have been engaging in open innovation for more than 30 years. For example, in the 1980s Philips worked with Sony on the optical recording standards. The phrase 'open innovation' wasn't common at the time, but that is exactly what we did."

A decade ago managers at Philips were inspired by the open innovation writings of

Henry Chesbrough. It encouraged them to change the way their business worked and to facilitate collaborative working. In 2004 Philips formally brought open innovation into its own strategy. The High Tech Campus is the template for a private enterprise to develop a site geared towards accelerating innovation. The model has been used on a smaller scale by Philips in other countries, by housing the Philips offices within innovation hot spots. For example, Philips moved its UK research activities to Cambridge Science Park to join a global hub of innovation.

Philips Innovation Services' move to share innovation expertise and facilities is not an altruistic gesture. The company is a successful multinational business with a commercial incentive for engaging in this process. Research and development is an expensive exercise. If Philips Innovation Services can maximise the use of its R&D facilities without affecting its own core development work for Philips, it goes towards paying for this. Also, by providing services to innovative young and leading companies, Philips Innovation Services can extend its innovation experience and explore areas that might be interesting for the company in the future.

Open innovation thrives from access to technology and expertise. Philips Innovation Services provides both, through 700 highly trained staff – 30% have PhDs, and 40% a bachelor degree or engineering qualification - open access labs, 15,000 electronic instruments, 19,000m² of labs and 9,500 m² of clean rooms (the largest in Europe).

Trust is essential for open innovation to flourish. As a reliable supplier and partner, Philips Innovation Services always respects customer confidentiality. To not do so would damage the company's brand and reputation. Nevertheless, it is down to customers to decide on the level of interaction with Philips. They can choose just to hire facilities or apparatus, engage Philips to carry out work on their behalf, or work with Philips in partnership to plan how to pursue their innovation goals.

UK-based electronic design company Plextek took the second approach. "Plextek made extensive use of our virtual lab facilities for remote RF testing," says Leo Poll, Philips Business Development Manager for the UK. "What this meant in practice was that Plextek designed an RF component for a customer, had test wafers made in a foundry and then shipped the wafers to Eindhoven. My colleagues in Eindhoven set up our RF test instruments to test the wafer and Plextek logged into the set-up remotely from Cambridge to control and test their design."

Researchers don't specifically need to travel to Eindhoven to use the High Tech Lab. Despite only being a one hour flight from London, the lab, its technology and its people, is becoming more accessible to anyone with an internet connection. Philips' Virtual Lab concept enables customers to use some of its services anywhere in the world. Customers can remotely guide a specialist through the process they need to undertake or manage the operation of advanced equipment themselves.

Other options available to help companies develop their innovations include the EU-funded EUMINAFab project. This provides SMEs in Europe with fee-free access to high tech laboratories through a consortium of 37 partners, including Philips and NPL. It helps SMEs with innovative ideas based on solutions using micro and nano fabrication technologies by providing access to equipment and personnel.

What chance is there of a UK High Tech Campus being developed? Some large corporate companies have already visited Eindhoven to learn about this approach. In the meantime, the infrastructures to develop micro versions are in place. Many UK science and innovation parks can provide companies with access to office space within an established research environment, with some providing access to existing research facilities and personnel. Leo Poll believes that adding a few pragmatic steps designed to encourage collaboration on a social level may be all that is needed to foster more effective cross collaboration.

However, no existing infrastructures can offer the history and range of competences that Philips provides already. "Our message to companies innovating now is that if you can't find a certain capability to progress your work then don't presume it doesn't exist," says Leo Poll. "You can ask Philips Innovation Services; as, if we don't have that capability already we will know someone who will."

Case Study

EUMINAFab provides organisations developing micro and nano technologies (MNT) with access to high-end equipment and expertise in structuring and characterising materials. Accessing such facilities is critical to proving MNT concepts and turning ideas into marketable products. However, few SMEs or research departments can justify such an investment to explore the feasibility of an idea.

This EC funded project allows them access to leading research centres across Europe, including Philips in the Netherlands, Fiat in Italy, and the National Physical Laboratory in the UK, which can provide the necessary support and give MNT developers access to these organisations.



Making innovation happen

NPL has begun a three-year project managing AIRTO, an organisation representing research technology organisations. NPL will draw on extensive knowledge transfer experience, including managing two KTNs, to help members share knowledge, grow AIRTO's membership and extend its influence in business and government.

AIRTO is a members' association for organisations supplying business-to-business and government services in the fields of translational and contract R&D, consultancy, accreditation, validation and testing, knowledge exchange, incubation and early stage financing.

NPL's experience of professional contract management was a key factor in the organisation winning a contract to run the AIRTO member association, says Jane Gate, Director of Operations, AIRTO.



In early 2011, NPL was selected to run AIRTO, the Association of Independent Research and Technology Organisations, until the end of 2013, on behalf of the AIRTO board. AIRTO represents around 40 research technology

organisations (RTOs) who operate at the interface between research and business. These include commercial, government-owned, and academic organisations.

NPL's was the winning bid because it demonstrated:

- Significant expertise and a good track record in delivering professional contract management services and systems
- Excellent networks and contacts that will benefit AIRTO members
- An appreciation of the needs of the membership
- A clear vision to expand membership and raise AIRTO's profile

NPL has a market-leading position in the UK running knowledge networks for government, commercial customers and universities. It is well versed in the mechanics of delivering such networks, such as promotion, management, event coordination, and developing and distributing e-alerts. NPL's management of two innovation networks for the Technology Strategy Board (the Sensors & Instrumentation KTN and the Location & Timing KTN) generated over £100m of innovation funding for members and brought together 4,000 people from a variety of sectors. NPL also runs the UK's Measurement Network, which has 3,000 members and six special interest groups.

AIRTO provides member organisations with a powerful collective voice to policy and government by championing the mission and value of RTOs and the key issues they

face through events, networking opportunities and engagement with public consultation processes. AIRTO creates access to key policy makers, raises the profile of the sector, and facilitates members' sharing of knowledge and expertise to help them run their organisations more effectively (e.g. the Finance Directors special interest group).

"AIRTO has a voice that far exceeds that of members like TWI working on their own, especially when expressing views on public policy and strategy, and communicating with government. AIRTO provides extensive and effective networking opportunities with politicians, senior civil servants and advisors, and fellow research organisations, through a range of unique mechanisms, which are invaluable to our business," says Peter Oakley, Associate Director, TWI Ltd.

NPL recognises that AIRTO is the only organisation dedicated to delivering services to and representing RTOs specifically, and has ambitious plans to grow AIRTO's membership and influence through lobbying and profile raising.

The next three years will be exciting – so why not join us? AIRTO welcomes any organisation operating in the technology transfer and innovation market.

If you are interested in joining AIRTO please contact enquiries@airto.co.uk +44 (0) 20 8943 6600

The Intermediate Research and Technology Sector is positioned between academia and corporate and governmental end-users of technology. It is made up of companies and organisations whose activities bridge gaps in the process of converting research into innovation and new technologies. According to a report by Oxford Economics in 2008, "Study of the impact of the Intermediate Research and Technology Sector on the UK economy", the sector is highly productive with each worker producing 50% more GDP per person than across the whole economy. It contributes at least £3 billion a year to the UK GDP and supports more than 60,000 jobs. The report also states that the sector is estimated to have undertaken R&D worth £400 million in 2006, helping to raise productivity in other UK companies.

Helping institutes to measure the impact of their knowledge transfer

As research budgets are pushed, understanding their value and impacts for business is becoming more critical than ever for continued investment. The National Physical Laboratory looks at the need to develop more effective measures for the impact of research and knowledge transfer by looking at both public good and commercial gain from stakeholders' perspectives. The newly developed 'Value Scorecard' looks at what stakeholders in the programme value and assesses this through quantitative and qualitative measures.





While predicting impact of research is difficult, setting and defining aspirations for impact at the start of a programme and identifying how that impact might be achieved is essential. NPL's value scorecard provides a way of actively monitoring research progress to provide regular reports back to stakeholders, and consistent reporting over medium to long-term time frames. Importantly, the methodology has the flexibility to address any immediate drivers through case studies. That way we can react to the needs of specific stakeholders when we need to.

The Value Scorecard method broadly follows a four-step process:

1. Determining the strategic objectives driving the programme
2. Identifying the key stakeholders in the programme and establishing what they value
3. Defining 'value windows' to view the programme from different key stakeholder perspectives
4. Establishing indicators, measures and metrics that describe performance towards those objectives

The National Physical Laboratory (NPL) has developed a new framework for measuring the impact of the knowledge transfer activity it undertakes. Tim Jones from NPL outlines how this process was developed, how it works.



The need to show the potential economic and societal impact of research is essential now funds are squeezed. Being able to show the value of knowledge helps to justify public investment at a

time when cuts are everywhere. For example, since 2009 applications for funding from the research councils have needed to include more explicit impact plans.

Yet, for many institutions, the methods available for measuring impact aren't quite right. While economic impact can be measured through wealth creation, societal impact can be seen through a variety of results. In fact, much of what we deem 'impact' is different from one person's perspective to another. Therefore, measuring something that can have a subjective qualitative element to provide an objective result can pose problems.

It was an issue like this that was the impetus for NPL to change the way it measures its own impact. Another public sector organisation was working with NPL on a project where impact needed to be gauged. The organisation wanted to explore other ways of measuring its work's influence than just through economic means, as this did not take into account the core role of the organisation in delivering a safe environment, or training people. After the project, we started to think about the similarities of this impact measurement challenge with that of NPL. Surely some aspects of this approach could be developed to improve the way of measuring our own impact? After all, if the UK's National Measurement Institute can't find a framework for effectively measuring impact, then who can?

We had a good foundation to start from. This foundation was based on many years' experience of working with sponsors in government to develop and apply impact assessment techniques. However, we also have to make sure that the work we do satisfies the needs of a diverse mix of stakeholders. At NPL this includes three distinct audiences that we work across – government, academia and industry.

Developing a new methodology

To find a more pragmatic method for showing impact across this range of stakeholders, we first examined the impact assessment techniques that were already being used by NPL and others. These included:

- **Economic models (macro and micro)** – These are simple and easy to use but complex to build, dependent on good quality data, and generally only present a one-sided view
- **Balanced scorecards** – These include financial and non-financial performance indicators linked to strategy, but do not incorporate the complexity of the environment that the work took place in
- **Industry surveys and case studies** – These provide useful evidence and examples, but care is needed with survey design and statistical interpretation. Also, case studies - as their name indicates - are a single example rather than a complete picture
- **Knowledge based view** – This is a complete treatment of management of knowledge as an intangible asset and across the knowledge value chain, but is complex and time consuming

None of the current models seemed effective enough on their own to satisfy the range of stakeholders that NPL needs to transfer knowledge to. Each model lacked something when viewed in isolation and we felt we could develop a better approach, something that took account of our position as a research organisation working at both ends of the spectrum – contributing to both public good and commercial gain.

So, instead, we used our learning from using these models to develop a new tool that took on the most useful aspects of each method. The Value Scorecard positions NPL's stakeholders at the centre of the methodology. It recognises our position in needing to show commercial and societal impact to different funders, investors and partners.

The methodology behind it provides a means of tracking progress towards achieving impact. It does this by drawing together strategic objectives with due acknowledgement of what key stakeholders in the programme value, along with combining quantitative and qualitative measures. In essence, it uses elements from existing models to create a new pragmatic solution that can regularly monitor progress from the stakeholder's perspective.

Value Scorecard for The National Measurement System

Reputation

- Delivering high quality science
- Visible leadership in measurement
- International influence in measurement matters

Economic

- Contribution to UK economic growth (prevention of shrinkage)
- Financial benefits from leveraging investment and offsetting NMS running costs – more with less
- Financial return on investment for BIS, other funders and suppliers

Capabilities

- World class metrology capabilities and skills available in the UK
- Focus for the provision of traceable measurement
- Capability of the NMS to deliver current and future measurement requirements of UK

Knowledge

- Availability of high quality knowledge, relevant to consumers at the right time
- Reach, engage and serve more organisations and individuals
- Easy access to programme deliverables and benefits

Well Being

- 'Well-being' of citizens arising from Health, The Environment, Sustainable practices and Security

Case Study

The Department for Business, Innovation & Skills (BIS) invests £70 million each year to make measurement more accurate for UK business and citizens. The impact of this public investment in measurement is proven. Using economic modelling, it is estimated that an additional £6 million spent by government on measurement technology would deliver up to £410 million of economic impact annually. (Source - Economic Impact Report, Metrology Investment: Impact on Innovation and Productivity, DIUS Science and Innovation Analysis team, May 2009.) Thousands of businesses each year gain measurement know-how and support through the NMS. An independent survey of 1,200 companies found that in a single year the NMS infrastructure helped businesses introduce products and processes that increased profitability by more than £700 million.



Application

We believe our Value Scorecard methodology is a pragmatic solution to addressing the challenges of impact assessment faced in technology and knowledge management environments like NPL. It is a marriage of assessing impact through its link to our overall strategic objectives, and the individual needs of our stakeholders.

We are taking steps to see how the methodology can be applied to a range of similar organisations, such as universities and it could even potentially be used to support demonstrating the benefits of social enterprises.

If you would like to hear more about the Value Scorecard and discuss how it could help to better measure the impact of your work, contact: tim.jones@npl.co.uk

Setting new standards

'Flat cash' investment in research equates to a real-term decline in funding over the next four years, meaning a need for more efficient use of funding which delivers greater impact. Brian Bowsher looks at the successes of outsourcing NPL's contract management through a collaborative approach with Serco that has seen increased quality of science and scientific outputs while reducing costs and implementing more efficient management of the business.

NPL
National Physical Laboratory

The government invests approximately

£7 billion

per annum into publicly funded research, about

£3.3 billion

of which comes from the Research Councils' funding shared between universities (£2 billion) and activities within government laboratories (£1.3 billion).

The importance of the research community to the growth of the UK was recognised within the Comprehensive Spending Review, with a relatively positive ‘flat cash’ settlement for research programmes (although this had greater impact on capital). The government invests approximately £7 billion per annum into publicly funded research, about £3.3 billion of which comes from the Research Councils’ funding shared between universities (£2 billion) and activities within government laboratories (£1.3 billion).

However, we still need to be innovative in how we manage our assets and deliver our science to survive. ‘Flat cash’ still means a 9% decline in real terms over the next four years at a time when the UK’s international competitors are investing heavily in science and technology. There is also the incentive that any efficiency savings can be reinvested in science.

The main innovation I would drive is much stronger collaborative working across the research sector. In our universities, all too often individual researchers protect ‘their’ equipment with low levels of utilisation and there are too many average centres rather than a more limited number of world-leading institutes. We need to work jointly on the big issues facing the UK, providing cross-disciplinary and cross-department thinking and solutions – not the science silos that operate today.

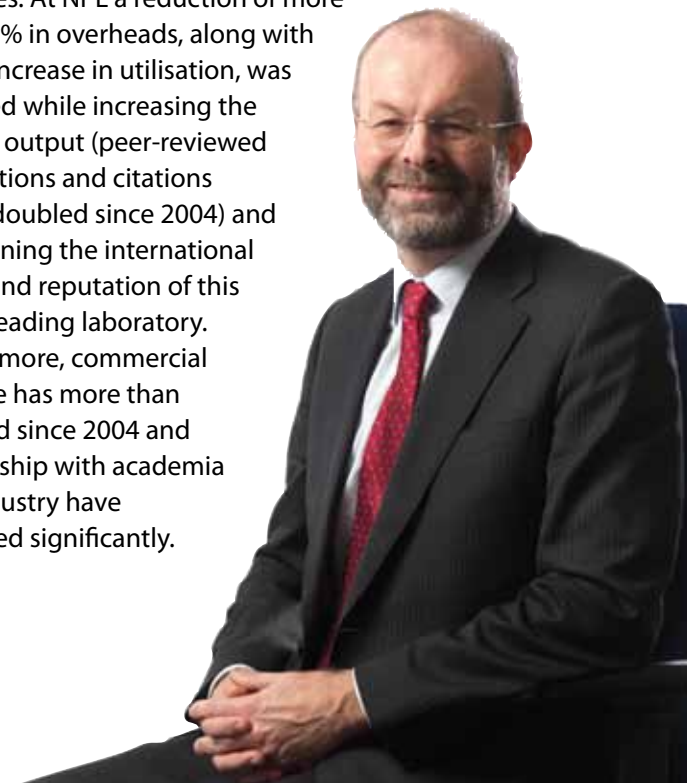
One welcome manifestation of this joined-up approach is the recent creation of the Knowledge and Innovation Group, which brings together BIS’s Innovation Infrastructure (including NESTA, the Design Council, UK IPO, the Technology Strategy Board, and the measurement, standards and accreditation network) and the Research Councils under Professor Sir Adrian Smith’s leadership.

Outside the Science and Research budget, government invests in more than 50 Public Sector Research Establishments in the UK, sponsored by various government departments and operating under a wide range of business models, including non-departmental public body, trading fund, executive agency and government-owned and contractor-operated (GOCO). Each of these has its own mission, customer, projects and delivery mechanisms.

If we introduce much stronger collaborative working across this network, for example, by rationalising and clustering capabilities, we could not only deliver significant savings from more effective and efficient management and sharing of available science assets, but we could ensure UK capability has a critical mass and remains internationally leading, thereby making the UK more competitive. These well sized and shaped research establishments would then effectively team with the best in academia and business to create greater output per pound invested.

Made to measure

Serco has implemented a more collaborative model across the science organisations it manages. At NPL a reduction of more than 30% in overheads, along with an 8% increase in utilisation, was achieved while increasing the science output (peer-reviewed publications and citations nearly doubled since 2004) and maintaining the international status and reputation of this world-leading laboratory. Furthermore, commercial revenue has more than doubled since 2004 and partnership with academia and industry have increased significantly.



National Physical Laboratory

NPL is a world-leading centre for the development and exploitation of measurement science, technology, related standards, and best practice in a diverse range of technical areas and market sectors. As the UK's National Measurement Institute, our capabilities underpin the UK National Measurement System (NMS), ensuring consistency and traceability of measurements in support of UK and overseas customer interests. We aim to provide world-class science and engineering with economic, social and environmental benefits to the UK.

National Physical Laboratory

**Hampton Road
Teddington
Middlesex
United Kingdom
TW11 0LW**

020 8977 3222

www.npl.co.uk

www.npl.co.uk/commercial-services