Response to NHS Chief Executive’s Open Call for Evidence and Ideas

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Technology Strategy Board response to the NHS Chief Executive Innovation Review

Introduction

The Technology Strategy Board is the UK’s Innovation Agency, a non-departmental public body sponsored by the Department of Business Innovation and Skills. Our goal is to accelerate economic growth through stimulating and supporting business-led innovation. We work with and across Government, Business and Academia and our organisation is composed primarily of personnel from business with an understanding of the commercial and technical challenges in specific markets. Our innovation support activities include knowledge exchange, networking and collaboration, and funding for innovative projects. We provide advice to government on policies relating to technology, innovation and knowledge transfer. In the area of Health we have a team of 8 specialists and programme managers, and working with industry, Department of Health, NHS-Strategic Health Authorities we have programmes with expenditure approaching £40m per annum. Some of the key programmes are detailed in appendix A and are summarised here:-

- **Assisted Living Programme (ALIP)** has invested £24.7m and is budgeted to spend another £23m over the next four years. ALIP aims to meet the demand for independent living by driving innovation in products, systems and services to improve quality of life and wellbeing at the same time as reducing costs to the NHS and opening new markets and opportunities for business.

- **Detection and Identification of Infectious Agents (DIIA) Innovation Platform** has invested £15m in the last 2 years and is investing a further £10m to enable companies to address the need to reduce mortality, morbidity and economic burden of infectious diseases.

- **Stratified Medicine Innovation Platform** has invested £9.5m so far and has an additional £40m budget over the next four years supporting companies to create cost-effective solutions to delivering the right treatment to the right patient at the right time.

- **Small Business Research Initiative (SBRI)** is a mechanism supported by Technology Strategy Board by which the Public Sector can engage with innovative small businesses to find and develop novel solutions to intractable challenges. Since the start of 2009 £8.7m of contracts have been issued. These have been in partnership with DH and Strategic Health Authorities (East of England, South East Coast and South Central). In the Growth Review the NHS committed a further £10M to this mechanism over the current and next financial year.

We welcome the review and believe that the NHS has the potential to drive significant levels of innovation delivering a triple benefit to –

Patients – through improved services and outcomes

Public sector – through increased efficiency and effectiveness

Private sector - helping to develop and deploy new innovations and increasing market and enterprise opportunities.
In Sir Ian’s letter to the Technology Strategy Board requesting input he writes “innovation must be encouraged and nurtured...We will need to create “pull” for new ideas ....We need more collaboration, cooperation and integration across all organisations and across private and public sector....We need a longer-term view on investments and we need to ensure staff are supported to introduce and scale up new ideas and technologies”. The Technology Strategy Board input is based on how the NHS could better interact with business to achieve the above goals. We believe that whilst there is no simple solution, major progress can be made through developing the NHS role of a “lead customer”.

The “lead customer”

Industry over the last couple of decades has been moving away from “vertically integrated” structures where all activities occur in-house to more open organisations and processes that encourage “open innovation”. Simply put, working with others to develop new ideas, products and services, looking to outside partners, suppliers and customers to co-operatively develop and deploy better solutions.

In order for a new innovative product or service to be quickly and readily accepted by its target users, it needs to be designed to fit their needs as closely as possible. The best way to achieve this is to work closely with an “intelligent lead customer” when developing the innovation. This relationship is a mutually beneficial one between the developer of the innovation (who gets a better understanding of needs) and the “customer” (who gets early access and a product or service that better fits their needs).

The lead customer articulates its challenges, shares its problems and identifies areas where the status quo is not good enough. It challenges its partners and suppliers to innovate and works with them to define and develop solutions which can deliver breakthrough rather than incremental improvements. Through this engagement the lead customer benefits from creation of products which meets its specific needs rather than procuring nearest available fit, they also get early access to novel solutions and the benefit they can deliver, as well as preferential pricing and support.

Lead customers are important to any innovation driven product provider. Companies use lead customers to de-risk the product creation process by guiding the specification, supporting the development process and testing and validating proto-types. Lead customers can be particularly important to early stage companies that often have a good idea and interesting technology but lack a route to market and the scale to have extensive marketing, test and validation teams. For the small entrepreneurial company the lead customer brings the market requirements and plays a key role in exploratory development.

Successful healthcare technology companies link their R&D capabilities with clinical studies, and the process of observing clinical procedures with healthcare professionals is seen as a key success factor in innovating to address unmet clinical needs. Indeed, competitive advantage can be built around bridging the gap between the technology and the end-user. Interestingly, the AD Little report [34] indicated that R&D and home markets are closely linked, with the latest innovations being trialled and tested in the home market closest to the R&D base. The ability of the home markets to embrace the latest innovations is seen as a key factor in where global companies choose to site their R&D bases.

from Technology Strategy Board ‘Medicines and Healthcare’ strategy 2008
Barriers to the NHS working effectively as a “Lead Customer”

**Financial Systems**
Silo budgets stifle the ability to take a holistic approach to services across the NHS and other sectors (e.g. social services and housing). There is much talk about a move to a preventative and wellbeing approach rather than waiting for emergency admissions, but this will require a dramatic shift in the way that current resources are deployed, especially in the NHS. The need to breakdown silo budgets and consider the costs to the NHS and healthcare as a whole is constantly cited as a significant barrier to the adoption of new technologies.

If the financial systems or tariffs mean that savings from the development and introduction of an innovation don’t accrue to the organisation, or department which has to implement that innovation, then there is no (financial) incentive for them to introduce it. Worse still, if there are cost or other implications of introducing the innovation these act as disincentives to introduce the innovation. An example is the adoption of stratification tests where the budget holder who paid for the tests did not generally see any financial benefit and so was not incentivised to provide the service.

Finally if the financial systems demand plans that show payback on investments within the financial year then they drive short term thinking with long term strategic planning suffering as a result.

**NHS Organisational complexity and/or fragmentation**
The NHS provider landscape is not homogenous. Practice varies from provider to provider as defined by local clinicians (albeit within a uniformity of medical training), whilst supporting processes and administrative systems (e.g. IT) also vary according to choices made by each trust. Within this landscape, some types of technological innovation can fit relatively easily regardless of the variation (e.g. ‘like-for-like’ replacement of liquid-filled thermometers with ear IR thermometers across all forms of clinical practice in all settings). More complex innovation (e.g. that modifies care pathways), requires re-evaluation of benefit and repetition of adoption design for every new setting into which it is considered. In other words, the effort to redesign the practice or processes to incorporate the innovation has to be repeated each time.

Even where there is no need to redesign a product or process, with each trust / practice having freedom to make purchasing decisions, organisations trying to sell new and innovative products and services into the NHS have to make multiple approaches and secure multiple contracts. This inevitably slows the adoption of Innovation, and increases the cost of engagement for both the NHS and for industry.

**Possible Solutions**

**The NHS as a Lead Customer**
From a global perspective, the NHS is a significant, integrated customer. How it behaves towards its suppliers can do much to foster and support innovation. Ideally, the NHS would engage with industry as an intelligent lead customer, widely articulating unmet and emerging needs, specifying challenges at a system level and focusing on desired outcomes rather than specific products. It would also be willing and able to engage in the product creation process providing input, guidance, test and validation of the solution and ultimately be part of the market. When the NHS behaves as a lead customer engaging with business in pre-
commercial stages of solution development it can not only generate more effective and efficient solutions to its own issues, but also support economic growth through working with business to develop globally competitive products and services.

**Managing Innovation**

There are clear benefits in the federated nature of the NHS and the ability to customise the products and services to local needs. However, innovation often requires scale and the solutions for issues such as reducing hospital admissions, coping with an ageing population etc are similar across regions.

Organisational best practice is generally to centralise that which is common and benefits from scale and focus and localise that which needs to be customised. Whilst clinical decisions and deployment are clearly a local issue, it is desirable to have a central team with overarching responsibility for innovation.

As the best idea generation and innovation (both technological and service driven) often happens at the interfaces between different technologies and different organisations. The central team should promote federation and collaboration across NHS organisations, business and other organisations involved in innovation and healthcare. Working across the NHS they would identify and prioritise areas needing innovation, articulating challenges that look at the system level and cut across internal organisational barriers (e.g. between primary and secondary care, or between acute and chronic care), and where appropriate engage with industry to derive innovative solutions, approving solutions for further deployment and avoiding costly duplication for the NHS and industry.

This team should provide a central and authoritative point of contact for industry interaction and be the strategic partner for organisations such as the Technology Strategy Board. They would run programmes designed to drive innovation such as the SBRI (see appendix for more information), and have a budget to drive innovation. This need not necessarily be new money rather consolidating and re-allocating existing budgets earmarked for innovation in NHS and DH.

A structure such as the new NHS Commissioning Board would be a logical home for such a team and provides high level support for innovation.

The Technology Strategy Board is keen to support the NHS in moving the innovation agenda forward and feels that the opportunity exists to develop a partnership, aligning programmes and activities to ensure maximum gain to the NHS and the economy in general.
APPENDIX A

Technology Strategy Board - specific programme areas

Assisted Living Innovation Platform (ALIP)

**ALIP’s Economic & Business Models and Social & Behavioural Studies**

ALIP aims to meet the demand for independent living. By driving innovation in products, systems and services we will improve quality of life and wellbeing at the same time as opening new markets and opportunities. However, many barriers remain if the systems and services are to be implemented and used at scale. We ran a competition in June 2010 which resulted in eight projects worth a total of £12.3m (including £8.8m invested by us) looking at the needs identified in the areas of Economic and Business Models and Social and Behavioural Studies. These projects are looking into many of the issues highlighted above and would be an ideal resource for the Innovation Review to connect to.

The Economic and Business Modelling theme aimed to provide improved evidence to underpin industry and social enterprise, to encourage investment in and implementation of assisted living services and technology. The Social and Behavioural Studies theme aimed to better understand the interactions between Assisted Living technologies and services and individuals, families and communities.

The aim of the Economic and Business Modelling competition was to provide improved evidence to underpin industry and social enterprise, to encourage investment in and implementation of assisted living services and technology. Specifically:

- To understand current and future markets for A/L. Will the market in the UK be driven by statutory provision by the NHS, or private provision? Or both? What is the interplay between the two? Where is the evidence?
- How will technology change the business model? Will the main business, and employment generation be in service provision, rather than device manufacture? How can we move the industry investment case on?
- If the NHS is a complex market, how can we develop financial flow models within the NHS, and integrate new services? What organisational changes will be needed if we are to implement large scale deployments? Returns on investment may be hard to quantify in strict cash terms. How can we measure wider benefits? How can we better understand mainstreaming and private purchase?

The aim of the Social and Behavioural Studies competition was to understand how Assisted Living technologies and services will impact upon individuals, families and communities. Specifically:

- Understanding the ‘users’ and their contexts. Understanding the barriers to adoption of A/L that exist at individual, family and community levels and at an organisational level. Addressing the need for users to acquire new and unfamiliar skills.
- Understanding the nature of ‘Assistive Living Technologies’. Addressing the lack of awareness of the potential of A/L, and limited access to information, and also the lack of access to the technologies themselves except through official gatekeepers.
- Further work in user centred design. Addressing limited usefulness, poor image, unattractive products, stigma, lack of a joined up service model and perceived impact on privacy.
- Methodology and measurement – toolkits, case studies and best practice.
Detection and Identification of Infectious Agents (DIIA) Innovation Platform

The DIIA Innovation Platform has been working with industry, BIVDA, NICE, the NHS and the Department of Health (DH) to consider how it can encourage adoption of quality products.

The DIIA platform and DH have commissioned a series of health economics studies to estimate the impact, in terms of morbidity, mortality and economic burden, of new and improved diagnostic tools and capabilities. For DIIA’s first series of competitions, these studies enabled the competition to estimate a viable cost, sensitivity, specificity and preferred time to result for point-of-care (POC) devices for meticillin-resistant *Staphylococcus aureus*, *Clostridium difficile*, extended-spectrum beta-lactamase producing bacteria, chlamydia and gonorrhoea.

The health economics studies being commissioned will address all the DH priorities for the platform.

The DH priorities are:

- tuberculosis
- sepsis
- antimicrobial resistance
  - hospital-acquired infections (meticillin-resistant *Staphylococcus aureus*; *Clostridium difficile*; extended-spectrum beta-lactamase producing bacteria)
  - community-acquired pneumonia
  - antibiotic prescribing in primary care (ie, diagnostic tools to reduce the inappropriate prescribing of antibiotics)
- sexually transmitted infections
  - chlamydia
  - gonorrhoea.

These studies will be published and made freely available.

The platform is holding a series of NICE/industrial engagement workshops to facilitate dialogue between NICE and industry. To date two workshops have been held and there are plans to have more and to build on them throughout the programme. Presenting companies have included Diagnostics for the Real World, Atlas Genetics, Lumora, Axis-Shield, Enigma Diagnostics, Roche Diagnostics, Smiths Detection, L3 Technology, Myconostica (now Lab 21) and TwistDx.

Along with BIVDA and NICE the platform is supporting and designing a workshop being organised by the Department of Primary Health Monitoring and Diagnosis in Oxford (MaDOx) to address the evidence required for the effective assessment of diagnostic technologies. This workshop will consider all diagnostics and all disease areas and conditions.

In discussion with DH, NICE and BIVDA, DIIA has designed an SBRI competition “Assessing the impact of near-patient testing” which will open on 26 September 2011. The competition will invest up to £1m in projects to produce new and improved tools, products or capabilities in the field of health economics to assist companies in the design and evaluation of diagnostic clinical trials. It is envisaged that the new tools will lead to better adoption of new diagnostic products, where appropriate, by providing assessors and decision-makers with high-quality data on their impact.

Stratified Medicine Innovation Platform

At recent workshops held to develop a sector wide technology roadmap for Stratified Medicine in the UK one of the major barriers identified was the slow adoption of new technologies within the NHS. This issue was raised by attendee’s not only from industry, mainly those from the diagnostics sector, but also flagged by health professionals dealing
with diagnostic testing. Aside from the major issue of ‘silo budgeting’ already discussed, workshop attendee’s wanted to see a system where there were equitable access rights to tests for all patients across the NHS at the appropriate time. The testing infrastructure also needs to be available equally. There was a desire to see a defined reimbursement pathway for Stratified Medicine tests through a smooth integrated system, ideally when tests received approval from NICE a budget should be attached in a model similar to that currently used for drugs.

Some of the barriers to adoption of Stratified Medicine were related to infrastructure within the health system particularly around data handling storage and distribution. Innovation in data storage and wider access to patient data (suitably anonymised) was seen as being a significant opportunity to accelerate development of Stratification systems. There was an impression that professionals across the healthcare spectrum required specific training in the various technologies used to stratify patients. In addition it was felt that there was no long term strategic planning within the NHS to allow the adoption of new technologies in this case particularly related to Stratified Medicine.

Several suggestions were made at the workshop for specific actions, these included national commissioning for Stratified Medicine services. Particularly for diagnostic tests which affect the provision of treatment, and so have a broader financial impact, alternatively cost of both test and treatment could be included in the drug tariff with the test being mandatory before prescription of particular therapy. There was a suggestion for improvement in awareness of the value assessment around drug/diagnostic tests across a wide range of stakeholders including healthcare professionals and commissioners. There was also a suggestion that a mechanism be found to encourage collaboration in clinical trials, perhaps this could be included as a positive in performance evaluation and therefore become a significant driver in career progression.

Small Business Research Initiative (SBRI)

SBRI is a simple process used to find new solutions to intractable problems where no or inadequate solutions exist. This is done by identifying the problem and desired outcome and allowing industry to suggest novel solutions. A competition is used to attract proposals from a broad range of companies, encouraging ideas from other market sectors and small and early stage companies. The challenge is expressed as a desired outcome rather than limiting innovation through specification of a solution. This enables unexpected or previously unimagined ideas to emerge. Following a selection process the most promising ideas receive development contracts to further prove and develop their concept.

Typically competitions are split into two phases.

Phase 1
Proposals concentrate on proving the scientific, technical and commercial feasibility of the proposed project. The results of Phase 1 determine whether the solution should go further to Phase 2 - not all projects will progress to the second phase.

Phase 2
Prototyping is undertaken in Phase 2. Projects that successfully complete Phase 2 can then be commercialised and offered to government departments and others under a normal procurement process.

By using SBRI the Department of Health and some of the more forward thinking SHA’s have engaged with innovative companies to address issues of national importance.

Department of Health:
The DH National Institute for Health Research (NIHR) has used SBRI to uncover highly innovative approaches to the problem of preventing Healthcare Associated Infections. The SBRI competition they ran attracted 56 applications, from across various industries, addressing the dual themes of improving hand hygiene and detecting *C. Difficile* and MRSA on surfaces.

Following initial feasibility studies on 13 of these proposals, 6 were contracted to develop their ideas through to prototype. Each of these offer the potential for significant improvement on current practice and technical solutions. One particularly innovative solution that is being developed is a non-thermal plasma technology from Creo Medical ltd. This technology uses an ionised gas to sterilise hands and offers the ability to reach higher levels of sterilisation, more rapidly than soap and water or alcohol based gels. Critically, this ionised gas is kinder on the skin than either of the standard solutions. This is a key factor in improving the hand hygiene of nurses who potentially must wash their hands more than 100 times in a shift.

**Strategic Health Authorities**

The NHS East of England has been at the forefront of SBRI usage in the NHS, first benefitting from its use in 2009. This experience led them to launch a further competition in 2010. The have addressed: Long Term Conditions, Patient Safety and Childhood Obesity.

Highlights from these competitions include:

- A 3D wound monitoring system from Eykona ltd. That enables better management of chronic wounds
- A new humidification system for ventilators that prevents ventilator acquired pneumonia and the potential for other infections which are associated with current humidification systems
- A new ultrasound technology that enables patients safely to self administer at home for use in musculo skeletal disorders and pain management.

NHS South East Coast has also addressed multiple challenges issuing calls for ideas to address the wellbeing of people with dementia and their carers and the prevention of stroke.

These competitions have lead to the development of new systems to

- keep people with dementia at home through improved monitoring systems
- help people with dementia remain hydrated thus preventing deterioration
- detect Atrial Fibrillation through non contact systems to enable rapid screening (and so prevent stroke)

NHS South Central has also engaged in the SBRI process running a competition to identify technologies to reduce hospital admissions by a targeted 20%

Since the announcement that the SHAs would no longer exist, there has been a reluctance to pursue new challenges using SBRI. It is expected that with the announcement in the growth review of the £10M budget to fund SBRI new competitions will be launched in the near future.