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BRIEFING

Issues and Ideas on Innovation

Informing the NHS Next Stage Review

Jonathan Grant, Philipp-Bastian Brutscher,
Annalijn Conklin, Michael Hallsworth,
Anna-Marie Vilamovska, Evi Hatziandreu

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1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
Westbrook Centre, Milton Road, Cambridge CB4 1YG, United Kingdom
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Preface

This document briefing, prepared for Department of Health, presents a 'think piece' on the key issues and ideas on innovation in the NHS. The objective of the work was to provide a challenge function for the Department of Health on its work around innovation for the *NHS Next Stage Review*. The issues and ideas are grounded in theory or empirical evidence and, where possible, supported by examples. This report does not purport to be a systematic review of innovation theory, but should be of interest to policymakers in the Department who are concerned with innovation, especially in the context of health systems.

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For more information about RAND Europe or this report, please contact the first author:

Jonathan Grant
President
RAND Europe
Westbrook Centre, Milton Road
Cambridge CB4 1YG
United Kingdom
Email: jgrant@rand.org
Tel: 01223 353329

Summary

This paper was commissioned by the Department of Health to help inform the conceptualisation and development of an innovation policy in the context of the *NHS Next Stage Review*. The purpose of the paper was to present a 'think piece' that challenged perceived wisdom and began to elaborate some 'big ideas'. The work was done to a short timescale and as such cannot be considered a systematic analysis of innovation thinking or policy. The work presented here was assimilated from our existing knowledge on innovation, from quick scans of the literature and from a number of brainstorming sessions within the RAND Europe team, and also with the Department of Health.

We have structured this paper as an annotated briefing. The key messages of the report can be found in the slides at the top of each page, with text providing further details underneath. This layout highlights the major thrusts of the project through the slides, but also allows the reader the option to delve deeper into the detail of the report as circumstances permit.

In summary we identify five key issues, and five key 'ideas', that the Department needs to consider in conceptualising an innovation policy for the NHS.

The key issues are:

- What is innovation?
- The 'innovation gap' in the NHS is finite.
- Innovation does not occur in isolation, but is part of a complex ecosystem.
- What is the degree of 'hidden innovation' in the NHS?
- Is the current NHS innovation architecture sufficient?

The key ideas are:

- Remember that leadership and culture are both key.
- Increase the price elasticity of health.
- Use information to increase competition.
- Use prizes to incentivise innovation.
- Use procurement to stimulate innovation.

Each of these issues and ideas are developed in the following slides.

Issues and ideas on innovation

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Policies to promote innovation have become increasingly popular over the past decade. The European Lisbon Strategy of 2000 made such policies a priority in order "to make Europe the most competitive and dynamic based economy in the world".[1] In the UK, innovation has been a key part of science policy since the publication of the 1993 White Paper *Realising Our Potential* [2] which, for the first time, conceived UK science policy within the broader framework of innovation policy. More recently, Lord Sainsbury's review, *The Race to the Top: A Review of science and innovation policies*,[3] emphasised the need for the UK to become a knowledge-based economy in the era of globalisation by providing stewardship for an effective science and innovation system. In both cases, wealth creation seems to be the driving force for the importance of innovation.

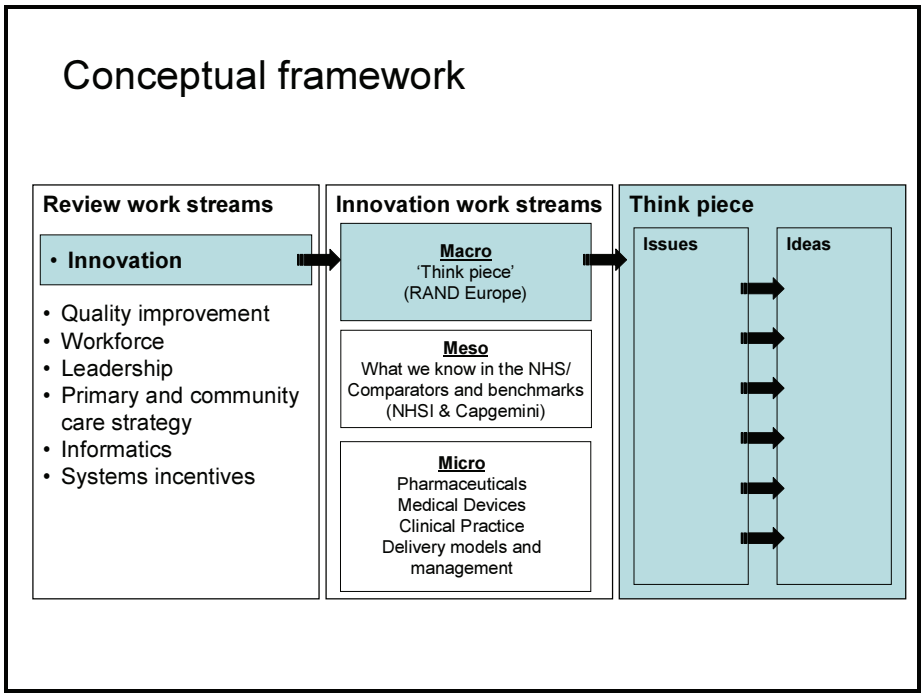
In the context of the NHS, the *Next Stage Review*[4] shifts the focus onto the need for the NHS to adopt new products, procedures and processes. It is envisaged that innovation will contribute to a 'self-sustaining, self-improving' NHS, and thus is not an activity unto itself. This paper aims to inform the thinking of how innovation can be embedded within the NHS. It explores wider experience and understanding of what it is to be innovative and what are the key issues facing the NHS in the context of innovation. And finally, it proposes some ideas for stimulating innovation.

[1] Lisbon European Council 23 and 24 March 2000 – Presidency Conclusions – Employment, Economic Reform and Social Cohesion.

[2] Cabinet Office (1993) Realising Our Potential: A Strategy for Science, Engineering and Technology. HMSO, London

[3] Copies of the report are available at: http://www.hm-treasury.gov.uk/independent_reviews/sainsbury_review/sainsbury_index.cfm

[4] Darzi (2007). *Our NHS our future. NHS Next Stage Review. Interim Report*. Department of Health, London.

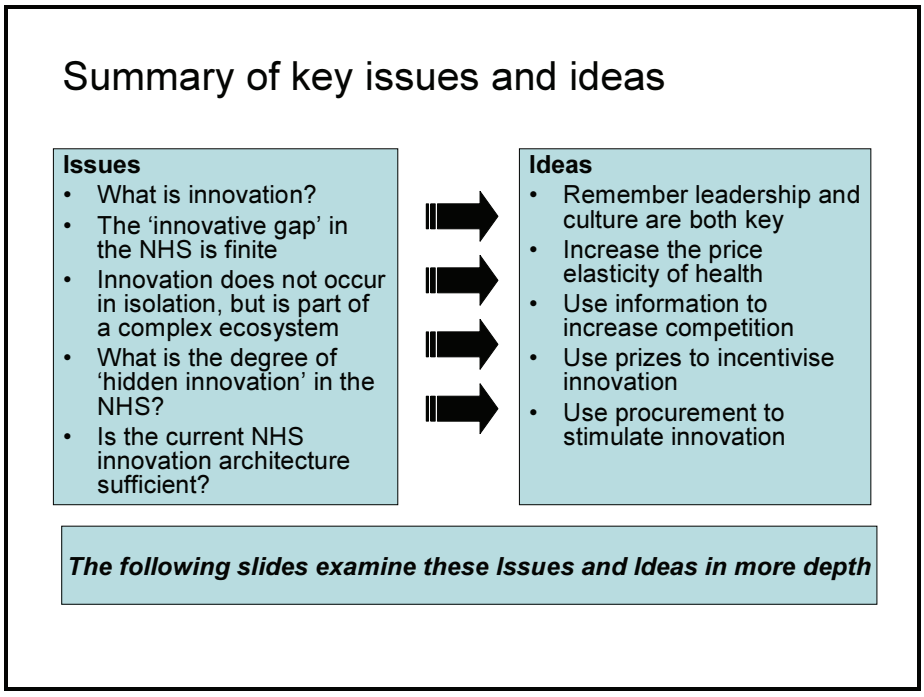


This 'think piece' is located in a wider set of work supporting the *Next Stage Review*. The work on innovation complements and is inter-linked with other examinations of quality improvement, systems and incentives, and leadership (amongst others). In the conceptual framework above, the work stream on innovation has been conceptualised into three layers. The first 'macro' layer is the focus of this paper and has two specific aims:

- To identify a set of key 'issues' that may challenge perceived wisdom in the context of innovation in the NHS; and
- To offer some 'ideas' and proposals for addressing these key and other issues.

The second 'meso' layer is being taken forward by the NHS Institute (NHSI) and Capgemini and is examining what actually happens in the NHS and other health systems or benchmarks. Finally, there are four streams of work led by the Department that examine innovation in different 'sectors': pharmaceutical; medical devices; clinical practice; and delivery models and management. This is at the 'micro' level in the framework.

It is important not to take the ideas and issues articulated in this piece in isolation, but to ensure they contribute to the wider thinking on innovation, and the *Next Stage Review*.



In the slide above we have summarised the key issues and ideas examined in this documented briefing. The key issues and ideas were prioritised from a longer list that was discussed and debated at a workshop with Department of Health staff on the 7th December 2007. The long list of issues and ideas, with a brief explanation, is provided in the Annex for further information.

What is innovation?

- The innovation process is commonly divided into three stages – also referred to as the Schumpeterian trilogy:
  - **Invention** is the initial conception of an idea
  - **Innovation** is the first market application of the idea to actual practice by a firm or a consumer
  - **Diffusion** is the process by which additional firms and consumers adopt the new technology.
- Innovation is a process that is far from linear and straightforward: inventions can occur at any point and generate further invention, and so on.
- Innovation cannot be measured directly; it is only possible to use proxy indicators. Both policy and business behaviours tend to be driven by such indicators as much as by the real drivers suggested by theoretical analysis

The innovation process is commonly divided into three stages: invention, innovation and diffusion. Invention is the initial conception of an idea. Innovation is the first application of the idea to actual practice by a firm or a consumer. Diffusion is the process by which additional firms and consumers adopt the innovation. This is referred to as the Schumpeterian trilogy.[5] The innovation process is complex and non-linear: an invention can occur at any point and lead to another invention, and so on.

It is useful to further distinguish between incremental and fundamental innovations (a single disruptive innovation). Schumpeter (and much subsequent literature) concentrates on fundamental innovations, and only relatively recently have applied scholars recognised the importance of the cumulative effect of incremental innovations.[6]

A further distinction can be made between product innovations and process innovations. Product innovations involve the introduction of new goods or services that are new or substantially improved. Process innovations involve the implementation of a new or significantly improved production or delivery method (typically associated with lower cost).

What we measure is always a proxy or indicator of innovation. In particular, intellectual property rights pose a great difficulty in this respect: a small proportion of innovation may be subject to copyright but most copyright material is not innovative (to the extent we are interested in utility rather than originality) and much of what is patented is 'merely' design rather than innovation or the outcome of R&D. The precise level and visibility of innovation is thus difficult to establish even when related to products and product-like services. For structural innovation in organisations and social innovation in the creation of new applications for existing products and/or services, visibility can be even more difficult.

[5] Schumpeter (1947) The Creative Response in Economic History, *The Journal of Economic History,, 149-159.*
[6] Nelson and Winter (1982) *An Evolutionary Theory of Economic Change*, Cambridge MA, Belknap,

The 'innovation gap' in the NHS is finite

- There is an assumption in the *NHS Next Stage Review* that the NHS has the potential to increase its innovative activities
- But there must be a finite (but unknown) level of innovation that the NHS can initiate and absorb, and there are a number of reasons to suggest this may be near its capacity:
  - The NHS is too large and too complex in structure to innovate
  - Pace of change in the NHS is inhibiting innovation
  - The market for health care structurally inhibits innovation
  - Innovation *per se* is a "wicked problem" that challenges public and private sectors in the UK and elsewhere
- In implementing an innovation policy for the NHS, it may be necessary to manage expectations and have a clear conceptual understanding of the theoretical limitations of innovation in the NHS

There are a number of characteristics inherent to the NHS that may make it unrealistic to anticipate further innovation. For example, these could include:

- **Size and structure** can be a barrier to innovation. To preserve their innovative fecundity, some companies spin off units when they grow too large.[7] There is, however, a trade-off: large organisations can permit and carry risk-taking.[8]
- **The pace of change** in an organisation may affect the uptake of innovation. There is evidence that a system must be allowed to achieve "maturity" in order to aid its assimilation of innovations.[9] In the context of the NHS, it has been argued that "oscillations of policy over the past decade" have created "innovation fatigue" or "change fatigue" in the NHS.[10]
- **Economic characteristics** of the health sector may inhibit innovation. As discussed later in this briefing, the price elasticity of health is known to be low and this, theoretically, could prevent certain types of innovation.
- **Innovation is "wicked problem" -** a term initially developed in the 1970s in relation to social planning.[11] It is difficult to tackle wicked problems because every aspect of the problem can be considered as a symptom of yet another problem.

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[7] Fritsch (2001) Product innovation, Process innovation, and Size, *Review of Industrial Organisation*, 19:3, 335; Damanpour (1996) Organizational Complexity and Innovation: Developing and Testing Multiple Contingency Models, *Management Science*, 42:5, 693-716.

[8] Dewar and Dutton (1986) The Adoption of Radical and incremental Innovations: An Empirical Analysis, *Management Science,* 32:11, 1422-1433.

[9] Cunningham (2005) *A case study analysis*. PUBLIN Work Package 4: Synthesis Report, NIFU STEP, Oslo; Gustafson *et al.* (2003) 'Developing and Testing a Model to Predict Outcomes of Organizational Change", *Health Services Research* 38:2, 751-776.

[10] Ham (2006) Creative Destruction in the NHS, *BMJ* 332, 984-985; Garside (2004) Are we suffering from Change Fatigue? *Quality and Safety in Health Care*, 13:89-90; Greenhalgh *et al.* (2004) Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations, *The Milbank Quarterly* 82:4, 581-629, 604.

[11] Rittel and Webber (1973) 'Dilemmas in a General Theory of Planning' *Policy Sciences*, 4: 155-169,

Innovation does not occur in isolation, but is part of a complex ecosystem

- Innovation cannot be seen as linear process; rather, it is a series of complex interactions between many different actors.
- One way of analysing these complex innovation interactions is by analysing the construction and distribution of knowledge in organisations
- A key concept is "absorptive capacity" – an organisation's ability to identify, capture, interpret, share and reframe new knowledge; to link it with its existing knowledge base; and to put it to appropriate use
- An 'ecosystem' model incorporates the complexity of innovation and the benefits of absorptive capacity. For example, 'knowledge ecosystems' are bottom-up, emergent and fluid networks that can cope with a turbulent environment
- Therefore, developing and nurturing an NHS 'innovation ecosystem' could increase its absorptive capacity and encourage the formation of the complex, dynamic interactions that produce innovation.

As previously noted, innovation is "a complex and interactive process involving multiple feedbacks between different services and functions as well as manifold interactions with customers and suppliers".[12] Complexity is created in the many fluid interactions and connections between different actors that lead to innovation. The recent Sainsbury Review lists some of the multiplicity of players in the UK's 'innovation ecosystem'. However, we wish to propose a more radical understanding of how such an 'innovation ecosystem' actually works, drawing on thinking on complexity science and organisational behaviour.

Many of these issues are addressed by knowledge-based approaches to organisational innovation, which offer a way of understanding innovation in organisations such as the NHS. These approaches consider innovation and diffusion as "the construction and distribution of knowledge".[13]

There is empirical evidence that an organisation is better able to assimilate innovations, particularly technological innovations, if it is "able to systematically identify, capture, interpret, share, reframe and re-codify new knowledge; to link it with its existing knowledge base; and to put it to appropriate use".[14] This ability has been given the title of "absorptive capacity".[15] As this list makes clear, "absorptive capacity" incorporates the principles of knowledge use and exchange that leads to innovations. The prerequisites for building such capacity are given as:

- An existing organisational knowledge and skills base
- A "learning organisation" culture

[12] NESTA (2007) *Hidden Innovation: How innovation happens in six 'low innovation sectors*, NESTA, London, p.15; *op cit* Damanpour (1996).

[13] *Op cit* Greenhalgh (2004); Gopalakrishnan and Bierly (2001) Analyzing innovation adoption using a knowledge-based approach, *Journal of Engineering and Technology Management*, 18:2, 107-130.

[14] Greenhalgh *et al* (2005) *Diffusion of Innovations in Health Service Organisations: A Systematic Literature Review*, BMJ Books

[15] Cohen and Levinthal (1990). Absorptive capacity: A new perspective on learning and innovation, *Administrative Science Quarterly*, 35:1, 128-152.

- Proactive leadership directed towards evidence sharing[16]

Given the complexity of the interactions that produce innovation, how can such absorptive capacity be generated and sustained in the NHS? The growing body of thought around 'ecosystem' models offers an answer. While the concept of an 'innovation ecosystem' is still developing,[17] the more established notion of a 'knowledge ecosystem' draws together these two threads of complexity and knowledge exchange. A knowledge ecosystem is based on the view that top-down management may be ineffective when attempting to create and control complex phenomena (innovation) in a shifting environment (the NHS). Rather, management should aim to create an 'ecosystem' that encourages interactions and links between entities, which will create self-organising, emergent networks that are resilient in the face of changing demands and a changing environment.[18]

The concept of a 'knowledge ecosystem' indicates that, rather than attempting to artificially stimulate innovation directly, it is better to create the culture, curiosity, incentives and leadership that encourage complex dynamic links to be formed between individuals and groups, leading to the rapid and fluid knowledge exchange that breeds innovation.[19] Although not without challenges, the application of this concept has the potential to create a more productive and resilient NHS 'innovation ecosystem'.

[16] *Op cit* Greenhalgh *et al* (2005).

[17] Although the Sainsbury uses the term 'innovation ecosystem' and lists the actors involved, it does not explore the concept fully. See also: Bronfenbrenner (1970) Towards an experimental ecology of human development, *American Psychologist*, 32, 513-31; Adner. (2006) Match your innovation strategy to your innovation ecosystem, *Harvard Business Review*, April 1 2006; Callaghan (2004) Technological Innovations in Organizations and their Ecosystems, in Dutton (ed) (2004) *Transforming Enterprise: The Economic and Social Implications of Information Technology*, MIT Press.

[18] Wood (2000) *Managing Complexity*, Economist Books.

[19] Bray (2007) "Knowledge Ecosystems: A Theoretical Lens for Organizations Confronting Hyperturbulent Environments', in McMaster, T (ed.) *Organizational Dynamics of Technology-Based Innovation: Diversifying the Research Agenda*, Springer, Chapter 31.

What is the degree of 'hidden innovation' in the NHS?

- 'Hidden innovations' are activities that can make vital contributions to the practice and performance of sectors, but which are not reflected in traditional innovation indicators
- Examples may include the development of oil drilling techniques through application in the field and back-office technologies in financial services
- Are we missing the 'hidden' innovation that is taking place in the NHS?
- If so, new metrics and measurement tools may be needed to identify the hidden innovation in the NHS.
- We recommend that any new metrics should draw on ideas about hidden innovation from a wide variety of other sectors
- However, remember Goodhart's Law – once a factor is identified and used as an indicator or target, it may lose its ability to measure accurately. In other words, 'hidden innovation' may only work if it remains 'hidden'.

'Hidden innovations' are underexplored activities that are not reflected in traditional indicators (e.g. investments in formal R&D, or patents awarded).[20] Despite not being measured, hidden innovation may make vital contributions to the actual practice and performance of a sector. For example, hidden innovation can account for:

- the development of oil drilling techniques through application in the field
- back-office technologies and integration of ICT in financial services
- new, more successful programmes for the rehabilitation of offenders.

'Hidden innovation' was recently examined by the National Endowment for Science, Technology and the Arts (NESTA) and the University of Manchester's Institute of Innovation Research.[21] NESTA identified four types of hidden innovation, three of which represent publicly-funded services that are typically excluded from studies of innovation:

Type I: innovation that is identical or similar to activities that are measured but which is excluded from traditional measurement;

Type II: innovation without a major scientific and technological basis, such as innovation in organisational forms or business models;

Type III: innovation created from the novel combination of existing technologies and processes such as internet banking;

Type IV: relates to locally-developed, small-scale innovations that take place 'under the radar' not only of traditional indicators but often also of many of the organisations and individuals working in a sector (e.g. multidisciplinary construction teams, everyday classroom innovations).

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[20] NESTA (2007) 'Hidden Innovation: How innovation happens in six 'low innovation sectors' London: NESTA.

[21] *Ibid;* NESTA (2006) *The Innovation Gap: Why Policy needs to reflect Reality in the UK*, London: NESTA; Howells, J., Tether, B. (2004) *Innovation in services: Issues at stake and trends*, Institute of Innovation Research (published by the European Commission).

The question then arises: are we missing the "hidden" innovation that takes place in the NHS, such as innovation in organisational forms or business models like new contractual relationships (Type II), or the novel combination of existing technologies and processes (Type III)? If so, this raises the further question of what types of hidden innovation are more prevalent in, or relevant to, the NHS.

There is a plausible argument that we can only attempt to increase innovation once we know its prevalence. If indeed there is 'hidden innovation' and 'substantial under-reporting of R&D activities within services' in the UK,[22] this suggests that our instruments for measuring the extent of innovation in the NHS may need to be refined. This is the recommendation of both NESTA and the Institute of Innovation Research. In particular, NESTA suggests that existing metrics are based on a relatively linear model of innovation (centred on formal R&D) that is increasingly irrelevant to the UK.[23] While it is likely that innovation metrics will continue to depend on proxies or contingent indicators (e.g. R&D spend, number of patents or publications for "visible" innovation), NESTA suggests that it is possible to develop such indicators that are more sensitive to the way hidden innovation works. They give the example of measuring exploration expenditure in the oil industry, rather than R&D expenditure.[24]

Clearly, the main challenges are:

- to ascertain whether and how hidden innovation can be identified and measured in the NHS
- to use such measurement to assess how much 'hidden innovation' is present in the NHS
- to decide how best to stimulate such innovation.

However, it may be necessary to sound a warning note. It may be that 'hidden innovation' can only be productive if it remains 'hidden'; since the evidence base on hidden innovation is still very small there is, however, no evidence to support such a warning. Furthermore, with regards to the challenge of measuring hidden innovation, it has been suggested that using a phenomenon to create indicators or targets will disrupt this phenomenon and consequently the indicator will lose its usefulness. This idea was originally formulated by the economist Charles Goodhart as "any observed statistical regularity will tend to collapse once pressure is put on it for regulatory purposes".[25]

[22] Howells and Tether (2004) *Innovation in services: Issues at stake and trends*, Institute of Innovation Research (published by the European Commission), p102; Midgley and Dowling (1978) Innovativeness: The concept and its measurement *Journal of Consumer Research*, 4, 229 – 242.

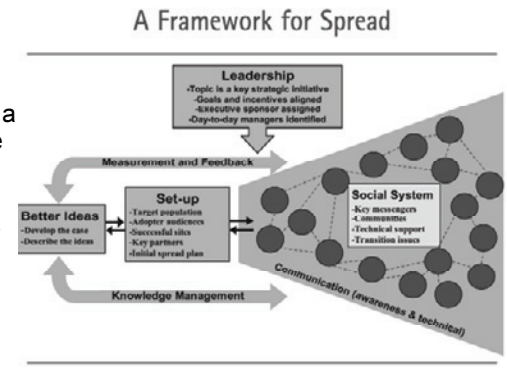
[23] *Op cit* NESTA (2007) p12.

[24] *Op cit* NESTA (2007) p22.

[25] Goodhart, (1975) Monetary Relationships: A View from Threadneedle Street in *Papers in Monetary Economics*, Volume I, Reserve Bank of Australia, 1975.

Is the current NHS innovation architecture sufficient?

- The NHS has established initiatives that aim to encourage innovation
- There is the appearance of a comprehensive architecture for innovation
- Questions to consider:
  - ➢ Is the architecture working?
  - ➢ Has the architecture had sufficient time to mature?
  - ➢ Are the elements of the architecture scalable?
- Trade-off between need for system change and system stability
- A clear evaluation plan is needed



Source: Nolan, K. et al (2005) Using a Framework for Spread: The Case of Patient Access in the Veterans Health Administration; *Journal on Quality and Patient Safety,* 31(6)

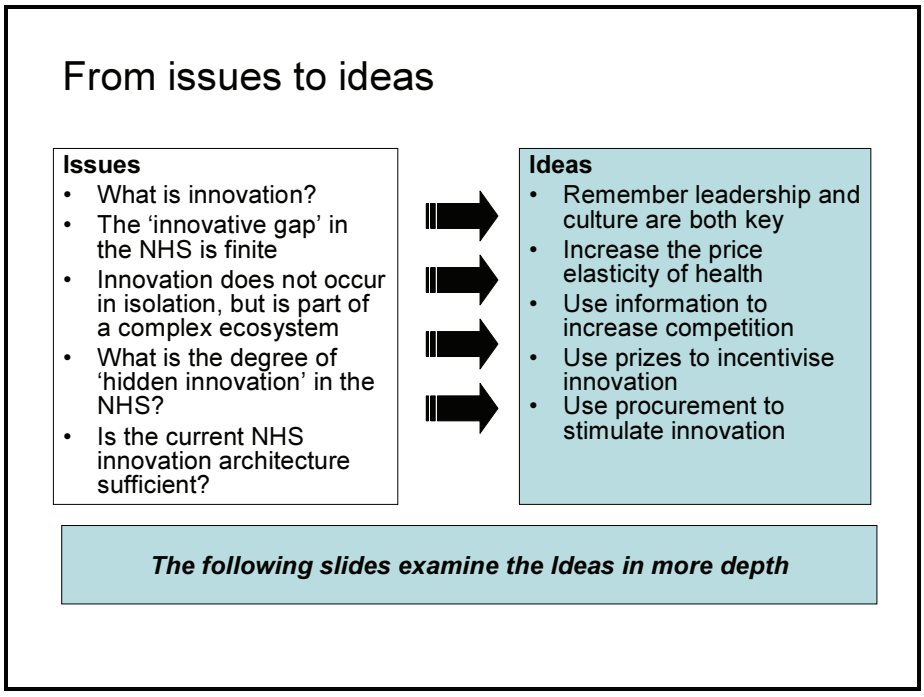
Over recent years the NHS has established a number of initiatives that either explicitly aim to encourage innovation or to stimulate innovation in the service indirectly. Current innovation activities and organisational structures provide the appearance of a comprehensive architecture for an innovation ecosystem for the NHS. The elements of this architecture include: the NHS Institute for Innovation and Improvement, associated Innovation Hubs, the NIC and the new Adoption Hub, NICE, the Centre for Evidence-based Purchasing and the newly created Health Innovation Council (to name but a few). The questions facing the Department are:

- ➢ Is the architecture working?
- ➢ Has the architecture had sufficient time to mature?
- ➢ Are the elements of the architecture scalable?

At this stage it is difficult make a judgement on these questions, but there seems to be an *a priori* assumption that the innovation architecture is not working (although, given the preceding comments on hidden innovation, such an observation needs to be treated cautiously).

Another issue relating to the architecture of the NHS is the trade-off between further system change and the system stability needed for blending, maturation and, ultimately, seamless functioning. The case can be made that the recent series of reforms/changes within the NHS may have hindered the innovative potential of the architecture.

A clear evaluation plan with concrete outcome measurement would allow a verdict on the effectiveness and appropriateness of the current architecture. If the architecture was indeed shown to be successful, then a phased "scaling up" would be required. The ultimate goal would be to create, articulate and communicate, in clear terms, the existence of a coherent innovation ecosystem.



The preceding section outlined a number of the key issues and challenges faced by the NHS in moving towards a 'self sustaining, self improving' organisation. It is evident that a coherent innovation policy can help deliver such an aspiration, but at the same time innovation alone will be insufficient. Moreover, there are a number of inherent barriers within the NHS that may inhibit innovation, whilst it may also be the case that there is also a lot of innovation occurring that is not visible. In the next section we move from framing the issues to suggesting solutions or ideas. These ideas are proposed in the context of the conceptual framework introduced at the beginning of this annotated briefing. That is, they are 'macro' level concepts that will need further development and testing before consideration for implementation.

Remember that leadership and culture are key

- Research has shown that organizational culture and climate are associated with attitudes towards adoption of innovation: the stage for innovation is set from the top
- Leadership is necessary because it:
  - Fosters commitment
  - Fosters culture
  - Establishes value system
- Key characteristics include: strong leadership, clear strategic vision and visionary staff in pivotal positions, a climate conducive to experimentation and risk taking
- Leaders are the strongest symbols of organisational culture
- Culture provides a foundation for creating a "plethora of innovation ignition sources"
- Incentives will be key to creating a climate for innovation

Leadership and culture lay the groundwork and create the nurturing environment necessary to foster innovation. These two parameters are both key in moving from the **'let it happen and help it happen'** approach to **'make it happen'.**

Although the outcomes of innovation may be hard to predict, the process of innovation is not as unpredictable as we may think. Research has identified processes that create successful innovations, processes that are amenable and predictable.[26] Research has also shown that organisational culture and climate are associated with attitudes towards adoption of innovation.[27]

That innovation requires orchestration from the top was firmly suggested in a 2006 study[28] on innovation that surveyed 765 CEOs from different sectors and from around the world. CEOs acknowledged that they have primary responsibility for fostering innovation. To promote and foster innovation effectively, CEOs need to create a more team-based environment, reward individual innovators and better integrate business and technology. In drawing on human capital as the "top sources of innovative ideas", CEOs stressed the overwhelming importance of external collaboration, reaching beyond structural limits by collaborating on a massive scale to open a world of possibilities for innovation.

Strong leadership, clear strategic vision and visionary staff in pivotal positions, and a climate conducive to experimentation and risk taking are some of the essential components of the non-structural, or "softer", determinants of organisational innovativeness.[29] Organisational culture exerts a significant influence on performance. Indeed the combination of culture, knowledge and

[26] Clayton and Christensen (2003) *The Innovator's solution: Creating and Sustaining successful Growth*, Cambridge M.A, Harvard Business School Press.
[27] Aarons *et al* (2005). *Organizational Culture and Climate and Attitude Toward Innovation Adoption*, Presentation for the 20th Annual SIOP Conference L.A.
[28] IBM Global Business Services (2006) *Expanding the Innovation Horizon: The Global CEO Study 2006*, IBM Corporations, New York.
[29] Op cit Greenhalgh *et al* (2004).

capital was identified as a key determinant for successfully transforming state-operated East German enterprises.[30]

In the context of the NHS, a number of observations can be made regarding innovation, leadership and culture that need to be considered in the wider work of the *Next Stage Review*, especially on leadership and incentives. These include:

- An impediment to effective NHS leadership may be the discrepant (perceived or real) time lag between reaping the benefits of innovation and the term of service. Longer term service or career advancement and recognition may mitigate this.
- Incentives will be key to creating a climate for innovation. At present there is a view (whether real or not) that the 'target driven' culture of the NHS results in risk avoidance. A more effective approach would embed a proactive, positive stand by establishing incentives to come up with ideas, to experiment and take risks. This could be done for example by installing an award for "successful failure".
- The structure of the NHS can be characterised as a collection of autonomous organisations, 'siloised' to different extents. A 'permeable boundaries' strategy—as was successfully implemented by Novartis to facilitate work across disciplines, functions, geographic and corporate boundaries—could be used by the NHS to overcome the problem of silos and to foster innovation.
- Irrespective of organisational capacity for innovation, one of the most striking features (common to most of the case studies in a recent PUBLIN synthesis report on Innovation in the Public Health sector[31]) was the key role played by the presence of highly skilled and committed 'entrepreneurs' or champions, able to drive the innovation process.
- The 'linkage and exchange' initiative was developed and applied at the Canadian Health Services Research Foundation as a tool of moving research into policy[32]. It entails establishing functional partnerships between researchers and policy makers in nearly all of the Foundation's activities (setting priorities, funding decisions etc), including its governance.

[30] Breu (2001) The Role and Relevance of Management Cultures in the Organizational Transformation Process
[31] *Op cit* Cunningham (2005).
[32] Lomas. (2000) Using ' Linkage And Exchange' To Move Research Into Policy At A Canadian Foundation; *Health Affairs*; 19(3).

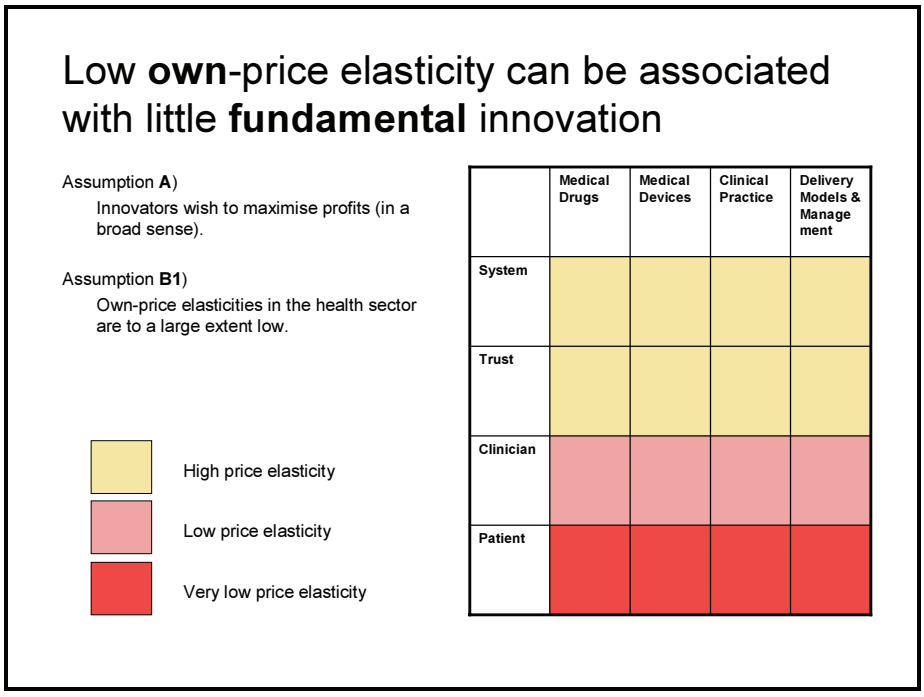
Increase the price elasticity of health

- There is good evidence that the health sector is characterised by low price elasticity, where low elasticity implies that demand is insensitive to changes in price
- Theoretically price elasticity is positively correlated with
  - Fundamental innovation (as opposed to incremental innovation)
  - Process innovation (as opposed to product innovation)
- Therefore, if the Department wishes to encourage either fundamental or process innovation, then it needs to increase price elasticity
- As discussed on the following slides this could include, for example, increasing choice, introducing co-payment, de-regulating prices, etc

There is good evidence that the health sector is characterised by low own-price elasticity and low cross-price elasticity[33]. Own-price elasticity is the change in quantity demanded that follows a one percent increase in price of the same product. Cross-price elasticity is the change in quantity demanded of a good that follows one percent increase in the price of another good.

If one assumes a profit maximising innovator (perceived in a broader sense such as the extent that prestige is correlated with hypothetical profits e.g. wide adoption), it can be shown that low own-price elasticity is associated with too little fundamental and too much incremental innovation. Similarly, a low cross-price elasticity is associated with too little (cost-saving) process and too much product innovation.

[33] Ringel, J.; Hosek, S.; Vollard, B. (2002) The Elasticity of Demand for Health Care. A Review of the Literature and Its Application to the Military Health System. RAND Monograph Report: and Stern, S. (1996): Market Definition and the Returns to innovation: Substitution Patterns in Pharmaceutical Markets. MIT Working Paper.



We know that the inelasticity of demand on the micro-level is, at least in part, due to effects of insurance, unawareness of cost, alternative treatments, etc.[34] Patients and (indirectly) clinicians differ in their degree of health insurance and the effect insurance has on their behaviour. The same is true for the awareness of patients and clinicians with respect to cost and alternative treatments. As a simplification (which maintains one's ability to generalise) we can assume that (aggregate) demand on the micro-level consists of two parts: one comprising price-sensitive and one comprising price-insensitive patients and doctors. The overall degree of price-sensitivity (or price-elasticity) will depend on the share of the price-sensitive part relative to the price-insensitive part.

In this setting, an innovator faces the following decision:

- Invest in incremental innovations and recoup the investment by serving the price-insensitive part of demand, charging a high price.
- Invest in fundamental innovations and recoup the investment by serving the whole market (i.e. both sensitive part and insensitive part) at a relatively low price, taking into account the significance of the innovation.

Obviously, the larger the share of demand which is price-insensitive, the less attractive it becomes to invest in fundamental innovations, since (nearly) the same market can be served at the same price with fewer investment costs.[35]

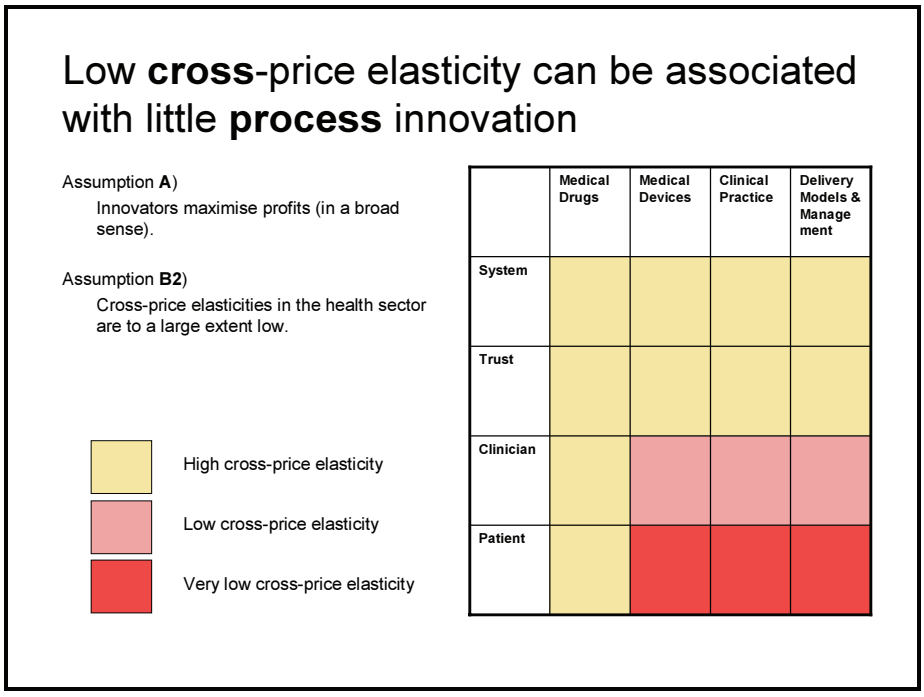
There are two ways to deal with this problem:

- Increase price-sensitivity (or own-price elasticity of demand) on the micro-level by, for example, introducing co-payments, decreasing reference prices, expand fund holding / prescribing budget constraints, publish cost comparisons, etc.

[34] Ringel, J. et al (2002) The Elasticity of Demand for Health Care. A Review of the Literature and Its Application to the Military Health System. RAND Monograph Report.
[35] See Dominguez,B; et al (2005): R&D in the Pharmaceutical Industry: A World of Small Innovations; Universtiat Pompeu Fabra Working Paper
downloaded from http://www.econ.upf.edu/docs/papers/downloads/936.pdf

- Increase competition between innovators. The idea is that under competition each innovator will have an (additional) incentive to be the one with the leading improvement. This can offset the incentive to invest primarily in incremental innovations in part: in some sectors such as pharmaceuticals, R&D markets may be fairly competitive already. In others, such as medical devices or clinical practices, this may not be the case and could be improved e.g. by means of prizes (which increase the awareness of innovators of each other and thereby their strategic interdependence).[36]

[36] ibid



To the extent that innovations are primarily picked up on the micro-level (and so assumption B2 in this slide is likely to hold),[37] there is little incentive for an innovator to invest in process innovations. A process innovation can be characterised as an innovation which allows either to provide the same product or service at lower cost (relative to an existing service), or a better product or service at the same cost.

A low cross-price elasticity implies that higher cost will not lead to a shift of demand to a (cheaper) alternative product or service. So there is little incentive to invest in process innovations which allow to provide the same product or service at lower cost (as long as there is a low cross-price elasticity). [38] There should not be a direct effect on process innovations which allow the provision of better products or services for the same costs.

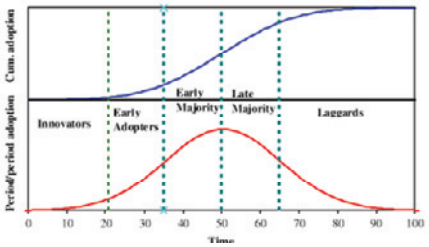
One way to deal with this problem is to increase the cross-price elasticity by: expanding fund holding / prescribing budget constraints, publish cost comparisons; publish a "Best Seller List" to increase awareness of alternatives, etc.

[37] Silcock et al (1997) The Cost of Medicines in the United Kingdom. A Survey of General Practitioners' Opinions and Knowledge, *PharmacoEconomics;* 11:1, 56-63; Stern (1996) *Market Definition and the Returns to innovation: Substitution Patterns in Pharmaceutical Markets*. MIT Working Paper.

[38] A good example for low cross price elasticity is the pharmaceutical industry in the U.S.. Given the substantial price differentials between pioneers and generics, generic penetration is often surprisingly modest. The case is slightly different in the UK (with a relatively high prescription rate of generics). This seems, however, at least in part, due to prescription practice rather than high cross-price elasticities – see: op cit Silcock et al (1997).

Use information to increase competition

- It was long thought that innovations in the health sector would follow a contagion model driven by ***social cohesion***. That is in which the quick "take-off" of a (successful) product is due to the fact that by discussing with others, individuals come to a (shared) normative understanding of the adoption costs and benefits of the innovation and on the basis of this decide to adopt the innovation.



Contagion Model

- However, contagion in the health sector (if present) is driven by ***structural equivalence.*** That is the quick "take-off" of a (successful) product is due to competition between individuals jointly occupying a position in the social structure (e.g. two PhD students supervised by the same Professor where each student is likely to adopt an innovation if the other one does – and if only to avoid ending up as the student considered less innovative by the Professor).

Diffusion of many products follows a contagion model as depicted above. The upper graph shows cumulative adoption, the lower one the one-time adoption paths of an innovation over time – taking an epidemiological perspective we would regard the first as prevalence and the second as incidence (the timing of new adoptions).

It was long thought that the particular structure of the contagion model (i.e. the steep portion of the slope of the upper graph) is due to social cohesion[39]. The idea was that only through discussion with others, individuals could gain a normative understanding of the adoption costs and benefits of an innovation (in a complex situation) and could decide whether to adopt the innovation or not. To the extent that it is time consuming to come to this (shared) understanding this explanation suggests a slow diffusion shortly after the introduction of the innovation and a quick one once everybody understands (and agrees that it is beneficial to adopt).

Burt (1987) suggested, however, that contagion in the health sector is not driven by social cohesion but rather by structural equivalence.[40] The idea is that the same sigmoidal structure of slow diffusion at the beginning and quick diffusion later on can be explained by competition between individuals who occupy a similar position in the social structure. An example Burt uses is that of two PhD students supervised by the same Professor. Each student is likely to adopt an innovation if the other one does (and only to avoid ending up as the student considered less innovative by the Professor).

One implication of this finding is that we should increase competition between individuals who occupy a similar position in the social structure (in order to speed up the diffusion process). Ideas of how this could be done are:

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[39] Coleman et al (1966) *Medical Innovation*. New York: Bobbs-Merrill

[40] Burt (1987) Social Contagion and Innovation: Cohesion Versus Structural Equivalence; *The American Journal of Sociology*;92:6.

- Introduce a **"Best Seller List"** of pharmaceuticals, medical devices, clinical practices, and delivery models and management. Apart from increasing awareness of new (popular) products, this can serve as a signalling device: If many others have adopted a certain innovation the likelihood that those on the same social structure as oneself have done so is relatively high. Optimally, such a list would not only contain cumulative adoption but also adoption numbers according to social structure (e.g. adoption by GPs, Neurosurgeons etc.).
- Introduce a **"Breakthrough" System** in which large numbers of teams from hospitals can learn from recognised experts and (afterwards) teach themselves. Apart from increasing awareness of new products, this can help to increase the degree of structural equivalence by (explicitly) introducing a reference group. Similar to the Professor in the earlier example, experts (or after those who were taught in the first instance) can serve as reference groups for those who are supposed to adopt the new product (thereby increasing competition and, consequently, adoption).[41]
- Introduce an **evaluation system** that captures and disseminates effective practice e.g. in hospitals (asking, among other things, for the openness of nurses, clinicians etc. with respect to innovations).

It is important to bear in mind that the question of what drives contagion in the health sector is still being discussed.[42] Some ideas are not explicitly picked up here because there is little empirical support for them (such as for "tension of change" or "Human Resource Issues")[43] or they are implicitly incorporated in some of the recommendations (such as "information cascades"). Furthermore, it is important to note that the contagion model itself need not be a good description of all products and services even if it is on the face of it.[44] Despite this, it may be worthwhile to supplement existing measures focusing on social cohesion and marketing with those drawing on (the often neglected) structural equivalence.

[41] Institute for Healthcare improvement (2003). *IHI's Collaborative Model for Achieving Breakthrough Improvement*. IHI.
[42] *Op cit* Greenhalgh (2004).
[43] Gustafson et al (2003) Developing and Testing a Model to Predict Outcomes of Organizational Change. *Health Services Research* 38(2); 751-776.
[44] Van den Bulte (2001) Medical Innovation Revisited: Social Contagion versus Marketing Effort, *American Journal of Sociology*, 106:5, 1409-1435.

Use prizes to incentivise innovation

- Prizes can incentivise innovators on problems for which solutions do not seem to be forthcoming
  - This type of prize is *ex ante*, as opposed to *ex post* which celebrates innovations that have all ready been achieved (such as the Nobel Prize)
- Historically prizes have led to important innovations
  - The Longitude Prize is probably the best know example. A prize of £20,000 (£2.5m in today's money) offered by the British Government for the design of an accurate method to measure longitude
  - A 12,000 franc prize, offered in 1795 by Napoleon's Society for the Encouragement of Industry for a method of food preservation, led to the development of food canning
- Recently that has been a renaissance in prizes
  - The Ansari X Prize for the first privately financed passenger space craft to fly into space twice in two weeks (worth $10m and won in 2004)
  - The Archon Genomics X Prize announced in 2006 (and as yet not won) for the first team to sequence one hundred human genomes in 10 days
- With the 60th Anniversary of the NHS in 2008, there is an opportunity to launch the Bevan Prize for Innovation

There exist three basic forms of (*ex ante*) prizes: Intra-firm incentives[45]; pre-bidding signalling devices in procurement and other contracting systems[46]; and *ex ante* grand prizes to stimulate R&D. The focus here is on the third type: a sponsor (such as government) defines a problem to be solved, a reward for solving it, and the terms of the contest. In the next stage it evaluates the different entries and determines the winner.[47]

Historically, R&D grand prizes have led to important innovations. Perhaps the best known is the series of prizes offered in 1714 by the British government to the inventor who could design an accurate method to measure longitude. Many methods were proposed, but the top prize of £20,000 pound was won by John Harrison for his chronometer. In 1775, the French Academy of Sciences offered an award of 12,000 francs for the development of artificial alkali. Nicholas Leblanc developed a process using the known reaction of sulfuric acid on common salt, ultimately leading to the growth of the 19th century inorganic chemical industry. A third important prize stimulated the development of food caning: A prize of 12,000 francs was offered in 1795 by Napoleon's Society for the Encouragement of Industry for a method of food preservation usable by the French military. It was awarded in 1810 to Nicolas Appert, the inventor of food canning. The process utilised heat treatment of food in sealed champagne bottles.[48]

Recently prizes have been rediscovered. Several years ago, the World Heath Organization and the World Bank proposed the use of prizes to induce the innovation of vaccines that would otherwise not be developed or distributed widely enough.[49] In 1990, the $100,000 Loebner prize was offered for the invention of a computer whose responses to questions cannot be distinguished from

[45] This can be awards for cost-saving ideas from the shop floor etc.

[46] Where firms compete in a pre-contractual bidding round for a procurement contract

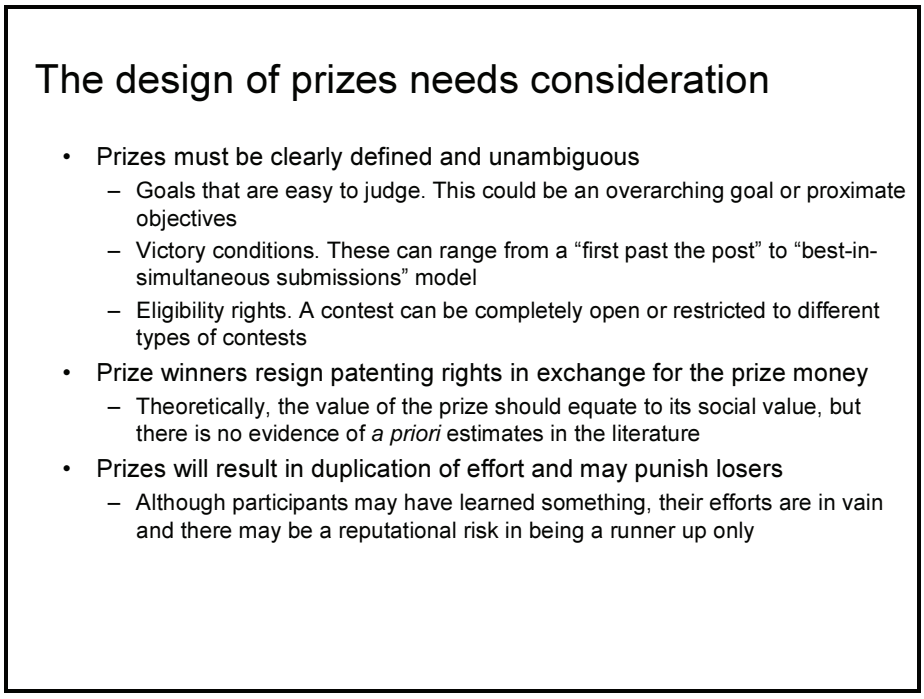
[47] Davis. (2004) *How effective are prizes as incentives to innovation? Evidence from three 20th century contests*. Paper presented at the DRUID Summer Conference 2004;
downloaded from: http://www.druid.dk/uploads/tx_picturedb/ds2004-1343.pdf (12.12.2007)

[48] ibid

[49] Cohen, J. (1998) Coaxing Big Parma Onto the Playing Field. *Science.* 281(5381), 1271

a human's. The Foresight Institute has sponsored a grand prize worth at least $250,000 to spur scientific and technical progress in nanotechnology. The $10 million "X Prize" was created in 1996 to stimulate the innovation of a new generation of launch vehicles to carry passengers into space. The Archon Genomes X Prize announced in 2006 (and as yet not won) for the first team to sequence one hundred human genomes in 10 days.

With the 60th Anniversary of the NHS in 2008, there is an opportunity to launch a Bevan Prize for Innovation. This prize could be complemented with a number of focused prizes addressing specific problems in care, clinical practice or medical devices.



Prizes are of interest in the present context for two reasons: (1) they can increase the speed of diffusion of innovations and (2) spread the burden of financing the incentive to innovate over a broader range of people (more than patents do).

The reason we are interested in a quick diffusion of innovations is that newly discovered information can be made widely available at very little social cost and that, as a consequence, it is beneficial from the social point of view for this information to be disseminated quickly.

It is often argued that patents contribute to a quick and wide diffusion of innovations via the disclosure requirement, and also by providing the legal basis for licensing. Yet, neither disclosure nor licensing is the same as placing new knowledge in the public domain as it is the case with prizes (since other economic agents cannot freely use it). Moreover, licensing is prone to a number of problems: Heller and Eisenberg[50] argue that licensing is likely to fail if researchers must negotiate multiple licenses. Mazzoleni and Nelson[51] add that transaction costs of licensing typically delay diffusion. Ordover[52] argues that licensing hampers diffusion indirectly by hampering R&D markets (e.g. by using licensing in anti-competitive ways) which hinders diffusion (by hindering R&D, in the first place).

The second argument for R&D prizes is that the incentive to invest in R&D does not rest with those who purchase the R&D outcome (as it is the case with patents).[53] The reason is that prizes can be financed by income taxation. However, some might argue that income taxation involves labour supply-related distortionary costs (having potential implications for trade-offs with social

[50] Heller and Eisenber (1998) Can Patents Deter Innovation? The Anticommons in Biomedical Research; *Science*; 280; 698-701.

[51] Mazzoleni and Nelson (1998) The benefits and costs of strong patent protection: a contribution to the current debate; *Research Policy*;27, 273-284.

[52] Ordover (1991) A Patent System for Both Diffusion and Exclusion; *Journal of Economic Perspectives*; 5:1,43-60.

[53] Even if regulation can reduce the burden on patients, there is an inherent trade-off with the incentive to invest in R&D as realized prices go down.

welfare from reduced incentive to work). Yet, as Sharvell and Ypersele[54] make clear, there are reasons to believe that financing innovation through income taxation involves lower distortionary costs than financing innovation through the grant of patents: "In particular, we know from the tax literature that raising funds through income tax can be adjusted in an optimal way to raise funds. Yet, even if this is not the case there is still some basis to believe that the income tax involves less distortion than intellectual property rights. The reason is that income taxation is equivalent to a uniform tax on all goods, whereas intellectual property rights involve concentrated taxes in the form of monopoly prices on just a subset of goods (and raising a given amount through a uniform tax on all goods typically involves less deadweight loss than through a tax on a subset of goods)".

The design of prizes can be used to tailor the incentive to innovate.[55] Design can be specified along four dimensions: scope, victory conditions, punishment of losers, and openness. As for the scope of a prize it is important to find the right balance between detailed specification (which facilitates the assessment process) and a specification that is general enough to incentivise innovators in a broad range of a technological area. Victory conditions can be "first-past-the pole" or "best-in-simultaneous submission". Whereas the first one emphasises speed (potentially at the price of some quality), the second one emphasises quality (probably at the price of more subjectivity in assessment). With regard to the punishment of losers, a balance has to be found between punishing losers by not rewarding their efforts and awarding also 2nd and 3rd best solutions (thereby possibly distorting incentives to compete). It is important to think also about the degree of openness of a prize. The competition can be open to everybody or restricted to certain competitors. The main advantage of restricting competition is that it reduces the likelihood of multiple entrants pursuing the same research idea (and hence, of wasteful duplication of effort). The disadvantage of restricting competition is that it may result in the elimination of competitors which could subsequently have developed competition-winning technologies. Each problem may require a slightly different specification along these dimensions.

[54] Shavell and Ypersele (1999) Rewards Versus Intellectual Property Rights; *NBER Working Paper 6956*

[55] Davis (2002) Do we need laternative incentives for basic research? Patents vs. prizes. Paper presented at the DRUID Summer Conference 2002.

Use procurement to stimulate innovation

- Procurement refers to the buying or purchasing of a product – a material good or an intangible service.
- Innovative procurement occurs when a desired product does not yet exist, but could probably be developed within a reasonable period of time.
- Current policy focuses on boosting innovation through supply side interventions such as knowledge transfer programmes and R&D tax credits.
- Numerous historical examples have demonstrated the potential of demand side instruments such as public procurement to stimulate innovation.
- Yet, "although there are several indications that private and public technology procurement is an efficient means of generating economically viable innovations, it does not follow that government policies to stimulate public and / or private technology procurement are easily implemented".

Procurement refers to the buying or purchasing of a product. Innovative procurement occurs when a desired product does not yet exist, but could probably be developed within a reasonable period of time.

Current policy focuses on boosting innovation through supply side interventions such as knowledge transfers programmes and R&D tax credits. Despite its widely accepted potential,[56] very little consideration has been given to innovative procurement.

The documented potential of public procurement in stimulating innovations is primarily due to the provision of "early users" for innovative firms. This provides them with initial revenue and customer feedback they need (but often cannot find) to "survive and refine their products and services so that they can later compete effectively in the global marketplace".[57] Other aspects underlying the acknowledged potential include:

- the creation of incentives and the reduction of market risk for suppliers
- the ability of public procurement to create new markets for innovations
- the signals to private users sent out by public demand for innovative products

Yet, as Granstrand & Sigurdsson note: "although there are several indications that private and public technology procurement is an efficient means of generating economically viable innovations, it does not follow that government policies to stimulate public and/ or private technology procurement are easily implemented".[58] Edler et al (2005) provide a number of requirements which make the procurement of an innovative technology more likely to be successful.

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[56] HM Treasury (2007) *Transforming Government Procurement* HMSO, London; HM Treasury (2006) *Investing in Britain's potential: Building our long-term future* HMSO, London; Edler et al (2005) *Innovation and Public Procurement – Review of Issues at Stake; Study for the European Commission ENTR/03/04*

[57] NESTA (2007) Driving innovation through public procurement.

[58] Granstrand (1985): Technological Innovation and Industrial Development in Telecommunications. The Role of Public Buying in the Telecommunications Sector in the Nordic Countries. *Nordic Co-operative Organization for Applied Research, Research Policy Institute.*

- Reconcile expectations, needs and limitations of a large number of users. This helps to define the needs that are to be addressed by the supplier, and to facilitate the application of the procured technology later on.
- Use market intelligence. This serves to understand what the market can deliver now and in the future. Moreover, it enables the procurer to obtain early feedback on the feasibility of the project.
- Clearly specify the tender. The challenge is to strike a balance between a functional specification that is detailed to provide clear guidance to suppliers, and a specification that is general to allow for the consideration of alternative solutions.
- Carefully select an awarding committee. The committee needs competencies in evaluating the technical, operational and economic requirements defined in the contract award criteria. It is clear, however, that selection will only be satisfactory if the requirements are well defined and the procurement targets are very clear.
- Manage contract delivery, which provides opportunities for gathering information and conducting evaluative analyses to draw lessons for future projects. It is important to engage in an ongoing interaction between suppliers and procurers and treating the project as an ongoing process, rather than a one off.

Annex: Long list of ideas and issues

To inform a workshop held with Department of Health staff on the 7th December, RAND Europe produced a long list of issues and ideas for discussion. The workshop provided guidance on the most pertinent and important concepts that form the basis of this annotated briefing. The other issues and ideas that were identified, but not developed, are captured below.

Issues

The innovation process in the NHS is hampered by the lag in ICT adoption in the NHS. Recent work has thrown light on the lag in take-up of ICTs in the public sector in Europe (i.e. behind that in the private sector) and thus on the failure of ICT-induced structural innovation to develop in the public sector. It may be worthwhile to study this phenomenon more carefully in the context of the NHS.[59]

The NHS does not need another 'invention' policy. The HIC needs to focus, perhaps exclusively, on stimulating innovation, fresh thinking and effective solutions in previously neglected areas through non-traditional 'innovation' policies. Furthermore, given that political climate also plays a critical role in determining levels of innovation, there is a parallel need for the NHS to foster a political climate appropriate to its chosen non-traditional innovation policies.

The focus on guidelines and quality standards supported by evidence-based medicine may not encourage, and may even stifle, innovation. It can be argued that the insistence that decisions need to be researched before they are taken and the increasingly complex system of guidelines have stifled the instinct for innovation, which involves some measure of risk and the possibility of failure.

The NHS faces professional resistance to change and tolerates failure to act on intra-NHS innovations. The failure to act on what is known appears to be tolerated within the NHS culture. The answer lies in providing more analytical support to allow local decision-makers to interpret costs and consequences.

The NHS must distinguish and appropriately manage the complex innovative ecosystem to balance trade-offs commensurate to each level of organisation. The NHS has to balance four fundamental trade-offs (at each level of the ecosystem and between the different levels): namely,

[59] Van Ark (2002). *ICT Investment and Growth Accounts for the European Union: 1980-2000*

flexibility versus commitment; incentives versus solidarity; diversity versus scale; and, experimentation versus certainty.

The adoptions of external innovations depend on the degree of absorptive capacity of the NHS. Absorptive capacity implies, according to Cohen and Levinthal, the ability to value, assimilate, and commercially exploit external knowledge. There is a subtle but important difference between these dimensions: "The first dimension is the similarity of scientific, technological, or academic knowledge, the "*know-what*" portion of [a firm's] knowledge base. The second dimension is the similarity of [a firm's] knowledge processing, the "*know-how*" portion of their knowledge bases. [The] last dimension focuses on similarities in the [firm's] commercial objectives, the "*know-why*" portion of their knowledge".[60]

Ideas

The NHS should employ "hunter gatherers". Organisations in the field of business and sport[61] (to name two) employ "hunter gatherers", who search for innovations across a wide variety of industries and locations, and seek to apply their findings to their employer's activities. These "hunter gatherers" do not respect the traditional boundaries of sectors and pathways of influence, but are prepared to consider innovations from any source and any location.

Capitalise on NICE as an innovation dissemination vehicle and use it to increase the ease of transmission of value-added information on innovations (clinical practice and pharmaceuticals). It would be beneficial to expand the range of information delivered to practitioners via NICE (e.g. on current healthcare pilot initiatives in the UK and their results, and pilot funding opportunities) thereby transforming NICE into an innovation information channel carrying several kinds of valuable information.[62]

The NHS must actively embed a 'culture of learning'. Critical to effective implementation and adoption of innovation is the task of embedding a 'culture of learning' such that *all* individuals are *aware of the benefits* from innovation and *be both encouraged and motivated* to innovate but also to learn from other innovators—one of five key factors identified that underpin a culture of learning.[63]

Expand the membership of the Health Innovation Council. The overwhelming majority of HIC members are involved in the health and healthcare sector. Given the enormous challenge of transforming the NHS' culture, it would be extremely valuable for the HIC to offer non-healthcare perspectives on this issue.

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[60] Op cite Cohen and Levinthal (1990)..

[61] Well know examples are Clive Woodward when leading England's world cup winning rugby team and more recently Sam Allardyce when at Bolton Wanderer's. Allardyce employed Mike Forde whose job was to "scour the globe for innovations that may be relevant to the club, whether they be in IT, scouting, psychology or people management". [Guardian, March 17, 2007].

[62] (http://www.nao.org.uk/publications/nao_reports/06-07/0607454.pdf at p11; and, http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4139061).

[63] A main barrier to implementing the innovation of demand-led skills training and education system is precisely the absence among employers of seeing the need for more skills (Leitch Review, World Class Skills, pp 103-116)

Enable better horizon scanning for providers. Increasing the information harnessing ability for the average provider can be expected to increase their financial management and planning, and as a consequence their capacity to follow NICE guidelines, for example.

Create highly-competitive pilot funding opportunities to energise the innovation capacity of the micro-system (medical centres and physician groups). A deliberate fiscal commitment should be made to support innovators and encourage creativity in the NHS (within the legislative status quo). One way of doing so is via the creation of a highly-competitive grant program covering the five areas of innovation identified by the *Next Stages Review* which will support the uptake of research evidence in everyday clinical practice, similar to the programs operating in other health systems (e.g. New Zealand[64]). This initiative can be used to select innovations for larger scale-up innovation in the NHS and as a knowledge-source for further iterations in the innovation process.

Invest in Health Information Technology to improve continuity of care, chronic disease management, reduce drug-related adverse reactions, and decrease NHS administrative costs. Explore it as an innovation dissemination vehicle. In the US, Health Information Technology (HIT) is used as a tool for both patient management and provider management. HIT serves as a clinical information dissemination pathway, allowing the sharing of 'best seller lists' of new medical devices, drugs, technologies, etc and the enabling of horizon mapping of providers by receiving up-to-date financial information to plan patient care. When providers have access to 'real-time' clinical and financial information, their expanded knowledge base puts providers in a better position to innovate. Moreover, HIT can itself be explored as an innovation dissemination vehicle.

Adopt innovative easy-to-use mapping and decision tools to help target sub-optimal population health outcomes. Using innovative easy-to-use mapping and decision tools can help target sub-optimal population health outcomes. One such tool is GIS. In addition to enabling providers, payers and researchers to spatially analyse population health outcomes and quality of care (by geocoding and mapping them), GIS allows for the overlaying of this information with demographic, socio-economic and neighbourhood-level data. Hence GIS can help providers and payers to not only visualise care-deficient pockets but also to compare them to their environment and better comprehend the factors which can affect these outcomes, and the potential sub-surface barriers which create them.

A selective introduction of innovations can increase the probability of success. International studies on takeoff of new products show that there is a significant temporal difference in takeoff across countries (i.e. till rapid growth starts).[65] It may be worthwhile to study the takeoff time in UK regional health markets (if existent). The idea is that if some regions prove to be early adopters it seems reasonable to introduce innovations there first, so that a) the innovator can earn

[64] An example is the competition run in New Zealand for the Healthcare Innovation Awards sponsored by the ministry of health (http://www.moh.govt.nz/moh.nsf/indexmh/twentytwo-finalists-health-innovations-awards-22may07?Open). The competition covered eight categories: Excellence in Primary Health Care; Excellence in Quality Improvement; Excellence in Prevention; Excellence in Rehabilitation; Excellence in Treatment; Innovation ; Process Improvement; People's Choice

[65] Tellis et al (2003): *The International Takeoff of New Products: The Role of Economics, Culture, and Country Innovitvenss*

a quick(er) return on her investment, and b) the innovation can gain acceptance outside the quick adopting regions by being successfully adopted in the quick adopting regions.

Decreasing switching costs can help accelerate the process of diffusion of innovation. In the context of user-led innovation and patient engagement, public 'resistance' to change in healthcare[66] (i.e. adoption and diffusion of innovation) will incur a "switching cost" that can impede the diffusion of innovation. There are a number of examples of decreasing such switching costs to speed up the diffusion process of new ideas and innovations include: abolishing long-term contracts; frequent buyer bonus systems (of pharmaceutical companies etc); introducing electronic patient cards to allow more patient mobility within the NHS; requiring compatibility of products/devices, etc.

[66] Op cite Cunningham (2005).