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BIG INNOVATION CENTRE

Missing an open goal?

UK public policy and open innovation

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The Big Innovation Centre is an initiative of The Work Foundation and Lancaster University. Launched in September 2011, it brings together a range of companies, trusts, universities and public bodies to research and propose practical reforms with the ambition of making the UK a global open innovation hub as part of the urgent task of rebalancing and growing the UK economy, and with the vision of building a world-class innovation and investment ecosystem by 2025.

For further details, please visit www.biginnovationcentre.com

Executive summary

Leading global organisations are increasingly viewing open innovation as the key to cost-effective new product and service development. Here the term 'open innovation' refers to both the sourcing and involvement of external organisations and stakeholders in the innovation process, and the 'open' sharing of innovation outside the organisation. While probably over-hyped in some quarters, we see open innovation as a genuine and powerful shift in strategy and practice by many organisations.

It is important not to see open innovation as a one-size-fits-all strategy, but more a careful consideration by organisations of where to be open, and where to be closed, according to where they see themselves with global innovation value chains and networks. Most global corporations are not under pressure – either from shareholders or other stakeholders – to be open for the sake of it, but rather are expected to manage an innovation strategy that deploys openness in a sophisticated and nuanced manner.

Academics and governments have started to develop innovation public policy drawing directly on the concept of open innovation. However, examining how open innovation is being deployed as a policy term in these fields uncovers some worrying trends: while leading corporations seem to have moved beyond approaches which try to make everything open, largely adopting nuanced strategies which combine degrees of openness at different points in global value chains in different sectors, public policy seems stuck at a less mature phase of open innovation, collating some rather traditional lists of innovation policy areas and ranking countries and regions by 'openness'. We believe these approaches are less sophisticated than those of leading corporations.

If they are to emulate those corporations' successful approaches, the UK government needs to focus on developing smart industrial policies regarding when and where their national innovation ecosystem is 'open'. This will involve analysis of the UK's role in different global value chains and networks – just as leading corporations do – and ensuring that areas where the UK is strong are invested in through policy, and where greater openness will benefit the UK if it is encouraged.

In particular we believe that the UK requires:

- Industrial and enterprise policy which considers the strengths and weaknesses of open innovation approaches for key UK industries which are operating at different points in the innovation value chain;
- An IP regime which genuinely incentivises investment in innovation, including through open routes, and discourages purely defensive use of IP to block new solutions to market demands;

- A financial and investment ecosystem which looks to support business as it grows, and to reward innovation over time – and particularly not to make blanket demands for fully closed, or open, innovation strategies as a prerequisite for new business funding in specific sectors;
- Improve our understanding of markets for open innovation, through analysis and encouragement of the required intermediaries which are required to populate a successful national innovation ecosystem

The Big Innovation Centre, a major initiative from The Work Foundation and Lancaster University, will examine how the UK can position itself to be a major global innovation hub in 2025. This industry-backed research centre will be an important conduit for robust and practical research which supports the development of the UK as a global innovation hub. Open innovation and its implications will be a key theme informing all the Centre's areas of work.

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Chapter 1 Provocation

Closed Sandwich

On the 2nd February 2011 pharmaceuticals giant Pfizer announced it would be closing the major research and development facility at Sandwich in Kent, with the potential loss of 2,000 jobs. The announcement caused a media storm, with considerable speculation regarding the causes, rationale, justification and impact of the decision.

Was this perhaps a failure of the Coalition Government's emerging growth strategy? Heated public discussion ensued regarding whether this meant the government's recently-announced 'patent box' fiscal policy – designed to increase the number of operations like Sandwich in the UK – was a busted flush or conversely, had not gone far enough, and the Sandwich decision was proof of the patent box's half-heartedness as an attempt to create growth through tax changes.

Pundits mulled over whether this was an effect of Asian research sites and talent being more competitive – or simply where the new customers were. Or then again perhaps was this instead about broader changes to international business models, including the shift away from large-scale single-firm R&D 'farms' and towards more 'open' innovation models?

The closure of the Pfizer Sandwich R&D facility provides a stark illustration of the importance of understanding the inter-relationships between government policies on creating growth through a national innovation ecosystem, and shifts in organisational and national strategies towards 'open' innovation. Without a better understanding of the role of 'openness' in innovation ecosystems, the motivations and justifications for, and implications of, the Sandwich closure, will remain unclear.

Although some organisations and sectors have always pursued what might be termed 'open' strategies, others, faced with stark challenges to established business models, have deliberately turned to more 'open' structures and processes for innovation. They have adopted open innovation both as a way to maintain the stream of innovations necessary to sustain competitiveness, and to try and reduce the considerable burden of major in-house research and development activities. These changes have major implications for how those firms operate: switching from pursuing basic research to a more 'search, acquire, exploit' business model. But what challenges do these changes present for the national investment landscape? Is there, for example, a risk that increased corporate open innovation activities in the UK and abroad result in a drop in overall investment in fundamental research and development by organisations in the UK? At the moment it is unclear whether incentives will align for others – including the public sector – to fill this gap, or even whether that will be necessary.

Perhaps of greater concern for the UK is that open innovation activities fundamentally disrupt and complicate the innovation investment and revenue-raising value chain. Following an innovation 'ecosystem' model, innovative value comes from a cohesive system of complex linkages which support investment in new knowledge generation, its development, and commercialisation. The open innovation paradigm creates at least the potential for a greater disconnect between knowledge creation and application or commercialisation. If knowledge – and the value derived from knowledge-based innovation – is increasingly crossing firm boundaries, then, from a UK plc perspective at least, the balance between where and how this value accrues becomes increasingly important. If commercial value is accruing elsewhere because a greater degree of activity in the innovation value chain is taking place away from the UK, then could, for example, the UK become a world-leading creator of ideas and developing products while only deriving limited economic benefit from those activities? Equally, if the value created by research increasingly presents itself in the form of licence-related income streams and one-off capital acquisitions (as opposed to corporate growth and new employment opportunities) then the nature of these cash flows is increasingly important for government growth and economic policy.

Given that for the foreseeable future the fastest growing markets are likely to be in emerging economies such as India and China, this dislocation of innovation value chains represents a particular spatial issue. There is little doubt that returns to commercialisation will be increasingly centred on these economies. Does this mean that greater levels of open innovation within corporate innovation activities will see innovation investment increasingly sourced, deployed, and accrued away from the UK?

Because this change touches on so many areas relevant to the success of the UK innovation system, an understanding of how innovation value chains are becoming increasingly open will be a major focus of activities and investigation undertaken by the Big Innovation Centre, a groundbreaking new initiative from The Work Foundation and Lancaster University. As a preliminary step in focusing the mission and research programme of the centre, it is vital that we explore precisely what corporate and organisational 'open innovation' might mean in the context of a national innovation ecosystem.

This discussion document develops these ideas, ultimately looking to consider the policy implications of a perceived shift towards open innovation by many kinds of UK and UK-based organisations.

- **First,** we sets out how the concept of open innovation is understood within a particular context: as a management theory for corporations. It illustrates that, within this management theory definition, open innovation does appear to be increasing, but stresses that the specific strategies of open innovation which corporations are pursuing entail fairly nuanced understandings regarding where they see themselves in the value chain – not a simple 'more open (or more closed) is better' approach.
- **Secondly,** we extends the analysis to look at other kinds of organisations which could be said to engage in open innovation, including SMEs and Universities, although the concept of open innovation needs to be shifted slightly from that frequently articulated .
- **Finally,** we explores the potential for translating the concept of open innovation to the study of the national innovation system. It notes that discussions of national open innovation policy have tended to follow a 'more open is better' trajectory, sometimes lacking the sophistication of corporations' nuanced open innovation strategies. It concludes with a) our initial reflections on the policy changes arising from an open innovation perspective, and b) how the Big Innovation Centre might look to approach this topic.

Chapter 2 Innovation value chains

Perhaps the most fundamental strategic decisions facing any company concern its core business model: the way it will derive value in its relations to other organisations and to customers. Through strategy, firms actively consider where to sit within production networks – for example when deciding how to relate to their suppliers and customers they consider how vertically or horizontally integrated to be. Firms consider what parts of the production process they can create value in and draw returns from, and which areas could be best left to others.[1]

There is a direct parallel with innovation. Organisations must consider how they invest in and create value from innovation processes in exactly the same way – how to draw value from innovation value chains. Some organisations operate across the whole innovation value chain – from basic research to the final delivery of new products and services (in effect vertically-integrated innovation). Other enterprises choose to focus on drawing value from specific areas of the innovation value chain: fundamental research, practical application and product development, or perhaps the development of innovative new business models.[2]

This section explores the notion of open innovation. It considers evidence suggesting that open innovation processes are increasingly shaping the operation of innovation investment value chains, and that open innovation models increasingly direct how firms engage in innovation (see Box 1 on the next page).

Open innovation

In his seminal book on open innovation, UC Berkeley Business School Professor Henry Chesbrough highlighted a fundamental divide between firms and industries in terms of how open they were to knowledge and external inputs into their innovation processes. He defined this openness, or open innovation as:

> *'The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand markets for external use of innovation, respectively'*[3]

He contrasted a traditional large firm which drove its innovation processes internally with ones which operated R&D and managed innovation in collaboration with external partners. The traditional closed model of innovation depends on a firm which used research and development practices to develop its new products internally.

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1 e.g. Hamel, G. and Prahalad, C. K. (1990) 'The Core Competence of the Corporation', Harvard Business Review, Vol 68, No. 3, May-June, pp79-91

2 Osterwalder, A. and Piqneur, Y. (2010) Business Model Generation, London: Wiley

3 Chesbrough, H., Vanhaverbeke, W. and West, J. (eds) (2006) Open Innovation: researching a new paradigm, Oxford: OUP, p1

Box 1: Defining innovation and innovation investment value chains

Innovation represents much more than invention or discovery. Innovation represents the creation and application of new knowledge. This can be understood as the commercialisation of a new product or service to meet a market demand, or the creation and implementation of processes which improve the productivity of existing activities. The representation of an innovation system below illustrates how this process can occur.

The Innovation System

Source: Adapted from NESTA (2009)

An innovation investment value chain can be best thought of as a practical mapping of how this innovation system operates for an individual innovative product or service – focusing in particular on how it was invested in, and where rewards accrue.

Figure 1 below illustrates the paths of ideas within a closed innovation organisation. Here new products and services are conceived of and developed entirely internally by the firm through the pursuit of technical breakthroughs. It is down to employees to select which internal idea to research, develop and ultimately bring to market these knowledge packages. This paradigm can be associated with the major research lab model pursued by large multinationals such as General Electric's Bell Labs. These organisations are closed in the sense that knowledge does not pass across the boundaries of the firm.

In contrast **Figure 2** represents an organisation whose business model is fundamentally open and based on the transmission of knowledge across the firm's boundaries. The organisation might actively seek ideas developed outside of the firm and when new ideas developed within the firm do not fit with the core business they can be sold or spun-out to create new ventures.

Figure 1: The Closed Paradigm

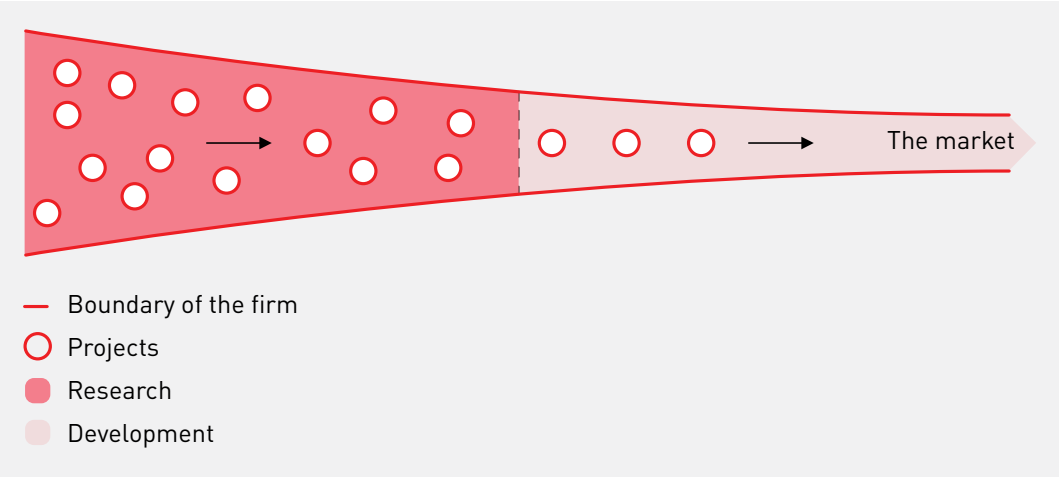
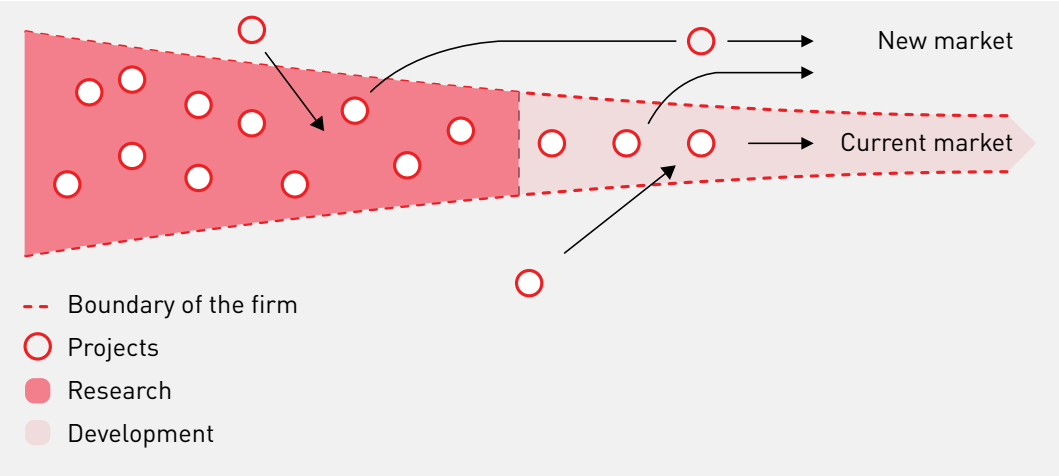


Figure 2: Open innovation



Source: Chesbrough (2003)

These models can be interpreted as two fundamentally different innovation investment value chains. Under the closed innovation model, all benefits from the innovation accrue to the single organisation, but all risks – including full development costs – are also borne by the single organisation.

In contrast, under an open innovation model, an organisation would look to a) share the costs of innovation development through more market-based approaches by looking to gain from and contribute to knowledge pools outside of the firm, b) defray some of the risks associated with innovations – by definition, you cannot be sure a particular innovation will be value-adding, and c) potentially disburse a greater share of the revenue which accrues from those innovations to other organisations involved in the innovation value-chain.

Chesbrough (2003) discusses the characteristics of industries dominated by one or another of these paradigms – **Table 1** summarises this interpretation.

Table 1: Contrasting principles of closed and open innovation

Closed innovation	Open innovation
Examples of industries: nuclear reactors, mainframe computers	Examples of industries: PCs, movies
Largely internal ideas Low labour mobility Little venture capital activity Few, weak start-ups Universities unimportant	Many external ideas High labour mobility Active venture capital Numerous start-ups Universities important

Source: Chesbrough (2003)

With open innovation such a widely deployed term for describing organisational activities, for the term to be useful it is important to focus on the definition of the concept. **Box 2** below indicates what we are referring to when we use the term open innovation.

Box 2: Open definitions of open innovation

The open innovation literature varies widely in its definitions of the concept. Some have gone as far as to classify open innovation as any innovation which draws on resources from outside of the firm. At the extreme this has been used to define innovation which comes from customer opinions (such as a 'suggestion box') as open innovation.

This approach, however, devalues the concept. It immediately can be applied to almost anything without offering any meaningful interpretive power – in the case above listening to your customers could be equally described as good business practice rather than an open innovation strategy.

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These broad definitions also risk confusing flows of codified information which any firm could expect to receive with the concept of transferring knowledge across the borders of the firm. Rather than allow this very fuzzy concept of open innovation, we believe that the best way to approach the concept is from the point of view of open innovation depending on some form of collaboration – i.e. genuine planned flows of knowledge across the border of the firm, or being developed in ways which could not operate without the collaboration, and in the service of innovation specifically.

The following typology developed by Tidd et al. (2005) offers a description of alternative forms of collaboration and allows us to illustrate their relevance for forms of open innovation.

Type of collaboration	Typical duration	Advantages	Disadvantages
Subcontractor/ supplier relations	Short term	Cost and risk reduction Reduced lead time	Search costs, product performance and quality
Licensing	Fixed term	Technology acquisition	Contract cost and constraints
Consortia	Medium term	Experience, standards, share funding	Subsequent differentiation
Strategic alliance	Flexible	Low commitment Market access	Potential lock-up
Joint venture	Long term	Complementary know-how Dedicated management	Strategic drift Cultural mismatch
Network	Long term	Dynamic learning potential	Static inefficiencies

Source: Tidd et al. (2005)

In some literature this boundary has been described as the difference between being open to external ideas, and open innovation *business models*. To avoid confusion, this paper focuses on this second interpretation of open innovation as a planned process of innovation which:

- Depends on some form of inter-organisational collaboration;
- Has intellectual property is its primary 'currency' or medium of exchange;
- Goes beyond 'business as usual' for organisations involved.

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This distinguishes these activities from, for example, 'open source' software (Android, Linux, for example), and 'platforms' on which others provide products or services (iTunes, for example). This is not to say that the *development* of these technologies could not be through open innovation, in our understanding, but that operating them does not constitute open innovation. This is in the same way that Debenhams 'opening up' space to concessions, or Tesco 'opening' shelf space to Heinz, does not constitute open innovation.

Box 3: Open innovation, open source and freely available knowledge

There also appears to be considerable confusion between what is meant by open innovation and the idea of open source. Open source reflects the practice of open and free sharing of technological information. It is typically associated with software development activities where the source code is released allowing others to build on it. The model has clear commonalities with open innovation – they both represent knowledge sharing across organisational borders and are both typically characterised by collaboration.

Under the framework illustrated above, open source can be a manifestation of open innovation – IBM has used open source approaches to drive standardisation across its customer base which makes it less costly for the firm to interact with its customers and allows it to sell more advanced bolt-on services which improve the experience of using the open source software.[4]

However, the terms open innovation and open source are often used in the literature as equivalent concepts. This is not appropriate; it is entirely possible for an organisation to pursue an open innovation strategy without engaging in freely distributing their knowledge in what would be recognised as an open source model. Equally, open innovation does not necessarily mean being fully open and releasing all knowledge – for example as with MIT's 'opencourseware' project.[5]

For many the open innovation paradigm has been seen as a very exciting positive. Open innovation draws on the principle that knowledge, application, and future profit streams are not necessarily bound together. The following statements illustrate the power of creating greater flexibility between these elements:

- It is sensible to be open to knowledge developed outside of the organisation, regardless of whether these are freely available or need to be purchased:
    - Ideas generated by others can be of use to your firm; and
    - These external ideas may even be worth more to you than to others – you may be better placed to exploit them than others who hold them.

- Willingness to let knowledge leave the firm, either freely, for a fee, or in order to develop future markets can also be a viable business strategy:
    - Ideas sitting locked up within organisations generate no benefits;
    - Selling ideas that wouldn't be developed to rival firms isn't necessarily bad for your business;
    - If you spin-out knowledge, and the idea develops externally and turns out to be of relevance, you may still be in a better position than your competitors to buy it back and exploit it internally;
    - It is possible to build larger markets for your products and services by carefully releasing related knowledge, allowing others to engage and develop complementary offers.

For other organisations however, being more open in their innovation processes presents significant challenges. These organisations may be perfectly sensible in resisting openness if they determine that their innovation processes are actually what create value for them. Such a situation may be particularly relevant in professional and business services where there are fewer 'tangible' barriers to new-entrant competition.

As organisations consider their place within innovation value chains they reflect on the subtle and complex balance between the advantages and disadvantages of openness for each area of corporate knowledge. **Table 2** illustrates this challenge for four different forms of open innovation. It provides a more nuanced map of corporate open innovation strategies, dividing them by whether they are primarily looking to bring in innovation (inbound) or externally exploit internal innovation (outbound), or whether they primarily incur a direct cost or realise a direct financial benefit (pecuniary) cost, or an indirect cost or benefit (non-pecuniary). For firms the challenge is complicated further still by the need to consider how these different forms of open innovation must interact.

Table 2: Forms of open innovation

	Inbound Innovation	Outbound Innovation
Pecuniary (paid for)	**Acquiring** input to the innovation process through the marketplace – licence-in and acquire expertise. **Advantages:** relate to the broader availability of knowledge. **Disadvantages:** Similarity of knowledge bases and challenges integrating ideas – languages, norms and cognitive configurations (Cohen and Levinthal 1990); Assimilating too much similar knowledge may stifle progress; Opportunities which are too distant are hard to align with existing expertise and practice. This means that the effectiveness of openness is contingent on the resource endowments of the partnering organisations.	**Selling/commercialisation** of inventions and technologies. **Advantages:** Chesbrough (2003) – selling out ideas that might have gone unused is a source of revenue generation; Fosfuri (2006) licensing out of innovations is becoming more common. **Disadvantages:** The 'disclosure paradox' dilemma (Arrow 1962) – market failures cause reluctance to reveal knowledge/ technology; Transaction costs limit the potential of selling technologies (Gambardella Giuri and Luzzi 2008); Challenge of anticipating future value (Chesbrough and Rosenbloom 2002); Problems related to negotiating intellectual property rights suitably.
Non-Pecuniary	**Sourcing/scanning** the external environment before initiating R&D (Chesbrough 2006). **Advantages:** External sources of ideas a positive (Rosenthal 1974/94); Potential for synergies with own processes e.g. P&G (Huston and Sakkab 2006). **Disadvantages:** Cognitive limitations to individual's understanding – search behaviour is key to understanding the limitation of open innovation.	**Revealing** – internal resources released to external environment. **Advantages** – progress as a group of firms through sharing knowledge and gains of cumulative achievement: Allen (1983) iron production industry 19thC England – sharing; Nuvolari (2004) Cornish mining industry. 'Myopia of protectiveness' Laursen and Salter 2006. **Disadvantages** – competitors can better position themselves to exploit your knowledge. Helfat (2006) difficulty in capturing the benefits that accrue. Smaller companies lack resources to manage the process for profit.

Source: Adapted from Dahlander and Gann (2010)

The complex ways that these different strategies play out in practice is illustrated in the cases of Amazon, and KLM, below – KLM seeking to better manage its supply chain by absorbing innovations from outside for indirect commercial gain through greater efficiencies, Amazon largely looking to externally exploit internal innovations for direct commercial gain.

Box 4: Case studies

KLM – improving customer experiences by facilitating supplier innovation

KLM, the Dutch airline, is an experiential service provider – much of its competitive advantage depends on being able to provide better customer experiences than its rivals. The process of improving customer experiences is not just about innovation within KLM; much of the customer experience depends on the airline's suppliers, from the firms that build their seats, to their IT providers and caterers. In order to accelerate this innovation in experiences, KLM seeks to draw on new ideas and expertise from its suppliers as much as possible. If KLM can facilitate innovation among its suppliers, this acts as an inflow of knowledge into the KLM itself.

KLM's approach to facilitating supplier innovation has two main strands: a redefinition of the relationship between KLM and its suppliers; and the use of an innovation fund to allow external companies to develop ideas that might ultimately benefit KLM.

KLM has moved its supplier relationships away from a lowest cost, transactional model, to a more collaborative partnership model. Rather than force suppliers down to the lowest price possible, which constrains their ability to develop their products and services, KLM has adopted a partnership model in which the airline works with its suppliers to promote innovation, which often saves KLM money in the long term.

KLM's innovation fund acts as a venture capital mechanism to fund product and IP development among start-up businesses. This allows KLM to benefit from innovations by external players, as well as potentially profiting from the success of the firms it funds.

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Amazon – generating revenue from outflows of knowledge

Whereas many of the best examples of open innovation involve companies that set out to acquire knowledge, Amazon has secured considerable commercial success from outflows of knowledge and capability.

Amazon has developed a world class capability for processing product information and customer preferences through its IT infrastructure and specialist staff. Rather than keep this capability for its own exclusive use, Amazon has sold this capability to a range of other merchants and companies needing access to IT infrastructure to increase its revenue streams.

Amazon's IT infrastructure, and the expert staff which support it, are the key element of Amazon's business model. It enables the company to process a vast number of orders at a negligible marginal cost, while matching products to customer preferences, and receiving bills in advance. Amazon spent an estimated $800m on developing its IT infrastructure during the company's expansion, but this large fixed cost is offset by a small marginal cost of using the infrastructure. If Amazon had kept this IT capability to itself, its business model would depend on maintaining a high level of turnover to offset its fixed costs.

However, Amazon has increased the range of activities using its core IT capability by opening it up to a range of other companies. First, Amazon allowed other firms to sell their goods through their website, providing an extra revenue stream for Amazon. To follow this, Amazon has begun offering cloud computing services to smaller businesses, enabling them to buy Amazon's capability rather than developing their own at great cost.

By using these outflows of its capability, Amazon is able to increase the scale of its business, and offset its large fixed costs effectively. This allows Amazon to offer excellent services to customers at a lower cost, while also making a profit itself.

As is clear from the examples cited above, the debate about whether firms should engage in blanket open or closed innovation is something of a red herring. Instead, understanding innovation value chains depends on understanding why organisations may choose to hold onto or open up access to aspects of their knowledge.

Even those examples held up as clear examples of polar-opposite strategies actually can often be seen as different, but equally appropriate and effective, open innovation strategies. Take Apple and Google – often held up as the paradigmatic cases of open vs. closed strategies.[4] The basic analysis runs that Apple is 'closed' – keeping tight control of Apple products (not allowing modifications, for example; filtering what software can be loaded onto Apple products; and withholding access to source code of Apple software) – while Google is 'open' – allowing other developers and organisations to develop their own innovations on its software.[5]

But this analysis obscures the subtleties of their respective open innovation strategies – most clearly, Google's strategy is for its Android operating system to be part of an 'open' element of its value chain (something which provides it with excellent access to end consumers), while it retains close control of other elements of the chain, such as its search algorithms, and advertising data.[6] And – as we would expect of a dynamic, innovation value chain-based open innovation strategy – as its ability to capture value at different points in the innovation value chain shifts, it makes appropriate alterations to the degree of openness it deploys.[7]

Both organisations are simply considering very strategically what knowledge to hold onto, how they want to position themselves to best absorb valuable external knowledge, and what knowledge they release, congruent with their overall business model and innovation value chain.

Are innovation value chains becoming increasingly open?

Because of the complexity of the concept, direct and universally applicable measures of the relative openness of organisations are not available. However, it seems reasonable to state that many major firms, particularly in the developed world, have increasingly looked to open innovation as a potential solution to the erosion of profitability for more established business models. And there is some evidence that it has been working – for example that adoption of some more open innovation elements has reduced time-to-market for new products and increased the number of recognised innovations from large organisations.[8] Further contextual support for the increasing importance and

4 e.g. Wu, T. (2010) The Master-Switch: the rise and fall of information empires, London: Atlantic Books
5 http://googleblog.blogspot.com/2009/12/meaning-of-open.html
6 http://techcrunch.com/2011/03/25/search-googles-castle-moat/
7 http://www.businessweek.com/magazine/content/11_15/b4223041200216.htm; see also http://android-developers.blogspot.com/2011/04/i-think-im-having-gene-amdahl-moment.html
8 Reznik, G. and Morrelli, A. (2009) 'Open innovation: How to create the right new products, the right way',Outlook, No. 3, Accenture, http://www.accenture.com/SiteCollectionDocuments/PDF/OutlookPDF_Innovation_02.pdf

occurrence of open innovation is given by a number of broader drivers of long-term change within western economies, particularly those classed under the 'knowledge economy'.[9] Elements from the broader knowledge economy affording a greater level of open innovation would include:

- **The rise of a well educated workforces** – knowledge not confined to an elite core within major corporations, but is now more widely spread across the workforce. This makes 'high fence' strategies to contain knowledge within large corporations less effective;
- **The rise of educated and sophisticated consumer** – demand is changing and creating potential for the co-creation of a diverse range of new products and services – this depends on the operation of key open processes;
- **Convergent technology** – the rise of general purpose technologies, particularly in digital, computing and internet areas has been identified by many as leading to a convergence of platform technologies, and more recently of consumer products. In many cases, the breadth of sources of intellectual property within a single device make it unviable for an independent organisation to source them internally;
- **The rise of specialist intermediaries** – institutions which can manage sophisticated activities such as knowledge brokering are key intermediaries for exchanging knowledge in open innovation processes;
- **Increasing flows of knowledge services** – while these flows are incredibly difficult to quantify at a national level, OECD trade data does confirm that the past decade saw a dramatic increase in the scale of international trades in knowledge services;
- **A supportive policy infrastructure for open innovation** – it seems that many of the policies which support the knowledge economy are supportive of open innovation practices. The evolving focuses of our universities (exemplified by the changing impact assessment guidelines) and the open nature of the Technology Strategy Board or research funding applications are good examples of this.

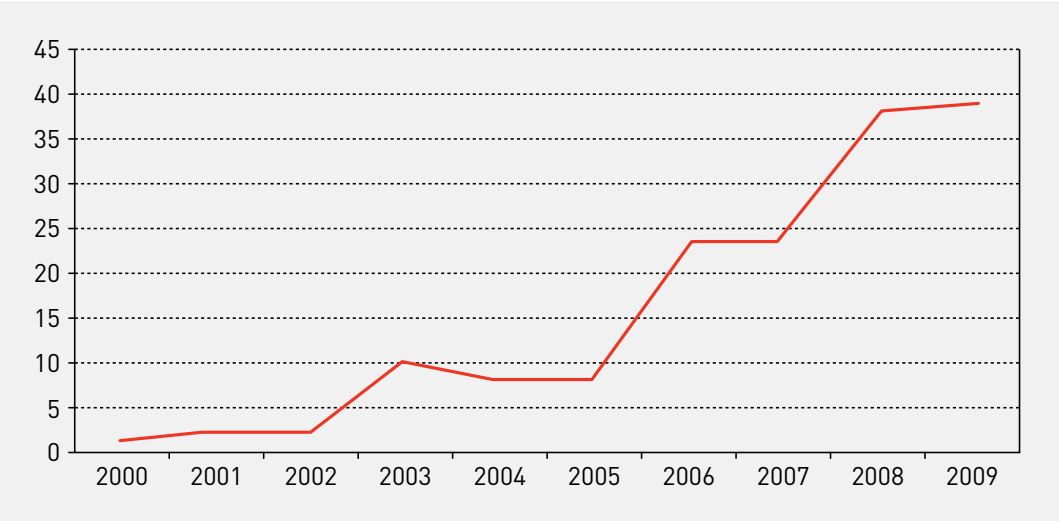
Given that individual organisations may successfully operate very different open innovation strategies, it is also likely that open innovation within a knowledge economy will have a particular impact on certain industrial sectors – some of which have

9 Levy, C., Sissons, A. and Holloway, C. (2011) A plan for growth in the knowledge economy, London: The Work Foundation, http://www.theworkfoundation.com/research/publications/publicationdetail.aspx?oItemId=290

been heavy investors in traditional R&D, such as pharmaceuticals, biotechnology, automotive, and the military, while others less so: healthcare, computers, software, communications, banking, insurance and consumer packaged goods.

Although it is circumstantial evidence, the 'buzz' surrounding open innovation also provides an indication of its increasing importance. Gassmann et al. (2010) in their recent review of open innovation literature[10], highlighted that there were now nine different perspectives on understanding open innovation. Given links between management studies and corporate practices, this is likely to be a strong indicator of the strategies that firms are pursuing now, and the analysis may well spur many more businesses to pursue open innovation strategies.

Figure 3: Academic interest in open innovation



Source: Dahlander and Gann, 2010

The move to open innovation strategies appears to be a genuine phenomenon – and one that is increasingly widespread – certainly for large global corporations. As we have defined it here, it represents a deliberate strategic move to balance the potential for gathering all gains from control of an innovation value chain against the possibility of sharing that risk (and the rewards) with other organisations. There is some evidence that large organisations which have moved to be more open in their pursuit of innovation have realised considerable gains. Furthermore, most large organisations moving to

10 Gassmann, O., Enkel, E., and Chesbrough, H. (2010), 'The future of open innovation', R&D Management, Vol. 40, No. 3: 213-221

become more open have developed strategies that balance different levels of openness at different points within the innovation value chain: it is important to recognise that they are not simply following a purely 'more open equals better' approach.

However, the main thrust of discussion surrounding the term has related to large corporations' open innovation strategies. The implications for other players in the broader innovation-ecosystem of large-firm shifts in strategy are neither clear-cut nor necessarily positive. While for some the changes are likely to represent a flowering of opportunities for inserting themselves into new innovation value chains, for others it may force unwanted change to value chains as new competitors disrupt existing business models. These challenges of increasingly open value chains for a range of stakeholders are the focus of **Chapter 3**.

Chapter 3 The challenge of increasingly open innovation value chains

It is clear that creating value within increasingly open innovation conditions presents a challenge for almost any organisation. Even the large corporations most likely to benefit from open innovation activities can find it a double-edged sword: for example the FIAT motor company's attempts to open their new product development process to external firms was widely assessed as a failure.[11] The decision to break-up their in-house new product development teams – part of a strategy to draw in new 'open' innovation from outside – caused a 'hollowing out' of key knowledge and expertise from the organisation, crippling the organisation's broader ability to capture value from innovation. Their open innovation experiment in this area was terminated. The FIAT case illustrates how even large multinational corporations can mismanage the process of working out which part of the innovation value chain to hold on to, and which to let go.

Organisations very differently positioned than large corporate investors in R&D have their own distinct challenges surrounding open innovation. In this section we focus on the effect of increasingly open innovation value chains on three areas:

- **Small and medium enterprises** (SMEs) – the fixed costs of managing open innovation processes fall disproportionately heavily on SMEs;
- **Universities** – face the challenge of rethinking their position within the value chain to identify additional revenue streams;
- **Specific geographic regions and places** – increasing dislocation between research and commercial application may increase the challenges faced by places which specialise in research.

SMEs

The increasing importance of open innovation processes has particular implications for SMEs. On the one hand it potentially promotes their importance within innovation, and it may boost routes through which owners can draw value from pursuing innovative activities, but research also shows that open innovation can be a costly and difficult strategy for small enterprises to pursue effectively.

From its origins in large multinational product-focused companies, the concept of open innovation has also spread to small and medium enterprises (SMEs). In many ways this has been a natural progression. Firstly, because SMEs account for an increasing percentage of R&D activity of all stripes – 24 per cent of US R&D spend in 2005 was by

11 e.g. Ciravegna, L. (2011) 'Outsourcing of New Product Development and the Opening of Innovation in Mature Industries: a longitudinal study of FIAT during crisis and recovery ', International Journal of Innovation Management, Vol. 15, No. 1, 69-93

SMEs, up from only 4 per cent in 1981. Secondly, SMEs are potentially the other side of the open innovation coin: they can be the niche intellectual property holders to whom big firms turn to gather innovation from outside. Open innovation techniques also often 'break down' large firm's innovation processes, allowing SMEs to engage in manageable chunks of innovation activity, where before they had insufficient scale to work across, or engage with, the multinationals' long innovation pipelines.

Van de Vrante et al. (2009)[12] found that SMEs engage in open innovation practices in stages: 'A sequence in the adoption of open innovation, starting with customer involvement, following with employee involvement, and external networking, and ending with more 'advanced' practices like IP licensing, R&D outsourcing, venturing, and external participations' (p435). This progression of SME involvement can also be understood in a different way: that they begin by being part of another organisation's open innovation strategy while perhaps maintaining fairly traditional processes themselves, before beginning to operate their own innovation pipeline according to open principles.

A number of clear benefits to SME participation in open innovation have been identified. In partnering with large organisations pursuing open innovation, they may have access to opportunities denied them as mere 'suppliers' or 'customers' of a large firm. Large firm open innovation approaches may also incentivise more entrepreneurial innovation in SMEs, as SMEs see a ready buyers' market for innovations they can come up with, but not necessarily deliver themselves. For SMEs practicing open innovation without large firm involvement, an open and collaborative approach to new solutions encourages networking and partnership between small enterprises, and broader and more efficient resource-sharing. There is also some evidence that open innovation combined with strong intellectual property protection has sparked a new business model of so-called 'born-global' entrepreneurial businesses.[13]

The general pursuit of increasingly open innovation strategies potentially boosts the exit opportunities for owners of SMEs. If large corporations are increasingly looking , and paying, SMEs for their intellectual property then this can represent a highly attractive proposition for the potential early stage investor. This is a point we persue further in **Chapter 4**.

12 van de Vrande, V. (2009) 'Open Innovation in SMEs: Trend, motives and management challenges', Technovation, Vol. 29, No's. 6-7, p423-437

13 Knight, G. A. and Cavusgil, S. T. (2004) 'Innovation, organizational capabilities, and the born-global firm'. Journal of International Business Studies, Vol. 35, No. 2, pp.124-141

However, despite the general rise of SME participation in open innovation activities, open innovation presents some distinct challenges to SMEs. Cosh et al. (2010)[14] have shown that firms of all sizes are just as likely to be engaging in open innovation activities, and that smaller firms are particularly likely to be engaged in transferring knowledge externally. Perhaps ominously however, they found that larger firms value the external knowledge they derive from open innovation practices much more highly than their smaller counterparts. Many micro businesses are concerned about how to manage their IP – the decision whether to patent, or how to value their IP were identified as challenges when engaging in open innovation practices.

To manage intellectual property opportunities and deals requires skills in IP valuation, access to opportunities, and capabilities in deal structuring – areas where most SMEs are inexperienced. Access to financial support for such deals through investment banking is often geared towards large firms, with advice costs unsupportable by small firms. A major resource investment of senior managers in an SME to deal negotiation could bring down a small enterprise if it were to collapse at a late stage. Activities which help to build networks between large firms and related SMEs (such as supply chain programmes, or initiatives such as Microsoft's BizSpark community of start-up customers) may help to build trust between organisations and could reduce some of these transaction costs.

Engaging in open innovation – particularly where they interact with large corporations – remains a clear risk for SMEs. Becoming part of the open innovation value chain of a large corporation offers opportunities otherwise out of reach, but potentially also opens them up to exploitation, or more complex interactions. Understanding how and where SMEs are inserting themselves into broader innovation value chains – that is, assessing their place in the innovation ecosystem – is a growing challenge for SMEs.

Universities

Arguably, universities have been practicing a form of open innovation practice since their mediaeval origins: both through academic publishing practices (knowledge sharing for which the producer does not charge the receiver) and through the dispersal of knowledge into the broader economy by educating students who go on to work outside academia. This perspective on universities' role in the innovation ecosystem suggests a deeper and more complex engagement with 'open' innovation than the slogan of a recent shift by UK universities from 'ivory towers to knowledge brokers'.[15]

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14 Cosh, A., Zahng, J., Bullock, A. and Mllner, I. (2011) 'Open Innovation Choices - What is British Enterprise doing?' Cambridge: UK~IRC

15 Gassmann,O., Enkel, E. and Chesbrough, H. (2010), 'The future of open innovation', R&D Management, Vol. 40, No. 3: 213-221

Nonetheless, changes to innovation value chains wrought by the changes labelled 'open innovation' do present challenges to universities, and raise some important questions on their position in the innovation ecosystem. Universities in the UK are increasingly challenged – particularly by government – to diversify funding streams, and to act as a more direct partner and player in the open innovation value chains of corporations. Modern universities' diversified engagements with industry include links through (at least) the following channels: 'publications/reports, informal interaction, public meetings or conferences, contract research, consulting, joint or cooperative research, patents, personnel exchange, licenses, recently hired graduates.'[16] Legislative changes in many jurisdictions have influenced this change. For example the 1980 Bayh-Dole Act in the US sought to encourage entrepreneurial spin-off companies from US universities by allowing them to retain intellectual property rights from research activities which were originally government funded. Some UK universities have, in turn, looked to follow this model, and shift their role in the innovation value chain from creation to a greater degree of innovation value capture, encouraged by government-commissioned studies such as the Lambert Report in 2003.[17]

Shifting to a spin-out/IP ownership and exploitation role has undoubtedly provided a challenge for universities to reposition themselves in relation to their multiple roles in the innovation ecosystem. Their role in 'basic' research and development in the UK is being enlarged as corporations use open innovation step away from major 'basic' research facilities. Universities also have a greater level of tension in relation to national policy, some voices pressuring universities to 'pay their way' more directly – that they should look to protect their native IP as much as possible – while others suggest that they should act as purely open 'public good' institutions, the better to allow maximum outflow of knowledge and innovation into the national economy. In reality, the blanket mandating of openness (or closedness) doesn't work: university activities to support development of innovation, or to support use of innovation, are most effective according to where they operating at different points within innovation value chains and networks. The challenge for universities is to be able to make decisions regarding the balance of openness in their role between the value to business and the value to the national economy.

16 Cohen, Wesley, M., Nelson, Richard, R., Walsh, J. P. (2002) 'Links and Impacts: The Influence of Public Research on Industrial R&D', Management Science, Vol. 48, No. 1, pp1-23

17 Lambert, R. (2003) Lambert Review of Business-University Collaboration: Final Report, London: HMT, http://www.hm-treasury.gov.uk/d/lambert_review_final_450.pdf

Spatial implications

Open innovation is increasingly re-making innovation value chains between organisations. Unsurprisingly, therefore, these changes create distinct spatial and place-based challenges. An increasing physical split between the location of research or new knowledge creation and its application or commercialisation is likely to present a significant challenge for many places. Under more open conditions, places can potentially be in a position where they are highly innovative and contribute to valuable innovation value chains, without being able to realise the benefits which would traditionally accrue from that strength and position. A specific geographic location could, for example, be a global centre for research, but, if in that market the value is captured most strongly through commercialisation activities located away from that research centre, then it is likely to struggle without a clear strategy for capturing its value within the innovation chain.

This presents a special challenge for the UK since, by global standards, the UK market for the next few years at least is unlikely to experience growth as strong as some global competitors. For the foreseeable future the fastest-growing markets are likely to be located in emerging economies such as India and China. If, as expected, these locations will present the most dynamic markets and the greatest opportunities for commercialisation, then the UK may find it more difficult to profit from innovation than in the past. Equally, if returns to commercialisation activities are increasingly centred on emerging economies, then rapidly-growing domestic market organisations which focus on commercialisation of innovation may not choose to focus investment in the UK.

The UK's advertising sector offers a powerful illustration of this point. Today the sector, and in particular its cluster in the West End of London, is a beacon of strength, and an important creator of value within the economy. Within innovation value chains its activity can be viewed as commercialisation-related – the sector creates value by applying its knowledge of what messages and mediums would inform consumers and influence their decisions. But if value chains are now more spatially dislocated, then commercialisation activities are freer to focus on emerging markets. It is not inconceivable that this may sideline the UK's advertising sector within global advertising, since advertising organisations centred in London may struggle to demonstrate an awareness of consumer demands and cultural sensitivities in many emerging markets. For global advertising corporations, such a shift of resources to emerging markets is a sensible commercial decision to bring innovation investment closer to growing markets. But to maintain global leadership, London-based parts of the business may have to re-

think their role in the innovation value chain, potentially providing a different kind of knowledge work and consulting expertise to other world markets than that they have excelled in in recent decades.

Increasingly open innovation value chains are likely to create greater spatial separation between research and commercialisation activities. This will challenge organisations to re-focus inter-organisation financial flows to places which are at the research and early investment end of innovation value chains. Such changes may also impact negatively rganisations in the UK – and therefore potentially the UK economy as a whole – which currently derive value from commercialisation, development and the application of new knowledge and innovation.

Chapter 4 A national approach – what do increasingly open innovation investment value chains mean for the National Innovation System?

The key conceptual challenge for this paper is to interpret our developing framework of increasingly open innovation value chains in the context of national public policy. This demands translating the concept from the level of the organisation to something which is of relevance to a national innovation system.

An analytical framework

From one perspective this ought to be a straightforward exercise. If pursuing more open innovation strategies (or at least more open in some areas) is sensible for a firm, then it is likely to be a good thing if more firms within an economy do so – it should, for example, result in more high performance firms.[18]

Unfortunately the model of open innovation presented here potentially represents a greater win for a single large firm than for the whole economy. Take, for example, the acquisition of a UK-based SME by a large non-UK multi-national. Interpreted in the context of **Figures 1** (closed) and **2** (open) in **Chapter 2** represents a positive opportunity for a multi-national company to exploit ideas which are external to the firm. However, this is not necessarily a gain for the SME's native national economy – the innovation could perhaps have been developed further by the SME, who might even have been more likely to retain related jobs and profits in the UK. In this way many of the firm-level wins from an open innovation strategy represent a zero-sum game at the level of the economy or innovation system – i.e. the economy will not be strengthened by more organisations pursuing more open innovation strategies.

But both the utopian and doom-laden scenarios for open innovation at the national level over-simplify the situation, as they implicitly assume that knowledge is of equal value regardless of its context. This ignores the potential synergies and complementarities between knowledge and the potential power of co-creation. As noted above, innovation depends not only on the creation of new knowledge but also on its application. The innovative potential of new knowledge is heavily contingent on how it is implemented – it is perfectly conceivable that a large organisation may have better routes, and a better chance of successfully commercialising the new knowledge than an SME – they may for example have stronger routes to markets or complementary products and services which can be bundled together. Equally, some products and services may be best driven forwards through independence and greater flexibility.

18 E.g. Lundvall, B.-Å. (ed) (1992a), National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning, London: Pinter, see also Ramstad, Elise (2009) 'Expanding innovation system and policy - an organisational perspective', Policy Studies, Vol 30, No 5, pp533-53

Box 5: Does the rise of open innovation mean a more 'cut and run' corporate culture for SMEs?

The announced sale of Autonomy to Hewlett-Packard for $10bn in August 2011 has reignited the debate over the robustness of British enterprise. Many are concerned that the owners of our profitable businesses sell out too easily. In the wake of the sale of Bourneville Cadbury to Kraft last year the Business Secretary directed the City's Takeover Panel to launch a consultation, and recently appointed Professor John Kay to lead a review of the effect of UK equity markets on the competitiveness of UK business.[21] But the impact of these activities - and of any planned changes - on the national innovation system remains opaque.

The apparent rise of this type of corporate activity might actually reflect the shift towards increasingly open ways of innovating; the purchase of SMEs by large companies is a key knowledge transfer process. In many cases these large enterprises may be able to yield greater returns from the knowledge embodied within the SME than the SME would by growing organically. The particular presence of this feature in the UK might simply be a fact of geography, and the limited scale of our domestic market. It may be that in some markets we lack the scale needed to nurture corporate giants.

But there are two issues here. Firstly, this type of activity potentially breaks the link between British innovation and domestic jobs growth – if successful British business fall into foreign ownership this may affect how they are managed and jobs growth in the UK may be lower than would otherwise have been the case, even if the whole business is growing – a question the Ownership Commission is focusing on and on which it is due to report shortly. In his August 2011 MacTaggart lecture, Google Chairman Eric Schmidt takes this line, suggesting Britain's failings are at the level of national policy:

> *'The UK does a great job of backing small firms and cottage industries, but there's little point getting a thousand seeds to sprout if they are then left to wither or transplanted overseas. UK businesses need championing to help them grow into global powerhouses, without having to sell out to foreign-owned companies. If you don't address this, then the UK will continue to be where inventions are born, but not bred for long-term success.*[22]

Cont.

19 http://www.bis.gov.uk/assets/biscore/business-law/docs/k/11-1015-kay-review-terms-of-reference.pdf
20 http://www.guardian.co.uk/media/interactive/2011/aug/26/eric-schmidt-mactaggart-lecture-full-text

Cont.

NESTA Chief Executive Geoff Mulgan also emphasises the importance of encouraging a longer-term outlook from both company founders and investors as being key to continued UK strength in innovation:

> *'The lesson of so many technology companies is that they always go through quite a few rocky patches ... nearly always along that track a company will have faced near-fatal crisis. Patient capital and founders who don't see selling out as a top priority are critical.'* [23]

The alternative is for UK to become a country that specialises in starting up great businesses. The rest of the world seems willing to pay handsomely for the knowledge and other intangible assets embodied within organisations such as Autonomy, and the potential of this exit route must act as a spur to many entrepreneurs. Surely then, this activity should be seen as a great British strength, and a symbol of our position as open innovation leaders? The jury is still very much out.

The second issue is that, as discussed further in this section, there are fundamental and systemic issues with how such markets for knowledge and knowledge enterprises work. It is far from clear that trades of such enterprises reliably capture their true value – especially to national economies – and that some enterprises will sell out too cheaply when their real value could be realised through organic growth, while other efficient trades will not happen.

If this activity is something the UK increasingly relies on, then these issues should be a real worry. This crystallises the need to build institutions and markets that understand the relationship between open innovation practices and the national innovation system.

In essence we need strong incentives to invest in knowledge, in order for knowledge to flow to where it will create the greatest benefits. This depends on our innovation system – the mix of markets and other forms of intermediary institutions through which knowledge moves around our economy. In this sense open innovation is a great opportunity since it will support greater knowledge flows. But, its rise clearly tests the quality of our innovation system and its ability to deliver knowledge to where it is most valued.

21 http://www.huffingtonpost.co.uk/2011/07/28/why-doesnt-the-uk-have-it_n_911915.html

Unfortunately this system depends – to a particularly strong degree in the UK – on 'knowledge' markets that we know are inherently prone to failure. We know that such knowledge markets are much more complex than standard markets for goods and services. While some intellectual property can be codified and traded in the form of patents, intangible assets (such as designs or brands) embody knowledge, but are intrinsically difficult to value.[22] Analysis is beset by issues of imperfect and asymmetric information and moral hazard. As NESTA described it in a recent report, 'IP, complexity and interdependence can be thought of as hard structural barriers to innovation'.[23]

If increasingly open innovation value chains are making external markets for innovation more important (compared to intra-firm arrangements) then this presents two challenges for policymakers. There is a greater need to compensate for market failure with additional public resources, and it creates a stronger impetus to improve the fundamental operation of the system.

A standard policy response

Currently, much of the literature on open innovation at a national policy level sidesteps the complex ways in which organisations adopt different levels of openness at different points within their innovation value chain. Instead, the standard policy analysis response seems more likely to look for 'bundles' of policies which encourage firms to pursue more open approaches to innovation with the hope that together this would make a region or nation more open in general (see **Table 3**). We provide Table 3 as an example not because we see it as bad research in its analysis – or indeed incorrect in its findings – but because it typifies a rather one-sided 'more open is always better' over-arching approach to considering policy areas for innovation.[24]

22 For a detailed discussion of this issue see Lekhi, R. (2009) Accounting for Intangibles, London: The Work Foundation and Research Republic, http://www.theworkfoundation.com/research/publications/publicationdetail.aspx?oItemId=223

23 National Endowment for Science, Technology and the Arts (2010) Open innovation: From marginal to mainstream, London, April, http://www.nesta.org.uk/library/documents/Open-Innovation-v10.pdf

24 See, for example, Meyer (2010: 199) for a similar 'shopping list' approach to open innovation policies

Table 3: Presence of open innovation policies in three countries[25]

Policy areas /guidelines		The Netherlands	Flanders (Belgium)	Estonia	Overall Conclusions
RTD policy					
I	Financial incentives	++	++	+ / ++	++
II	High-quality IP systems	+	o	o	o
III	Support standards	0	-	-	-
IV	User innovation	-	-	-	--
Interaction policy					
V	Develop skills	o	+	o	o
VI	Stimulate interaction	++	++	+ / ++	++
VII	Enhance technology markets	-	o	-	-
VIII	Use go-betweens	+	+	o	+
IX	Back up clusters	++	++	o / +	+ / ++
Entrepreneurship policy					
X	Support corporate entrepreneurship	-	-	o	_
XI	Access to finance	++	++	+	++
XII	Back up challengers	++	++	o / +	+
Science policy					
XIII	Appropriate funding	+	+	o	+
XIV	Balanced incentives	-	o / -	o	o / -
XV	Focus on excellence	+	+	o	+
XVI	Organised diffusion	++	++	o / +	+ / ++
Education policy					
XVII	General stimulation	+	+	+	+
XVIII	Entrepreneurship education	+	o	o	o
Labour market policy					
XIX	Aim for flexibility	+	o	+	+
XX	Enable knowledge migration	+	-	o / +	o
Competition policy					
XXI	Stimulate competition	++	+	++	++

25 De Jong, J. P .J., Vanhaverbeke, W., Kalvet, T. and Chesbrough, H. (2008), Policies for Open Innovation: Theory, Framework and Cases, Research project funded by VISION Era-Net, Helsinki: Finland, http://www.openinnovation.eu/download/OIPAFfinalreport.pdf

Focusing on policies which all encourage a blanket 'openness' not only ignores the subtlety of how organisations pursue open innovation management strategies, but it also ignores the central policy challenge of open innovation: the need to compensate for, and to improve, the fundamental operation of markets for knowledge. Put simply, for businesses openness isn't a principle or an ideology, but a process with which organisations engage strategically. Policy makers would do well to think of it in the same terms.

Correcting for a changing innovation investment landscape

The UK's position as a predominantly knowledge-based economy in the UK makes its degree of investment in innovation probably its only source of enduring competitive advantage. But do greater levels of open innovation across the economy threaten that overall level of investment? In an almost off-hand comment in the final chapter of his 2003 book, Chesbrough indicates he believes that it will:

> *'The new division of labour between industry, government and academia will witness less basic research inquiry being conducted inside corporate research laboratories. The strength of diffusion mechanisms, and the resulting breakdown in the virtuous circle, mean that industry can no longer be expected to underwrite the bulk of the costs of early-stage research'.*[26]

While it is a limited proxy for investment in innovation, we know that large firms disproportionately invest in research and development. If industry 'can no longer be expected' to make their traditional investment, who can, or should, step up to fill the gap? US data seems to suggest that SMEs seem to have been increasing their R&D spending in past decades; however it is unclear whether this is on an adequate scale to offer a replacement. A wholesale move to corporate open innovation then appears to risk what Herstad et al. (2010) describe the challenge as a 'tragedy of the commons':

> *As everyone in the longer run cannot cut their own R&D activity to live off spillovers from everybody else, support for intramural R&D is vital to reduce the risk of downward spirals in knowledge investments which collectively may result in 'tragedies of the commons'... Policy should therefore compensate for, not reinforce, incentives to substitute own R&D with external sourcing.*[27]

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26 Chesbrough, H. (2003) Open Innovation: The New Imperative for Creating and Profiting from Technology. Boston: Harvard Business School Press

27 Herstad, Sverre, J., Bloch, Carter, Ebersberger, Bernd, Van De Velde, Els (2010) 'National innovation policy. and global open innovation: exploring balances, tradeoffs and complementarities.' Science & Public Policy, Vol. 37, Issue 2, p113-124

This logic offers a direct call for public intervention in research to increase as a direct result of greater openness within innovation. Unfortunately in the current time of fiscal austerity additional public resources are unlikely to be forthcoming. This increases the importance of schemes that incentivise private investment in innovation, not just blanket openness. Revisions to our R&D tax credits and the forthcoming Patent Box system will be key here: both are potentially powerful, but if mishandled – for example allowing the Patent Box to become used as a tax holiday for major organisations repatriating existing profits – could do as much harm as good to the innovation system. Developing these as viable and effective tools in a way which boosts the national innovation system will be of critical importance for success.

Building a more supportive system for open innovation activities

The UK must consider how to build markets which are supportive of innovation. Rather than encouraging innovation practices to become more open across the board, the policy agenda must generate infrastructures that support open innovation practices at the points in global industrial innovation value chains where that approach is likely to play to the strengths of the UK economy. This necessitates consideration of market infrastructure and institutional elements such as:

The intellectual property regime

> Confidence in the currency of intellectual property becomes even more fundamental to economic activity in the context of open innovation – securing market clarity is important here, and the increasingly open innovation investment value chain model offers a perspective or a framework through which BIC will approach questions of intellectual property.
>
> An important first step will be for the government to implement the recommendations of the Hargreaves Review on Growth and IP.[28] As the Big Innovation Centre's Director, Professor Birgitte Andersen, recently noted: 'the intellectual property system must incentivise and reward inventiveness and creativity throughout the economic system rather than the current winner-takes-all approach, and must close income and technology gaps within industry. The Hargreaves Review is clearly a progressive move for copyright policy, but it is not a panacea: in implementing its recommendation we must keep the bigger innovation picture at the heart of the IP regime.'[29]

28 Hargreaves, I. (2011) Digital Opportunity: A review of Intellectual Property and Growth, London, the Intellectual Property Office, http://www.ipo.gov.uk/ipreview.htm

29 Andersen, B. (2011) 'Think Big!' the Open Rights Group: http://zine.openrightsgroup.org/hargreaves/think-big

The proposed Copyright and Business Models Centre, supported jointly by the three UK Research Councils, will also have a key role to play in mapping the ecosystem for IP and business growth in the UK through open innovation.

Financing investment in open innovation

Formal intellectual property rights apply weakly for many areas of knowledge. A particular issue is how the model operates for things that can not be patented (i.e. non IP based services and business models in particular) – strong venture capital markets are likely to be relevant here for building into a business which can be valued and traded on the strength of its business model. As The Work Foundation outlined in a recent report to the Independent Commission on Banking, there is a clear case for re-appraising the UK financial sectors' position in supporting the knowledge economy and key future growth sectors.[30] The increasing importance of open innovation practices has heightened this need further still.

Building markets for open innovation

It is clear that understanding and nurturing successful markets for knowledge through open innovation is a particular issue for small and medium enterprises. Many organisations at this scale appear to struggle to draw value from the knowledge that leaves their organisations. They lack the capacity to effectively manage their intellectual property in a strategic manner, or to leverage it to access further finance. They are particularly concerned about how to enter knowledge markets and negotiate effectively, when, compared to major corporate potential buyers, they are likely to be at a major skills and resources disadvantage. It seems that there is a growing role for knowledge brokers, knowledge exchange forums and other intermediaries that offer advice regarding deal architecture, and that this may not all be provided by the market.

It is likely that the public sector will also have a role to play here, perhaps through the recently-announced Technology and Innovation Centres. With the right support, public sector intermediary institutions have been shown to support flourishing of knowledge markets effectively when the incentive structures for developing innovations in the private sector have been unclear.[31]

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30 Hutton, W. and Nightingale, P. (2011) The Discouraged Economy: A submission from The Work Foundation to the Independent Commission on Banking, London: the Work Foundation

31 See, for example, Clausen, T. and Rasmussen, E. (2011) 'Open innovation policy through intermediaries: the industry incubator programme in Norway', Technology Analysis and Strategic Management, Vol. 23, No. 1: 75-85

A mission – making the UK the best place to commercialise an idea

The dislocation of innovation investment value chains also heightens the importance of another long-standing policy challenge: whether the UK can, or should, focus on being the best place to commercialise an idea or innovation. By positioning itself at that point in the innovation value chain, despite their increasing networked complexity, and spatial dislocation, may be the nation's strongest approach to tap into innovation value chains from, and in, other countries. But to achieve that mission demands much more than having a competitive tax rate, or even the often-measured variables of the ease with which a business can be set up or how onerous tax regulations are to comply with. Almost by definition these firms, through their foundation on ideas and knowledge, will depend on access to high level skills for their development. As noted within the recent Work Foundation report on high-growth businesses, overcoming systematic weaknesses in UK management and leadership skills should be an urgent enterprise policy priority.[32] From this perspective it must also be an open innovation policy priority.

Finally, the attractiveness of the UK enterprise environment depends on infrastructures and the strength of networked institutions. Traditionally this is interpreted in physical terms – roads, railways, phone lines and the architecture of high speed internet. But, for the knowledge economy, the presence of strong business services networks are an equally important consideration. Fortunately for the UK, this appears to be an area of real strength, but as we argued in a recent Work Foundation's report, this sector needs continued support and investment, along with a steady increase in the supply of highly skilled labour.[33]

32 Levy, C., Lee, N. and Peate, A. (2011) Ready, Steady, Grow? How the government can support the development of more high growth firms, London: The Work Foundation

33 Sissons, A. (2011) Britain's Quiet Success Story: Business Services in the Knowledge Economy', London: the Work Foundation, http://www.theworkfoundation.com/research/publications/publicationdetail.aspx?oItemId=287

Chapter 5 The Big Innovation Centre and open innovation

The analysis presented within this paper suggests that a) the greater relevance of open innovation and b) sustained progress towards more open innovation investment value chains, will both have significant impacts on the operation of the national innovation ecosystem. However, to-date, insufficient analysis has gone into researching and understanding the implications of these changes to the innovation system.

Thus far, the debate has focused too narrowly on the question of whether more or less open innovation structures are preferable – either at a firm level, or across our innovation system. Policy thinking must look beyond this – even if open innovation is on balance a negative for our economy, increasingly open innovation investment value chains appear to be an international feature. There is probably very little that the UK can do to stem this tide overall. Instead policy makers must focus on what would help our businesses to better exploit these changing innovation value chains in a nuanced and sophisticated way – as many of our leading corporations are doing.

Our research has highlighted how responding to shifting innovation investment value chains will demand action on three fronts:

1. Greater public support for fundamental research;
2. Building better markets for knowledge and ideas; and
3. Further action to ensure that the UK is the best place in the world to commercialise an idea.

Get this right and the UK will be able to thrive in the changing innovation environment. Fail here and we risk the erosion of our innovation ecosystem and growing limitations on our ability to create vale from our investments in innovation.

The Big Innovation Centre, a major new initiative from The Work Foundation and Lancaster University, will be driving forward this analysis and commentary. At its core the centre's mission is:

> *'To make the UK a global open innovation hub, to build a world-class innovation ecosystem, and rebalance and grow the UK economy.'*

The Big Innovation Centre brings together some of the world's leading companies with key institutions from across the policy landscape, all united by a commitment to innovation, building an environment in which innovation can flourish.

The commitment and drive of these organisations is focused on delivering five far reaching research programmes. All five programmes will be informed by our evolving understanding of the role of open innovation in the UK innovation ecosystem:

1. **Building innovative markets, places and networks** – will unpick the practicalities of how innovation ecosystems operate in different parts of our economy. It will look to map the role of open innovation activities and identify barriers to their pursuit;

2. **Building an innovation friendly financial system** – seeks to ensure that our financial system can enable UK businesses and entrepreneurs to pursue optimal open innovation strategies;

3. **Universities and public research organisations as interactive partners within the innovation system** – will consider the support/ incentives offered to universities here and the role played within open innovation;

4. **Skills for innovation** – will take a broad view to the questions of the capacities that support innovation, focusing on the technical skills for invention as well as the softer communication and business skills needed to succeed in open environments; and

5. **The Enterprising State** – will explore the practical role of our state in supporting innovation, and assess our intellectual property regime in facilitating open innovation practices.

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