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NESTA Making Innovation Flourish

Linking Innovators

Why the UK and India need to collaborate in a recession-hit world

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Executive summary

The model of collaboration for innovation between the UK and India is based on an understanding of innovation which has its roots in both countries' policies on science. Typically, policymakers had a bureaucratic expectation that a small number of very brilliant scientists would turn their research into new products, from where they expected innovation to emerge. For decades, their policies supported this view. India built a solid scientific infrastructure managed by iconic institutions such as the Council of Scientific and Industrial Research. Scientists occupied a central role in Indian policymaking, with scientific and economic planning closely linked. In the UK, big science projects were developed in the decades following the Second World War, with policy measures progressively introduced to improve the transfer of knowledge from research to the market place.

Recently, both the UK and India have pushed innovation up their domestic policy agendas. And this has been reflected in collaboration between the two countries.

Innovation is now seen as vital to increasing a nation's wellbeing and competitiveness, and the world's ability to tackle seemingly intractable social and environmental challenges. In 2007, the UK government created a department with innovation in its title and a seat at the Cabinet table. In 2005, India set up the National Knowledge Commission, to make recommendations on how to turn India into a knowledge economy.

This new approach was also translated into the establishment of new partnerships aimed at developing educational, scientific and technical links between the two countries. However, most of the programmes that have been established still reflect the influence of the traditional model of innovation. They are often closed, top-down and focused on improving both countries' performances according to traditional scientific innovation indicators.

Yet in today's world, innovation is different: it is becoming increasingly open and moving in unexpected directions. Emerging countries have broken into global markets and small non-institutional players are actively involved in the globalisation process. The rise and democratisation of Information and Communications Technologies (ICT), as well as the involvement of a wide range of external actors in the innovation process, have taken innovation out of the laboratory. All this is forcing changes in the way innovation occurs, making collaboration across disciplines and boundaries central to the process.

At the same time, the global economic crisis, now hitting both the UK and India, could make it hard to prioritise innovation. Innovation fell victim to the last recession in the UK, in the 1990s, with businesses cutting their spending. Businesses now may want to preserve cash flow through a focus on short-term gains rather than creating value for the future. Universities' funding and endowments are already shrinking. And as industry sponsors and charitable foundations look for ways to cut costs, they will be much slower at committing to university research. Falling tax revenues and the need for massive financial-stimulus measures could put pressure on national funding for research. All this could make innovation more difficult.

All the more reason, then, to promote more networks in innovation and global collaboration: international collaboration will help countries find common and innovative solutions out of the downturn. By working together, UK and Indian actors in both the public and the private sector can tap into international flows of knowledge to leverage creativity wherever it exists and use it to develop new ideas, services and products. International collaboration will allow places to gain access to resources such as capital and talents which may otherwise be limited in a downturn.

Yet, paradoxically, just as the UK and India need to collaborate more, such collaboration is becoming increasingly difficult to establish. Although it makes sense to do so, actors are less likely to collaborate in a recession, because

it is more difficult to establish and maintain the necessary trust. The UK and India have let mutual misperceptions take ground which are likely to hamper their future ability to trust each other. In the UK, India is seen as a low-cost economy and past historic ties have let policymakers think that India could be a natural partner. But in India, the UK is perceived as a rather old-fashioned country with whom it can be quite difficult to establish long-lasting partnerships in the field of innovation. Policymakers in both countries need to look afresh at each other's innovative potential and move beyond such stereotypes.

Policy can play an important role in helping maintain or build strong collaborations for innovation that are critical to both countries' abilities to innovate and attack the recession.

Recommendations

We make a number of recommendations which we believe can ensure continued co-operation and innovation in these difficult economic times.

- **DIUS should adopt a strategic approach to collaboration for innovation.** The UK and India should also set up clear strategies in targeted sectors to avoid people and resources being scattered. This would also help provide both long-term commitment and a solid basis for the trust that is needed for collaboration and the establishment of networks.

- **Building on the fruitful example of the UK-India Round Table, DST and DIUS should create a joint commission to identify key areas of collaboration and test out new models of collaboration.** This would help define strategic areas of collaboration, channel funding into these areas, and provide opportunities to explore new collaboration or build on the existing ones.

- **The UK should establish an interactive website, UK Link, that helps identify the most suitable Indian partners for innovation collaboration.** DIUS should use the portal information service Business Link to provide a direct channel to programmes that support collaboration.

- **The Science and Innovation Network (SIN) should be given more support to operate in India.** SIN is ideally positioned to play the role of trusted intermediary between Indian and UK institutions working in the field of innovation. In India, SIN has a critical role to play in disseminating an appealing and attractive UK innovation narrative. It should widen its team of stringers in India by partnering with local institutions rather than hiring more UK staff. In the UK, it should communicate and disseminate more widely the information it gathers about Indian innovation policy and opportunities.

- **UK Regional Development Agencies (RDAs) should develop 'sectoral collaboration coalitions' to explore opportunities in second-tier cities.** RDAs should join forces on trips and specialise more in their work in India to cut costs and avoid duplication.

- **The UK and India should create a social innovation and applied research collaboration fund.** Both countries should develop partnerships that capture the full range of innovation that is occurring which can help address problems like climate change.

- **UK Knowledge Transfer Networks should increase their international membership.** External knowledge-sourcing networks are increasingly recognised as important assets for creating and sustaining innovation and competitiveness.

Education can help provide a solid basis for long-term collaboration. Students usually keep strong links with their country of study, and tend to be keener to collaborate with people from this country in their professional life.

- **UK universities should partner with private businesses to fund and attract Indian students to the UK.** One of most cited barriers to studying in the UK is its high cost of living.

- **UK universities should turn themselves into 'universities without walls' by developing online courses and building on innovative schemes where students can mix online and campus-based study.** This would ensure that a wider number of Indian students have access to their courses and that such access is cheaper than going to the UK.

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UK India Business Council

UK Science and Innovation Network

UK Trade & Investment

UK-India Education and Research Initiative

The views and conclusions expressed in this report represent those of NESTA only. References to other organisations, including those consulted in the course of the research, does not imply endorsement by those organisations.

NESTA is the National Endowment for Science, Technology and the Arts.

Our aim is to transform the UK's capacity for innovation. We invest in early-stage companies, inform innovation policy and encourage a culture that helps innovation to flourish.

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Collaboration for innovation between the UK and India

1. Introduction

The UK and India have a tradition of co-operation in innovation, science and technology. Such collaboration has traditionally embraced a linear understanding of innovation, leading to centrally driven bilateral science and technology-focused partnerships.

However, the nature of innovation has undergone deep changes over the past decade. Innovation is becoming increasingly open and multidirectional, with developing countries' cities and regions quickly imposing themselves as global innovation hotspots. Networks that are created by ground-level innovators themselves have become central to innovation.

The global economic crisis will affect both the UK and Indian innovation systems. It is hitting both economies hard and putting intense pressure on their innovation systems. The downturn was brought on by the ultra-networked globalised nature of modern economies, which allowed the financial crisis to spread across the globe and to the real economy. And it is forcing Indian and UK governments and businesses to focus on short-term issues, pushing back innovation, and tempting them to retreat from global networks.

But, short-termism could also be short-sighted. Leveraging international networks can allow India and the UK to make the most of each others' ideas and resources to innovate, helping both economies to recover. However, this could be difficult. Mutual trust is increasingly important in the successful development of partnerships in the uncertain environment created by the economic crisis. And the UK and India have let misperceptions of each other take ground, and these are likely to create additional obstacles to collaboration in these difficult times.

If India and the UK are to successfully exploit the opportunities for innovation partnerships, policymakers in both countries should actively help to establish the conditions conducive to cross-border collaborations. This means that the UK will need a clear and targeted international innovation strategy that will offer India the guarantee that it is committing resources over the long term.

2. Both in the UK and India, innovation policy grew out of science policy

2.1 In the UK, innovation policy emerged from science policy

Post-war reconstruction and the demands of the Cold War pushed successive UK governments into making huge investments in defence research to fund large, costly scientific projects.[1] In the 1950s and 1960s, for example, the UK government developed a space programme to participate in the growing international satellite market.[2] Early computers, such as the Mark I at the University of Manchester, became the centrepieces of major public research laboratories.[3] In most cases, these projects were developed following a military method of research organisation: the ideas of a handful of brilliant scientists were turned into new products.[4]

Innovation was seen as a linear process. Scientific discovery was followed by applied research, and the commercialisation of a new product or process. Policymakers understood that both the public and private sectors operated this model.[5] In the private

1. Hughes, J. (2003) 'The Manhattan Project: Big Science and the Atom Bomb.' New York: Columbia University Press.
2. European Space Agency (2005) 'An Overview of United Kingdom Space Activity 1957-1987.' Noordwijk: ESA.
3. Lavington, S. (1998) 'A History of Manchester Computers.' Swindon: The British Computer Society.
4. Leadbeater, C. (2006) 'The Ten habits of mass innovation.' London: NESTA.

sector, prominent laboratories such as those of Smithkline in Kent or British Telecom at Martlesham were established, supporting hundreds of staff and fuelled by large sums of money. Public sector laboratories worked in the same way, whether in defence research at Porton Down or advanced physics at the Rutherford Laboratory. Innovation was recognised as such when new scientific and technical knowledge became embedded in manufactured products.[6] Thus, government intervention was needed only to invest sufficient resources at the conception, research and development (R&D) stages.[7] Interactions with inventors and product users were infrequent.[8]

2.2 In India, innovation policy was submerged in science policy

Immediately after Independence in 1947, the Indian government sought to promote economic development through a new national system of science and technology.[9] India's first prime minister, Jawaharlal Nehru, made science and technology one of his major priorities for national development.[10] Most Indian flagship scientific institutions and programmes were established around that time. The Council for Scientific and Industrial Research (CSIR), which had been created in 1942, was maintained and still remains India's largest publicly funded industrial R&D organisation today. A network of 38 public laboratories was built around it to support industrial and scientific research.[11] The new Indian government also set up the first of the Indian Institutes of Technology (IITs) to train highly skilled scientists and engineers to build the technology the country needed to grow.[12]

In the 1970s and 1980s, the governments of Indira and then Rajiv Gandhi took important steps to integrate scientific and economic planning.[13] In 1971, Indira Gandhi created the National Committee of Science and Technology to overhaul India's approach to science and technology and incorporate science and technology in socioeconomic planning. This led to the creation of the Department for Science and Technology, and of a Science and Engineering Research Council to fund basic research. In the 1980s, Rajiv Gandhi put even more emphasis on science and technology. And to obtain independent advice on science and technology issues, he created a new advisory body, the Science Advisory Council to the Prime Minister.

The dominance of the public sector in undertaking research and creating new products meant there were few incentives to foster private sector innovation. Indeed market-led innovation was stifled by the Licence Raj, a host of protectionist policies characterised by high tariffs, import licences and restrictions on foreign investment.[14] Businesses' abilities to innovate were also limited by the overprotection of Indian industries and the obligation to obtain a government permit for the creation of a new business or when an existing firm sought to increase capacity.[15] Indian policymakers showed little understanding of the importance of innovation to their country's growth and competitiveness.[16]

2.3 In both countries, innovation was understood as a linear and closed process

Even though they had different approaches to its development, both countries regarded innovation as a linear process, with innovation only recognised when new scientific and technical knowledge became embedded in actual products. Though it differed in importance between the two countries, they both believed government intervention was needed mainly to invest sufficient resources at the conception, research and development stages.

3. Recently, innovation has moved up the policy agenda

3.1 In the UK, innovation has been identified as a priority

In the late 1990s, the UK government put innovation at the core of its policy agenda. It saw innovation as critical to closing the productivity gap with other developed nations such as Germany, France and the US.[17] Consequently in 2004, the UK government set a target of increasing the level of R&D from 1.9 per cent to 2.5 per cent by around 2014.[18] It also aimed to increase total science expenditure to £6.3 billion in 2010–11, up from £4.2 billion in 2004–05.[19] The Research Councils, which fund a significant proportion of university research, and Regional Development Agencies were also granted over £1 billion to help support innovation across the country.

The government also strongly emphasised the importance of commercialising research. Following the Lambert Review, a Higher Education Innovation Fund to improve the quality of technology transfer offices in universities was set up.[20] This led to the expansion of such offices in many UK

5. NESTA (2006) 'The Innovation Gap.' London: NESTA.
6. NESTA (2008) 'Taking services seriously.' London: NESTA.
7. NESTA (2006) 'The Innovation Gap.' London: NESTA.
8. Ibid.
9. Parthasarathi, A. and Singh, B. (1992) 'Science in India: The First Ten Years.' Mumbai: Economic and Political Weekly.
10. Tripathi, S. (2007) India's Growth Path: Steady but not Straight. 'Issues in Science and Technology.' Spring 2007.
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12. Sandipan, D. (2004) 'The IITians.' New Delhi: Penguin Books.
13. Rao, C.N.R. (2008) Science and technology policies: The case of India. 'Technology in Society.' Volume 30, Issues 3-4, August-November 2008, pp. 242-247.
14. Marathe, S. (1986) 'Regulation and Development: India's Policy Experience of Controls over Industry.' New Delhi: Sage Publications.
15. UNCTAD (2007) 'National innovation system and macroeconomic policies: Brazil and India in comparative perspective.' Geneva: UNCTAD.
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17. HM Treasury (2000) 'Productivity in the UK: the evidence and the Government's approach.' London: HMT.
18. HM Treasury (2004) 'Science and Innovation Investment Framework 2004-2014.' London: HMT.
19. Ibid.
20. Lambert, R. (2003) 'Lambert Review of business-university collaboration.' London: HMT. The fund was administered by the Higher Education Funding Council for England (HEFCE). Such offices are also called Knowledge Transfer offices. They ensure that the research developed in universities is available to industry and government to develop new products and services.

universities, including Cambridge, Oxford, Edinburgh, Glasgow and Manchester.

Small and medium-sized enterprises (SMEs) were also given greater support to innovate. The government targeted a new R&D tax credit at small firms to stimulate innovation in the private sector.[21] To make access to finance easier for entrepreneurs and start-up businesses, the government also created Enterprise Capital Funds for investments of up to £2 million.[22]

Human capital has been recognised as critical to the UK's long-term ability to innovate. The Leitch Review sets out an ambitious programme to make the UK a world leader in skills by 2020.[23] In particular, it recommends that at least 40 per cent of adults should have a university degree by 2020 (up from 29 per cent in 2005). Recently, the government has taken measures to encourage employer investment in skills, creating a new Commission for Employment and Skills and encouraging employers to commit to training more employees at work.

Last year, the UK government took a bold step towards placing innovation at the centre of the policy agenda. In 2007, a new ministry tasked with innovation policy, the Department for Innovation, Universities and Skills (DIUS), was established. For the first time, innovation had a seat at the Cabinet table, and was linked to skills. This new emphasis is also reflected in the UK's innovation strategy 'Innovation Nation',[24] published in March 2008. This strategy supports the view that innovation is vital to increasing the UK's competitiveness and the quality of life of the UK population, and that innovation is critical to meeting some seemingly intractable global issues such as climate change and pollution.

3.2 In India, policymakers have become more innovation aware

The economic liberalisation of the 1990s set the basis for an innovation boom in India.[25] In 1991, the Indian government adopted a series of new measures to liberalise the economy, opening it up to external competition.[26] This included a set of economic policies aimed at eliminating industrial licensing, reducing protection for internal products, allowing foreign investment and unleashing competition.[27] These changes forced India to break with its old habits: innovation was no longer limited to large public sector firms, Indian businesses could participate in global trade, and competitive pressure was unleashed to drive change.

Recently, the Indian government changed its science and technology policy with an increased focus on innovation. Prime Minister Dr Mamohan Singh recognised the importance of knowledge and innovation to India's future competitiveness, when he created a National Knowledge Commission in 2005. This Commission advises him on how to 'transform India into a knowledge society'[28] and has pushed for bold reforms of the education, innovation and technology systems.[29]

The Indian government placed education at the centre of achieving its objective to make India an innovative country. In the Eleventh Five Year Plan (2007-2012), the Government committed Rs. 3 trillion (US $61.5 billion) to education, a five-fold increase over the 10th Plan.[30] The share of education in the total planned budget increased from 7.7 per cent to 20 per cent.[31] The Indian government also announced the establishment of three new Indian Institutes of Technology, two new Indian Institutes of Science Education and Research, and 16 central universities.[32]

Science kept a central place in the policy agenda, with a substantial increase in investment. In 2009, the Prime Minister committed to double the investment in Science from 1 per cent of national income to 2 per cent of national income.[33] And it announced the creation of a new National Science and Engineering Board, aimed at supporting fundamental research.[34] Modelled on the US National Science Foundation, the new foundation would be autonomous of the government bureaucracy, and run by scientists.

The break with earlier innovation policy is completed with the attention now paid to the role of SMEs in the innovation process. This contrasts sharply with the earlier focus on giant corporations as powerhouses of innovation for the wider economy. In October 2005, the Department of Biotechnology announced a Small Business Innovation Research Initiative (SBIRI) scheme to provide early-stage funding to help science entrepreneurs create new technology-based businesses.[35]

21. HM Treasury, DTI, HM Revenue & Customs (2005) 'Supporting growth in innovation: enhancing the R&D tax credit.' London: HMT.
22. See BERR website, Enterprise Capital Funds.
23. Leitch, S. (2006) 'Prosperity for all in the global economy – world class skills.' London: HMT.
24. DIUS (2008) 'Innovation Nation.' London: DIUS.
25. Tata Management Training Centre (2006) 'Innovation in India: recent trends.' Pune: TMTC.
26. Ibid.
27. Ibid.
28. See National Knowledge Commission website.
29. NKC (2007) 'Towards a Knowledge Society – Three years of the National Knowledge Commission.' New Delhi: NKC.
30. Ibid.
31. Ibid.
32. Government of India (2008) 'Key Features of Budget 2008-2009.' Union Budget and Economic Survey.
33. DST (2008) 'PM calls for a knowledge-based society and a science-based economy.' Press Release. 3 January 2009.
34. Government of India. Bill No. 61 of 2008. 'The Science And Engineering Research Board Bill, 2008.'
35. See Ministry of Science and Technology, Department of Biotechnology website.

4. This has been reflected in increased collaboration for innovation between the two countries

4.1 Both countries have opened their innovation systems

As innovation crept up the domestic policy agenda, it began to influence foreign policymaking. International co-operation, in particular, came to be seen of mutual benefit for innovation policy. Governments in both countries now support the view that international collaboration for innovation is essential to their countries' future prosperity and the ability to tackle major challenges such as climate change.[36]

Education has been central to the collaboration agenda

India has increasingly been recognised by the UK as a partner of choice for such collaboration. In 2005, the UK established a Global Science and Innovation Forum (GSIF) to design and implement its strategy for international engagement in science and technology.[37] The GSIF aims to encourage cross-government exchanges of information and ideas to improve international collaboration in science and innovation. Under its aegis, the Indian and UK governments jointly created the Indo-UK Science & Innovation Council in 2006 with the aim of accelerating co-operation in both areas.

This partnership bore fruit with the 2006 launch of a five year educational programme, the UK-India Education and Research Initiative (UKIERI), that aimed to increase research and education links between the two countries. Both governments offered significant contributions. The UK government provided a total of £23 million and the Indian DST provided match funding for science-related collaboration.[38] This has already led to the creation of over 475 new Indo-UK university and school links, including research awards, collaborative research projects, and the signing of a Memorandum of Understanding on Higher Education leadership development.[39]

Science remains a priority area

A network of Science & Technology attachés was introduced by the UK in 2000 to tap into foreign innovations and draw on international best practice. More recently, the UK government decided to make innovation even more central to the network's agenda, and gave DIUS the responsibility of co-managing and co-funding the network with the Foreign and Commonwealth Office.[40] The Network is spread across India's biggest cities – Mumbai, Bangalore and New Delhi – with a UK team based in New Delhi closely monitoring India's innovation policy.

In 2006, Lord Sainsbury, the UK Minister for Science and Innovation, and Shri Kapil Sibal, the Indian Minister for Science, Technology and Ocean Development, established new strategies aimed at deepening co-operation in science and innovation. These included both countries earmarking up to US$8 million over five years to support joint science and innovation initiatives, and adopting mega series of large top-down projects in areas such as nano-science and energy.[41]

Some of the UK's key public and private bodies dealing with innovation are now present in India, including Research Councils UK (RCUK), which has an office in New Delhi. Many other institutions including the Royal Society, the Royal Academy of Engineering, the British Academy, and the Wellcome Trust also have a presence in India and are actively seeking to develop collaborative projects. One recent example is the 'Next Generation Networks' project part-funded by RCUK, DIUS, the Indian DST, and led by the Engineering and Physical Sciences Research Council (EPSRC). The project aims to bring online education, healthcare and early warning weather and natural disaster systems to remote areas in both countries.[42]

Trade and investment have received more attention from policymakers

Ministerial visits to promote trade links between the two countries have become more frequent over the past five years. Greater resources have been allocated with the re-branding of the Indo-British Partnership Network as the UK-India Business Council (UKIBC). This new organisation benefited from a thirteen-fold increase in funding (from £75,000 to £1m).[43] UKIBC is actively promoting trade and investment links between both countries, and has developed original projects such as the 'Next Generation India network' which aims to bring together young businessmen and students from both countries.[44]

In parallel, UK Trade and Investment (UKTI) developed an R&D programme focused on attracting overseas-owned R&D-intensive businesses to undertake more R&D in the UK.[45] Working with R&D technology specialists, as well as virtual teams, it has successfully attracted several Indian companies to the UK. The UK-India Joint Economic and Trade

36. DIUS (2008) 'Innovation Nation.' London: DIUS. And DST (2008) 'Annual Report 2007-2008.' New Delhi: DST.
37. See BERR, Global Science & Innovation Forum website.
38. See UKIERI website.
39. Ibid.
40. DIUS (2008) 'Innovation Nation.' London: DIUS.
41. Namely, (i) Stem cell research & animal biotechnology;(ii) Next generation networks in telecommunications; (iii) Nano science and materials science;(iv) Weather science and climate change; (v) Energy technologies including hydrogen fuel. DST (2007) 'Annual Report 2006-2007.' New Delhi: DST.
42. RCUK (2009) '£9m to help research digital revolution.' Press Release. 19 January 2009.
43. See UKIBC website.
44. Ibid.
45. UKTI (2008) 'UK inward investment report.' London: UKTI.

Committee (JETCO) also received further support to remove barriers to market entry and to identify opportunities for co-operation between the two countries in key sectors.[46] In 2008, the Business, Enterprise and Regulatory Reform Select Committee welcomed these efforts, asserting that the UK had taken encouraging and promising measures to establish closer relationships with India.[47]

4.2 However, the increased collaboration between the UK and India in the field of innovation still focuses on a linear view of innovation

While the DIUS 'Innovation Nation' White Paper recognises the changing face of innovation, the UK government's programmes are still heavily biased towards a linear and scientific view of innovation. Programmes like the Science and Innovation Network may now include the word innovation in their names, but they are still heavily focused on scientific innovation. UKTI targets innovative businesses using one of the most traditional measures of innovation – R&D intensity – as a basis to assess a business's innovativeness.[48]

While this type of innovation is still very important, and it is important to develop programmes to support it, it does not always capture the full extent of innovation. In particular, it does not always take into account the changing face of innovation.

5. How innovation occurs has changed

5.1 International networks are changing the nature of innovation

Traditionally, governments and large corporations have played a major role in driving globalisation, removing legal barriers to trade and signing bilateral and multilateral agreements.[49] However, their importance is changing rapidly. The rise of ICT has added a new dimension: goods and services flow much more freely across the globe. And their circulation is often disconnected from the person or organisation sending them. This has allowed smaller actors to play a role in driving globalisation.[50]

Today's globalisation involves SMEs,[51] transnational ethnic communities,[52] and global virtual communities such as Wikis, Facebook or Second Life.[53] These smaller actors also include dense transnational social networks that bind places together creating so-called 'global enclaves',[54] such as the strong linkages between Bangalore and Silicon Valley in IT.[55] Finally, off-shoring and out-sourcing have allowed the globalisation of careers[56] and skills markets.[57]

These new players are forging new connections between countries and within them, without the mediation of governments, and are bringing distant places closer (they may also be making close places more distant from each other as the links are across areas of interest rather than geographical).[58] All this opens new channels of global interaction and is nurturing the development of global flows of talents, capital and ideas.

5.2 In the 1980s many developing countries broke into global markets

Over the past two decades, the emergence of developing countries transformed the balance of global economic power. Since the Industrial Revolution, there have been various waves of globalisation, and all have been characterised by falling transport costs, reduced trade barriers and a liberalisation of trade and capital flows.[59] But it is only relatively recently that emerging countries have started to play a major role in this process.

Many commentators have predicted that their economic role will be growing at a very fast rate with profound consequences and opportunities for the world. The investment bank Goldman Sachs believes that within 40 years, Brazil, Russia, India and China together could have larger economies than the UK, Germany, Italy, France, Japan and the USA combined.[60] And the World Bank has asserted that despite the global financial crisis, India and China would continue to grow.[61]

Their indigenous innovation capabilities and their R&D investment are both growing rapidly. China's R&D spending increased at an annual rate of 10 per cent from 1995 to reach $30 billion in 2005.[62] China is also a world leader in nanotechnology and telecommunications and is rapidly improving in highly technical fields such as biotechnology and genomics.[63] India's performance over the past decade has been similarly impressive. The country is now recognised as one of the world's most innovative: in 2005, UNCTAD ranked India third after the US and China as an R&D hotspot.[64] Though most R&D investment is still made by the public sector, the World Bank calculated that private R&D was more than seven times higher in 2004 than in 1991.[65] Patentable innovations have also shown a sharp rise, with the number of patent applications filed

46. See UKIBC website.
47. BERR Select Committee (2008) 'Waking up to India: Development in UK-India economic relations.' London: The Stationery Office.
48. NESTA (2006) 'The Innovation Gap.' London: NESTA.
49. NESTA (2008) 'UK global innovation – Engaging with new countries, regions and people.' London: NESTA.
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51. UNESCAP (1999) 'Economic and Social Survey of Asia and the Pacific.' Bangkok: UNESCAP.
52. Portes, A. (1997) 'Globalisation from below: the rise of transnational communities.' Working Paper 98-01. Princeton: Princeton University Press.
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54. Montgomery, A. (2008) Virtual enclaves: the influence of alumni email lists on the workspaces of transnational software engineers. 'Global Networks.' Volume 8: Issue 1.
55. Saxenian, A. (2006) 'The New Argonauts: Regional Advantage in a Global Economy.' Cambridge, MA: Harvard University Press.
56. Mahroum, S. (2002) 'The International Mobility of Academics: The UK Case.' Universal Publishers.
57. OECD (2007) 'Staying Competitive in the Global Economy: Moving Up the Value Chain.' Paris: OECD.
58. NESTA (2008) 'UK global innovation – Engaging with new countries, regions and people.' London: NESTA.
59. HM Treasury (2004) 'Longterm global economic challenges and opportunities for the UK.' London: HMT.
60. Goldman Sachs (2003) 'Dreaming with BRICs: The Path to 2050.' Global Economics Paper No. 99: October, 2003.
61. IMF (2009) 'Transcript of a Briefing of Asia Press by International Monetary Fund Managing Director Dominique Strauss-Kahn.' 2 February 2009.
62. OECD (2008) 'OECD Reviews of Innovation Policies: China.' Paris: OECD.
63. NESTA (2008) 'UK global innovation – Engaging with new countries, regions and people.' London: NESTA.

more than doubling to 24,505 in 2005-06, from 10,592 in 2001-02.[66] India has taken the lead in sectors such as IT, biotechnology and pharmaceuticals.[67] Companies such as Infosys, Wipro, or Tata are amongst the world's most innovative businesses and renowned brands.

Some of these emerging countries' cities and regions have become dynamic innovation hotspots, competing on equal footing with western innovation centres. Some Indian states and regions are outstanding examples of rapid development. Mumbai, New Delhi and its neighbouring cities Noida and Gurgaon, Chennai in Tamil Nadu, and Hyderabad in Andhra Pradesh have all become global boom centres with international inflows and outflows of people, business, and capital. In addition, second-tier cities such as Ahmedabad, Pune and Chandigarh are becoming hotspots for innovation.[68]

5.3 The nature of innovation is changing

All these changes are reinventing innovation. The rise of ICT and the democratisation of the innovation process have taken it out of the laboratory. Collaboration across disciplines and boundaries has become central to the innovation process, which is being pushed in unexpected directions.

Innovation across national borders is becoming commonplace. An increasing number of businesses are internationalising their R&D activities.[69] Problems requiring global solutions such as climate change have pushed scientists to share costs and expertise.[70] International co-authorships have also grown at an unprecedented speed.[71]

A growing number of businesses are adopting more open ways of innovating.[72] Successful innovators are interacting with a diverse range of actors such as universities, suppliers and small firms, rather than relying on knowledge produced in-house. Procter & Gamble, for example, expects 50 per cent of its future products to originate outside the company.[73]

Users and consumers are now, more than ever, a source of new ideas.[74] Some develop and refine products themselves, allowing new and better products to emerge. The McKinsey Global Institute estimates that this type of user-driven innovation will develop quickly.[75] Businesses are learning how to leverage user-generated content, drawing on this external pool of innovative ideas.[76]

Innovation, then, is no longer a closed process that rigidly follows a defined pattern. As a result, traditional innovation metrics that build on the linear model, like R&D expenditures and the numbers of scientists employed, do not capture well this new innovation.[77] These traditional measures were better suited to an innovation system driven by scientific and technological progress alone.[78] While such innovation remains very important, other types of innovation are also flourishing and playing a central role in a country's ability to remain competitive.[79]

6. Both innovation systems are now under intense pressure

6.1 The recession was brought on by the networked character of the modern economy

The collapse of the US sub-prime mortgage market and the reversal of the housing boom in other industrialised countries affected every country from the second half of 2008. Stock markets have fallen, large financial institutions have collapsed or been bought out, and governments have had to come up with rescue packages to bail out their financial systems. According to the IMF, world economic growth is projected to fall to just 0.5 per cent in 2009, its lowest rate since the Second World War.[80] Economic growth in the 30 countries of the OECD is forecast to fall by 0.4 per cent in 2009,[81] and the growth of the Asian economies is projected to slow from 7.6 per cent in 2007 to 4.9 per cent in 2009.[82]

The main and perhaps most important difference with earlier recessions is that the world economy is now much more connected. Some have talked of 'financial contagion',[83] suggesting that the financial crisis spread as quickly as a dangerous illness, ignoring boundaries and affecting every country in the world.

The economy has become much more connected over the past decade. The containerisation of the transport systems and other efficiency improvements has helped significantly reduce the cost of transporting goods.[84] The growth of the new Internet sector and related fields in the late 1990s and the subsequent emergence of online businesses, like Google, Amazon and Skype, paved the way for an open and global network of electronic communications.[85] This allowed many more

64. UNCTAD defines a hotspot as 'a place where companies can tap into existing networks of scientific and technical expertise; which has good links to academic research facilities; and provides an environment where innovation is supported and easy to commercialize.' UNCTAD (2005) 'World Investment Report 2005.' Geneva: UNCTAD.
65. The World Bank (2007) 'Unleashing India's innovation.' Washington D.C: The World Bank.
66. Evalueserve (2008) 'Evalueserve study on R&D ecosystem in India.' Evalueserve.
67. NESTA (2008) 'UK global innovation – Engaging with new countries, regions and people.' London: NESTA
68. Ibid.
69. OECD (2007) 'OECD Science, Technology and Industry Scoreboard 2007.' Paris: OECD.
70. DIUS (2008) 'Innovation Nation.' London: DIUS
71. UNESCO (2005) 'UNESCO Science Report 2005.' Paris: UNESCO.
72. Mckinsey (2008) The next step in open innovation. 'The McKinsey Quarterly.' June 2008.
73. NESTA (2008) 'Connect, Collaborate, Innovate.' London: NESTA.
74. Von Hippel, E. (2005) 'Democratizing innovation.' Cambridge: The MIT Press.
75. Mckinsey (2008) The next step in open innovation. 'The McKinsey Quarterly.' June 2008.
76. Von Hippel, E. (2005) 'Democratizing innovation.' Cambridge: The MIT Press.
77. NESTA (2007) 'Hidden innovation.' London: NESTA.
78. NESTA (2006) 'The innovation gap.' London: NESTA
79. NESTA (2008) 'Total innovation.' London: NESTA.
80. IMF (2009) 'World Economic Outlook Update – Global Economic Slump Challenges Policies.' Washington D.C: IMF.
81. OECD (2008) 'OECD Economic Outlook No. 84, November 2008.' Paris: OECD.
82. IMF (2008) 'Regional Economic Outlook: Asia and Pacific.' Washington D.C: IMF.
83. Snower, D. (2008) How to fight the global financial contagion. 'Financial Times.' 17 December 2008.
84. Levinson, M. (2006) 'The Box: how the shipping container made the world smaller and the world economy bigger.' Princeton: Princeton University Press.
85. OECD (2008) 'OECD Information Technology Outlook 2008.' Paris: OECD.

cross-border economic exchanges, which transformed societies.[86]

The current economic downturn is the first to take place in this context of intense connectivity. When the recessions of the 1990s hit, the Internet was used only by a handful of economic actors, and was not used by most ordinary people. This is the Internet's first proper recession.[87]

6.2 Both countries are deeply affected

The UK is one of the world's most affected nations

Globalisation means that problems elsewhere in the world economy can have a major impact on the UK, and then be transmitted rapidly to the UK wider economy.[88] In December 2008, Alistair Darling admitted that London's status as a major financial services centre might result in the UK being worse affected than other economies less dependent on the finance industry.[89]

The credit crunch has already had major consequences on the UK wider economy. The IMF projected that the UK will see its economy contract by 2.8 per cent in 2009, and predicted that it would experience the worst contraction among advanced nations.[90] UK businesses of all sizes are experiencing worsening cash flow positions or difficulty accessing credit. This contributes to slowing economic growth.[91]

Amongst the hardest hit industries will be construction and manufacturing, in particular relatively low-technology manufacturing.[92] Business-facing creative sectors such as advertising, architecture and software, will also feel the brunt of the downturn.[93] The financial services sector will be profoundly reshaped.[94]

Unemployment has already begun to accelerate. According to the Office of National Statistics, in January 2009, the number of unemployed people was 1.92 million, up 131,000 from the previous three months, the highest level since 1997.[95] And unemployment is predicted to jump to over 9 per cent in 2009, compared to 5.5 per cent in 2008.[96] Some predict that London and the South East will be hit the hardest over the next two years, with almost two in five of jobs at risk.[97]

India has been hit too

In an increasingly inter-connected world, India could not remain insulated.[98] Over the past few months, India has seen its stock markets suffer. Indian products and services are also sold globally, and a slowdown in wealthy countries means an increased likelihood of a slowdown in India, as well as the risk of job losses and associated problems such as social unrest.

In its latest Five-Year Plan, the planning commission predicted an average growth rate of 9 per cent, rising to 10 per cent from 2012.[99] This has recently been revised down by the Reserve Bank of India.[100] The economy is slowing markedly as demand for Indian exports falls, with exports declining in absolute terms in October 2008 (for the first time in seven years).[101]

To add to these grim trade trends, foreign institutional investors pulled out close to $10 billion from India, dragging the capital market down with it.[102] The liquidity crisis and credit squeeze are already hurting various sectors.[103]

6.3 Innovation is likely to particularly suffer

In such an economic context, policymakers will be forced to balance many legitimate demands on the public purse. Their priority will be to relieve their citizens' immediate economic difficulties. Businesses and governments will have to prioritise – and innovation spending might prove hard to justify to worried populations and shareholders. During the 1990s crisis, spending on innovation was one of the first investments to be cut.[104] The present crisis is thus placing many different strains on innovation.

Businesses interested in preserving cash flow might focus on short-term gains rather than creating value for the future by investing in innovation. With unemployment rising, consumer spending falling and savings shrinking, many businesses are understandably focusing on getting through the crisis of the week rather than growing for the future. However, focusing on short-term issues may work for a while, but could have diminishing returns. And it might prevent companies from positioning themselves as long-term winners.[105] Start-ups are also amongst the first hit by the recession. The crisis in confidence among banks is spreading, creating a risk-averse investment culture that will starve high-tech start-up firms and other businesses of capital.[106]

Universities' funding and endowments are also shrinking.[107] As industry sponsors and charitable foundations look for ways to cut costs, they will be much slower to commit to university research.[108] Many will cut research investments and support to universities and research institutions. According to the financial

86. WTO (2008) 'World Trade Report 2008 – Trade in a globalizing world.' Geneva: WTO.
87. Leadbeater, C. and Meadway, J. (2008) 'Attacking the recession.' London: NESTA.
88. HM Treasury (2008) 'The UK Economy: addressing the long-term strategic challenges.' London: HMT.
89. Watt, N. (2008) Chancellor admits Britain is facing more severe downturn. 'The Guardian.' 16 December 2008.
90. IMF (2009) 'World Economic Outlook Update – Global Economic Slump Challenges Policies.' Washington D.C: IMF.
91. HM Treasury (2008) 'Pre-Budget Report 2008: Facing global challenges: supporting people through difficult times.' London: HMT.
92. LGA (2008) 'From Recession to recovery: the local dimension.' London: LGA.
93. Bakhshi, H., McVittie, E. and Simmie, J. (2008) 'Creating Innovation: Do the creative industries support innovation in the wider economy?' London: NESTA.
94. Leadbeater, C. and Meadway, J. (2008) 'Attacking the recession.' London: NESTA.
95. Office of National Statistics (2009) 'Labour Market Statistics Headlines – January 2009.' London: ONS.
96. OECD (2008) 'OECD Economic Outlook No. 84, November 2008.' Paris: OECD.
97. LGA (2008) 'From Recession to recovery: the local dimension.' London: LGA.
98. Institute of Development Studies (2008) 'Voices from the South. The impact of the global financial crisis on developing countries.' Brighton: IDS.
99. Planning Commission (2006) 'Towards faster and more inclusive growth. An approach to the 11th Five Year Plan.' New Delhi: Planning Commission.
100. Subbarao, D. (2008) 'The Global Financial Turmoil and Challenges for the Indian Economy.' Bankers' Club, Kolkata. December 10 2008.
101. Ibid.
102. Lakshman, N. (2008) World Financial Crisis: India's Hurting, Too. 'Business Week.' October 8 2008.
103. Subbarao, D. (2008) 'The Global Financial Turmoil and Challenges for the Indian Economy.' Bankers' Club, Kolkata. December 10 2008.
104. Sainsbury (2007) 'The Race to the Top: a review of government's science and innovation policies.' London: HMT.

research company Moody's, universities' endowments may shrink by 30 per cent in 2009.[109] This may mean that universities will have to put off developing new research programmes and buying new equipment, focusing instead on maintaining existing research and equipment.

7. Collaboration will become increasingly important to countries' abilities to innovate

7.1 Harnessing the potential of international networks

As we have seen, the extent of the financial crisis reflects the increasingly interconnected world that has developed over the past decade. However, the causes of the recession do not lie in networks *per se*, but in malfunctioning and poorly regulated financial networks.[110] The remedies will not be to retreat from these global networks but to reform and manage them more effectively.

Examples of previous economic crises reveal that protectionism and the sidelining of international trade networks increased economic pains. During the 1930s, governments chose to embrace protectionism which played an important role in prolonging the Great Depression. The imposition of import controls and tariff barriers[111] in the three years following the Wall Street crash in October 1929 contributed to a 30 per cent decline in world trade. In addition, international institutions remained mute and global governance was almost non-existent, with no international agreement on resolving the international monetary crisis until after World War Two.[113]

Solutions to the economic downturn will be more effective if they work with those networks. Governments have already started to recognise this by organising international meetings aimed to find common solutions to a common problem. Such efforts should not only come from central governments, but from all levels of government. Regions and cities should use networks to their advantage too.[114]

7.2 Absorbing the best ideas to turn them into new innovations

Most innovation does not come from the ability to create new knowledge.[115] Rather, it arises from the ability to access and absorb external knowledge and turn this into new innovations.[116] Actors in both the public and the private sector can tap into international flows of knowledge to leverage creativity wherever it exists. They can capture the best and most relevant knowledge, and turn it into new innovations. Cross-border links and alliances will become central to scaling knowledge down from the global to the local, where it has a direct impact on the economy.[117] In addition, with resources for innovation becoming increasingly scarce, tapping into external ideas to innovate might prove to be a cost-efficient way of innovating. Accessing external knowledge will become central to the ability of the UK and India to come up with new innovations at less cost, and remain linked to the world's most vibrant and dynamic innovative places.

7.3 Finding common solutions

Most importantly, collaboration across international borders will also help regions find common solutions.[118] Networks help them to learn about promising technological, process, products or social innovations. International collaboration will allow places to gain access to resources such as capital and talents which may be lacking in the context of economic hardship.[119] Global networks can also be helpful in evaluating new ideas. These efforts will lead to new ways of collaborating and new models for collaboration which will be most useful in finding common solutions to cross-border problems that are likely to become increasingly acute, including climate change and global economic disparities.

To innovate in the context of the economic crisis, India and the UK will need outward-looking, internationally connected and entrepreneurial networks to spot new opportunities, investors and partners.

8. But co-operation is difficult to achieve, with trust becoming more important than ever

Networks are a critical source of information for partners seeking to collaborate. They allow the latter to learn about commercial opportunities, technological advances, and the nature and availability of resources. All are critical to creating new products, services and ways of working.[120]

Trust plays a central role in maintaining and developing successful collaboration and sustainable networks.[121] For a collaboration bringing together international actors to be successful, both 'hard' and 'soft' factors need

105. Hagel, J. and Brown, J. S. (2008) Innovation for hard times. 'Business Week.' 21 November 2008.
106. Deutsche Bank Research (5 December 2008) 'Economic downturn hits start-ups in multiple ways.' Frankfurt: DBR.
107. Goldenberg, S. (2008) Harvard fears big cuts after $8bn fund slump. 'The Guardian.' 4 December 2008.
108. Smith, T. (2008) Economic downturn will impact research in different ways. 'mndaily.com.' 12 February 2008.
109. Narain, C. (2008) Downturn may impact University spending. 'The Daily Princeton.' 12 November 2008.
110. Leadbeater, C. and Meadway, J. (2008) 'Attacking the recession.' London: NESTA.
111. Jakob Marsden estimates that the cumulative impact of trade restrictions over 1929 to 1932 was responsible for over half (by value) of the decline in world trade. See Marsden, J.B. (2001) Trade barriers and the collapse of world trade during the Great Depression. 'Southern Economic Journal.' 67:4.
112. Marsden, J.B. (2001) Trade barriers and the collapse of world trade during the Great Depression. 'Southern Economic Journal.' 67:4.
113. Kindelberger, C.P. (1986) 'The World in Depression 1929-1939.' Berkeley: University of California Press.
114. NESTA (2008) 'Innovation by absorption.' London: NESTA.
115. NESTA (2008) 'Innovation by absorption.' London: NESTA.
116. NESTA (2008) 'UK global innovation – Engaging with new countries, regions and people.' London: NESTA.
117. Levinson, N. S. and Asahi, M. (1995) Cross-national alliances and interorganizational learning. 'Organizational Dynamics.' Volume 24, Number 2, pp.50-63.
118. NESTA (2008) 'Innovation by absorption.' London: NESTA.
119. Leadbeater, C. and Meadway, J. (2008) 'Attacking the recession.' London: NESTA.
120. Castilla, E.J., Hwang, H., Granovetter, E. and Granovetter, M. (2000) Social Networks in Silicon Valley in Lee, C., Miller, W., Hancock, M. and Rowen, H. (Eds.) 'The Silicon Valley Edge: A Habitat for Innovation and Entrepreneurship.' Palo Alto, CA: Stanford Business Books.

to co-exist. The hard side consists of financial and operational issues, and the soft side of mutual trust and commitment.[122] Trust allows participants to share information and engage in collaborative activities with an expectation of reciprocity.[123]

However, participation in social networks is not free: it requires an investment of time and effort, as well as the 'free' dissemination of valuable knowledge.[124] The benefits from participation are often uncertain and intangible (not unlike those of innovation itself).

In the context of the recession, businesses and organisations may have fewer resources to invest in building or maintaining networks. Downsizing or changes in corporate policy to enhance cost-efficiency could reduce the amount of resources devoted to collaboration. As a result, the number of actors involved in networks will fall, as will the speed and reliability of information being disseminated. Actors will find it increasingly less useful to belong to a network, and will be tempted to retreat from them (especially if they are eager to cut costs). As a result, a vicious cycle of network destruction will be triggered:[125] as the number of actors involved in networks falls, others will follow and fewer new members will want to join.[126]

In addition, in the context of high uncertainty created by the recession, exclusion from a network will become less of a problem for the remaining members because the benefits they get have significantly reduced. This might lead to more opportunistic behaviour,[127] thereby nurturing a climate of distrust.

9. The crisis might make collaboration for innovation between the UK and India even more difficult

The economic crisis will reveal whether the relationship between India in the UK is really a 'special relationship'. Perceptions that both nations have of each other will become critical to their ability to keep collaborating or develop new collaborations, in spite of the economic downturn. It will reveal whether the relationship is based on *ad hoc* needs or whether the two countries have managed to establish long-term links.

This will be more difficult because both countries seem to have let mutual misperceptions grow. In the UK, India is still perceived as a low-cost economy and a back-office for UK companies,[128] despite India's increasingly important indigenous innovation capacity.[129] Many UK actors also believe that several decades of colonisation, the Indian diaspora in the UK, and a shared language have allowed solid ties to be established between the two countries.[130] Policymakers often refer to a 'special relationship' between India and the UK. However, this has induced complacency in the UK about its relationship with India,[131] and its ability to collaborate. UK policymakers have assumed that a shared history would allow collaboration and mutual trust to happen almost naturally.

This contrasts with India's perception of the UK. The UK's complacency has persuaded Indian policymakers that the UK is not always a committed partner. Some have regretted the lack of long-term commitment and of follow-up actions. For instance, the BERR Select Committee has urged the UK government to organise a follow-up summit.[132] The UK's relative complacency about its relationship with India might affect Indian policymakers' level of trust in their UK counterparts. Historic ties and the colonial past do not mean much in a country where half the population is under 25. For the vast majority of the Indian population, their first encounter with the UK is in textbooks or through their grandparents. Consequently, most of them perceive the UK as a rather old-fashioned country, stuck in its traditions.[133] The US is more attractive to them.

Over the past two years, however, the UK has taken active steps to change things. More sustained relationships have been established and an increasing number of organisations have set up offices in India.[134] However, threats to the Indian and UK economies created by the current financial crisis could set back recent progress. The economic crisis will reveal whether collaborations for innovation were solid or opportunistic. Policymakers should therefore take every step possible to reinforce them.

So with the foundations for collaboration so shaky, both countries have a new road to build if they are to re-establish a strong basis for mutual trust in the context of a global recession.

121. Vangen, S. (2003) Nurturing Collaborative Relations – Building Trust in Interorganizational Collaboration. 'The Journal of Applied Behavioral Science.' Vol. 39, No. 1, pp. 5-31.
122. Cullen, J. B., Johnson, L. and Sakano, T. (2000) Success through commitment and trust: the soft side of strategic alliance management. 'Journal of World Business.' Volume 35, Issue 3, 3rd Quarter 2000, pp. 223-240.
123. Adler, P. (2001) Market, Hierarchy, and Trust: The Knowledge Economy and the Future of Capitalism. 'Organization Science.' 12 (2), pp. 215-234.
124. Cainelli, G., Mancinelli, S. and Mazzanti, M. (2007) Social capital and innovation dynamics in district-based local systems. 'The Journal of Socio-Economics.' 36, pp. 932-948.
125. These processes of contagion have been studied in the case of the finance sector. Allen, F. and Babus, A. (2008) 'Networks in Finance.' Wharton Financial Institutions Center Working Paper No. 08-07.
126. Mateos-Garcia, J. and Bakhshi, H. (2009) 'Filling in the Gaps: Recession as Disconnection.' Unpublished working paper. London: NESTA.
127. Poppo, L., Zheng Zhou, K. and Ryu, S. (2008) Alternative Origins to Interorganizational Trust: An Interdependence Perspective on the Shadow of the Past and the Shadow of the Future. 'Organization Science.' 19 (1).
128. The Work Foundation (2008) 'The UK and India: the other 'special relationship'?' London: The Work Foundation.
129. The World Bank (2007) 'Unleashing India's innovation.' Washington D.C: The World Bank.
130. Bound, K. (2006) 'India, the uneven innovator.' London: Demos.
131. Ibid.
132. BERR Select Committee (2008) 'Waking up to India.' London: The Stationery Office.
133. See UKIBC website.
134. BERR Select Committee (2008) 'Waking up to India.' London: The Stationery Office.

10. Building trust for collaboration

10.1 The UK needs a strategic and targeted collaboration strategy

DIUS should adopt a strategic approach to collaboration for innovation.
The UK's lack of a strategic approach to research with India is a major hindrance to UK/India collaboration. This increases the feeling that the UK's involvement in India lacks high level support, which could prevent potential Indian collaborators from teaming up with UK organisations. And this is worrying in a world where an increasing number of nations are trying to collaborate with India and compete with the UK.[135]

The UK and India should set up clear strategies in targeted sectors to avoid people and resources being scattered.
This would also help provide both long-term commitment and a solid basis for the trust that is needed for collaboration and the establishment of networks while maintaining excellence of research as a priority.

Building on the fruitful example of the UK-India Round Table,[136] DST and DIUS should create a joint commission to identify key areas of collaboration and test out new models of collaboration.
This would help define strategic areas of collaboration, channel funding into these areas, and provide opportunities to explore new collaboration or build on the existing ones.

While elaborating its strategy, DIUS should work closely with other UK government departments to ensure it encompasses all types of innovation activities and that international innovation efforts are not scattered throughout government. DIUS should also work with RDAs and cities to adopt globally-minded innovation policies.

10.2 Business Link should become more international in focus

The UK should establish an interactive website, UK Link, that helps identify the most suitable Indian partners for innovation collaboration.
A growing number of businesses in the UK want to improve their own collaborative efforts with Indian counterparts. Although clearly a positive development, this proliferation of initiatives could slacken the collaborative process by confusing potential Indian partners. It might deter Indian businesses if the process appears to be too complicated. And, both countries risk losing out if the right partners are not connected to the most relevant opportunities.

DIUS should therefore use the portal information service Business Link to provide a direct channel to programmes that support collaboration. Such a platform would also contain and provide access to updated information for potential collaborators. Business Link is a self-help portal of action-focused information for SMEs, linking to all relevant ministries and departments. The current service is good with a high satisfaction rate among users.[137]

Such a website could be called 'UK Link', providing a single umbrella site for the range of collaborative efforts available. This would also allow UK organisations willing to innovate in partnership with India, but not having enough resources, to set up an office in India to link up with their Indian counterparts.

But although UK Link should be the primary gateway to collaboration support, the rest of the network should ensure that if potential Indian partners approach a UK business directly, they should be able to provide support without referring the business back to UK Link. Alternatively, they should pass Indian collaborators with whom they can't collaborate or support either to UK Link, or directly to another UK institution that operates in the field.

10.3 Making collaboration accessible to the widest range of actors possible

Giving the Science and Innovation Network (SIN) greater support to operate in India.
As shown earlier in the report, building trust with India is challenging and it will become increasingly so in the context of the global recession. Consequently, immediate rewards for the UK science base are often more difficult to obtain than with other countries such as Japan or the United States. Yet, SIN is ideally positioned to play the role of trusted intermediary between Indian and UK institutions working in the field of innovation. It has an increasingly key role to play in maintaining and building links with India during the recession. And this will prove particularly rewarding in the long-term for the UK science base. It will help maintain and even build links that will otherwise be weakened as a result of the crisis, forcing the UK to catch up in the decades to come.

135. Swiss Federal Department of Home Affairs (2008) 'Higher education, science and technology in India – an overview.' Bern: FDHA.
136. See UK in India website.
137. In 2004, 60 per cent of respondents found the website either extremely useful/relevant or very useful/relevant. National Audit Office (2006) 'Supporting Small Businesses.' London: NAO.

SIN has a critical role to play in disseminating an appealing and attractive UK innovation narrative.
Given the wide range of institutions SIN can potentially work with in India, it is ideally positioned to disseminate the 'UK's international innovation story'. SIN reaches a wide range of institutions and businesses across India. It interacts with both Indian and UK public as well as private institutions, and is present in India's three most dynamic cities (Mumbai, Bangalore and New Delhi). SIN should therefore be actively involved in the elaboration of the UK international innovation strategy. And it should also be one of the main channels to communicate the UK strategy. SIN's activities in India can enhance India's perception of the UK, and can play a leading role in disseminating an appealing 'UK innovation story'.

SIN should adapt its work to the changing nature of innovation.
While the network's activities have been increasingly focused on innovation since its creation, it is still biased towards science and technology. SIN's objectives put emphasis on R&D, high-technology, and technology transfers.[138] While this is important for the UK, it does not always takes into account the fact that the structure of the UK economy is now dominated by services. In 2002, 40.5 per cent of UK Gross Value Added (GVA) came from knowledge-based activities: 6.2 per cent in high technology manufacturing and 34.3 per cent in knowledge services.[139] SIN in India should therefore look beyond science and technology if it is to maximise its contribution to the UK's ability to innovate.

The information gathered by the India SIN team should be disseminated to a wide range of UK actors.
SIN regularly reports on the latest news in the world of innovation policy and research in India. SIN should communicate more and better across UK government departments and institutions to ensure all are aware of its existence and make the most of the intelligence gathered by the network. It would allow them to better identify potential Indian partners if they need to collaborate with India. It would also help create and develop a better understanding of India's strengths in the field of innovation in the UK. SIN has a role to play in mitigating the misperceptions that exist between the UK and India and that hamper both countries' abilities to collaborate. It should therefore disseminate its work more widely in the UK.

SIN should widen its team of stringers in India by partnering with local institutions rather than hiring more UK staff.
SIN is currently organised around Mumbai, Bangalore and New Delhi. This means that SIN has a limited exposure to second tier cities. SIN should explore more opportunities outside the big three cities. It should expand its pool of potential Indian partners by tying up with still untapped 'niche' institutes, businesses and researchers outside the mainstream channels.

Partnering with local Indian institutions would also ensure that there is some continuity and that the relationship is less reliant on time-limited individuals. Turnover of UK staff is often cited as a factor that hampers the continuity and smoothness of the relationship between India and the UK. It can take months for fruitful and solid relationships to be established.

Building networks with second-tier cities.
India's impressive economic growth and the rapid development of its capacities to innovate are not confined to New Delhi, Mumbai or Bangalore. There are 35 Indian cities with more than a million inhabitants, and many of these are rapidly emerging as significant global players.[140] For instance, cities such as Hyderabad and Chennai are strengthening their position as hubs for innovation; Ahmedabad has benefited from pro-industry Gujarat state policies, which are now becoming a big draw for investment from savvy Indians overseas; Pune is leveraging its high concentration of scientific institutions (hosting more than 6,000 international students) to attract investment and collaboration.[141]

So far, the UK has not explored enough opportunities off the beaten track. UK institutions often remain focused on India's largest cities, thereby missing out on opportunities emerging in smaller, but rapidly developing ones.[142] Expanding the pool of potential Indian partners outside the mainstream channels would also place the UK in a better position to fight growing competition from other nations keen to co-operate with India.

UK Regional Development Agencies (RDAs) should develop 'sectoral collaboration coalitions' to explore opportunities in second-tier cities
In recent years, UK regions have showed an increasing interest in collaborating with emerging countries, particularly India. However, they often approach potential Indian partners

138. DIUS and FCO (2008) 'Science and Innovation annual review 2007-08.' London: DIUS.
139. Sainsbury (2007) 'The Race to the Top: A review of government's science and innovation policies.' London: HMT.
140. Market Research World (2009) 'The rise of second-tier cities in India.' See http://www.marketresearchworld.net/index2.php?option=com_content&do_pdf=1&id=1820; http://www.euromonitor.com/The_rise_of_second_tier_cities_in_India
141. NESTA (2008) 'UK global innovation.' London: NESTA.
142. Bound, K. (2006) 'India, the uneven innovator.' London: Demos.

separately, thereby duplicating efforts and confusing their Indian interlocutors for whom regional differences in a country as small as the UK mean little.[143]

RDAs should instead join forces and create cross-regional networks in different economic sectors that allow them to undertake joint scoping trips to India and share information, instead of competing against each other. With increased pressure on regional budgets, cross-regional coalitions focused on specific sectors would allow them to share resources and reduce costs.

10.4 Promoting non-linear collaboration for innovation

The UK and India should create a social innovation and applied research collaboration fund.
The economic crisis is putting a strain on the UK and Indian economies. Both countries will want cheaper solutions to their most pressing development needs and social problems including chronic illnesses and climate change. So, both countries should develop partnerships that capture the full range of innovation that is occurring which can help address these problems.

India is a rich source of new ideas and social innovations that could potentially be replicated in the UK. Its sheer size and diverse population has given rise to some original ideas and innovations.[144] India's traditional knowledge can also provide an important pool of innovative solutions to some of UK's major social challenges such as chronic illnesses or its ageing population.[145]

The UK should create a fund that focuses on identifying and financing social innovations originating from India. This implies working not only with traditional innovation institutions but also with NGOs and other social agencies.

Knowledge Transfer Networks should increase their international membership.
External knowledge sourcing networks are increasingly recognised as important assets for creating and sustaining innovation and competitiveness.[146] Networks help small firms grow, allowing them to access and tap into new knowledge.[147] This allows small firms to access resources they do not possess internally and therefore to compete successfully with large firms.[148]

However, it is difficult for SMEs to become part of such knowledge networks, and even more difficult to join international networks. Furthermore, the economic downturn reduces SMEs' level of trust in their partners, tempting some of them to withdraw from such networks. Therefore, trusted intermediaries are increasingly important in helping SMEs gain access to international knowledge and resources.

Knowledge Transfer Networks (KTNs) operate nationally in specific fields of technology or business application. They are funded primarily by the Technology Strategy Board (TSB). They bring together people from businesses, universities, research, finance, the public sector and technology organisations to stimulate innovation through knowledge exchange. Businesses recognise their importance and the support they bring.[149] The remit of the TSB should be expanded to allow them to involve more international players. Organisations such as SIN, UKTI and UKIBC should help these networks to expand their Indian membership.

10.5 Building the basis for future fruitful collaboration

Education can help provide a solid basis for long-term collaboration. Students usually keep strong links with their country of study, and tend to be keener to collaborate with people from this country in their professional life. UK universities have therefore a crucial role to play in fostering fruitful collaboration between the UK and India.

The Indian student population is likely to increase significantly in the future. But, despite a 24 per cent increase in the numbers studying at UK universities between 2006 and 2007,[150] it is likely that relatively few will be able to afford to study in the UK. If the UK is to harness this potential and make the most of the opportunities provided by its excellent universities, it should explore innovative ways of providing access to it. This means that UK universities should anticipate upcoming changes and adapt their offer to ensure that they can meet the needs of a society that already counts 500 million people under 25. UK universities should think more creatively about ways of attracting and providing education to Indian students.

UK universities should partner with private businesses to attract Indian students to the UK.
One of most cited barriers to studying in the UK is its high cost of living.[151] UK universities

143. The Work Foundation (2008) 'The UK and India: the other 'special relationship'?' London: The Work Foundation.
144. See for example The National Innovation Foundation (in Ahmedabad) website at www.nif.org.in, and the Honeybee Netwrok website at www.honeybee.org
145. See for example the traditional medicine centre in Bangalore.
146. Lechner, C. and Dowling, M. (2003) Firm Networks: External Relationships as Sources for the Growth and Competitiveness of Entrepreneurial Firms. 'Entrepreneurship and Regional Development.' 15(1): pp. 1-26.
147. Knoben, J. and Oerlemans, L. (2006) Proximity and Inter-Organizational Collaboration: A Literature Review. 'International Journal of Management Reviews.' 8(2): pp. 71-89.
148. Huggins, R. (2000) 'The Business of Networks: Inter-firm Interaction, Institutional Policy and the TEC Experiment.' Aldershot: Ashgate.
149. The comprehensive review, which obtained views from 2,100 KTN users and R&D intensive businesses, strongly confirmed the value of the networks. 75 per cent of business respondents rated KTN services as effective or highly effective. Over 50 per cent have developed, or are developing, new R&D or commercial relationships with people met through a KTN and 25 per cent have made changes to their innovation activities as a result of their engagement. Technology Strategy Board (2008) 'Knowledge Transfer Networks reviewed.' Press Release. 4 December 2008.
150. Gill, J. (2008) UK sees 24 per cent rise in Indian students. 'Times Higher Education.' 27 March 2008. According to Higher Education Statistics Agency data, the figure rose from 19,205 in 2005-06 to 23,835 in 2006-07.
151. The Observatory on Borderless Higher Education (2007) 'International Student Mobility: Patterns and trends.' London: OBHE.

should partner with private businesses to attract Indian students to the UK. There could be more competitions like Mention Britain, a TV show sponsored by Airtel and made by New Delhi Television, which offered Indian students a chance to compete for five undergraduate scholarships to UK universities, worth up to £45,000 each.[152]

UK universities should turn themselves into 'universities without walls' by developing online courses and building on innovative schemes where students can mix online and campus-based study.

With India's first challenge with regard to higher education being expansion,[153] UK universities should ensure that a wider number of Indian students have access to their courses and that such access is cheaper than going to the UK. Universities should harness the opportunities offered by new technologies to diversify their offer and widen the number of students they have access to. UK universities should for instance become 'universities without walls' by offering online courses that would involve only one or two trips to the UK to take exams, similar to the courses offered by the Open University. A good example that could be developed is the Managed Learning Zone (MLZ) developed by the British Council. The MLZ provides students in India with the economical option of obtaining qualifications through flexible supported online study, with the chance to complete part of the programme on a UK campus. It offers Indian students the possibility to choose from a range of courses in management, computing and business studies. The British Council should establish similar zones across the country. More UK universities should join this zone or develop similar approaches.

152. Places are on offer at five universities, and contestants will enter in the subject they want to study – management at Leeds, biomedical sciences at Sheffield, computing science at Middlesex, journalism and media at Cardiff and engineering at Warwick. Hemmens, W. (2007) Indian reality TV show to offer university places. 'The Guardian.' 4 April 2007.

153. National Knowledge Commission (2008) 'Towards a Knowledge Society.' New Delhi: NKC.

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