

Call For Expressions of Interest for an Innovation and Knowledge Centre (IKC) in Synthetic Biology

Call type: Expression of interest

Closing date: 20 December 2012

Related themes: Engineering, Healthcare

Summary

The Engineering and Physical Sciences Research Council (EPSRC), The Biotechnology and Biological Sciences Research Council (BBSRC) and the Technology Strategy Board (TSB) would like jointly to invite expressions of interest to establish an IKC in Synthetic Biology. Closing date for EOIs will be 20th December 2012.

Background

Synthetic biology is the design and engineering of biologically based parts, novel devices and systems as well as the redesign of existing, natural biological systems. It is an emerging area arising out of the confluence of several core disciplines; biology, engineering, chemistry and ICT, to create new products and processes. The step change in the synthetic biology approach is to engineer biological systems to perform new functions in a modular, reliable and predictable way, allowing modules to be reused in different contexts. It has the potential to deliver important new applications and improve existing industrial processes across many sectors including healthcare, energy, pharmaceuticals, materials and remediation – resulting in economic growth and job creation.

Synthetic biology is still at an early stage of development, but its potential is widely considered to be very high. It is a platform and translational technology linking a broad range of foundational science with an extensive range of possible applications, some already progressing towards market. Research is moving fast, but developing specific processes to commercial scale will invariably take time and encounter new challenges.

The UK Roadmap for Synthetic Biology recommended that an IKC be established in synthetic biology to provide the important function of academic / business integration. This call aims to implement that recommendation, and will provide up to £10m of funding over an initial 5 years, subject to demonstrating ongoing efficacy, to help commercialise synthetic biology technologies in a responsible way.

Applicants should read the Synthetic Biology Roadmap at http://www.innovateuk.org/_assets/tsb_syntheticbiologyroadmap.pdf before responding to this call.

Innovation and Knowledge Centres (IKCs)

Led by an academic institution(s) Innovation and Knowledge Centres (IKCs) are intended to accelerate the commercialisation of world class science and emerging technologies into new products, processes or services. Designed to foster collaboration and deliver competitive advantage to the businesses with whom they interact, IKCs possess expert knowledge and understanding of core science and technologies.

The unique capabilities of an IKC fit within the innovation landscape to create fertile, knowledge-rich environments in which business can collaborate with academics and other businesses to create the next generation of technology as it emerges from the research base. Such early-stage collaboration enhances understanding of both the technology and the likely markets and drivers that will determine its economic potential. An IKC will collaborate with business in a number of ways; an example can be the creation of demonstrator projects – a key route to the commercialisation of a technology.

The most productive relationships between the research base and industry are enduring and multidimensional – i.e. span research, training, communication, consultancy and services. Therefore, an IKC will possess or have direct access to:-

- Core capabilities in the domain(s) of the chosen science and technologies – a shared environment to enhance collaboration, and leading to the creation of critical mass.
- Flexible capabilities in companion and enabling technologies that might be needed to remove barriers to innovation and make systems work
- Market analysis and market development capability, to evaluate the commercial opportunities across a range of potential end-uses
- Facility & equipment fit for purpose - to enable operational activities; to produce technology demonstrators; with access for third parties
- Ability to dynamically respond to business need
- Professional management of knowledge and intellectual assets, including both internally and externally owned intellectual property.

As well as delivering demonstrable commercial advantage and improvement to the companies that interact with it, or emerge from it, the IKC will use its excellent research to advance the fundamental science and create new technology and innovative approaches for future exploitation by industry. It is expected that the impact of the IKC is felt across its chosen technology domain, on a national level and on an industry-wide basis. The centre will build upon its world class research capability to deliver innovation of international renown.

The Synthetic Biology IKC - THE CHALLENGE

The UK possesses outstanding expertise in its science and engineering base as well as imaginative businesses, of varying maturity and size. The science is rapidly advancing and markets are changing almost as quickly. This is true, not just in the core synthetic biology technologies, but also in the supporting technologies and the areas of potential application. It can be difficult for

individuals in businesses to stay abreast of scientific developments across the entire field and to determine how these can be best applied to the opportunities they see in their own organisations and markets. No individual or group of individuals is likely to be fully aware of all of the most promising business opportunities. ***One of the key objectives of the IKC in Synthetic Biology is, therefore, to bring those at the cutting edge of research together with innovators in business to determine the most likely routes from scientific potential to commercial use, and to help them to work together to develop their ideas: to energise the commercialisation of new products and processes, and to inform the research base.***

Creating the industrial translation process: Synthetic biology is, by definition, an applied approach; it draws on a range of fundamental fields in the life sciences. The industrial translation process takes the idea through a development process from laboratory to market. Outputs from the industrial translation process may include characterised and optimised biological parts, processes and systems, new bio-based methodologies and bio factories, and industrial engineering methods, tailored to the needs of specific industrial sectors.

To enable the technology to realise its full potential, it is essential to develop processes whereby industrialists and academic researchers can collaborate effectively. With a platform technology such as synthetic biology there are many different potential applications, in numerous markets (e.g. energy, pharmaceuticals, healthcare, materials, remediation), but it may not be clear initially in which markets traction will be best gained first, or which applications will be the most significant in the longer term. Business innovators and academics need to work together to establish the likely requirements in a range of potential markets, and to develop and carry out R&D projects that develop the technology to meet these requirements.

Accelerating the journey to market: Most modern technological products and services exist in complex, and global, supply chains, and it takes time to introduce and have adopted radically different propositions. Each component of the chain has to evaluate the impact a new technology may have on their own organisations, and has to satisfy itself that it can assure the quality and delivery of the commercial offering. One of the best ways to speed up this process is to create 'demonstrators' that show what is on offer in a compelling way. Helping innovating organisations to produce demonstrators of various kinds will advance the technology more quickly to market. In some cases the type of demonstration needed will be demonstration of scale, and access to production capability to assist scale-up will be important. Some of the facilities needed already exist in the UK. In other cases, demonstration will require access to cutting-edge laboratory equipment, and it is important that critical equipment is located within the UK – it should be made easier for businesses to access the expertise and facilities within the university sector. This could be particularly valuable in highly specialised areas or where a combination of biology and electronics or material sciences is used.

Reducing the commercial and technical risk: New product introductions often fail, even where the products themselves can deliver benefits for consumers and have economic potential. A proven method of bringing more products to market sooner is to help reduce the risk of technical failure, and to share the financial risk. This can be done by bringing people from different organisations and with different capabilities together to work jointly on

collaborative projects. These organisations can find better solutions to problems, and share the research and development costs, reducing the burden on any individual one of them. In the next stages of the development of synthetic biology, whilst companies may perceive that there is little or no technical risk in specific project areas, they certainly perceive that there is commercial risk.

The primary objective of the IKC is to accelerate and promote business exploitation of an emerging research and technology field in a strategically important area. It is a nucleating point for the emergence of a new industry. It creates early stage critical mass, allowing businesses from different sectors to develop and exploit the technology. It provides access for companies to scientific, technology, application and market expertise and associated laboratory and scale up facilities. It speeds up the journey to full scale industrial adoption of emerging technologies.

The IKC in Synthetic Biology must meet these requirements, and help UK business to benefit from the excellent research work being carried out within its own facilities and across the wider UK academic base in synthetic biology.

KEY SECTORS

One of the exciting features of synthetic biology is its broad applicability. Its potential is truly as a platform technology, capable of realising benefit in a very wide range of markets. Key opportunities, identified in the UK Synthetic Biology Roadmap, and from which the UK is well placed to benefit include: **Medicines and Healthcare; Fine and Speciality Chemicals; Energy; Environmental; Sensors; and Agriculture and Food.**

In addition to the sectors mentioned above, a thriving industry would draw upon a range of core and underpinning infrastructures and technologies delivered through substantial investments made by Research Councils and TSB. Technology development in these areas could provide a basis for new industries, with DNA sequencing an example of a successful UK development in underpinning technology.

EMBEDDING RESPONSIBLE RESEARCH AND INNOVATION

The UK Roadmap for Synthetic Biology emphasised the need for innovation in synthetic biology to take place in a responsible manner, taking into account any social, ethical and regulatory issues raised by the innovation. It is expected that the IKC will undertake an active programme of education, stakeholder and public engagement and two way dialogue with wider social groups. This work should be carried out alongside other already active groups in this area (e.g. the research councils, RAEng and others).

Equipment

Where possible, researchers are asked to make use of existing facilities and equipment, including those hosted at other universities. If equipment is needed as part of the research proposal, applicants must follow EPSRC's rules for requesting equipment over £10,000 in value. Individual items of equipment up to the current OJEU (Official Journal of the European Union) procurement threshold can be included on research proposals submitted through this call, but research organisations will be expected to make a contribution to the cost. All requests for

single items of equipment above the current OJEU threshold will need to go through a separate process which will assess the strategic need for the equipment and how to ensure maximum usage. These proposals will be assessed through the separate Strategic Equipment peer review process.

For more information on equipment funding, please see:

<http://www.epsrc.ac.uk/ourportfolio/themes/researchinfrastructure/subthemes/equipment/Pages/default.aspx>.

Eligibility

For information on the eligibility of organisations and individuals to receive EPSRC funding, see the EPSRC Funding Guide:

<http://www.epsrc.ac.uk/funding/apprev/basics/Pages/fundingguide.aspx>

As this call is a targeted funding opportunity provided by EPSRC, higher education institutions, and some research council institutes and independent research organisations are eligible to apply. A list of eligible organisations to apply to EPSRC is provided at:

<http://www.rcuk.ac.uk/research/Pages/Eligibilityforrcs.aspx>

How to apply

Expressions of interest will be no longer than six pages with standard margins and a minimum font of 11pt. They should be e-mailed to IKC@epsrc.ac.uk before 4pm on 20th December 2012. Full proposals will be invited by 18th January 2012, with a submission date of late March 2013.

Decisions will be announced by end of May 2013.

Submitting application

The Synthetic Biology IKC will be established on a foundation of world class multidisciplinary research, therefore EoIs can be submitted that include more than one institution where there is critical expertise which cannot be provided by the lead institution. EoIs must, however, demonstrate that the majority of work will be undertaken by, and that a core critical mass exists within the lead institution. Where more than one institution is included in an EoI clear plans for managing the collaboration must be shown.

The appendix contains further information which successful applicants invited to submit a full stage proposal will be guided. Applicants are not required to address these issues in the EoI, but they are included here for information.

An institution may *lead* only one expression of interest, and all expressions of interest must have a letter of support from the Pro-Vice-Chancellor, or equivalent, of the lead institution, outlining institutional support. If this is a joint bid the lead institution must be clearly identified.

An indicative cost breakdown only is required at the EoI stage, and opportunities for industrial partnership and leverage should be identified.

Guidance on the types of support that may be sought and advice on the completion of the research proposal forms are given on the EPSRC website

(<http://www.epsrc.ac.uk/funding/apprev/Pages/default.aspx>) which should be consulted when preparing all proposals.

Assessment

Assessment process

EoIs and full proposals will be assessed by an independent panel of experts.

Assessment criteria

Institutions are invited to submit an expression of interest (EoI) to establish a centre in synthetic biology. The EoI should outline the following key features.

- **Vision and leadership for the centre:**
 - **What is the vision for the centre; and which sector(s) will the IKC underpin?**
 - **Who is the planned or actual lead for the centre; who are the other key personnel; what is their background?**
- **The proposed centre should demonstrate:**
 - **Excellence in synthetic biology science and engineering, and ability to create a shared environment to enhance collaboration, leading to the creation of critical mass.**
 - **Capabilities in the companion and enabling technologies that might be needed to remove barriers to innovation and make systems work.**
 - **A methodology for market analysis and market development, and capability to evaluate the commercial potential across a range of end-uses**
 - **Access to facilities and equipment; meeting the needs of their vision; enabling operational activities; producing technology demonstrators; and providing access for third parties**
 - **A track record in responding dynamically to business need and supporting business innovation in the targeted sectors**
 - **An ability to manage knowledge and intellectual assets professionally, both for internally and externally owned intellectual property.**

Guidance

Guidance for reviewers

Information about the EPSRC peer review process and guidance for reviewers can be found at:

<http://www.epsrc.ac.uk/funding/apprev/review/Pages/default.aspx>

Key dates

Activity	Date
Call Open	2 nd November 2012
Deadline for EoIs	20 th December 2012
Full Proposals Invited	18 th January 2013
Closing Date for full proposals	Late March 2013
Decisions announced	Late May 2013

Contacts

Robert.Heathman@epsrc.ac.uk EPSRC

Andy.Cureton@bbsrc.ac.uk BBSRC

Belinda.Clarke@tsb.gov.uk TSB

Change log

Name	Date	Version	Change
Rob Heathman	1 st November 2012	1	N/A

Appendices

IKCs – How they operate

Enabler criteria

Leadership

Effective leadership by the executive team is critical to an IKC's success. The team must clearly articulate its vision for the IKC, and engage staff in realising this vision. An IKC exists in a particular domain to accelerate the commercialisation of world-class UK expertise in science and engineering in new areas with high growth potential. The IKC leadership team should capitalise on the research and development assets of UK academic institutions to promote the uptake of technology by existing companies and/or the establishment, and commercial success of, new ones. They should promote excellence across their activities and become exemplars for the successful commercialisation of UK-based ideas and invention.

Governance

Whilst the leadership team has overall responsibility for the good health of the centre and its ability to meet its strategic objectives, there are clear requirements for the governance structure of an IKC. It is a condition of IKC funding that the executive board of the IKC appoints an independent chairman and non-executive board to ensure good governance of its activities. The non-executive board should include senior industry figures, those with extensive innovation experience and academics from other academic institutions. It should provide guidance on the direction of the IKC and challenge to the IKC team. The governance process must ensure that, for example, commercial benefits accrue to businesses collaborating with the IKC, but that these do not distort the principle of openness of the IKC, and its willingness to engage with all stakeholders in the sector.

To complement the formal processes, the management of the IKC should maintain regular contact with the funders of the programme, particularly in respect of their management and monitoring processes, and to help the IKC maximise the opportunity and connections across other technology areas. This requires the ongoing commitment and resource allocation from the funders to provide a person as 'connector' or point of contact for IKC activities and provide context/clarity on the operational relationship between the IKC and other centres, to maximise the opportunity from wider collaboration and sharing best practice, rather than just as a funding delivery role.

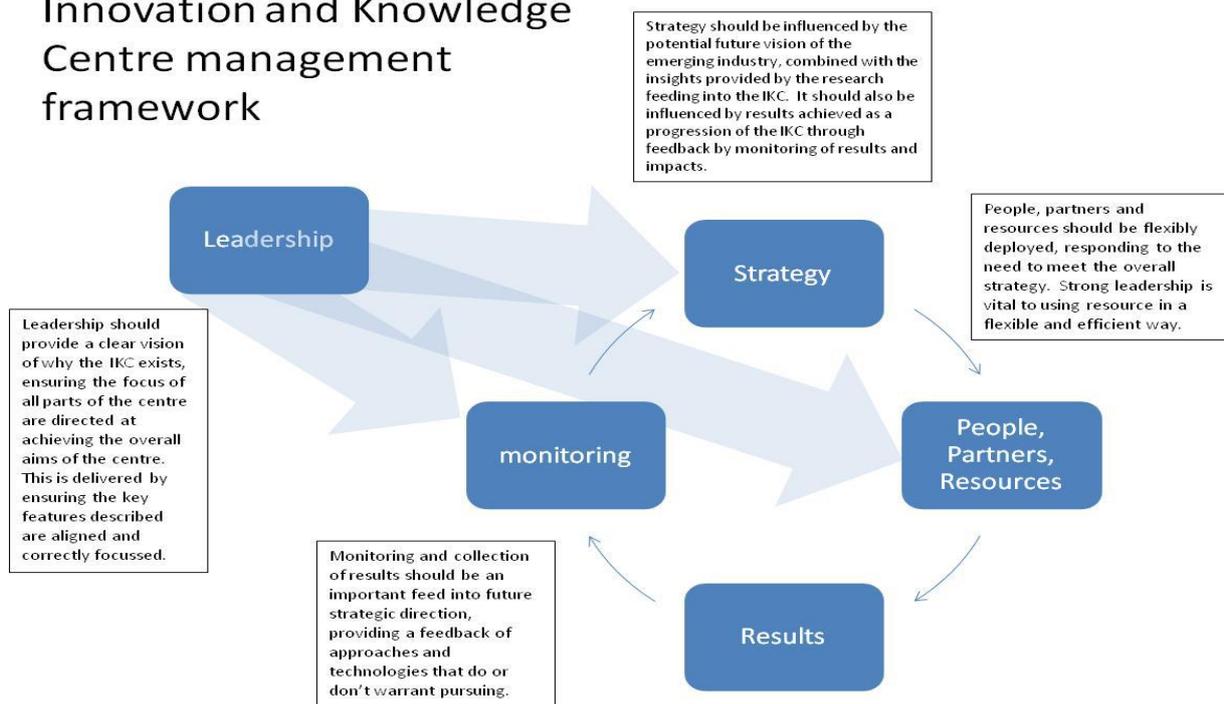
Strategy

The prime objective of an IKC is to accelerate and promote business exploitation of an emerging research and technology field in a strategically important area. It is the nuclearing point for the emergence of a new industry

One of the important themes in an IKC is to create critical mass in areas of disruptive technology with real commercial potential. This is a vital step in helping to create major new industries in the UK based on these new technologies. An industry could be said to be a collection of companies participating in a common value chain, so to help create a new 'industry' we have to establish infrastructure capable of helping a number of companies exploit an emerging technology; exactly how many companies will depend upon the nature of the technology domain and market opportunities.

Although the UK excels in research, and in many areas leads, most research is done globally – the challenge for the UK is to generate wealth from the excellent new science done by the UK research base. We have to be the best at getting them to market, and doing this quickly. An IKC should act as a nucleating point for an emerging industry. Its purpose is to start building critical mass in a chosen technology domain. It continues to advance the science and the generation of new knowledge, and it helps companies get access to that science sooner and more easily; it helps them evaluate it in the context of their market aspirations; it helps them demonstrate new applications and gain the confidence to invest further. Its success is measure by its impact on the success of the companies it assists on this journey. The diagram below indicates how elements of an IKC iterate and reflect.

Innovation and Knowledge Centre management framework



Overarching purpose

Each IKC should have a clear statement of its overarching purpose, pertinent to its own technology domain and in line with the overall vision and general principles of IKC operation. This is essential, since many of the practical aspects of operating and evaluating the success of an IKC depends upon the extent of progress towards achieving this.

Given its role as a nucleating point for an emerging industry, and in accelerating world-class technology to market, it is a prerequisite for an IKC to have an established reputation in the relevant scientific field. One indication of this is that it already receives a substantial income for internationally competitive research from the research councils. It also needs to be able to articulate clearly the potential applications of its technology, and the current and potential future business landscape in these domains. It needs to secure upfront commitment from a cohort of potential industry users of the technology to work with the IKC to evaluate the opportunities. Ideally some of this commitment would be financial.

The initial funding period for an IKC is five years. From the outset the IKC must plan, and resource, substantial industry engagement and collaborative work. If it

is not yet possible to identify some *potential* applications and routes to market, it is probably too early to consider the creation of an IKC. One possible route to market might be through spin-out companies from the university. This is a valid route to commercialisation, but on its own constitutes the creation of a single company, or small number of companies, and probably not the early stage of an entire industry. Whilst we encourage this activity from the academic world, an IKC should not concentrate unduly on the creation of spin-outs. The substantive part of an IKC's efforts should be targeted at supporting businesses, newly formed or well established, based outside of its own structures.

Intellectual assets

The funders expect IKCs to create a multitude of intellectual assets (technology expertise, know-how, show-how, intellectual property and intellectual property rights) and that they will do so with an understanding of the value these assets can bring to the businesses with which they interact. Each IKC will agree with the funders, as part of the conditions of its grant funding, an intellectual property (IP) policy setting out its approach to managing IP and the processes it will adopt. The ultimate impact of the IKC will be growth in the industrial base of the UK, as well as, creating new, business-inspired, academic research and development.

There is recognition that intellectual assets are both tangible and intangible in nature and both should be addressed strategically by the IKC. Principles of operation in this area are already present in the Knowledge Exchange and Commercialisation Principles developed by the research councils¹¹. The activities, approaches and the management of intellectual assets by universities and IKCs should reflect these. In summary:

- 1) The intellectual property rights (IPR) arrangements between the IKC and its customers and partners should facilitate the achievement of the IKC's overarching purpose, that is, accelerating the commercialisation of an emerging technology and using the output from UK research to help businesses to grow.
- 2) IKCs are expected to manage IP in a professional and transparent manner. The approach adopted should encourage collaborative working and help the exploitation of IP. Proper arrangements should be put in place to record and protect existing (background) IPR, including commercially-sensitive information, from IKCs and collaborating partners. New (foreground) IPR should also be recorded and protected as appropriate, with regular reviews on the merit of maintaining that protection. However, licensing and direct exploitation of IP by the IKC itself is expected to provide only a relatively small part of an IKC's income.
- 3) IKCs should manage the development, protection and exploitation of new technology for the benefit of UK industry and encourage a knowledge of existing third party IPRs:
 - a) having arrangements flexible enough to be tailored to the different circumstances of partners and business users, large and small
 - b) not creating perverse incentives for partners or businesses

- c) avoid infringing any of the State Aid rules and ensure that the IKC can maintain 'no aid' status, and
 - d) not creating burdensome costs for small companies and other customers.
- 4) The arrangements will need to differentiate between projects carried out under the three tranches of funding:
- a) for work done exclusively under core funding, we would expect the IKC to own and to take necessary steps to protect any IP created. The objective should be to strengthen the IKC's overall technical capability and enable it to deliver its overall goals more effectively and license out relevant rights to its business users
 - b) for collaborative work funded jointly by business and the public sector, we would expect the IKC to follow the existing regime for publicly funded collaborative research – ie, for all partners to agree appropriate arrangements to share the rights to exploit IP created, for example as suggested by the Lambert agreements
 - c) for R&D contracted with business(es) we would expect exploitation rights to new IP to be determined by contract and in general for these to lie with the businesses contracting with the IKC. The centre must also protect any IP that customers bring into the centre as part of a project. IP arrangements with the customer must not inhibit future use of the centre's background IP (eg, for other customers).

The understanding of the industrial sectors that are specific to the IKC and the understanding of a route to market for UK companies will dictate and drive the approach to IP assets and their exploitation. A number of models and practices already exist and partners should be flexible in their approaches to ensure benefits to businesses, the economy and society. The sharing of assets including IP ceding a freedom to operate, or a royalty free licence, may be more effective in the nucleation of a new industry than a traditional ownership or royalty licensing model.

Duration of an IKC

An IKC is granted funding for an initial period of five years. During this time the operation of the IKC will be subject to normal performance evaluation as described elsewhere. Where a technology domain reveals exceptional promise, the funders may be prepared to support an IKC in that technology domain for a further period, renewed in tranches. The decision to continue to fund *an* IKC in a particular technology domain for this extended period will be made on an assessment of the needs and growth prospects of the emergent industry. The decision to award this extension to *the existing IKC* will be based upon the success of the IKC's own operation and performance in the established metrics.

Some time before end of the initial five-year funding period, an assessment will be made of the prospects for the emerging industry and its innovation needs. It will be important to understand what the obstacles to continued development and uptake of the technology are, and the appropriate mechanisms to overcome them deployed. It will be important to understanding the role a centre would play, relative to a more distributed programme of investments, and if a centre continues to be needed, whether an IKC is the right type of centre. At this point it could be possible to make any adjustments needed to the scope of the IKC's

work. At some point, it might be appropriate to set up a larger and closer to market centre, and the future of any individual IKC would also have to be assessed in that context.

If a decision is made to extend research council and Technology Strategy Board funding to an IKC the host university may also be required to continue its commitment. An ongoing dialogue between funders, the IKC and the university should be maintained to enable the IKC to continue its support to business uninterrupted.

Within the initial funding term of five years the revenue from intellectual assets (including IP) to the IKC should be fairly limited, and insufficient to cover the long-term costs of running the centre. Therefore, realistic projections should be incorporated into the IKC's plans. Investment in an IKC over an extended period will be in response to a market need and balanced against opportunity costs; in a world of finite resources, making longer term investment in one technology area has to be judged against the opportunities forfeited in another.

Should the decision be made not to extend the funding of a particular IKC, the host institution will be free, should it chose, to continue to support a centre in the same area, but this will not be able to continue to use the IKC name. The funders are keen to see the term IKC as a mark of excellence and to exert their control over the use of the term. The presence of an IKC in a technology domain should signify that a technology is new and exciting, with real potential for adoption and economic impact, and it should flag that the centre hosting the IKC has world-class expertise in that technology, and its commercialisation.

People

The expertise and commitment of the team of people within an IKC are critical to its ability to deliver commercial value from the world-class science of the university within which it is based, and elsewhere. Hence it will be essential, if it is to deliver its strategic objectives, for the IKC to have robust policies and processes to recruit, retain, develop and manage the performance of its people. These people will drive the exploration and adoption of new technology and business models, working closely with teams from the companies working with the IKC.

The team will need to have a clear understanding of the overarching purpose of the IKC, and its own contribution to achieving it. From the outset there needs to be a broad balance of skills within the IKC – in science, technology, market analysis, commercial acumen, stakeholder management etc. As work evolves it is expected that the need for new capabilities will emerge. The IKC needs to have the ability to identify capability gaps and fill them, possibly by bringing in expertise from other departments in the host university, or by recruiting externally the best in their fields.

It is expected that the IKC management team will create a dynamic culture that attracts new staff to work in the centre, and businesses and other academics to work with it. The IKC team should be sensitive to the different vocabularies sometime adopted in different sectors, and have the ability to engage in a fruitful way in a range of different settings.

Partnerships and resources

Collaboration

In order to achieve its objectives the IKC will necessarily have a wide range of collaborations; with industry, with academia, and with other bodies that are important in the space (such as in standards, metrology, regulation, government departments, non-governmental organisations, research institutes and research technology organisations). In keeping with the centre's own level of expertise, these interactions should draw on the very best capabilities available and help maintain the international competitiveness of UK business.

At the point at which an IKC is established, it will have already identified a cohort of potential partners in the various sectors relevant to its technology domain. Some of these will have already committed to working with the IKC on specific projects. The IKC is expected, in addition to supporting these early undertakings, to pursue an energetic outreach activity and to continue to develop a breadth of interactions and collaborations that deliver tangible benefit to the businesses involved. In particular it should be reducing time to market, helping to implement new/improved processes, and/or extending product ranges. To help in this the IKC will provide access to its assets, both physical (facilities and scientific equipment) and intellectual (techniques, know-how and expertise). These could be proprietary systems, or commoditised 'off the shelf' ones.

So long as it advances the overarching purpose of the centre, access for both business and academe are encouraged. The IKC should assist in the nucleation of an industry and provide underpinning support for core science development. The IKC will be aware of the wider science and industry ecosystems, and possess knowledge of road mapping activities and a vision for the development of the future industry(s). It may be an existing national centre of excellence and will positively interact with and contribute to the missions of other institutions or centres (including Catapults and Doctoral Training Centres).

The IKC is established to be a *national* centre of expertise in technology development and commercialisation in its particular domain. In this respect the businesses, and other collaborators, with which it engages should be drawn from the best nationally, not just those organisations operating near it. It needs to have capacity to engage with SMEs as well as large companies, and the service it offers should be truly world class.

As a 'nucleating point' the IKC should help partner companies engage with and benefit from a range of other innovation activities and programmes, for example Collaborative Research and Development, SBRI, Knowledge Transfer Partnerships, Research and Technology Clubs, Industrial CASE awards, Industry Fellowships and open funding sources.

International

The IKC will be a driving force within the innovation ecosystem and demonstrate active collaboration with other relevant research groups of international reputation. Each IKC should develop an international strategy, building on analysis of internationally competitive science and industry strengths. It should outline, in the context of helping to grow a new industry in the UK, a strategy and plan for its international engagement. It will be expected to engage in

collaborations of an international standard and awareness of international markets and dynamics, and the position of UK businesses and how to help them.

Processes, products and services

Market awareness and activity

The IKC will undertake the iterative business of matching an emerging technology capability to potential end-use markets in order to establish where the technology is most likely to gain early traction. It should have internal capability to do this, and work with business and partners to make the evaluation as robust as possible. It should use the information gained to inform the work it does; for instance, the new knowledge it generates, the collaborations it establishes and the IP it chooses to protect.

Excellence in collaboration

As discussed above, much of the work of the IKC will be carried out in collaboration with others. It will have streamlined processes for this in place, and aspire to be the partner of choice for innovators in their technology domain.

Further advancing the science

The IKC team will continue working at the cutting edge of science with original work carried out by a strong team of researchers of varying levels of experience (from professorial to doctoral students). They will stay abreast of developments worldwide, and use this knowledge to inform their own work. The strength of the team will enable them to continue attracting grant funding from sources including research council and funding council grants, under normal peer review processes.

Access to expertise and equipment

The IKC will have an open door policy to business and other academic collaborators. It will make available to UK business the benefit of its knowledge and experience, and will enter into collaborations with them to help advance the commercial development of the technology. It will, under suitable arrangements, make its physical equipment and assets available for business use.

Profile

The IKC should seek opportunities to engage with stakeholders across the various technologies and markets relevant to its area of expertise. Whilst not promoting itself excessively, it should ensure that its profile is sufficiently visible that the right people are aware of its existence, and find it easy to engage with.

Results criteria

The funders will conduct regular monitoring of the progress being made by an IKC. It will establish, through use of independent reviewers and the active participation in the supervisory and executive boards, whether the IKC is on a trajectory that will meet its ultimate objective and deliver benefit to UK business. A number of quantitative and qualitative measures will be used to assess progress. These will be used to decide whether or not to continue the core grant funding, and if to award additional tranches. Funding (including core funding) will

be withdrawn from IKCs that demonstrate insufficient progress in the metrics, or where the governance arrangements are felt to be insufficiently robust.

An independent panel will conduct formal stage gate reviews and make recommendations to the funders. In addition to regular reviews with the connectors from the funding organisations, there will be formal monitoring events, involving the independent panel and scheduled for months 9, 24 and 42. Monitoring is intended as an ongoing process to enable the IKC to demonstrate delivery and its 'fitness for purpose'. The formal stage gate review process may raise specific items that the independent assessors may wish to see addressed outside of the normal schedule.

Business

Metrics

The IKC should be able to demonstrate its awareness of the key markets and players within its technology domain and its successful interaction with them. It should be able to show that these engagements have a strategic purpose, and are representative of the entire landscape in the UK – that it is acting as a national centre. It should be able to place this in an international context. It should be able to show, over time, what the benefit to business is of these interactions. Such benefits include: the number of projects completed; additional investments companies are making in this technology domain; the licences taken; the number of new products, processes or services companies have introduced and to which the IKC contributed; the growth of the companies in the IKC's orbit and the growth of the market overall.

The IKCs are required to report the following metrics, for areas where it has had involvement:

- business support metrics
 - number of potential end-use sectors
 - size of potential markets
 - number of companies in these sectors, and number and percentage engaging with the IKC
 - number of potential markets evaluated
 - number of company 'assists'
 - number of collaborative projects
 - number of 'demonstrators' produced
 - number of external organisations using IKC resources (business, academic)
 - investment in these areas – from IKC and others
 - number and nature of spin-out companies from universities or corporates
- outcome measures

- number of new products, services and processes launched by business
- increased GVA, jobs, profitability and turnover in businesses supported
- percentage of companies raising new equity (and, if possible, average multiplier public to private)
- speed to market of core technology
- size of UK industries exploiting the technology

IKCs are encouraged to track and report any other metrics, not identified above, but which are helpful indicators of progress towards their overarching objectives.

People

The centre and its people should review their performance against the IKC's overarching purpose. Judgements of mechanism by which the intervention produces value include:

- people metrics
 - number of IKC staff, academic experience, doctoral and post-doctoral research
 - extent of technologies and markets in which capability exists
 - extent of networking, workshops, conference etc. activities
 - amount of in-house training delivered
 - positive feedback from stakeholders
 - negative feedback (or complaints) from stakeholders.

Science and society

The IKC is funded through public money and should seek to contribute to societal well being:

- society benefits
 - number of publications
 - number of citations
 - excellence of the science
 - number of patents licensed to UK organisations, and number of companies benefiting
 - number of qualified staff trained (PhDs etc)
 - IKC contributions to international reviews

- assistance to other academic institutions, government departments, non-government organisations etc
- environmental benefits from the IKC
- other societal benefits from the IKC.

In areas where it is possible (and previously agreed), the societal assessment should be achieved within the spirit of the Technology Strategy Board's Responsible Innovation Framework, or other relevant ethical, legal and social issues guidance.

Key

Funding granted to an IKC is seen as an investment, albeit a long-term one, in the emerging technologies and industries programme. The vision is to help create new industries in the UK which, in a decade or so, have revenues of around £1bn per annum. The key results concern the nature of the emerging industry:

- emerging industry benefits
 - number of companies using the new technology
 - turnover of companies from the new technology
 - growth rate of the sector and its constituent companies.

Summary

An IKC is a key component of the UK's approach to the commercialisation of emerging technologies. It creates early stage critical mass in an area of disruptive technology. It possesses international quality research capability in its technology domain, and access to the companion technologies needed to make commercially viable product, process or service systems work. Based in a university it is led by an expert team with a truly entrepreneurial spirit. It continues to advance the research agenda, but its most important impact is in the enhanced wealth generation of the businesses with which it interacts.
