



Evaluation of BBSRC's Industrial Partnership Award and 'stand-alone' LINK schemes

September 2012

This document represents the views and conclusions of a panel of experts.

BBSRC
Polaris House
North Star Avenue
Swindon
SN2 1UH
www.bbsrc.ac.uk

Contents

Abbreviations	4
Executive Summary	5
1. Introduction	11
1.1 BBSRC.....	11
1.2 Evaluation context.....	11
1.3 BBSRC and working with business.....	12
1.4 Introduction to the Industrial Partnership Award scheme.....	12
1.5 Introduction to the 'stand-alone' LINK scheme.....	12
1.6 Evaluation methodology.....	15
2. Standard of research	17
Summary.....	17
2.1 Overview of grant performance.....	17
2.2 Publications.....	18
2.3 New products, processes, resources, tools and technologies.....	22
2.4 New intellectual property and spin-out companies.....	24
2.5 Further funding to develop the research.....	25
2.6 New and improved partnership links.....	28
2.7 Differences between IPA and 'stand-alone' LINK grant outputs and outcomes.....	30
2.8 Grants which did not meet the expected standard.....	31
2.9 Issues affecting grant performance.....	31
2.10 End of award reporting.....	32
3. Research impacts	33
Summary.....	33
3.1 Training and skills development.....	33
3.2 Economic and societal impacts.....	35
3.3 Knowledge exchange.....	38
3.4 International standing of UK bioscience research.....	39
4. Interactions with the industry partner	40
Summary.....	40
4.1 Prior interactions with industry.....	40
4.2 Interaction with the industry partner during the grant.....	42

4.3 Interaction with the industry partner after the grant ended	46
4.4 Industry contributions towards project costs	47
4.5 Benefits from collaborative research.....	48
5. Balance and coverage of the portfolio	49
Summary.....	49
5.1 Funding by research area.....	49
5.2 Support for basic, strategic and applied research	50
5.3 Addressing BBSRC's strategic priorities	51
5.4 Funding by academic institution.....	51
5.5 Industry participation in the IPA and 'stand-alone' LINK schemes.....	53
6. Application and administration processes	56
Summary.....	56
6.1 IPA and 'stand-alone' LINK applications	57
6.2 Application and assessment processes	58
6.3 IPA and 'stand-alone' LINK application uplifts.....	62
6.4 Barriers to participation in the IPA and 'stand-alone' LINK schemes.....	64
6.5 Promoting academia-industry collaborations	66
6.6 BBSRC's support for collaborative research with industry	67
7. Conclusions and future perspectives.....	68
Summary.....	68

Abbreviations

BBSRC:	Biotechnology and Biological Sciences Research Council
BIS:	Department for Business, Innovation and Skills
BSI:	Bioscience for Industry Strategy Panel
CASE:	Collaborative Awards in Science and Engineering (former definition)
Defra:	Department for Environment, Food and Rural Affairs
EU:	European Union
fEC:	Full Economic Cost
HEI:	Higher Education Institution
IF:	Impact Factor
IP:	Intellectual Property
IPA:	Industrial Partnership Award
ROS:	Research Outcomes System
sa-LINK:	'stand-alone' LINK
SME:	Small and medium enterprise
STEM:	Science, technology, engineering and mathematics
TSB:	Technology Strategy Board

Executive Summary

This document summarises the views of a specialist Review Panel convened to provide an independent evaluation of BBSRC's Industrial Partnership Award (IPA) and 'stand-alone' LINK schemes. The objectives of the evaluation were to:

- assess the quality and international standing of the research
- identify major highlights and outcomes of the research
- assess the economic and societal impacts of the research
- comment on the extent to which the schemes have contributed to meeting BBSRC's wider objectives for interaction with industry
- comment on the balance and coverage of the IPA and 'stand-alone' LINK scheme portfolios
- comment on the schemes' application and assessment processes
- identify ways to build on successes and ways to address any identified gaps and issues

The Panel's analysis was based on questionnaire responses from 85 former and current IPA grantholders, 11 former and current 'stand-alone' LINK grantholders, and 31 IPA scheme applicants. Relevant data were also collated from grant application forms, grant final reports and the BBSRC grants database. The completed grants had start dates between 2002 and 2008.

Key conclusions

1. The IPA and 'stand-alone' LINK schemes are effective mechanisms for supporting collaborative research with industry

The IPA and 'stand-alone' LINK schemes are successful funding programmes which help to ensure that high-quality industrially-relevant research is supported within the BBSRC research portfolio. The schemes encourage academia and industry to develop collaborative research proposals and the resulting academia-industry partnerships are mutually beneficial. Academic researchers gain access to industry materials, facilities and expertise, and have a potential route for the subsequent exploitation of their research. Industry gains access to academic expertise, intellectual property and skilled staff, and is able to explore a wider variety of research ideas than would be possible internally. The two schemes have distinct but complementary roles within the BBSRC research portfolio; the IPA scheme supports more speculative research whereas the 'stand-alone' LINK scheme supports pre-competitive research which is closer to market and is more likely to be addressing a specific problem. The schemes also leverage substantial financial and 'in-kind' support from industry and are good value for money for BBSRC.

2. The IPA and ‘stand-alone’ LINK schemes support high-quality research

The quality of the research supported by the IPA and stand-alone LINK schemes is generally very high and there are several examples of excellent or outstanding projects. The high standard of the research is demonstrated by the quality and quantity of research outputs and outcomes including publications, new products and processes, new intellectual property, spin-out companies, further funding and new partnership links. The research supported through the schemes is of a similar standard to the wider responsive mode portfolio, although the outputs reflect the more strategic and applied nature of the research. There are also differences in the outputs and outcomes arising from IPA and ‘stand-alone’ LINK projects, which are likely to be a consequence of the different types of research supported by the two schemes. A small number of projects did not perform as well as expected, but the proportion of these less successful projects was similar to that observed for other responsive mode funding.

3. IPA and ‘stand-alone’ LINK research projects are delivering economic and societal impacts

IPA and ‘stand-alone’ LINK projects have delivered, or have strong potential to deliver, benefits to the wider public good, including contributions to human health, animal health and welfare, food security, the environment and mitigating climate change, bioenergy and industrial biotechnology, and other areas of government policy. Industry partners have had an important role in realising the impact from the research and the schemes have accelerated the exploitation of BBSRC-funded research by encouraging industry involvement in the research at an early stage. The level of exploitation is generally higher than within the wider responsive mode portfolio; this is very positive and expected given the nature of the research and the scheme’s rationales. However, many grantholders tend to overstate the potential impacts of their research and end-of-award reporting does not enable BBSRC to capture the longer-term impacts of its investment in the schemes. In general, the most successful IPA and ‘stand-alone’ LINK projects had a clear plan from the outset of how the impact from the research would be delivered.

4. The interactions with industry partners benefit staff training

The IPA and ‘stand-alone’ LINK schemes provide additional training opportunities for postdoctoral researchers and other staff beyond what might be expected from other responsive mode funding. The broader training experience is a very valuable feature of the schemes. Researchers benefit from access to industry expertise, facilities and resources, and gain greater insights into industry approaches to research. The schemes provide training in strategic and applied research, which is very important for the provision of skilled staff to the wider UK economy. Postgraduate students working on related projects also benefit from the interactions with industry partners.

5. The IPA and ‘stand-alone’ LINK schemes are fostering successful academia-industry partnerships

The majority of academia-industry partnerships supported through the IPA and ‘stand-alone’ LINK schemes are successful and this is demonstrated by a variety of measures including industrial co-authorship on publications, further funding from the industry partner, industry involvement in the exploitation of the research, and the maintenance of the partnership after the grant ended. The level of industry participation in individual IPA and ‘stand-alone’ LINK projects is varied. There is a mixture of passive and active involvement which may reflect the different culture of particular industry partners and the relative ease with which individual academic research groups are able to build relationships with industry. For a small number of projects, the interaction with the industry partner was less successful than anticipated and, in some cases, this affected the success of the project. However, the issues affecting academia-industry interactions were generally outside grantholders’ or BBSRC’s control (e.g. the industry partner’s priorities changed, the industry partner merged with another company, the industry partner went out of business). The schemes have primarily supported researchers who had previously conducted collaborative research with industry.

6. BBSRC should monitor IPA and ‘stand-alone’ LINK projects more closely

There is limited scope for BBSRC to address the issues which affect academia-industry partnerships. However, BBSRC could help mitigate some issues through closer monitoring of IPA and ‘stand-alone’ LINK projects. BBSRC should require industry partners to provide an annual, light-touch report about their research project. This would enable industry to provide their views on the project’s progress, identifying successes, benefits and any concerns. In addition, BBSRC should encourage grantholders to establish collaboration agreements as early as possible. It becomes more difficult to produce these agreements as projects progress and the lack of a formal agreement can be a barrier in the collaboration.

7. The balance and coverage of the IPA and ‘stand-alone’ LINK schemes’ portfolios are appropriate

The balance and coverage of the IPA and ‘stand-alone’ LINK schemes are driven by industry. The schemes support research from across the BBSRC remit with a particular emphasis on agriculture and bioscience underpinning health. They provide strong support for strategic and applied research and this helps to balance the responsive research portfolio. In addition, a higher proportion of the research is aligned to BBSRC’s strategic priorities compared with other responsive mode funding. A welcome variety of institutions have participated in the IPA and ‘stand-alone’ LINK schemes, reflecting the open nature of the responsive mode funding mechanism.

8. There is scope to broaden the range of companies that participate in the IPA and 'stand-alone' LINK schemes

In total, 88 individual industry partners had participated in the IPA and 'stand-alone' LINK schemes. A wide variety of companies and industry sectors were represented with the 'health and pharmaceuticals' and 'agriculture (crops)' sectors the most predominant. Overall, the representation of different industry sectors is appropriate given the UK industry base. However, the representation of some particular sectors is low (e.g. bioenergy, industrial biotechnology) and small and medium enterprises (SMEs) are underrepresented. It is also slightly disappointing that five companies account for almost half of industry participation in IPA scheme.

9. There are barriers which limit wider industry participation in the IPA scheme

The IPA scheme is currently most suited to larger companies and there are barriers which limit participation in the scheme by SMEs, specific industry sectors or companies with low profitability. BBSRC should consider how it might adapt the scheme to encourage wider participation from SMEs and other underrepresented industry. Although the requirement for a 10% fEC cash contribution towards IPA project costs is generally appropriate and attractive for industry partners, it limits participation by some companies. BBSRC should consider relaxing the rules for industry contributions to allow 'in-kind' contributions, recognising that it would need to provide strict criteria on the types of contributions that are permissible. BBSRC could also consider a lower level of financial contribution for SMEs. Other barriers to industry participation in the IPA scheme which BBSRC should address include misconceptions about the duration of projects supported through responsive mode, difficulties with identifying academic partners with shared research interests, and a lack of awareness of the scheme among the research community and UK industry.

10. The IPA and 'stand-alone' LINK schemes' application and assessment processes are generally effective, but there are some tensions

The IPA and 'stand-alone' LINK schemes are embedded within the responsive mode funding mechanism and applications are assessed alongside other responsive research applications using the same criteria. In general, this is positive and beneficial. The open nature of responsive mode funding is a strength; it allows academia and industry to develop collaborative research proposals in any area of BBSRC's remit and to their own timescales. However, Research Committees are less comfortable assessing IPA and 'stand-alone' LINK applications compared with other responsive mode proposals and there are tensions comparing strategic and applied research with basic research. It is encouraging that Pathways to Impact statements and a variety of criteria other than scientific excellence are considered as part of the assessment process, but more emphasis should be placed on these aspects of the research proposal when deciding which applications should be funded. BBSRC should also provide Research Committees with additional guidance to ensure that they view the IPA and 'stand-alone' LINK schemes as different funding instruments with different objectives compared with other responsive mode funding.

11. The uplifts provided to IPA and ‘stand-alone’ LINK applications are effective and should be retained

The uplifts provided to IPA and ‘stand-alone’ LINK applications are achieving their objectives and the schemes have higher success rates compared with other responsive mode funding. However, the IPA application success rate is not the same across all the Research Committees which is a concern. BBSRC should monitor IPA success rates for individual Research Committees over three-year periods and consider intervening if success rates are too low or too high. The IPA and ‘stand-alone’ LINK schemes’ uplifts remain appropriate and have not led to low quality research being supported. IPA and ‘stand-alone’ LINK applications can be funded lower down the rank order than other responsive mode applications (although they are still ranked as internationally competitive). BBSRC should ensure that Research Committees provide feedback to funded applicants where appropriate, so that any potential issues with the science can be addressed. There are particular tensions within Research Committees regarding the very strong uplift provided by the ‘stand-alone’ LINK scheme; these may worsen in the future as the closure of the themed LINK programmes is likely to result in increased demand for the ‘stand-alone’ LINK scheme.

12. There is scope to improve the ‘stand-alone’ LINK application and assessment processes

There are some specific aspects of the ‘stand-alone’ LINK scheme’s application and assessment processes which BBSRC could improve. These include reducing the number of contentious ‘in-kind’ contributions included on ‘stand-alone’ LINK applications and considering the potential benefits of an outline application stage. BBSRC should also examine whether the current Research Committee structure provides the most appropriate expertise for the assessment of ‘stand-alone’ LINK applications and consider assessing these applications through a separate Committee whose membership is more familiar with industrially-relevant research.

13. BBSRC should publicise the success of the IPA and ‘stand-alone’ LINK schemes more widely

There is a lack of awareness of the IPA and ‘stand-alone’ LINK schemes among the research community and UK industry. BBSRC should develop publicity materials which demonstrate the benefits of participation in the schemes to industry and academia, including case studies and testimonials. There are also misconceptions about the IPA and ‘stand-alone’ LINK schemes which should be addressed. For example, the precise role and purpose of the IPA and ‘stand-alone’ LINK schemes are not clear to the research community or Research Committees, and the schemes’ application and assessment processes are not well understood. Moreover, there are perceptions among some Research Committee members and academic researchers that the schemes support lower-quality research. BBSRC should address these by publicising the high-quality and impact of IPA and ‘stand-alone’ LINK projects.

14. The IPA and ‘stand-alone’ LINK schemes are making important contributions to BBSRC’s overall strategy for working with business

BBSRC supports collaborative research with industry through a variety of funding mechanisms. This is positive as individual companies have specific needs and preferences which influence the schemes and programmes they choose to participate in. The IPA and ‘stand-alone’ LINK schemes have a clear role within BBSRC’s collaborative research portfolio and are making considerable contributions towards BBSRC’s objectives for working with industry. It is encouraging that many companies choose to participate in the IPA and ‘stand-alone’ LINK schemes; this demonstrates that the schemes are meeting their needs and is a further indicator of the high quality of science supported. It is vital that BBSRC continues to invest in collaborative research programmes, including the IPA and ‘stand-alone’ LINK schemes. BBSRC’s support for academia-industry collaboration delivers numerous benefits to academia and industry, and provides a route for the exploitation and commercial application of publicly-funded research. Moreover, BBSRC’s investments in collaborative research are helping to support important UK industry sectors and will ultimately produce substantial benefits to the UK economy and society.

1. Introduction

1.1 BBSRC

1. The Biotechnology and Biological Sciences Research Council (BBSRC) is one of seven Research Councils sponsored through the Department for Business, Innovation and Skills (BIS) of the UK government. Its principal aim is to foster a world-class biological science community in the UK. The mission of the BBSRC is to fund internationally competitive research, to provide training in the biosciences, to encourage opportunities for knowledge exchange and economic impact, and to engage the public and other stakeholders in dialogue on issues of scientific interest.
2. BBSRC supports research and training in a number of ways, including research grants, studentships, and fellowships. In the 2011-12 financial year, around 52% (£284M) of total operating expenditure was invested in research grants to universities and BBSRC strategically-funded institutes.

1.2 Evaluation context

3. BBSRC is committed to the effective evaluation of the research and training it funds, as part of its strategy for evidence-based decision making. Evaluation plays a central role in:
 - enabling BBSRC to account to government, the public, the scientific community and other stakeholders for the funds it allocates
 - justifying BBSRC funding allocation and contributing to the evidence that all Councils are required to submit to BIS
 - informing internal funding decisions, providing evidence of progress and achievement, and facilitating the development of a strategic overview for future funding decisions
 - helping BBSRC to improve its policy and practice, through informal policy decisions and the design of new schemes, programmes and processes; and through identifying good practice, lessons learned and ways to improve processes
4. Formal evaluation of research is currently conducted at a number of levels in BBSRC:

Project:	<ul style="list-style-type: none">• evaluation of final reports from grants
Scheme:	<ul style="list-style-type: none">• evaluation of major research investments, for example, through responsive mode or research initiatives (time-limited research funding in strategically significant areas)• evaluation of funding schemes (e.g. international Partnering Awards, Research and Technology Clubs, fellowships, studentships)
Institution:	<ul style="list-style-type: none">• Institute Assessment conducted every five years at the BBSRC strategically-funded institutes
5. BBSRC's Evaluation Framework¹ outlines the Council's approach to evaluation and the methodology used.

¹ www.bbsrc.ac.uk/researchevaluation

1.3 BBSRC and working with business

6. As a publicly funded organisation, BBSRC has a responsibility to ensure that the research it supports delivers benefits to society. The commercial application of research is one route by which this is achieved and it is therefore important that BBSRC engages with business. BBSRC's investments in research and training underpin innovation in important UK industrial sectors including the agriculture, bioenergy, bioprocessing, biotechnology, chemical, food, healthcare, and pharmaceutical sectors. By enabling industry participation in research at an early stage, and by engaging industry in BBSRC's strategy development, BBSRC seeks to ensure that its research investments meet the needs of these bioscience using industries.
7. The strategic priorities described in BBSRC's Strategic Plan² provide a focus for BBSRC's collaboration with business:
 - food security
 - bioenergy and industrial biotechnology
 - basic bioscience underpinning health

1.4 Introduction to the Industrial Partnership Award scheme

8. The Industrial Partnership Award (IPA) scheme is BBSRC's principal mechanism for supporting collaborative research with industry within responsive mode. It was introduced in 2001 as a means of encouraging scientists to consider and seek industrial partnership in their research grant proposals, and to ensure that a route for knowledge transfer existed for BBSRC-supported research.
9. The IPA scheme provides funding for science-led grants where an industrial partner makes a significant contribution to the cost of the project. Responsive mode applications with a qualifying level of industry contribution are awarded IPA status and are considered more favourably during the assessment process (subject to meeting a quality threshold). Since the IPA scheme's inception in 2001, 128 IPA projects have been funded with a total BBSRC investment of £57.2M³.

1.5 Introduction to the 'stand-alone' LINK scheme

10. LINK is a government scheme which provides support of up to 50% of the total costs of collaborative research between industry and the research base, the balance of funding being provided by industry. The scheme comprises a number of programmes in defined technology or market sectors which are sponsored by government departments and Research Councils, each programme being made up of collaborative research projects. Examples of LINK programmes where BBSRC has supported research grants include:
 - Advanced Hygiene and Food Manufacturing LINK
 - Applied Genomics LINK
 - Bioremediation LINK
 - Food LINK
 - Food Quality and Innovation LINK

² www.bbsrc.ac.uk/strategy

³ Data are as at August 2012.

- Horticulture LINK
- Renewable Materials LINK
- Sustainable Arable Production LINK
- Sustainable Livestock Production LINK

All of these programmes are now closed to new applications.

11. BBSRC also provides support through responsive mode for 'stand-alone' LINK projects that do not fit into an existing programme, but otherwise meet LINK criteria:
 - the project involves collaborative research with at least one company and one research-base partner
 - overall government support for a project is no more than 50%
 - the application is for research which is pre-competitive in nature
 - arrangements for ownership and exploitation of intellectual property have been agreed by the partners
 - the project has an appropriate management framework and both the scientific and commercial deliverables are clearly defined.
12. The first 'stand-alone' LINK grant was awarded in 1996. In total, 32 'stand-alone' LINK grants have been funded with a BBSRC investment of £8.8M⁴. 'Stand-alone' LINK grants are considered very favourably in the assessment process, because of the substantial level of industrial contribution (subject to meeting a quality threshold).
13. Although the 'stand-alone' LINK and IPA schemes have similar objectives, the two schemes are distinct. 'Stand-alone' LINK projects are expected to have greater industry involvement compared with IPA projects.

⁴ Data are as at August 2012.

Features of the IPA and 'stand-alone' LINK scheme at the time of the evaluation

Feature	Scheme	
	IPA	'stand-alone' LINK
Funding mechanism	<ul style="list-style-type: none"> responsive mode specific research initiatives[†] (determined on a case-by-case basis) 	<ul style="list-style-type: none"> responsive mode
Type of research supported	<ul style="list-style-type: none"> precompetitive research basic, strategic or applied research 	<ul style="list-style-type: none"> precompetitive research basic, strategic or applied research
Required industry contribution towards fEC project costs	<ul style="list-style-type: none"> 10% cash contribution only additional 'in-kind' contributions are encouraged, but are not considered when determining IPA status 	<ul style="list-style-type: none"> 50% cash or 'in-kind contributions
Eligibility of industry partners	<ul style="list-style-type: none"> partner should be registered in the UK or have a UK R&D manufacturing site if a suitable company cannot be found in the UK, an overseas company may be used (this is determined on a case-by-case basis) 	<ul style="list-style-type: none"> partner should be registered in the UK or have a UK R&D manufacturing site if a suitable company cannot be found in the UK, an overseas company may be used (this is determined on a case-by-case basis)
Application assessment	<ul style="list-style-type: none"> by Research Committees alongside other responsive mode applications same assessment criteria as other responsive mode applications 	<ul style="list-style-type: none"> by Research Committees alongside other responsive mode applications same assessment criteria as other responsive mode applications
Uplift applied during the assessment process	<ul style="list-style-type: none"> substantial uplift provided equivalent to a nominal increase in success rate of 20% 	<ul style="list-style-type: none"> very substantial uplift provided any project ranked as internationally-competitive is normally funded
Requirement for collaboration agreement with industry partner	<ul style="list-style-type: none"> collaboration agreement required 	<ul style="list-style-type: none"> collaboration agreement required BBSRC must be provided with a copy of the collaboration agreement

[†] This evaluation is focused on IPA projects funded through the responsive mode funding mechanism, whereby research grants are awarded to unsolicited research proposals from eligible applicants in any area relevant to the mission of the Council. IPA projects funded through research initiatives are not included.

1.6 Evaluation methodology

14. Information for the evaluation was gathered from a number of sources:

- **Former IPA grantholders:** A questionnaire was sent to a sample of 52 researchers with completed IPA grants⁵. The sample included grants with start dates between 2002 and 2008. The questionnaire covered topics including the success of the grant, the interaction with the industry partner, research outputs and outcomes, economic and societal impacts, and views on BBSRC's support for collaborative research with industry. 43 grantholders completed the survey (83% response rate). The responses accounted for 68% of all completed IPA grants at the time of the survey.
- **Current IPA grantholders:** A questionnaire was sent to a sample of 45 researchers with current IPA grants. The sample included grants with start dates between 2008 and 2011 (i.e. ranging from grants that were almost complete to those that had recently started). The questionnaire covered views on BBSRC's support for collaborative research with industry. 42 grantholders completed the survey (93% response rate). The responses accounted for 80% of all current IPA grants at the time of the survey.
- **IPA applicants:** A questionnaire was sent to a sample of 53 researchers who submitted an IPA grant application between 2008 and 2010 which was not subsequently funded. The questionnaire covered views on BBSRC's support for collaborative research with industry. 31 researchers completed the survey (58% response rate). The responses accounted for 46% of unfunded applicants between 2008 and 2010.
- **Former 'stand-alone' LINK grantholders:** A questionnaire was sent to a sample of seven researchers with completed 'stand-alone' LINK grants. The sample included grants with start dates between 2003 and 2006. The questionnaire was very similar to that sent to former IPA grantholders. Six grantholders completed the survey. In addition, the response of one researcher from a previous evaluation was reused. The responses accounted for 78% of all completed 'stand-alone' LINK grants with start dates from 2003 onwards at the time of the survey.
- **Current 'stand-alone' LINK grantholders:** A questionnaire was sent to all four researchers with current 'stand-alone' LINK grants. The grants had start dates between 2009 and 2010. The questionnaire was very similar to that sent to current IPA grantholders. All grantholders completed the survey (100% response rate).
- **BBSRC databases**

The questionnaires are reproduced at Appendix 2 (p. 72). The survey responses were received between April and May 2011.

⁵ Eleven grants in the completed IPA grant sample were component grants of joint research projects (five projects total). In general, the data in this report are presented with reference to individual grants or grantholders (i.e. each component grant is considered separately). However, where appropriate, data are provided at the project level.

15. The evidence collected for the evaluation was reviewed by a panel of experts from academia and industry who are familiar with collaborative research and who between them have expertise across the BBSRC remit. The Review Panel membership is at Appendix 1 (p. 71). The Panel met in August 2011.
16. The IPA and 'stand-alone' LINK schemes have different rationales and the Panel reached its conclusion about each scheme separately. However, where appropriate, the Panel considered the extent to which the two schemes have complemented one another.
17. Results from previous evaluations of the responsive mode portfolio are provided for information. These data provide some context within which to view the performance of IPA and 'stand-alone' LINK grants. However, any direct comparison should be treated with caution.
18. The majority of non-academic partners of IPA and 'stand-alone' LINK grants are industry companies. However, for a small number of grants the non-academic partner was not a company (e.g. a levy body). For conciseness, the non-academic partners of IPA and 'stand-alone' LINK grants are referred to as 'industry partners' throughout the text.

2. Standard of research

Summary

- the IPA and 'stand-alone' LINK schemes support high-quality research
- the high standard of the research is demonstrated by the quality and quantity of research outputs and outcomes
- the research supported by the IPA and 'stand-alone' LINK schemes is of a similar standard to the wider responsive mode portfolio
- the outputs arising from the IPA and 'stand-alone' LINK grants reflect the more strategic and applied nature of the research
- there are differences in the types of outputs arising from IPA and 'stand-alone' LINK grants; these are likely to be a consequence of the different types of research supported by the two schemes
- a small number of grants were funded that did not perform as well as expected

Key recommendations

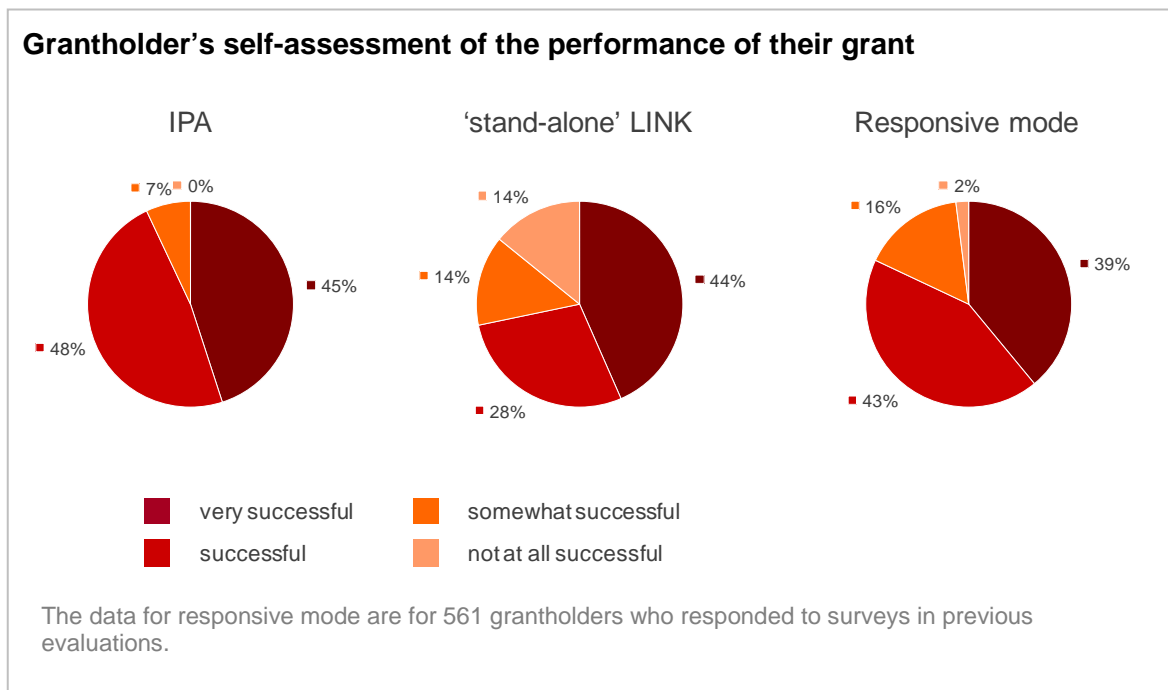
- BBSRC should introduce a light-touch reporting mechanism for industry partners to provide direct feedback to BBSRC at the end of the grant

2.1 Overview of grant performance

19. The overall performance of grants funded through the IPA and 'stand-alone' LINK schemes was very good. The standard of research was similar to that of the wider responsive mode portfolio and there were several examples of excellent and outstanding projects. Grantholders were generally very positive about the performance of their grants: 83% and 84% of IPA and 'stand-alone' LINK grantholders, respectively, stated that their grant was successful or very successful. There was a slight tendency for grantholders to overstate the success of their project but, in general, most self-assessments were fair and reflected the high standard of the research.

Researchers at the University of Cambridge were awarded an IPA grant to investigate the neuroendocrine regulation of mammalian fertility. They collaborated with *Paradigm Therapeutics* (now *Takeda Cambridge*) to study how a small protein (kisspeptin) binds to a receptor protein (GPR54) to stimulate the release of a hormone required for normal fertility. The research demonstrated that kisspeptin is probably the only protein that can activate the GPR54 receptor and that this interaction is required for both the initiation of puberty and for ovulation during the menstrual cycle. The research contributed to six original research articles, including a paper in the prestigious *Proceedings of the National Academy of Sciences of the USA* which was co-authored with the industry partner. The findings may have important implications for the diagnosis and therapy of reproductive disorders and the development of new contraceptives.

20. The high standard of the research supported through the IPA and 'stand-alone' LINK schemes was demonstrated by the quality and quantity of research outputs and outcomes, including publications, new products and processes, new intellectual property and spin-out companies, further funding, and new partnership links. The outputs arising from the IPA and 'stand-alone' LINK projects reflected the more strategic and applied nature of the research supported through the schemes (see Chapter 5, p. 49). For 'stand-alone' LINK projects, the outputs differed to those of other responsive mode grants in nature, but not in quality.



2.2 Publications

21. A substantial number of publications had arisen from the IPA and 'stand-alone' LINK grants⁶. In total, 204 and 32 original research articles⁷ were reported as arising from the IPA and 'stand-alone' LINK grants, respectively. The median numbers of original research articles per grant were three (IPA) and two ('stand-alone' LINK). This is in line with the level of published outputs from other responsive mode portfolio evaluations.
22. The quality of the research publications was generally high. Papers had been published in high-ranking multidisciplinary journals, as well as prestigious journals in specific scientific fields.
23. A lower proportion of original research articles were published in the highest impact factor (IF) journals compared with other responsive mode evaluations, particularly for 'stand-alone' LINK grants⁸. This was a consequence of the nature of the research rather

⁶ For IPA grants, publication data were obtained from 43 questionnaire responses and all 52 final reports. For 'stand-alone' LINK grants, data were from seven questionnaire responses and all eight final reports.

⁷ The distinction between original research articles and review articles is not made in final reports. Therefore a best attempt was made to categorise each publication using online databases. Papers reported by more than one grantholder were only counted once.

⁸ For information, in previous evaluations of the responsive mode portfolio:

than its quality: strategic and applied research is less likely to be published in high impact factor journals, irrespective of its quality.

Researchers at Birbeck, University of London received an IPA grant to investigate how kinesin-8 motor class proteins control the shape of the microtubule skeleton in cells, particularly in cells which are multiplying in number. The research revealed aspects of the molecular mechanism by which kinesin-8 motor proteins 'walk' toward microtubule ends and regulate the length of these microtubules. The key findings from the grant were published in a paper in the prestigious *EMBO Journal*, which was co-authored with the industry partner (*Cytokinetics*). The work may provide a potential target for new anti-cancer therapeutics, as the microtubule skeleton has an important function in cell division.

An IPA grant supported a collaboration between scientists at the University of Manchester, Queen's University Belfast and several commercial partners. The grant holders developed a process using the bacterium *Shewanella* to remove colour (azo dyes and pigments) from wastewaters produced by the textile industry. The research also led to the identification of a class of secreted compounds (flavins) that are released by *Shewanella* bacteria to enhance their bioreduction activity, a process through which the bacteria obtain energy. This fundamental discovery has implications for many biotechnological applications including bioremediation and microbial fuel cells. The associated paper was published in *Applied and Environmental Microbiology* and has been cited over 130 times.

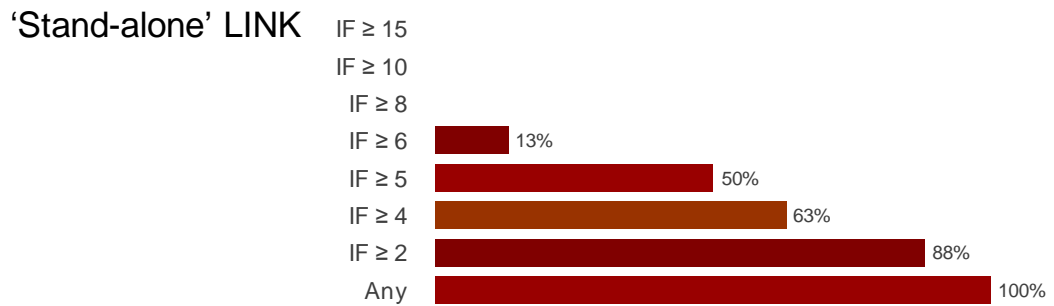
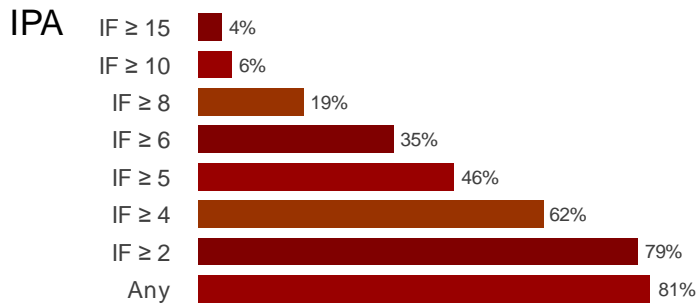
Scientists at the University of Bristol were awarded a 'stand-alone' LINK grant with *Smith and Nephew* to study the regulation of stem cell differentiation, with the aim of creating new cartilage tissue. They demonstrated that a protein, nucleostemin, is a marker of undifferentiated human adult bone marrow stem cells and that it is involved in the regulation of proliferation of these cells. The research resulted in a paper in *Stem Cells* which has been cited over fifty times. The project may eventually contribute to treating cartilage problems in older people, particularly osteoarthritis.

Researchers at the University of Glasgow collaborated with *Pfizer* to understand the thickening of arteries in the lung, a process which is often associated with cardiovascular disease and high blood pressure. The IPA grant highlighted important interactions between two chemicals in this process (serotonin and mts1). The research resulted in the publication of four original research articles, including a paper in the high-ranking journal *Circulation*.

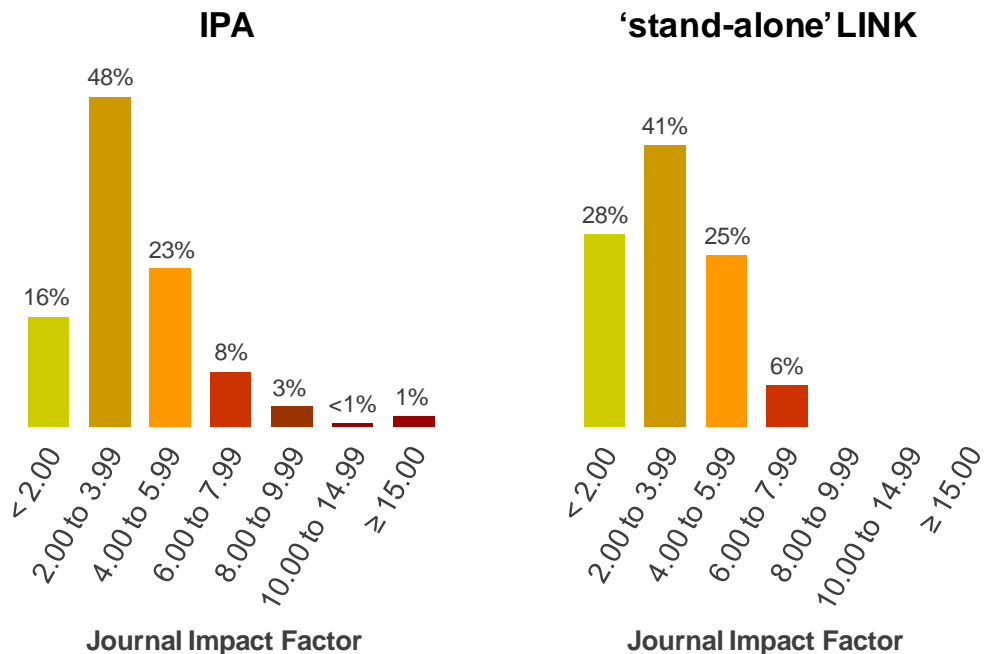
Scientists at the University of Oxford were awarded a 'stand-alone' LINK grant with *PowderJect Pharmaceuticals Ltd* to study the needle-free delivery of powdered drugs and chemicals through the skin. They conducted imaging experiments to investigate the key physical and molecular biology interactions that occur once particles are delivered to the skin and demonstrated the suitability of this novel route of drug administration. The research was very productive and contributed to a large number of publications, including thirteen original research articles in a variety of specialist journals.

-
- 34% of grant holders funded by the Animal Sciences Committee had published in a journal with an IF of five or more; 11% had published in a journal with an IF of ten or more
 - 42% of grant holders funded by the Engineering and Biological Systems Committee had published in a journal with an IF of five or more; 9% had published in a journal with an IF of ten or more
 - 66% of grant holders funded by the Plant and Microbial Sciences Committee had published in a journal with an IF of five or more; 7% had published in a journal with an IF of ten or more

Proportion of grantholders who published an original research article in specific journal categories



Distribution of original research articles by journal impact factor category



Journals were categorised by impact factor using ISI Web of Knowledge Journal Citation Reports (2009 edition). For the graphs showing the distribution of original research articles by journal impact factor, the <2.00 category also includes journals for which no impact factor is currently available.

Industrial co-authorship

24. Publication co-authorship is one route by which an industry partner's contribution to the research can be recognised and it can be an indicator of the success of the interaction or the level of engagement between academic and industry partners. 23% and 19% of original research articles arising from IPA and 'stand-alone' LINK grants, respectively, had an industrial co-author⁹. The level of industrial co-authorship on IPA and 'stand-alone' LINK publications was notably higher than for the responsive mode portfolio¹⁰.

Scientists at the University of Manchester conducted research to examine the loading and release of therapeutic biomacromolecules from polymers which can be used to coat medical devices. The IPA grant enabled the researchers to develop approaches for the delivery of clinically significant amounts of anti-sense oligonucleotides from a thin film coating in a controlled manner. The research contributed to twelve original research articles, seven of which were co-authored with the industry partner, *Biocompatibles UK*.

25. A notable proportion of grantholders had published an original research article with an industrial co-author as a result of the grant. For example, 38% and 63% of IPA and 'stand-alone' LINK grantholders, respectively, published at least one original research article with an industrial co-author. 31% (IPA) and 63% ('stand-alone' LINK) of grantholders had published an original research article with the industry partner on the grant.
26. Although the level of industrial co-authorship on IPA and 'stand-alone' LINK grant publications was encouraging, it was still slightly lower than might be expected. For example, the secondment of industry staff was a major mechanism by which industry partners met the 50% contribution towards 'stand-alone' LINK grant project costs, and this could reasonably have resulted in more co-authored papers. However, the co-authorship data need to be treated with caution as some industry partners may not wish to be acknowledged on publications for commercial reasons (e.g. so that competitors are not aware of the interaction with the academic partner). It would be helpful for end of award reporting to record whether the industry partner had requested not to be included on any publications arising from the grant.

International co-authorship

27. 44% and 63% of IPA and 'stand-alone' LINK grantholders, respectively, published an original research article with an international co-author as a result of the grant. 28% (IPA) and 22% ('stand-alone' LINK) of original research articles had an international co-author. The level of international co-authorship was similar to that observed in other evaluations of the responsive mode portfolio¹¹ and was another indicator that the schemes are supporting high-quality researchers and research projects.

⁹ The data on industrial and international co-authorship were obtained from ISI Web of Knowledge.

¹⁰ In previous evaluations of the responsive mode portfolio, the proportion of papers with industrial co-authors was between 3% and 12% (the weighted mean was 6%).

¹¹ In previous evaluations of the responsive mode portfolio, the proportion of papers with international co-authors was between 7% and 35% (the weighted mean was 21%).

Other publication outputs

28. Some types of publication outputs were not explicitly captured as part of the evaluation, although they were reported in some grantholder's final reports. These included conferences presentations and conference proceedings papers. Although these outputs are considered as less prestigious than peer-reviewed original research articles, they are important in the context of academia-industry collaborations. For example, presentations at international conferences can provide publicity or be marketing opportunities for the industry partner. In addition, they can help industry identify academics who are active in specific research fields.

Grants which did not result in an original research article

29. Ten IPA grantholders (19%) reported that no original research articles had arisen as a result of their grant to date. This was disappointing, but the level was similar to that observed in previous evaluations¹². All 'stand-alone' LINK grantholders reported an original research article as a result of their grant.
30. For several IPA and 'stand-alone' LINK grants, including some of the IPA grants which did not result in an original research article, publication was delayed at the request of the industry partner in order to protect intellectual property (IP). This is to be expected and, as such, the publication data may be an underestimate of overall grant performance.

2.3 New products, processes, resources, tools and technologies

31. 81% and 57% of IPA and 'stand-alone' LINK grantholders, respectively, stated that the research supported by their grant had or could result in a novel product, process, resource, tool or technology. This was positive and generally higher than reported in previous evaluations of the responsive mode portfolio¹³. The outputs were varied and included constructs, datasets, formulations, genetic stocks, kits, methodologies, processes, reagents and tools.
32. A high proportion of outputs were reported as having the potential to be commercially exploitable (IPA 74%; 'stand-alone' LINK 100%)¹⁴. For 'stand-alone' LINK projects, there was also strong involvement from industry partner in the exploitation of the outputs; this was one of the major strengths of the 'stand-alone' LINK scheme.

¹² In previous evaluation of the responsive mode portfolio, the proportion of grants that resulted in no peer-reviewed publications was between 7% and 22% (the weighted mean was 12%).

¹³ In previous evaluations of the responsive mode portfolio, the proportion of grantholders who stated that the research supported by their grant had or could result in a novel product, process, resource, tool or technology was between 27% and 71% (the weighted mean was 45%).

¹⁴ In previous evaluations of the responsive mode portfolio, the proportion of outputs which were reported as having the potential to be commercially exploitable was between 19% and 75% (the weighted mean was 42%).

Researchers at the University of Nottingham worked with *Archimedes Development Ltd* to develop safe, stable and efficient drug delivery systems which could be used to administer medicines through the nose or gut. The IPA grant characterised the molecular properties and stability of two types of molecules (chitins and pectins) and examined their effectiveness in drug delivery. The highly productive research resulted in new optimised formulations based on these molecules and a product has now been taken into clinical trials for the delivery of pain relief products for cancer therapies. In addition, formulations are being tested for the delivery of avian influenza, norovirus infection and anti-nausea drugs.

Scientists at Rothamsted Research collaborated with *BASF Plant Sciences* to investigate the production of omega-3 long chain polyunsaturated fatty acids in plants. These fatty acids are widely viewed as being important constituents of human diet and are associated with health benefits. However, the primary source of these fatty acids is fish oils and their availability in the future may be limited by the global decline in fish stocks. As part of the IPA grant, the researchers developed transgenic linseed plants which accumulate omega-3 steraridonic acid. The plants can provide a sustainable supply of omega-3 fish oils and could therefore have a substantial societal impact by replacing threatened fish stocks as a source.

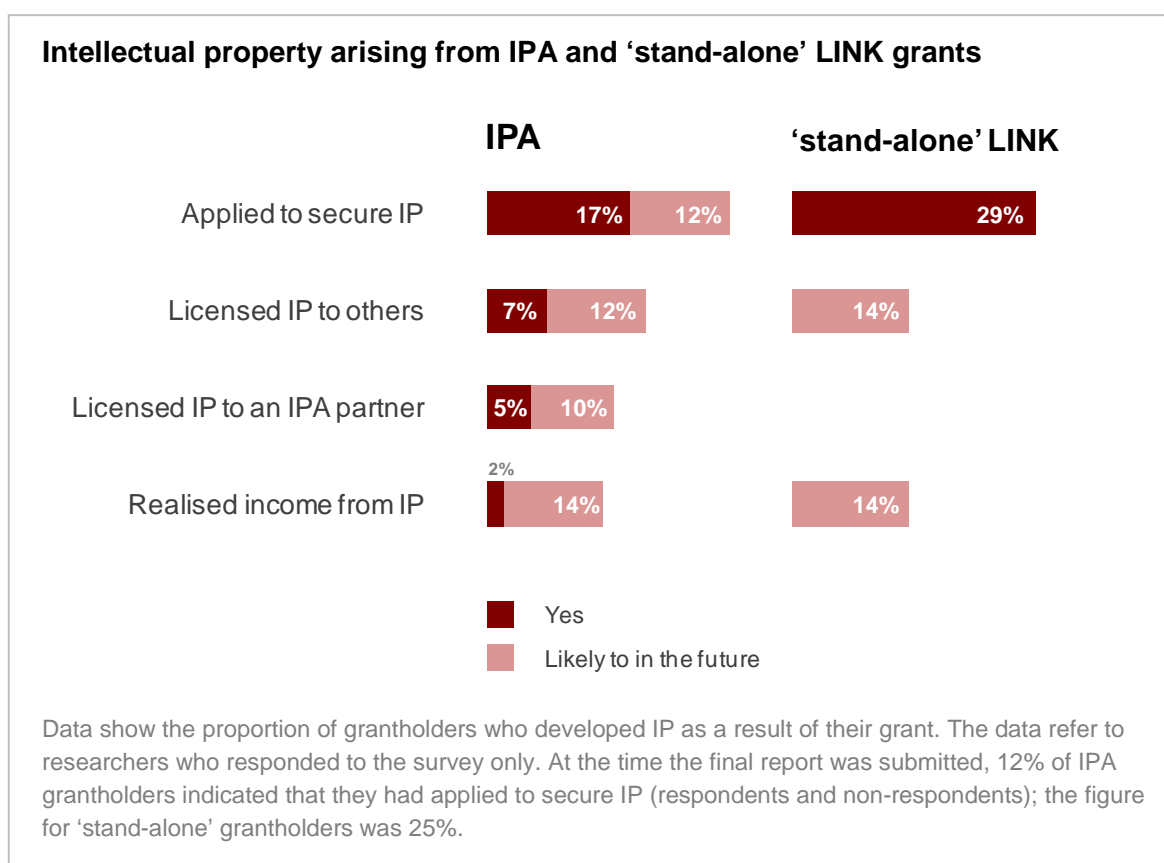
New products, processes, resources, tools and technologies reported by IPA and 'stand-alone' LINK grantholders

	IPA	'stand-alone' LINK
Proportion of grants which resulted in a new product, process, resource, tool or technology	50%	57%
Proportion of grants are likely to give rise to a new product, process, resource, tool or technology in the future	31%	
Proportion of outputs that have the potential to be commercially exploitable	74%	100%
Proportion of grantholders who stated that their industry partner was involved in the output's exploitation	33%	67%

2.4 New intellectual property and spin-out companies

Intellectual property

33. The proportion of IPA and ‘stand-alone’ LINK grantholders who had applied to secure IP as a result of their grant was notable. 17% and 29% of IPA and ‘stand-alone’ LINK grantholders, respectively, reported that they had applied to secure IP. Three IPA grantholders (7%) had successfully licensed their IP to others and one had yielded income. Many IPA and ‘stand-alone’ LINK grants had only recently finished, so there was potential for further licensing and income.
34. The level of new IP reported by grantholders was higher than observed for other responsive mode grants¹⁵. To some extent, this is to be expected given the IPA and ‘stand-alone’ LINK schemes’ rationales and the industry involvement in the research. Nevertheless, it is a clear indication that the schemes are contributing to BBSRC’s objectives for working with business.
35. Some industry partners may have a policy not to patent research findings from collaborative research. Again, it would be helpful if this were recorded as part of end of award reporting. It would also be useful to know whether the *industry partner* has realised income from the IP, although industry may not be willing to share this information.



¹⁵ In previous evaluations of the responsive mode portfolio, the proportion of grantholders who reported that they had applied to secure IP rights was between 4% and 25% (the weighted average was 10%). The proportion of grantholders who reported that they were likely to apply to secure IP rights in the future was between 3% and 17% (the weighted average was 7%).

Spin-out companies

36. Four IPA grantees (10%) stated that the research supported by their grant had contributed to the establishment or further development of a spin-out company, with a further five (12%) indicating that it was likely to do so in the future¹⁶. This is impressive and represents an excellent example of how research can be exploited to provide economic benefits for the UK.

Researchers at the University of Aberdeen collaborated with *Apatech Ltd* and *Renishaw plc* to investigate bone formation, disease and repair. Their IPA grant supported the purchase of a Raman microscope which enabled the chemical composition of bone material to be determined with very high resolution. The equipment underpinned further work which contributed to a Proof of Concept award from Scottish Enterprise and the formation of the spin-out company *Sirakoss*. The company has developed a synthetic bone graft substitute product, *MaxiSi™*, which has applications in the treatment of bone defects and traumas.

IPA funding supported a collaboration between scientists at the University of Birmingham, the University of Dundee and a consortium of companies. An important output of the research was improved methods for the sustainable production of a clean energy source (hydrogen) from food wastes using engineered bacteria. In addition, the project also developed strains of bacteria which are optimised for the bio-recovery of precious metals from wastes. The findings contributed to the establishment of a spin-out company, *Biowaste2Energy*, which has developed a two-stage fermentation process to convert biological waste into hydrogen.

37. No 'stand-alone' LINK grantees reported contributions to the establishment or further development of spin-out companies. This is to be expected: the industry partner of a 'stand-alone' LINK grant makes a large contribution to the total project costs and, as such, the research is much more likely to be exploited through the industry partner than through the establishment of a new spin-out company.

2.5 Further funding to develop the research

38. A notable proportion of grantees were successful in obtaining further funding to extend the research: 47% and 29% of IPA and 'stand-alone' LINK grantees received such funding. This included funding for research grants, studentships, career development, and commercialisation and development activities.
39. 16% of IPA grantees received further support from BBSRC and 37% received further support from other funders. The most common sources were industry (14% grantees), the European Union (7%), the Engineering and Physical Sciences Research Council (7%), the Department for Environment, Food and Rural Affairs (7%), university funding (5%) and the Wellcome Trust (5%). The other funders were reported by a single grantee and included: Advantage West Midlands, Cancer Research UK, the Ministry of Defence, the Medical Research Council, Research Councils UK, and the Scottish Funding Council. Many IPA grantees also received further funding from their industry partner for research which was not related to the grant.

¹⁶ These data refer to IPA grantees who completed the survey. One additional spin-out company was reported in the final report of a grantee who completed the survey.

Researchers at the University of St. Andrews were awarded an IPA grant to study muscle growth and quality traits in Atlantic salmon. They collaborated with *EWOS Ltd* and identified molecular biomarkers which are able to predict salmon muscle growth. The research has practical applications in the fish farming industry; for example, it can reduce the time and costs associated with testing the effectiveness of new fish feeds. The academic researchers obtained additional funding from their industry partner and continued to collaborate through the Technology Strategy Board's *Sustainable Protein Production* programme. In addition, they obtained other funding to develop the research including a five-year grant from the Scottish Funding Council through the *Marine Alliance for Science and Technology Scotland* platform, an EU grant, and a BBSRC CASE studentship with a leading UK supplier of frozen fish dishes.

Scientists at Rothamsted Research worked with *DuPont UK* to improve the control of fungal diseases of crop plants. The IPA grant provided valuable knowledge on the symptomless growth of the fungal pathogen *Leptosphaeria maculans* (phoma stem canker disease). This has been used by the industry partner in its marketing and has the potential to generate better control strategies as well as environmental benefits. The researchers subsequently obtained further BBSRC funding to develop the research through the *Sustainable Arable Production* LINK programme, working with a consortium of industry partners including plant breeders and farmers.

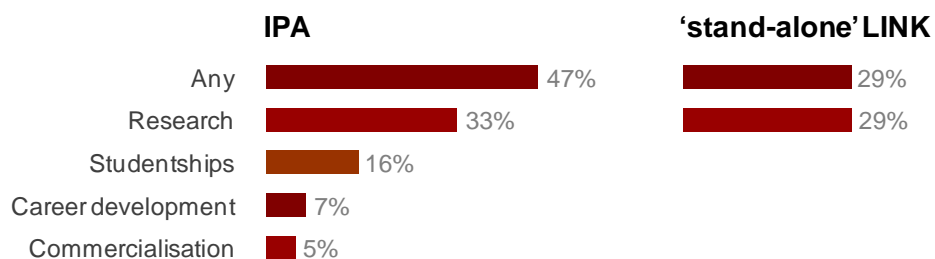
A collaboration between scientists at the University of Cardiff and *GlaxoSmithKline* investigated how cells communicate with one another using protein messengers. The IPA-funded research focused on proteins in the Wnt signalling pathway which controls a variety of developmental processes. The research subsequently contributed to the establishment of a major academic-industry collaboration between the University, *Cancer Research Technology*, *Merck Serono* and the Institute of Cancer Research. This three-year research programme aims to identify inhibitors of the Wnt pathway which can be used in cancer therapy.

40. A lower proportion of 'stand-alone' LINK grantholders received further funding to extend the research compared with IPA grantholders. No 'stand-alone' LINK grantholders received further funding from BBSRC and two received further funding from other funders (industry and the Elkin Foundation). One 'stand-alone' LINK grantholder received further funding from their industry partner for research which was not related to the grant.
41. Overall, 56% and 43% of IPA and 'stand-alone' LINK grantholders, respectively, had received further funding. This was encouraging and similar to the level observed for other responsive mode evaluations¹⁷. There was some scope for grantholders to widen the sources of their further funding. However, it was noted that the closure of the Regional Development Agencies may reduce the available funding opportunities in the future.

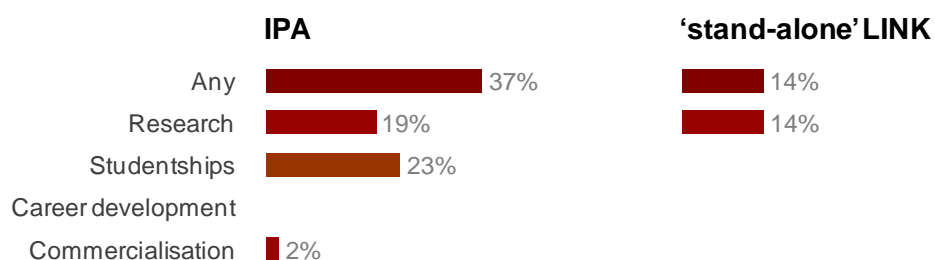
¹⁷ In previous evaluations of responsive mode research, an average of 53% of grantholders secured further funding to continue or develop their research project.

Proportion of IPA and 'stand-alone' LINK grantholders who secured further funding

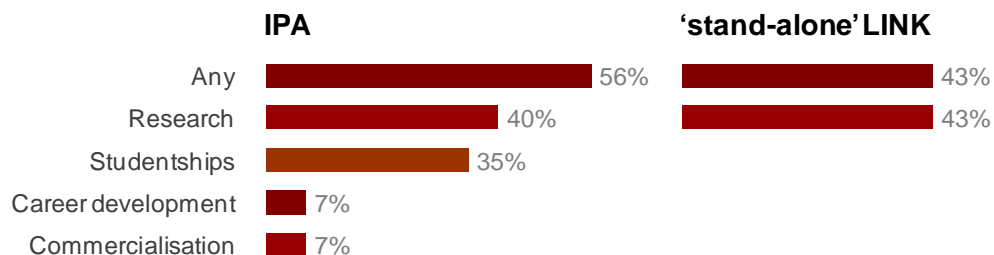
Further funding to develop the research



Further funding from the industry partner (not related to the research)



All further funding

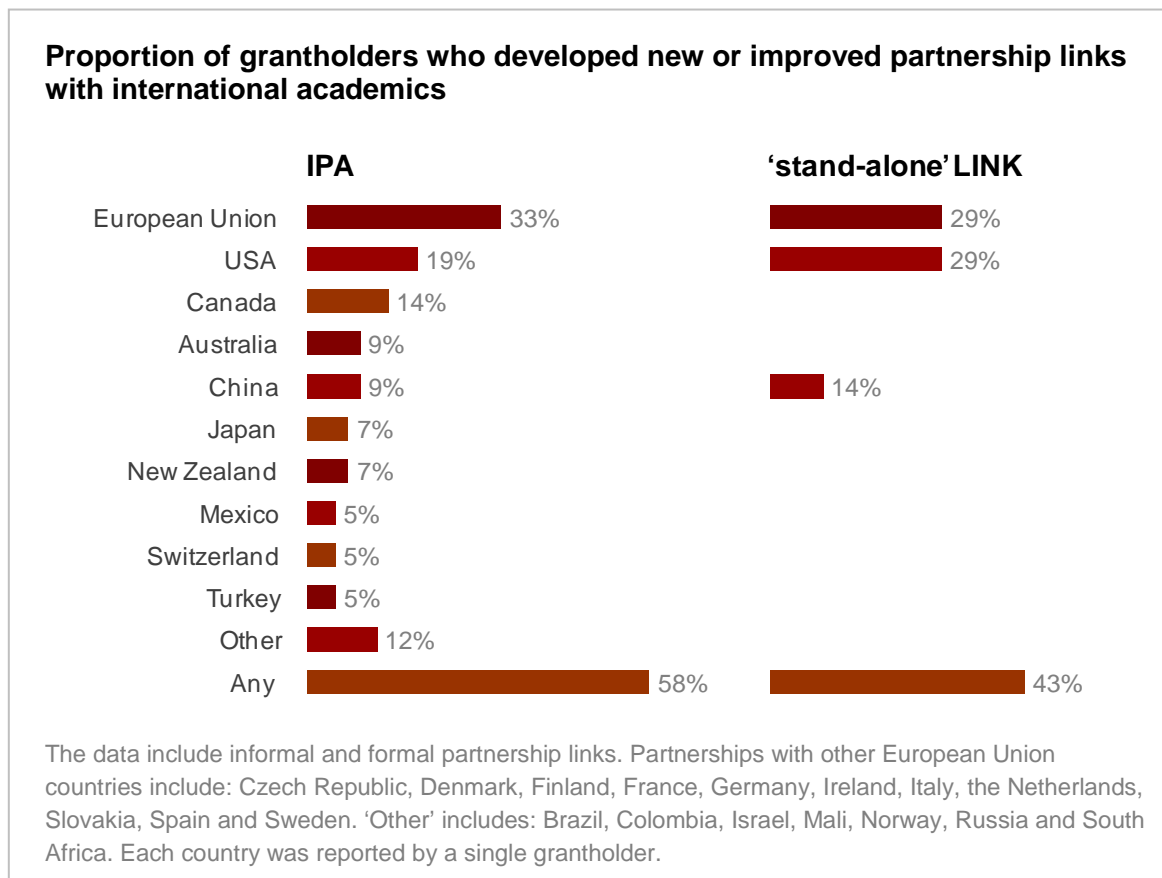


'Research' includes research grants from Research Councils and charities, as well as contract research.
 'Career development' includes fellowships and other awards supporting career development activities.
 'Commercialisation' includes commercialisation and development activities such as BBSRC Pathfinder funding, Follow-on Funding, and TSB technology development funding.

2.6 New and improved partnership links

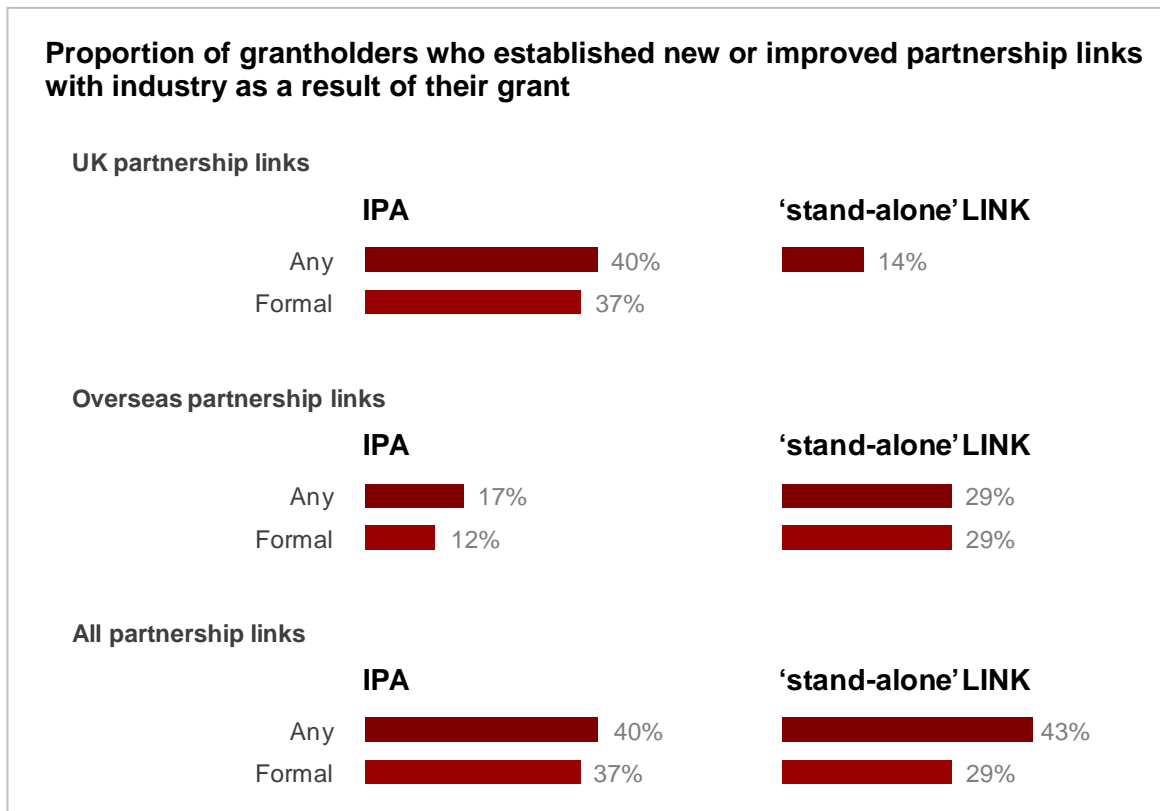
Academic partnership links

42. A high proportion of researchers established or developed academic partnership links as a result of their IPA or 'stand-alone' LINK grant. 70% of IPA grantholders reported that their grant led to new or improved partnership links with academics in the UK or overseas; 67% established or developed a formal research collaboration (e.g. joint publication; joint grant application). For 'stand-alone' LINK grantholders the figures were 57% (new or improved partnerships) and 57% (formal collaboration). However, it was difficult to determine the extent to which the development of these partnerships was directly dependent on the IPA or 'stand-alone' LINK funding.
43. A healthy proportion of researchers had established links with international academics. 58% of IPA grantholders reported that their grant led to new or improved partnership links with overseas academics; 56% established or developed a formal research collaboration. For 'stand-alone' LINK grantholders, the figures were 43% (new or improved partnership links) and 43% (formal collaboration). The majority of overseas partnership links were with researchers in other European Union countries or the USA, but many other countries were also represented. The individual partnership links were varied; for example, some were associated with research grant funding (e.g. EU grants) whereas others were more informal collaborations. The data on international partnership links provide additional evidence that the schemes are supporting high-quality research.



Non-academic partnership links

44. IPA and 'stand-alone' LINK grantholders also established or developed non-academic partnerships as a result of their grant (excluding the industry partner on the grant). 40% of IPA grantholders reported that their grant led to new or improved partnership links with industry in the UK or overseas; 37% established or developed a formal collaboration (e.g. co-funding, joint publication, joint grant proposal). For 'stand-alone' LINK grantholders the figures were 43% (new or improved partnerships) and 29% (formal collaboration). The majority of international partnerships were with companies based in other European Union countries or the USA. The remainder were based in Canada, Israel and Switzerland.



45. IPA grantholders established or developed partnership links with 41 different companies (excluding the industry partner on the grant). These included large multinationals and small and medium enterprises (SMEs). Sectors represented included: agriculture, biotechnology, chemical, environment, food and drink, health, pharmaceuticals, and publishing.

Scientists at the University of Southampton worked with *Vitacress Salads Ltd* to investigate the genetic basis of lettuce leaf quality. They identified regions of the lettuce genome containing genes which control various agronomic traits and their findings have the potential to improve the quality of baby salad leaves used in pre-packed salads (e.g. reducing damage and waste in the processing chain, increasing product shelf-life). The IPA grant contributed to a number of additional collaborations. The academia-industry partnership was extended to include a major lettuce breeding company in the USA with the aim of introducing the newly identified traits into commercial varieties. In addition, the industry partner brokered links between the academic partner and two major UK supermarkets, and they are now working together through collaborative studentships.

46. The data for IPA and 'stand-alone' LINK grantholders who established or developed partnership links with other industry illustrate how such partnerships can be self-reinforcing. Industry prefers to work with academic researchers who have a track record of academia-industry collaboration, and word-of-mouth communication between industry partners about academic research groups is particularly important in certain sectors. Participation in the IPA and 'stand-alone' LINK schemes can therefore make academic researchers more attractive to other industry partners and can be a catalyst for the development of new collaborations. In addition, through participation in the schemes, academic researchers are exposed to the benefits of academia-industry collaboration, which may encourage them to seek out new industry partners.

2.7 Differences between IPA and 'stand-alone' LINK grant outputs and outcomes

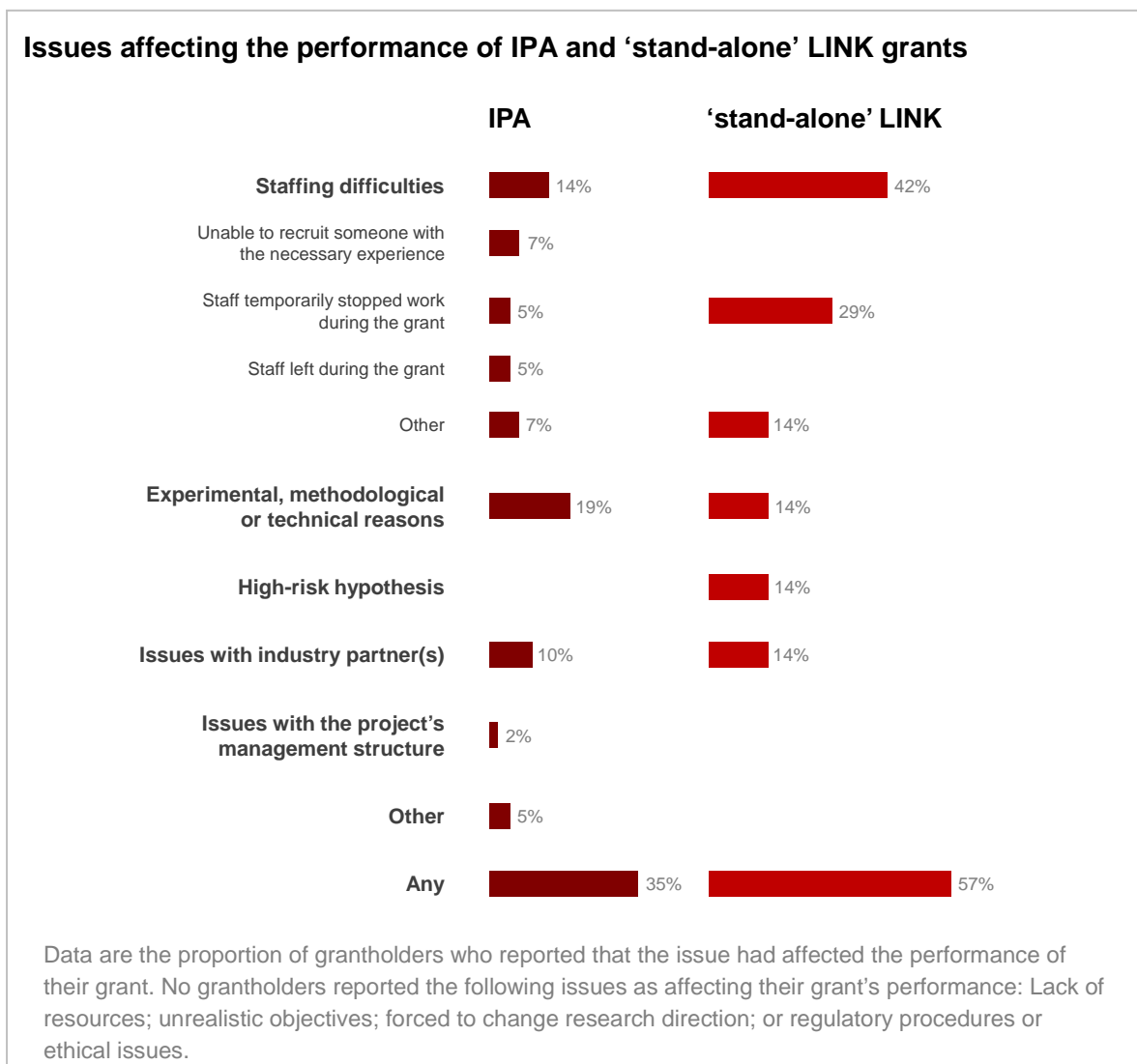
47. There were some differences in the outputs and outcomes arising from IPA grants compared with 'stand-alone' LINK grants. For example:
- a higher proportion of original research articles arising from IPA grants were published in high-impact journals compared with 'stand-alone' LINK grants
 - a lower proportion of IPA grantholders co-authored a publication with their industry partner
 - a lower proportion of outputs arising from IPA grants had the potential to be commercially exploitable or were being exploited by the industry partner
 - a lower proportion of IPA grantholders applied to secure IP, although a higher proportion reported that their IP had been licensed to others
 - a higher proportion of IPA grants contributed to the establishment or further development of a spin-out company
 - a higher proportion of IPA grantholders secured further funding to continue or develop the research
48. The differences in the outputs and outcomes arising from IPA and 'stand-alone' LINK grants were likely to be a consequence of the different nature of the schemes and the types of research supported. For example, the 'stand-alone' LINK scheme supports a higher proportion of applied research than the IPA scheme (Chapter 5, p. 49) which is less likely to be published in a high-impact journal, irrespective of its quality. 'Stand-alone' LINK grants require a 50% industry contribution towards project costs. The research may therefore be more closely aligned with the industry partner's interests or the industry partner may be more directly involved in the project, increasing the likelihood of the research findings being exploited by the industry partner. In addition, as the 'stand-alone' LINK scheme tends to support research which is closer to market, there may be less scope to obtain further funding to continue or develop the research (e.g. the expectation is that the research will be taken forward by the industry partner, there are limited sources of funding for commercialisation and development activities).

2.8 Grants which did not meet the expected standard

49. A small proportion of IPA grants did not perform as well as expected, for example, failing to meet their original objectives or producing relatively few outputs. Overall, the proportion of less successful projects was similar to that observed for the wider responsive mode portfolio. The issues affecting grant performance are covered in section 2.9. In addition, a small proportion of IPA grants delivered excellent research, but did not contribute to the wider objectives of the scheme. Specifically, for a few grants, there was little evidence of how the research would produce benefits for the UK or the industry partner, or deliver other impacts.

2.9 Issues affecting grant performance

50. 35% of IPA grantholders identified issues which affected the performance of their grant; for 'stand-alone' LINK grantholders the figure was 57%. The main issues affecting grantholders were: experimental, methodological or technical issues; staffing difficulties; and issues with the industry partner (Chapter 4, p. 40). In the majority of cases grantholders were able to overcome any issues and meet their project's objectives. However, for a small number of grants, the success of the project was affected.



2.10 End of award reporting

51. The end of award reporting requirements for IPA and 'stand-alone' LINK grants are similar to those of other responsive mode grants. However, as the schemes have different objectives to other responsive mode funding, there are some areas where additional reporting would be beneficial. Industry partners do not provide any feedback on IPA or 'stand-alone' LINK grants as part of the formal reporting process. BBSRC should consider introducing a light-touch mechanism through which industry partners would provide direct feedback about the project, including an assessment of the potential impact of the research by the industry partner. This would enable BBSRC to understand further the effectiveness of the schemes in promoting successful academia-industry collaborations and the extent to which they are delivering research which is of benefit to industry.
52. It was difficult to assess the long-term impact of BBSRC's investment in the IPA and 'stand-alone' LINK grants from the information contained in final reports. Final reports are submitted three months after the grant ends, when it is usually too early to report extensively on the project's achievements or any exploitation of the research. BBSRC should develop more sophisticated approaches to capture the outcomes and impacts of its research investments. The introduction of the cross-Council Research Outcomes System (ROS) will be very useful in this context. It will also enable BBSRC to examine the effectiveness of the schemes by comparing the outputs and outcomes of IPA and 'stand-alone' LINK funding with other forms of funding.
53. There was some over-reporting of outputs within final reports, particularly publications. For a few grants, some of the reported outputs appeared to be primarily supported through other funding sources, rather than the grant in question. Again, the introduction of ROS may help address the issue of over-reporting, as the system allows outputs and outcomes to be captured for several years after the grant ended, and requires outputs to be directly related to specific awards.

3. Research impacts

Summary

- the IPA and 'stand-alone' LINK schemes support training which is important for the provision of skilled staff to the UK economy
- the interactions with industry partners have benefited staff training and skills development
- IPA and 'stand-alone' LINK grants have delivered, or have a strong potential to deliver, benefits to the public good
- the overall level of research exploitation is higher than for other responsive mode funding
- industry has played an important role in realising the impacts from the research
- there is scope to improve grantholders' participation in public engagement activities
- the IPA and 'stand-alone' LINK schemes have supported knowledge exchange with academic and non-academic users
- the research supported by the IPA and 'stand-alone' LINK schemes has contributed to the high international standing of UK bioscience

Key recommendations

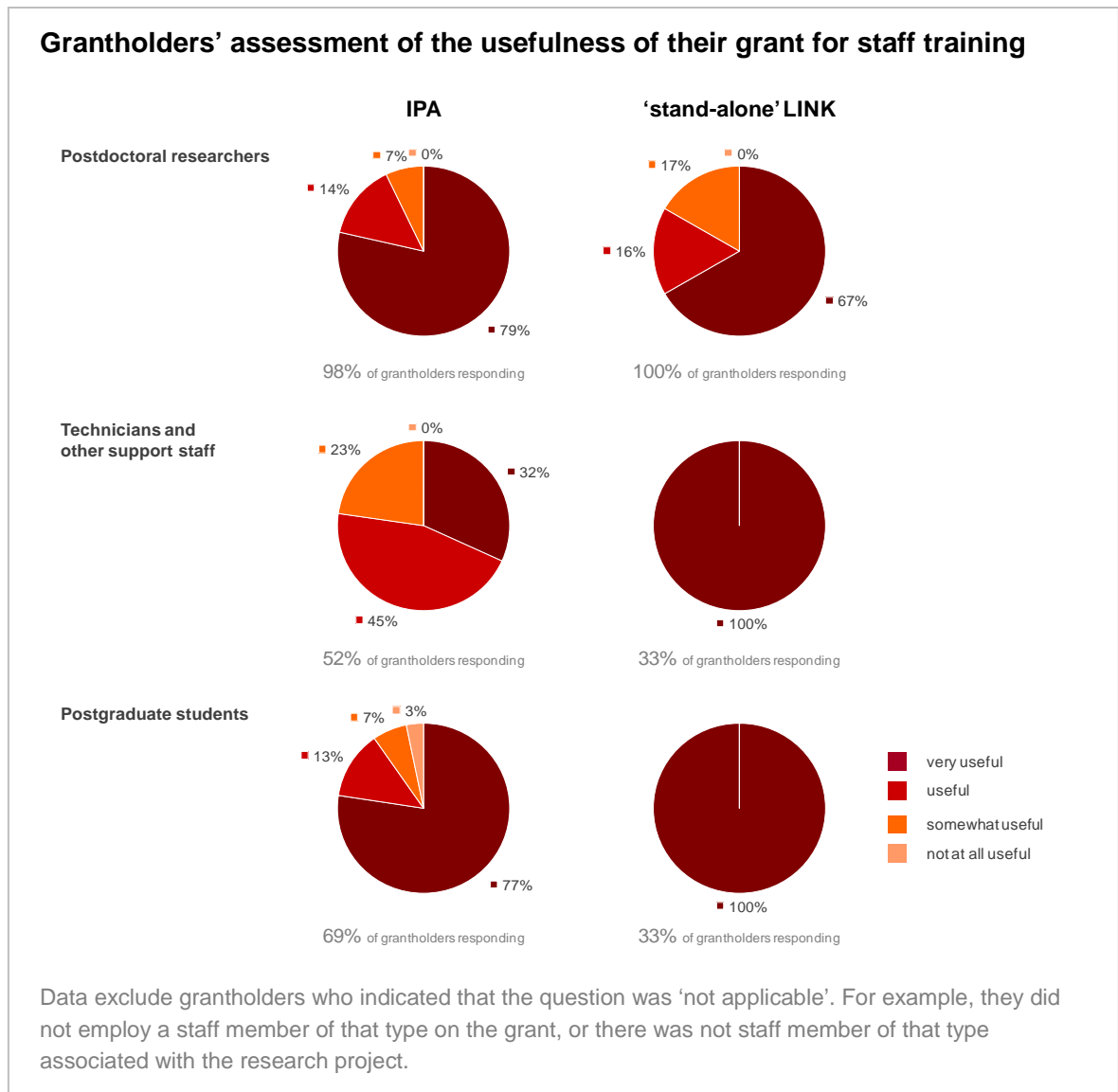
- BBSRC should continue to develop mechanisms to capture the long-term impacts of its investment in the IPA and 'stand-alone' LINK schemes
- BBSRC should investigate the typical time taken for research to be exploited in different industry sectors, to provide greater insight into the performance of IPA and 'stand-alone' LINK projects

3.1 Training and skills development

54. The training of postdoctoral researchers is a vital function of BBSRC research funding. It provides the skilled scientists who conduct research as well as contributing scientifically-literate personnel to the wider economy. 90% and 83% of IPA and 'stand-alone' LINK grantholders, respectively, stated that their grant was useful or very useful for the training of the postdoctoral researcher employed on the grant. 71% and 83%, respectively, stated that the interaction with their industry partners produced additional benefits to staff training compared with a standard responsive mode grant. For example:

- a broader training experience for staff employed on the grant and, in some cases, the grantholder
- greater insight into industry culture and how industry science is conducted
- greater understanding of the needs of industry, and how academic research can contribute to addressing these needs
- greater understanding of industry's focus on delivering tangible outcomes
- greater understanding of the scale of industry science

- access to expertise and facilities which were not available at the academic institution
 - learning project management techniques from the industry partner
 - additional networking opportunities
 - subsequent employment by industry
55. A notable proportion of grantholders reported that postgraduate students who were working on related projects also benefited from the interactions with industry partners. The Panel members from industry noted that there is a general perception that students who have been exposed to industry are more employable.
56. It was clear that the IPA and 'stand-alone' LINK schemes provide additional training opportunities beyond what might be expected from other responsive mode funding, and that the schemes were contributing to the provision of skilled staff to the UK economy. In this context, it is important for BBSRC to capture and monitor the first destinations of staff employed on IPA and 'stand-alone' LINK grants; the introduction of ROS will be useful for this. BBSRC should also emphasise that training and skills development is an important function of the schemes.



3.2 Economic and societal impacts

57. Economic and societal impacts are those ultimate impacts that relate to the overall objectives of BBSRC as an organisation and would generally be expected to arise in the longer term. Examples of economic and societal impacts that should arise from BBSRC investments in research and training include:
- research findings are used for the public good
 - research contributes to the increased competitiveness of the UK economy
 - income to the research community and 'UK plc'
 - the UK maintaining its high standing in the biological sciences
 - public confidence in biological science research is maintained
58. A high proportion of IPA and 'stand-alone' LINK grantholders reported impacts or potential impacts arising from their research, including contributions to human health, animal health and welfare, food security and sustainable agriculture, the environment and mitigating climate change, bioenergy and industrial biotechnology, and government policy in these areas. This was a notable achievement, especially considering that there was less emphasis on delivering economic and societal impacts from the research when many of the grants were funded. However, there was a tendency for grantholders to overstate the impact of their research, and some did not distinguish between realised and potential impacts. This is likely to be a generic issue within the academic research community rather than a specific issue with the IPA and 'stand-alone' LINK schemes. It may reflect the research community's lack of experience with impact reporting or their grasp of the impact agenda.
59. It was difficult for the Panel to assess the extent to which the IPA and 'stand-alone' LINK schemes had delivered economic and societal impacts. For many grants it was still too early to evaluate the impact of the research, and for some areas it is very difficult to capture impacts (e.g. the influence on policy decisions). Nevertheless, the majority of IPA and 'stand-alone' LINK grants have delivered, or have a strong potential to deliver, benefits to the public good, and the overall level of exploitation of the research was higher than in the wider responsive mode portfolio. This is very positive and expected given the nature of the research and the schemes' rationales. It is important for BBSRC to identify the long-term outcomes and achievements of IPA and 'stand-alone' LINK funding, and BBSRC should continue to develop mechanisms to capture the impact of its investment in the schemes.

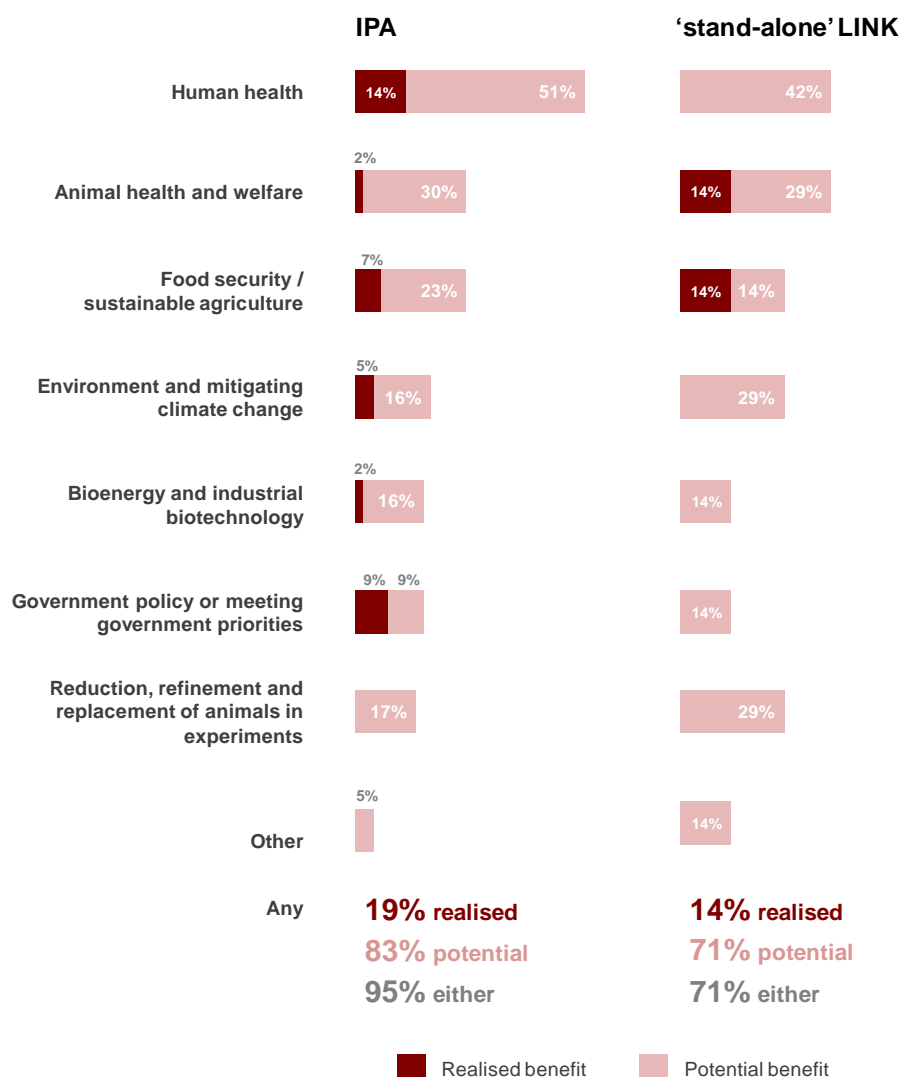
A collaboration between researchers at Rothamsted Research, University College London, *Bayer CropScience* and *Bayer Healthcare* investigated the resistance of insect pests to a specific class of insecticides (neonicotinoids). The IPA grant contributed substantially to improving knowledge of the current incidence and potential mechanisms of pest resistance to these chemicals. The results have informed the work of the UK Chemical Regulations Directorate, which is responsible for UK policy on pesticide approval and resistance management. The research has also been disseminated to advisors, agrochemical companies, farming industries, grower groups and regulators in part through the UK Insecticide Resistance Action Group and the global Insecticide Resistance Action Committee. Elements of the work have been incorporated into revised programmes for insect control in South East Asia.

Scientists at the Institute for Animal Health were awarded a 'stand-alone' LINK grant with *Fort Dodge Animal Health* to investigate Marek's disease (MD). MD is an economically important disease of poultry caused by the Marek's disease virus (MDV). It is characterised by rapid-onset cancer and has serious welfare implications. The research provided new insights into the events and mechanisms of MD pathogenesis. In addition, the researchers developed techniques for the quantification of MDV genome copy numbers from feather and dust samples from poultry houses. The methods for virus quantification distinguish between pathogenic and vaccine strains of MDV, and can be used to ensure vaccination programmes are being conducted effectively. The technology was patented and was adopted by the industry partner as a service incentive to use their vaccine products.

Researchers at the University of Nottingham were awarded an IPA grant with *Syngenta* to identify genes which influence tomato fruit quality. The researchers discovered specific regions of a wild tomato species' genome that contained genes which could help improve tomato fruit texture. The discovery was patented and the industry partner has used conventional breeding techniques to introduce improved fruit quality traits into elite, commercially-grown varieties of tomato. The research should ultimately result in tomatoes with increased firmness and improved post-harvest life, which will provide consumers with a better quality product and reduce food waste. There is also potential to translate the work to other fresh produce.

60. In general, the most successful IPA and 'stand-alone' LINK grants had a clear plan from the outset of how the impact from the research would be delivered. Moreover, industry had made important contributions to realising the impact from the research. By encouraging industry involvement in the BBSRC-funded research at an early stage, the schemes are accelerating the exploitation of research and the delivery of impact. However, it is also important to recognise that, ultimately, the economic impact of research is determined by the market rather than the activities of grantholders or BBSRC; not all innovations will be commercially successful, regardless of their intrinsic merit or the high quality of the underpinning research.
61. The time needed to exploit a research discovery and deliver impact is likely to vary considerably between industry sectors. For example, a new microbial strain might be commercialised fairly quickly, whereas the development of a new pharmaceutical could take many years. BBSRC should investigate the typical time taken for research to be exploited in different industry sectors. This would improve benchmarking and provide additional insight into the performance of the IPA and 'stand-alone' LINK grants.

Proportion of IPA and 'stand-alone' LINK grantholders who reported that their research had made, or has the potential to make, contributions to the public good

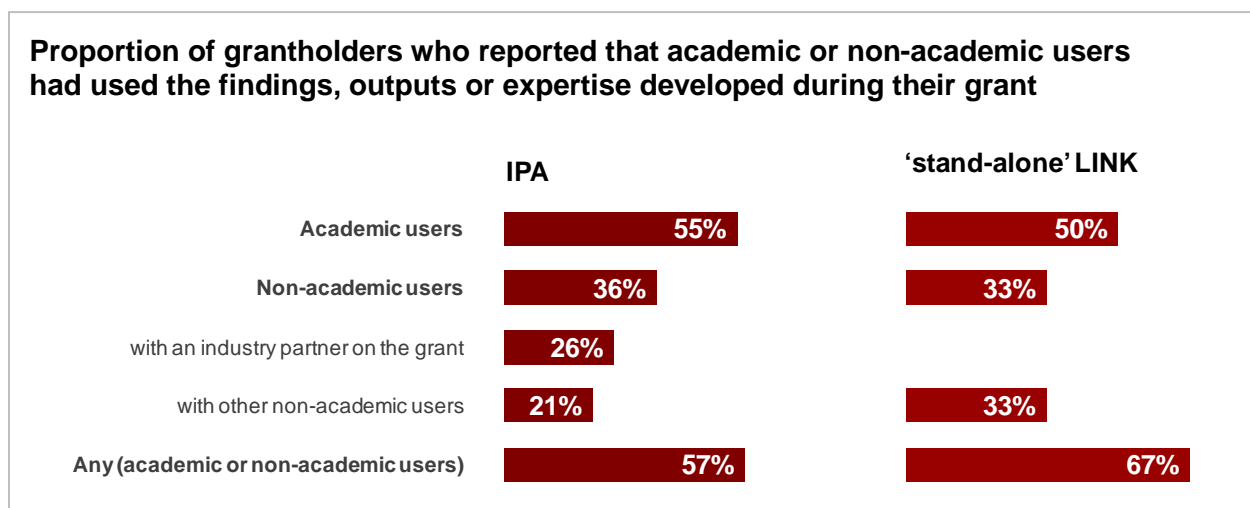


Public engagement

62. BBSRC requires grantholders, or a member of their research group, to conduct public engagement activities as a condition of the grant. The participation in public engagement activities during the IPA and 'stand-alone' LINK grants was mixed. For some grants, researchers' participation in public engagement activities was very good, whereas for others it was disappointing with no or minimal participation. 89% and 38% of IPA and 'stand-alone' LINK grantholders, respectively, reported public engagement activities in their final reports. Overall, there was scope to improve grantholders' involvement in public engagement activities. The science supported by the schemes should lend itself to public engagement: the more strategic and applied nature of the research is likely to be more accessible to the public compared with basic science. However, with more applied projects, where there is increased likelihood of commercial outcomes, industry partners may be less willing to allow the research to be publicised. This may explain the lower level of participation in public engagement activities among stand-alone LINK grantholders.

3.3 Knowledge exchange

63. 57% and 67% of IPA and ‘stand-alone’ LINK grantholders, respectively, reported that *specific* academic or non-academic users had used the findings, outputs or expertise developed during the grant. This is a higher level of knowledge exchange than reported for other responsive mode research¹⁸.



64. The knowledge exchange with academic users include the sharing of data, expertise, methods and resources developed during the grant, and were achieved through formal and informal approaches (e.g. research collaborations, publication citations, discussions at scientific meetings).
65. The non-academic users were primarily from industry although other users included advisors, breeders, farmers, the public, regulators and trade / user groups. The examples of knowledge exchange were varied. For example: the evaluation or adoption of techniques and methodologies developed during the grant; informing industry’s research priorities; influencing the advice industry provides its clients on the use of their products; use of the research findings to support product marketing; securing IP; and the development of educational resources.

¹⁸ In the evaluation of BBSRC’s ‘genomics’ research supported through responsive mode, 17% of grantholders reported specific examples of knowledge exchange with non-academic users. The question about knowledge exchange was not asked in other evaluations.

3.4 International standing of UK bioscience research

66. It was not feasible in the context of this evaluation to generate specific international comparison data for the research conducted through the IPA and 'stand-alone' LINK schemes. However, the Department for Business, Innovation and Skills publishes a number of Public Service Agreement target metrics for UK bioscience research as a whole¹⁹. The metrics compare the performance of the UK in biosciences with other major research countries using bibliometric data from ISI National Science Indicators. The most recent data were published in 2011 and show the UK to be ranked very highly for the quality of its bioscience research. The UK was ranked second (behind the USA) for its share of citations in the biosciences, and was ranked first in citations impact.
67. The research supported by the IPA and 'stand-alone' LINK schemes has contributed to the high international standing of UK bioscience. This is demonstrated by the data regarding international co-authorship on publications (p. 21), further funding from the European Union (p. 25), and new and improved partnerships with international academics (p. 28). Moreover, the high-level of participation by multinational companies is an indicator of the high quality of the research performed in the UK through the IPA scheme.

¹⁹ [Reference/webpage no longer available – Feb 2016]

4. Interactions with the industry partner

Summary

- the IPA and ‘stand-alone’ LINK schemes primarily support academic researchers who have previously conducted collaborative research with industry
- the IPA scheme promotes the development of new academia-industry partnerships, many of which subsequently become long-term collaborations
- most academia-industry partnerships supported through the IPA and ‘stand-alone’ LINK schemes are successful
- grantholders often experience issues which affect the success of the academia-industry interactions; among these, the most common are changes in industry partners’ priorities or circumstances
- the schemes have leveraged significant support from industry
- IPA and ‘stand-alone’ LINK projects benefit from the interactions with industry partners

Key recommendations

- BBSRC should monitor IPA and ‘stand-alone’ LINK projects more closely
- BBSRC should encourage grantholders to establish a collaboration agreement as early as possible; IPA grantholders should be required to provide BBSRC with a copy of the agreement
- BBSRC should require grantholders to inform the Council of any significant changes to industry partners’ circumstances or their participation in the project
- BBSRC should require industry partners to provide a *light-touch* annual report on the project

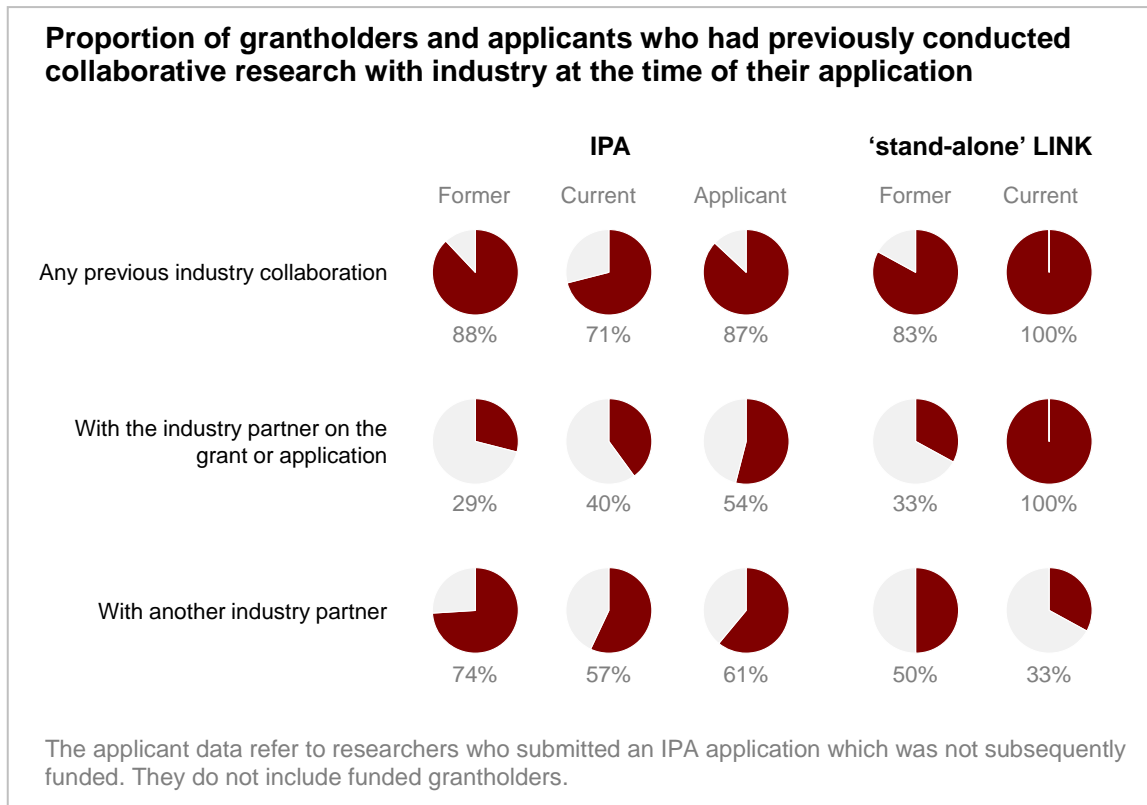
4.1 Prior interactions with industry

68. The majority of IPA and ‘stand-alone’ LINK grantholders had previously conducted collaborative research with industry at the time of their application. The previous interactions included CASE studentships²⁰, industry-funded collaborative research, research grants (e.g. IPA, LINK), a Royal Society Industry Fellowship and collaborations at an earlier career stage.
69. The strong support for researchers who had previous interactions with industry was appropriate as industry prefers to work with academics who have a track record of conducting collaborative research. This is particularly relevant for the ‘stand-alone’ LINK scheme where industry partners must make a very substantial contribution to the total project cost; it is unlikely that industry would commit to a ‘stand-alone’ LINK project with

²⁰ CASE (formerly Collaborative Awards in Science and Engineering) are a type of doctoral studentship designed to incorporate an element of industrially-relevant training. See: www.bbsrc.ac.uk/funding/studentships/case.aspx.

an academic researcher who has no previous collaborative research experience. In addition, individual academic research groups vary in their capacity to establish and develop interactions with industry. Academic researchers who are better at developing partnerships are more likely to participate in the IPA and 'stand-alone' LINK schemes.

70. A small proportion of IPA grants were awarded to researchers without any previous interactions with industry. This is positive and indicates that the scheme can be a useful tool for encouraging academic researchers to interact with industry.
71. Industry is likely to explore working with a new academic partner using a lower cost mechanism before committing to a full collaborative research proposal. In this context, BBSRC's support for CASE studentships is very valuable as they can be a precursor to more substantive collaborative research, including participation in the IPA and 'stand-alone' LINK schemes.
72. The majority of IPA grants were for new collaborations where the academic researchers had not previously conducted collaborative research with the industry partner on the grant. Many of these partnerships subsequently developed into longer-term collaborations (section 4.3, p. 46).



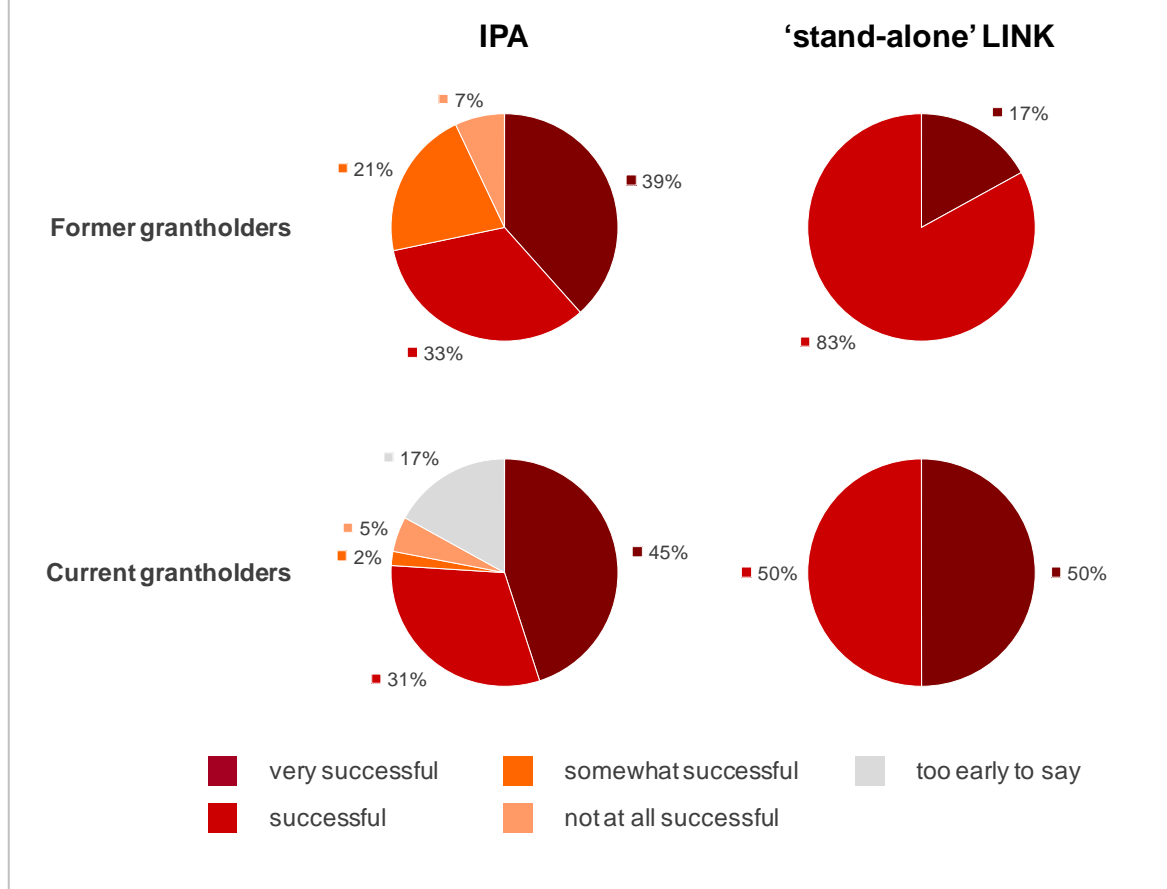
4.2 Interaction with the industry partner during the grant

74. Most academia-industry partnerships supported by the IPA and 'stand-alone' LINK schemes were successful. This is demonstrated by a range of measures including industrial co-authorship on publications (p. 21), further funding from the industry partner (p. 25), industry involvement in the exploitation of research (p. 22-24), and the maintenance of partnership links after the grant ended (p. 46). Grantholders were generally positive about the success of the interaction with their industry partner(s) during their grant. For example, 72% and 100% of former IPA and 'stand-alone' LINK grantholders, respectively, stated that the interaction was successful or very successful.

Researchers at the University of Manchester were awarded an IPA grant with *GlaxoSmithKline* to investigate how circadian timers regulate an important physiological pathway in the lung. The collaboration was very successful and the research could form the basis of new methods to control inflammatory diseases such as asthma. The grant resulted in five original research articles with academic and industry co-authors, including one in the prestigious *Proceedings of the National Academy of Sciences of the USA*. The industry partner's lead researcher in the collaboration is now heavily involved in studies at the University through a part-time secondment and an honorary Chair. In addition, the grant contributed to the establishment the Centre for Nuclear Hormone Research in Disease, a substantial joint industry-university initiative which sees academics, industry and the National Health Service working together to find new therapies for inflammatory conditions such as asthma and rheumatoid arthritis.

75. The extent of the industry partner's participation in individual IPA and 'stand-alone' LINK projects was varied. There was a mixture of passive and active involvement which may reflect the different cultures of particular industry partners and the relative ease with which individual academic research groups were able to build relationships with industry.

Grantholders' assessment of the success of the interaction with their industry partner during the grant

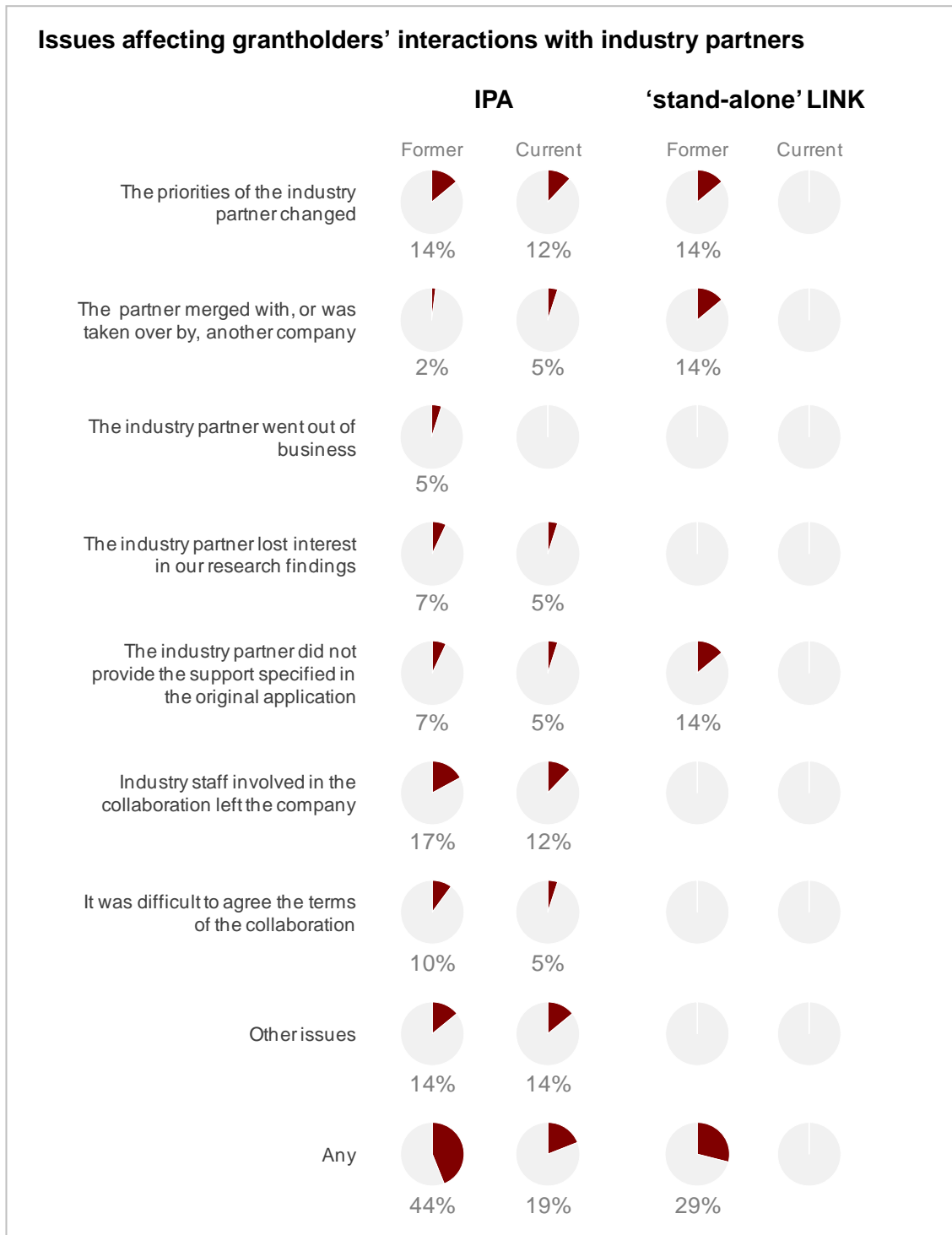


Issues affecting the interaction with industry partners

76. Many IPA and 'stand-alone' LINK grantholders experienced issues which affected the interaction with their industry partner during the grant. Among these, the most common were that the priorities of the industry partner changed or that key industry staff involved in the collaboration left the company. The majority of grantholders were still able to meet their project's objectives regardless of any issues. However, for a small number of projects, issues with the industry partner had a negative impact on the research (e.g. where specific research objectives were dependent on the involvement of the industry partner).
77. IPA and 'stand-alone' LINK applications are funded preferentially compared with other responsive mode applications because of industry partners' interest in the research, their involvement in the projects, and their contributions towards project costs. In addition, industry partners often represent an important route through which the research may be exploited. As such, projects where there is limited engagement from the industry partner or where the industry partner withdraws their support represent a particular challenge for BBSRC.
78. The issues which affect academia-interactions are potentially more of a concern for the 'stand-alone' LINK scheme than the IPA scheme. Stand-alone LINK applications

receive a very strong uplift in the assessment process and the industry partner's contribution is likely to be essential to meeting the objectives of the research.

79. The issues which affect the success of academia-industry interactions are generally outside grantholders' or BBSRC's control. Changes to industry partners' priorities or circumstances are an unavoidable consequence of working with industry and should not be considered as a weakness of the schemes. There is limited scope for BBSRC to address the issues which impact upon academia-industry partnerships, although BBSRC could help mitigate *some* issues through closer monitoring of IPA and 'stand-alone' LINK projects.



Collaboration agreements

80. The lack of a collaboration agreement can be a barrier to the success of the academic-industry partnership. All IPA and 'stand-alone' LINK grantholders are required to have a collaboration agreement with their industry partner. The 'stand-alone' LINK scheme requires grantholders to provide BBSRC with a copy of the agreement, which is good practice. However, there is no similar requirement for the IPA scheme.
81. IPA grantholders should also be required to provide BBSRC with a copy of the collaboration agreement as a condition of the grant. BBSRC should encourage grantholders to establish the agreement as early as possible as it becomes more difficult to produce these as projects progress. This requirement should not affect a project's start date and projects should be allowed to start without a collaboration agreement in place. Nevertheless, BBSRC should expect all grantholders to have a complete collaboration agreement in place within twelve months of the project start date as a condition of the award.
82. Access to, and ownership of, intellectual property are often the most difficult aspect of the collaboration agreement. It may be helpful to separate these aspects from the wider collaboration agreement and address them at a later date (e.g. within one year of the project start date). For example, a *pro forma* contract could be put in place which covers the payment schedule and general terms of the academia-industry interaction as a first step. However, it is recognised that many companies may not be willing to do this.
83. The Intellectual Property Office provides a set of Model Research Collaboration Agreements (the Lambert Toolkit) to assist universities and companies that wish to undertake collaborative research projects with one another²¹. BBSRC should further encourage the use of such model agreements as they can reduce the amount of time and money the academic and industry partners spend negotiating.

Monitoring of IPA and 'stand-alone' LINK projects

84. BBSRC should consider closer monitoring of IPA and 'stand-alone' LINK projects in comparison with other responsive mode grants. This is appropriate because of the additional challenges associated with academia-industry partnerships and since some projects would not have been funded without the uplifts provided by the schemes.
85. BBSRC should enforce the requirement for grantholders to inform the Council of any change to their industry partner's circumstances or participation in the research project, if it will affect the research objectives or the wider success of the project. It would not normally be appropriate for BBSRC to stop funding for projects where the industry partner had withdrawn their support. However, BBSRC should ensure that the remaining funding is used effectively (e.g. by agreeing new objectives for the project).
86. It is also important for BBSRC to receive feedback from industry about IPA and 'stand-alone' LINK projects. BBSRC should require industry partners to provide a *light-touch* annual report on the project. This should include the industry partner's views on the project's progress, as well as any successes, benefits to the company, or concerns. Where appropriate, the industry partner should explain why they were withdrawing from a project. This would enable BBSRC to understand if a withdrawal was due to internal company factors or dissatisfaction with the project's progress or direction. Other advantages of such a reporting are that it would provide a mechanism for industry to

²¹ www.ipo.gov.uk/lambert

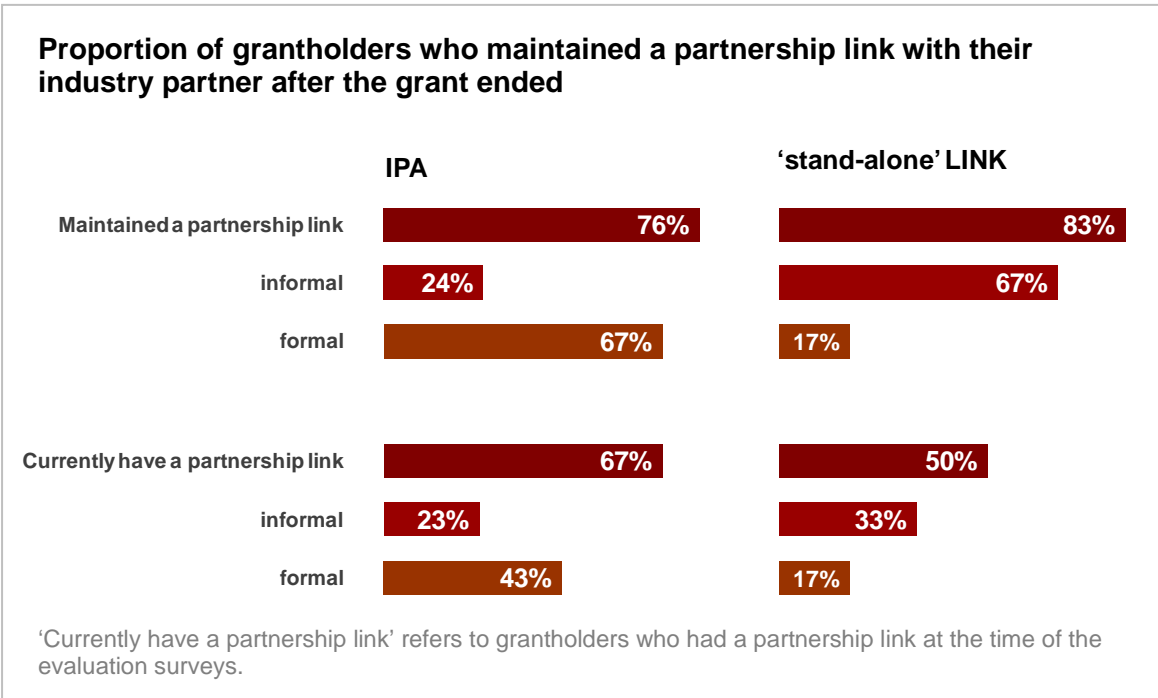
provide direct feedback to BBSRC and that it could help build relationships between BBSRC and individual companies.

4.3 Interaction with the industry partner after the grant ended

87. The IPA and stand-alone 'LINK' schemes have fostered longer-term partnership links between academia and industry. 76% of IPA grantholders maintained a partnership link (formal or informal) with their industry partner after the grant ended; 67% still had a partnership link at the time of the evaluation surveys. The figures for 'stand-alone' LINK grantholders were 83% and 50% respectively. The data for further funding also demonstrate the success of the schemes in fostering longer-term partnerships (p .25).

Scientists at the Institute for Grassland Research (now IBERS) worked with the *Meat and Livestock Commission* to investigate the interaction between diet and the rumen bacterial population in cattle. The IPA grant generated new knowledge of the role of microbes in determining the final concentrations of saturated and unsaturated fatty acids in meat and milk. The original industry partner is now devolved in England (*Eblex*), Scotland (*Quality Meat Scotland*) and Wales (*Hybu Cig Cymru*) and the grantholders have continued to work with each organisation. The researchers have also received further funding to develop the work through an EU Framework VI project (ProSafeBeef) and a Defra project (ProBeef).

88. A lower proportion of 'stand-alone' LINK grantholders maintained a formal partnership with their industry partner compared with IPA grantholders. Again, this is likely to be a consequence of the nature of the research supported by the two schemes. The 'stand-alone' LINK scheme is more likely to support applied research and once a specific research problem has been addressed there is less need to maintain a formal relationship. As such, the small proportion of 'stand-alone' LINK grantholders who maintained a formal link with their industry partner should be viewed as a natural progression of the partnerships rather than a weakness of the scheme.



Applicants' subsequent interactions with their industry partner

89. The primary route by which the IPA and 'stand-alone' LINK scheme support the development of academic-industry collaborations with is through the funding of research grants. However, the schemes also foster partnership links as part of the application process. 42% of IPA scheme applicants indicated that they still developed a collaboration with their industry partner, even though the application was not funded, and a further 19% stated that they intended to do so in the future. This is a positive outcome, although in most cases the applicants were not able to develop the collaboration to the same extent as would have been possible with IPA funding.

4.4 Industry contributions towards project costs

90. Industry partners are required to make contributions to IPA and 'stand-alone' LINK project costs:
- **IPA scheme:** the industry partner must provide a direct cash contribution of at least 10% of the full economic cost (fEC) of the project²². 'In-kind' contributions are encouraged but are not considered as part of the 10% contribution
 - **'Stand-alone' LINK scheme:** the industry partner must provide a 50% contribution to the total project costs in cash or 'in-kind'
91. The requirement for financial contributions has enabled BBSRC to leverage substantial support from industry and has helped ensure that the schemes provide value for money. Some larger companies were very engaged in the IPA scheme and contributed a significant amount of additional 'in-kind' contributions (which were not necessarily included on the original grant applications).

Industry contributions towards project costs

IPA

BBSRC contributed **£38.2M** towards IPA project costs and **industry** contributed **£7.9M**. Of the industry contributions, **£5.9M** were direct contributions and **£2.0M** were indirect contributions

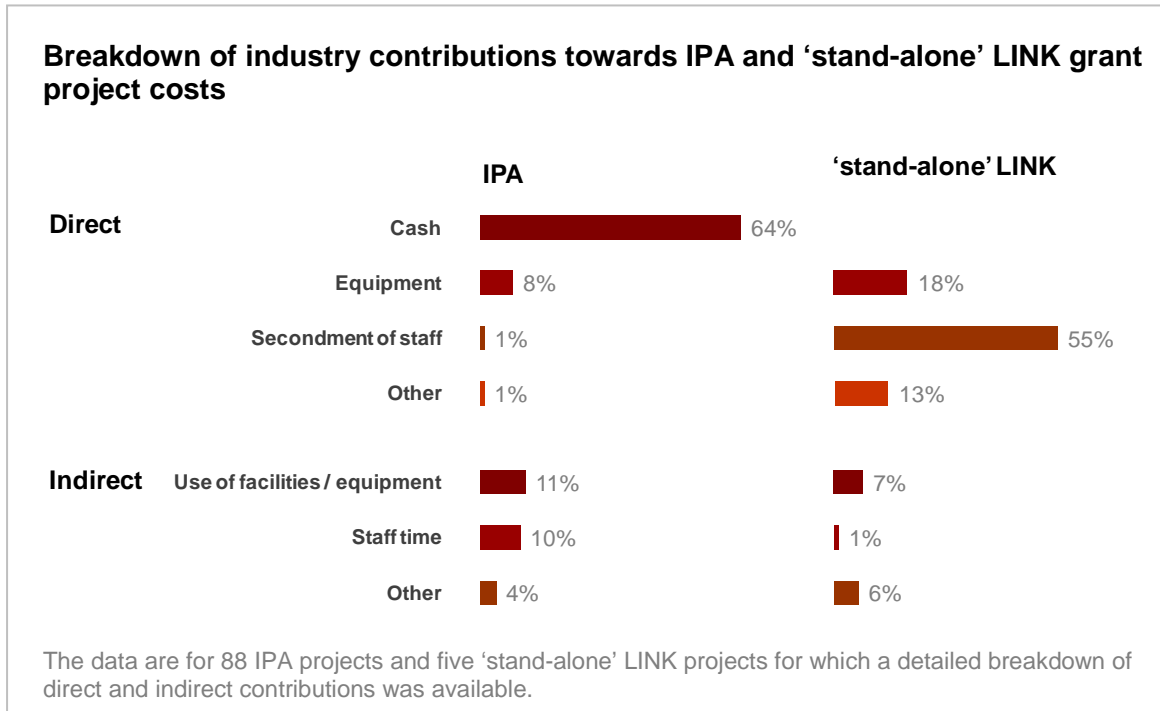
'stand-alone' LINK

BBSRC contributed **£3.2M** towards 'stand-alone' LINK project costs and **industry** contributed **£3.4M**. Of the industry contributions, **£2.7M** were direct contributions and **£0.7M** were indirect contributions

²² The IPA scheme's requirements for industry contributions have changed over the lifetime of the scheme:

- 2001 - Jul 2004: minimum 15% contribution required in cash
- Jul 2004 - Sep 2005: minimum 15% contribution required in cash or 'in-kind'
- Sep 2005 - present: minimum 10% contribution required in cash, relative to the fEC project cost

92. The types of industry contribution varied between the IPA and 'stand-alone' LINK schemes. The ability to provide 'in-kind' contributions was very important in enabling industry partners to meet the 50% contribution for 'stand-alone' LINK projects.



4.5 Benefits from collaborative research

93. Academia and industry both benefited from their participation in the IPA and 'stand-alone' LINK scheme. For example, academic researchers gained access to industry materials, facilities and expertise, and had a route to deliver impact from their research. Industry partners gained access to academic expertise, innovative research, intellectual property and skilled staff. Moreover, industry was able to explore a wider range of research ideas than would be possible internally.
94. IPA and 'stand-alone' LINK research projects also benefited from the interactions with industry partners. Many of the outcomes and achievements arising from the research could not have been achieved, or would not have been achieved to the same extent, without the involvement of the industry partner.

5. Balance and coverage of the portfolio

Summary

- the balance and coverage of the IPA and 'stand-alone' LINK scheme portfolios are appropriate and reflect the industry-facing nature of the schemes
- the schemes have primarily supported projects in the areas of agriculture and health
- the support for strategic and applied research within the IPA and 'stand-alone' LINK schemes has helped to balance the responsive mode portfolio
- a higher proportion of IPA and 'stand-alone' LINK projects are aligned to BBSRC strategic priorities compared with other responsive mode grants
- there is scope to broaden the range of companies that participate in the schemes
- there are barriers which limit industry participation in the IPA scheme

Key recommendations

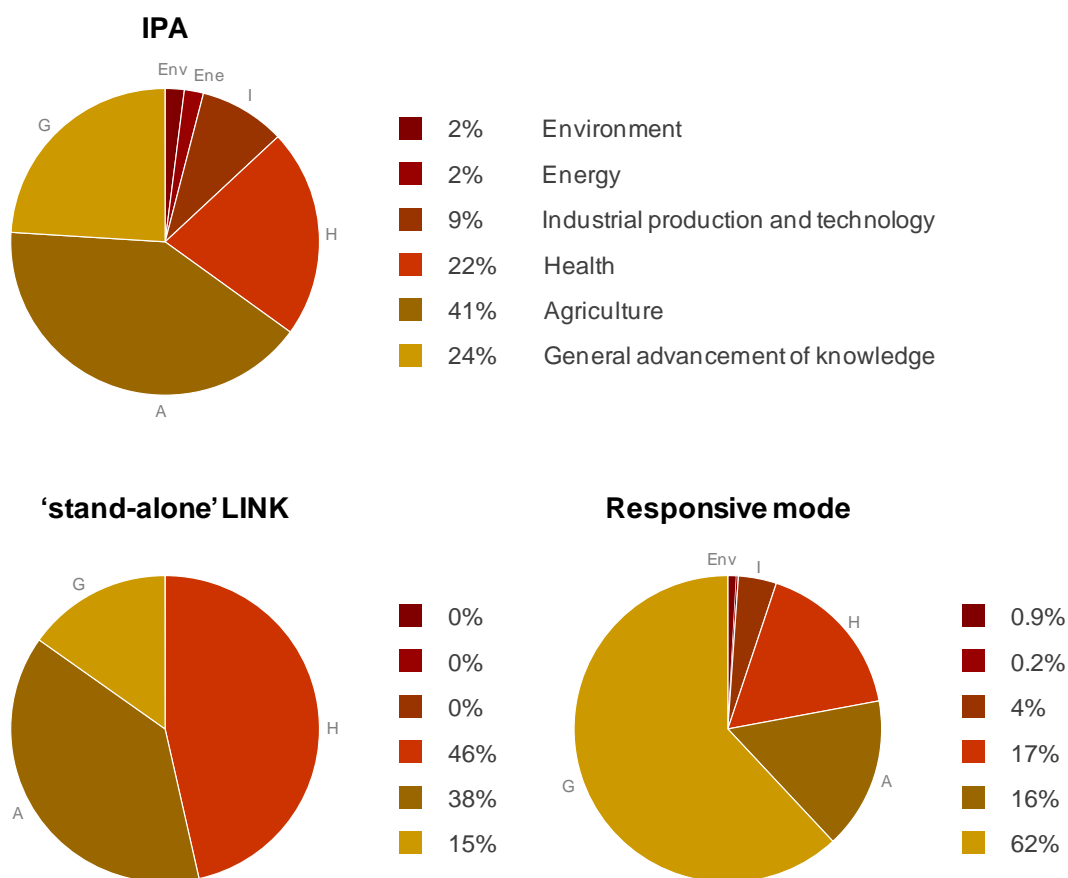
- BBSRC should consider how it might adapt the IPA scheme to encourage greater participation from SMEs and any underrepresented industry sectors

5.1 Funding by research area

95. Since the IPA scheme's inception in 2001, 100 IPA projects have been funded with a total BBSRC investment of £42.3M²³. Over this period, 13 'stand-alone' LINK projects have been funded with a total BBSRC investment of £3.3M.
96. The IPA and 'stand-alone' LINK schemes have supported research from across the BBSRC remit, with a strong emphasis on agriculture and health. Overall, the balance and coverage of the science areas supported by the IPA and 'stand-alone' LINK portfolios are appropriate and reflect the industry-facing nature of the schemes.

²³ The data include projects with start dates from 1st July 2002 to 1st March 2011.

Classification of IPA and 'stand-alone' LINK projects by Office of National Statistics NABS codes

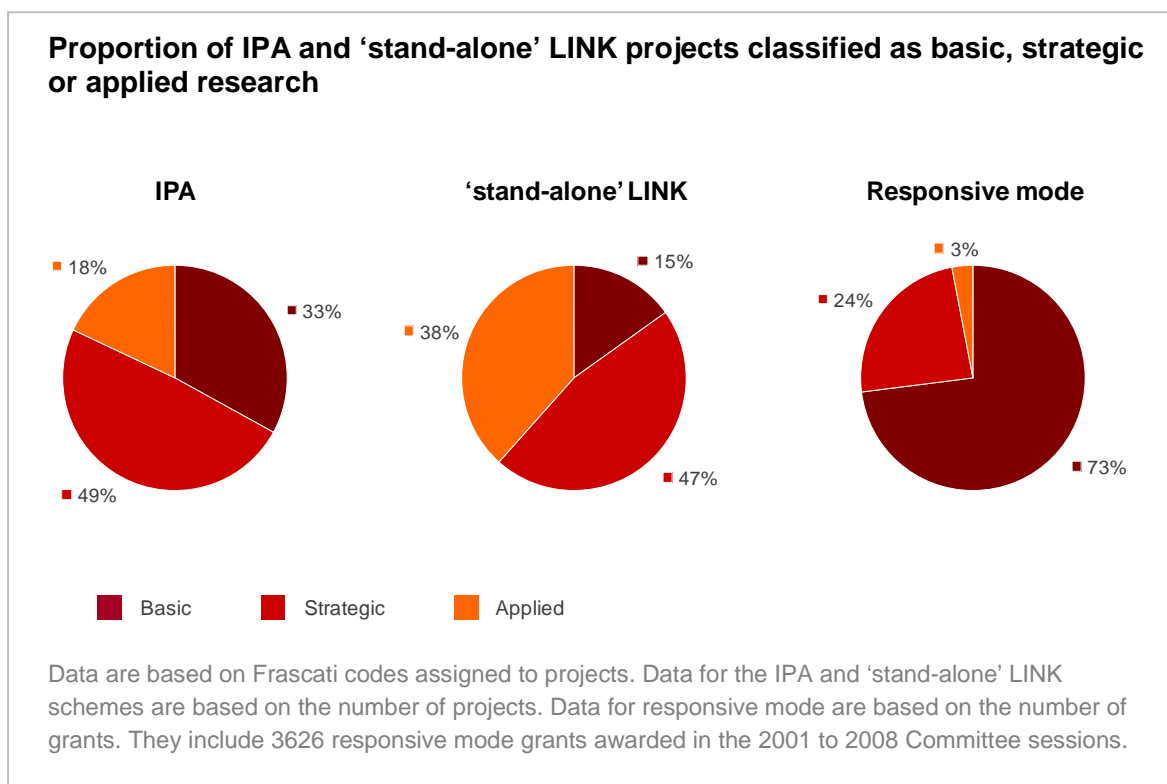


The data for the IPA and 'stand-alone' LINK schemes are based on the number of projects. The data for responsive mode are based on the number of grants; they include 3626 responsive mode grants awarded in the 2001 to 2008 Committee sessions. NABS: Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets.

5.2 Support for basic, strategic and applied research

97. Researchers can receive support for basic, strategic or applied research through the IPA and 'stand-alone' LINK schemes (as is also the case for other responsive mode funding):
- **basic:** research conducted for the advancement of knowledge
 - **strategic:** research conducted with the expectation that it will form a broad base of knowledge likely to underpin the solution of recognised or expected current or future problems
 - **applied:** research that is directed primarily at addressing a specific practical problem or objective
98. The IPA and 'stand-alone' LINK schemes have provided strong support for strategic and applied research. This is positive and expected given the nature of the schemes. Moreover, it has helped to balance the overall responsive mode portfolio, as other responsive mode grants predominantly support basic research.

99. The proportions of basic, strategic and applied research differ between the IPA and 'stand-alone' LINK schemes, with the 'stand-alone' LINK scheme supporting a higher proportion of applied research. This reflects the distinct but complementary nature of the schemes: the IPA scheme tends to support more speculative research, whereas the 'stand-alone' LINK scheme supports pre-competitive research which is closer to market and is more likely to be addressing a specific problem.



5.3 Addressing BBSRC's strategic priorities

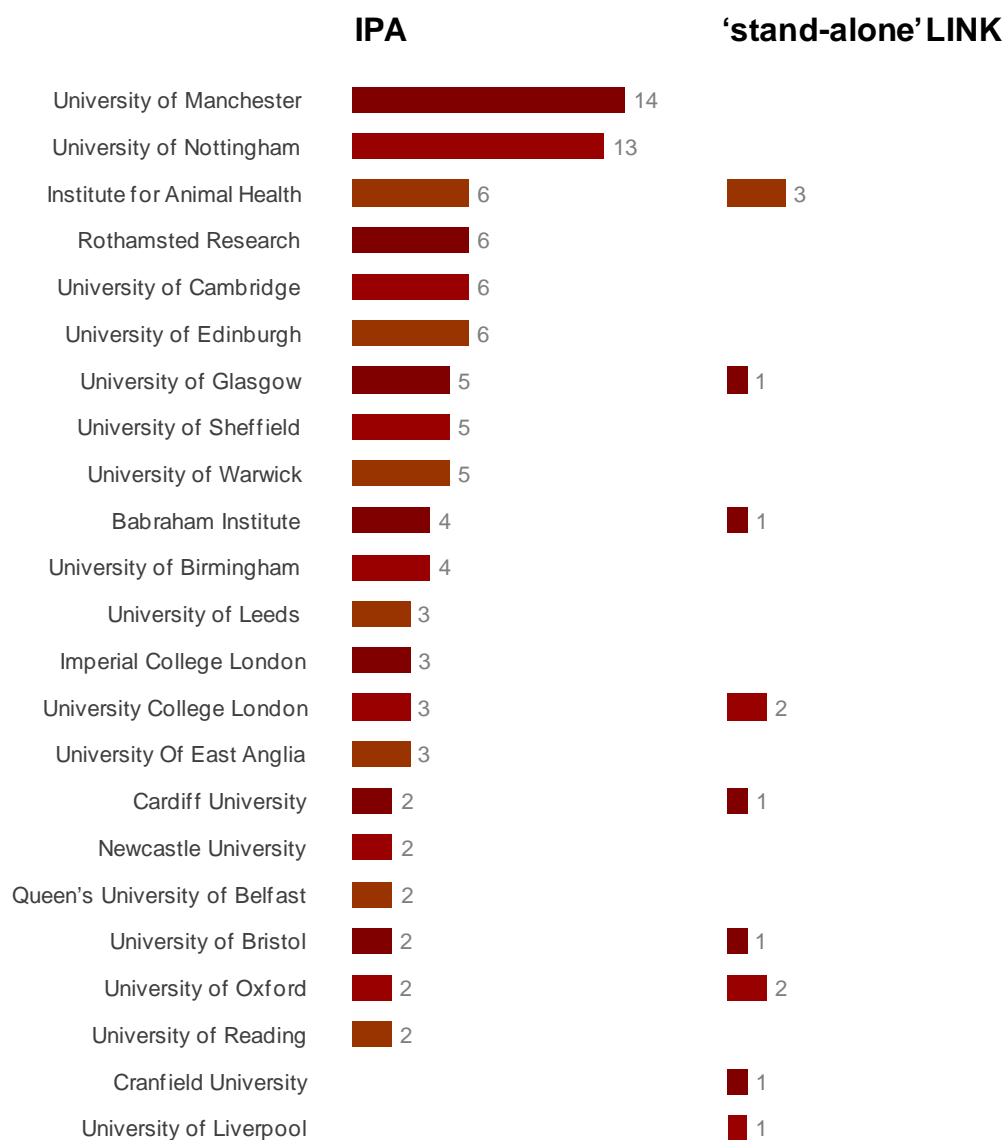
100. BBSRC's Strategic Plan describes the research priorities and enabling themes which drive the Council's investments over specific periods. The 2010-2015 Strategic Plan defines three major strategic research priorities for BBSRC: food security; bioenergy and industrial biotechnology; and basic bioscience underpinning health. Previous Strategic Plans set out earlier priorities. Higher proportions of the IPA and 'stand-alone' LINK scheme portfolios were aligned to BBSRC's past and current strategic priorities compared with other responsive mode funding.

5.4 Funding by academic institution

101. Forty institutions had participated in the IPA and 'stand-alone' LINK schemes. This is welcome and illustrates the open nature of the responsive mode funding mechanism. Some institutions had a high level of participation in the schemes, which may reflect a more outward-facing culture within these institutions.
102. There were some HEIs and BBSRC strategically-funded institutes where the level of participation was lower than expected. In some cases this was probably due to

participation in other collaborative schemes (e.g. the themed LINK programmes) and so may change in the future. In other cases, the institutions' research interests may for example be focused on model organisms which could limit the opportunities for industrial collaboration.

IPA and 'stand-alone' LINK grants awarded to individual institutions



Institutions which were awarded a single IPA grant are not shown: Aberystwyth University; Birbeck College; Brunel University; Durham University; EMBL European Bioinformatics Institute; Institute of Grassland and Environmental Research; John Innes Centre; King's College London; Queen Mary, University of London; Royal Veterinary College; University of Aberdeen; University of Buckingham; University of Exeter; University of Kent; University of Southampton; University of St Andrews; University of York.

Data refer to the original institution to which the award was made. Subsequent transfers are not included. Data refer to grants rather than projects.

5.5 Industry participation in the IPA and ‘stand-alone’ LINK schemes

103. A wide variety of companies had participated in the IPA and ‘stand-alone’ LINK schemes. In total, 88 individual industry partners had participated: 77 in the IPA scheme and 13 in the ‘stand-alone’ LINK scheme (two companies participated in both schemes).

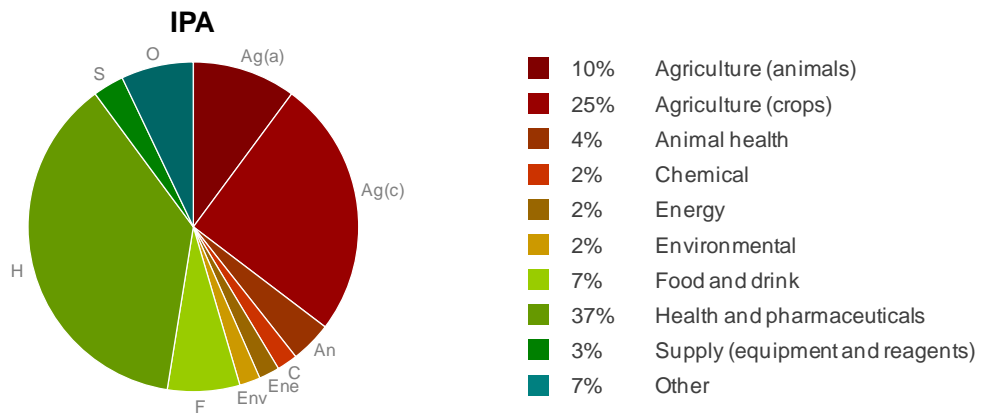
Industry partners who participated in the IPA scheme



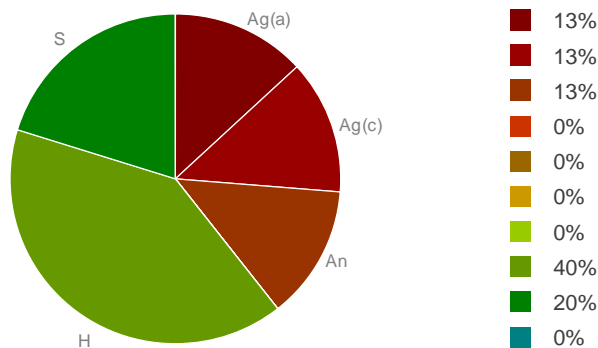
Font size in this word cloud reflects number of IPA projects the industry partner participated in, not the financial value of their contribution: smallest text represents a partner on one IPA project; smallest = 1 project; small = 2 projects; medium = 3 to 4 projects; large = 5 to 9 projects; largest = 10 or more projects.

104. The majority of IPA (88%) and 'stand-alone' LINK (92%) projects involved a single industry partner. In this respect, the schemes differed from the themed LINK programmes which often involved industry consortia and enabled the costs to be shared among several companies. Most industry partners had participated in a single project. Of the 77 companies that participated in the IPA scheme, 64 (83%) were partners in a single IPA project. Of the thirteen companies that participated in the 'stand-alone' LINK scheme, eleven (85%) were partners in a single project.
105. There was representation from a variety of sectors, although the 'health and pharmaceuticals' and 'agriculture (crops)' sectors accounted for over half of all projects. Several sectors were underrepresented (e.g. bioenergy, industrial biotechnology), but this may improve should these industries become more prevalent within the UK.
106. Some industry partners had a high level of participation in the IPA scheme and these were predominantly multinational companies. Their high level of engagement demonstrates that the scheme is meeting their needs, and it may be helpful for BBSRC to ask these companies why they value the scheme. However, it was also slightly disappointing that five companies accounted for almost half of the industry participation in IPA projects.
107. A small number of IPA and 'stand-alone' LINK projects involved a levy body or other trade organisation as the non-academic partner. It is positive that these organisations are considered as 'industry' under the IPA and 'stand-alone' LINK scheme rules as they can make very valuable contributions to BBSRC-funded research.
108. Small and medium enterprises (SMEs) were underrepresented in the IPA scheme, with approximately one in four IPA projects involving an SME industry partner. Currently, the IPA scheme is most suited to larger companies and there are barriers which limit SME participation. For example,:
- the requirement for a 10% fEC cash contributions towards project costs
 - identifying academic partners with shared research interests
 - the duration of projects funded by the IPA scheme
- The barriers to SME participation are covered in more detail in Chapter 6. Some of these are also relevant to other underrepresented industry groups (e.g. particular sectors, companies with low profitability).
109. There was limited overlap between the industry partners of IPA and 'stand-alone' LINK projects and those of CASE studentships. For example, only about one in four IPA partners had also sponsored a CASE studentship.
110. Overall, the representation of companies from different industry sectors was appropriate given the UK industry base. However, there is scope to broaden the range of companies that participate in the IPA and 'stand-alone' LINK schemes. In particular, BBSRC should consider how it might adapt the IPA scheme to encourage greater participation from SMEs and any underrepresented industry sectors.

IPA and 'stand-alone' LINK project partnerships by industry sector

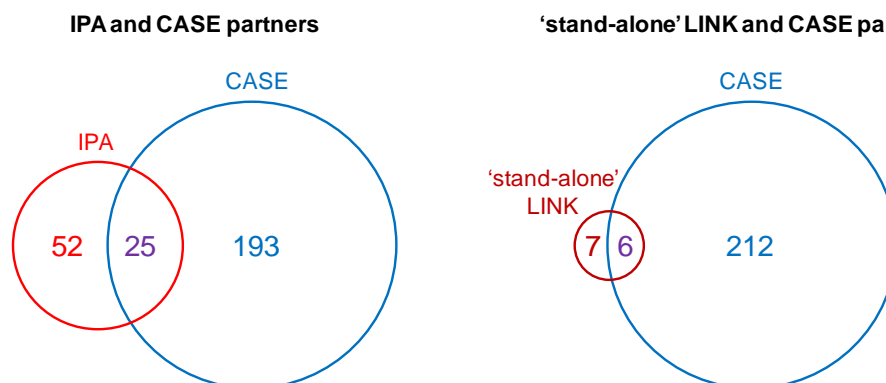


'stand-alone' LINK



The classification was based on the sector of the industry partner involved in the project. Where a partner was active in several sectors, the most appropriate sector for each partnership was chosen on a project-by-project basis. The IPA data are for 125 partnerships, involving 77 individual companies and organisations. The 'stand-alone' LINK data are for 15 partnerships, involving 13 individual companies and organisations.

Venn diagrams illustrating the overlap between IPA and 'stand-alone' LINK industry partners with those of CASE studentships.



The figures refer to the number of individual companies (i.e. there is no weighting for the number of projects or studentships an individual company was involved with). For information, 295 CASE studentships (49%) had a sponsor that was also an IPA partner; 26 CASE studentships (4%) had a sponsor that was also a 'stand-alone' LINK partner.

6. Application and administration processes

Summary

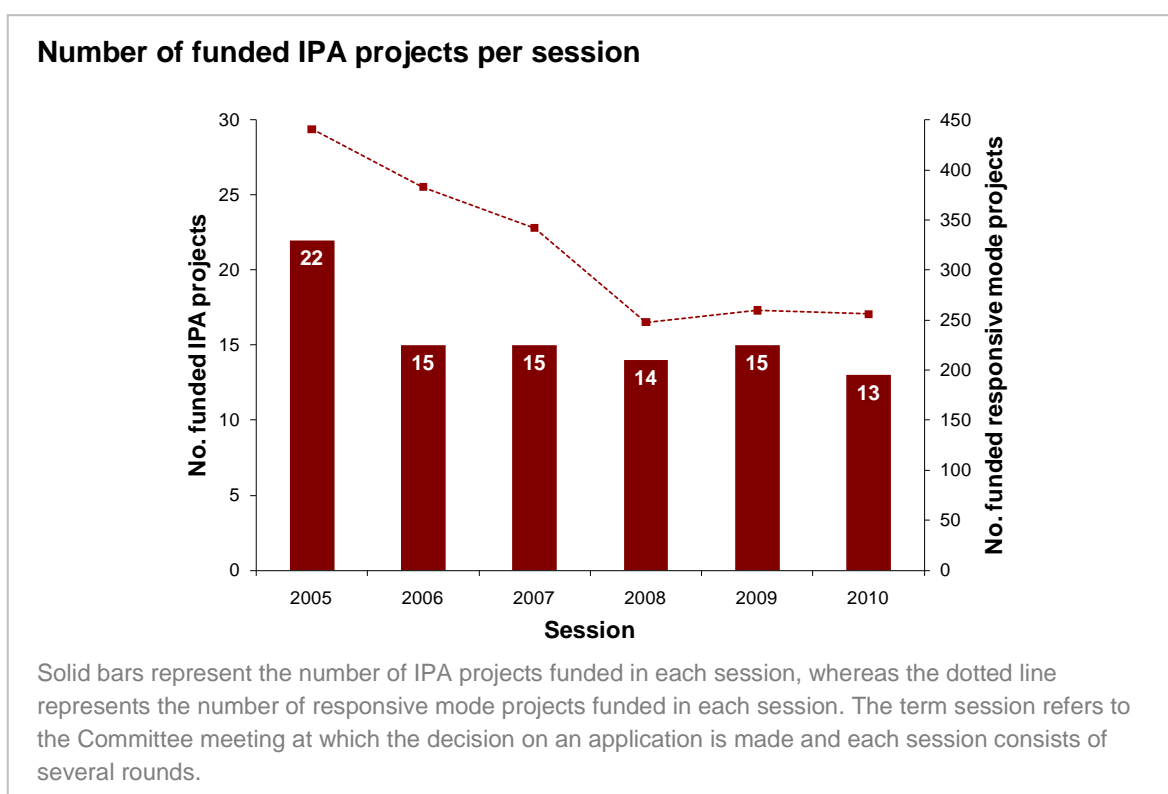
- the IPA and 'stand-alone' LINK schemes' application and assessment processes are generally effective, but there are some tensions and concerns
- there are misconceptions about the schemes within Research Committees and the research community
- the uplifts provided to IPA and 'stand-alone' LINK applications are achieving their objectives and should be retained
- there are barriers which limit industry participation in the schemes, particularly for SMEs, specific industry sectors or companies with low profitability

Key recommendations

- BBSRC should publicise the high quality of the research supported through the schemes to Research Committees and the research community
- BBSRC should place greater emphasis on Pathways to Impact statements and criteria other than scientific excellence during the assessment process
- BBSRC should ensure that Research Committees provide feedback to successful IPA and 'stand-alone' LINK applicants, and that any potential issues with the science identified by the referees or Committee members are addressed by the applicants
- BBSRC should seek to reduce the number of contentious 'in-kind' contributions included on 'stand-alone' LINK applications
- BBSRC should consider introducing an outline application stage for the 'stand-alone' LINK scheme
- BBSRC should consider assessing 'stand-alone' LINK applications through a separate Research Committee whose membership is more familiar with industrially-relevant research
- BBSRC should monitor IPA application success rates and ensure that these are similar across all Research Committees
- BBSRC should consider how it might adapt the IPA scheme to encourage wider participation by SMEs and other underrepresented industry, including:
 - relaxing the rules on 'in-kind' contributions
 - reducing the level of financial contribution for SMEs
 - emphasising that shorter duration projects will be supported
 - facilitating academia-industry introductions
 - increasing awareness of the schemes among industry and academia

6.1 IPA and 'stand-alone' LINK applications

111. The number of IPA applications has remained relatively constant since 2005²⁴, with approximately forty applications submitted each year. All current and former Research Committees^{25,26} have received IPA applications, although the proportion of applications classified as IPA varies considerably between Committees. Under the current Research Committee structure, 3.4% of responsive mode applications were IPAs (Committee A, 4.7%; Committee B, 4.8 %; Committee C, 3.7%; Committee D, 1.5%).
112. The number of funded IPA projects has also remained relatively constant since 2005, with approximately fifteen applications funded each year. However, the proportion of IPA projects in the responsive mode portfolio has increased over time because the overall number of responsive mode projects funded has decreased. Under the current Research Committee structure, 5.4% of responsive mode projects were IPAs (Committee A, 8.0%; Committee B, 5.2%; Committee C, 3.0%; Committee D, 3.9%).
113. A very small number of 'stand-alone' LINK applications are submitted each year (e.g. approximately four applications per year, the majority of which are funded), although this is expected to increase following the closure of the themed-LINK programmes. All current Research Committees have received and funded 'stand-alone' LINK applications.



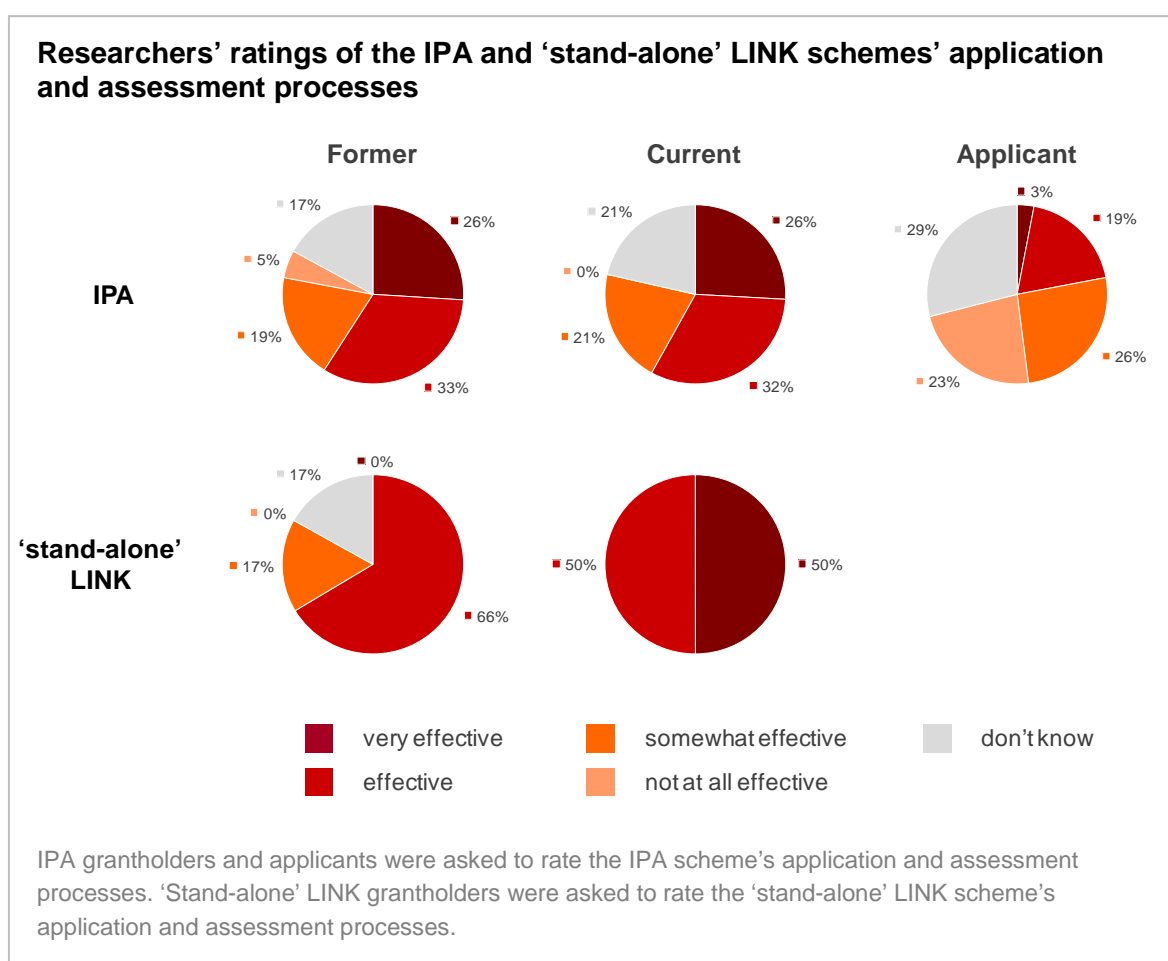
²⁴ Data prior to 2005 were not available.

²⁵ The four current BBSRC Research Committees are: A, Animal disease, health and welfare; B, Plants, microbes, food and sustainability; C, Genes, development and STEM approaches to biology; D, Molecules, cells and industrial biotechnology

²⁶ Prior to 2009, there were seven BBSRC Research Committees: Agri-food, Animal Sciences, Biochemistry and Cell Biology, Biomolecular Sciences, Engineering and Biological Systems, Genes and Developmental Biology, and Plant and Microbial Sciences.

6.2 Application and assessment processes

114. IPA and 'stand-alone' LINK applications are assessed by the Research Committee with the most appropriate remit for the proposed research. They are assessed alongside other responsive mode applications using the same criteria²⁷. IPA and 'stand-alone' LINK applications are advantaged in the assessment process providing they meet a quality threshold. The industry interest in the project and the associated contributions towards the project costs are recognised through an uplift which is applied after the application has been formally assessed (see section 6.3).
115. Overall, the application and assessment processes for IPA and 'stand-alone' LINK schemes are effective and the majority of grantholders were satisfied with the respective scheme's processes. However, there were several areas where the Panel identified tensions or concerns.



²⁷ Responsive mode applications are assessed according to the following criteria: scientific excellence; industrial and stakeholder relevance; relevance to BBSRC strategy; economic and social impact; timeliness and promise; cost effectiveness; staff training potential of the project (where resources are requested for postdoctoral or other research staff). See <http://www.bbsrc.ac.uk/documents/grants-guide/> for further details.

The responsive mode funding mechanism

116. The IPA and 'stand-alone' LINK schemes are embedded within BBSRC's responsive mode funding mechanism and, in general, this is positive and beneficial. For example, the open nature of responsive mode funding ensures that the IPA and 'stand-alone' LINK schemes can support research from any area of the BBSRC remit. In addition, as there are several responsive mode funding rounds each year, industry can develop collaborative research proposals to their own timescales or be more reactive. This contrasts with other funding for collaborative research (e.g. the Technology Strategy Board's targeted and time-limited calls). However, there are some tensions with assessing IPA and 'stand-alone' LINK applications alongside other responsive mode applications, particularly for 'stand-alone' LINK.
117. Research Committees can be less comfortable assessing IPA and 'stand-alone' LINK applications compared with other responsive mode applications. In particular, there are challenges comparing strategic or applied research with basic research. Grantholders and applicants were concerned that Research Committees may view basic research as being of intrinsically higher quality than strategic or applied research (e.g. because basic research often appears to be more novel). They were also concerned that the assessment criteria and Research Committees' expertise are most suited to the assessment of basic research proposals.
118. A major strength of the IPA and 'stand-alone' LINK schemes is the increased potential to deliver impact from the research. In this context, it is encouraging that Pathways to Impact (Ptl)^{28,29} statements and a variety of criteria other than scientific excellence are considered as part of the assessment process (e.g. industrial and stakeholder relevance; relevance to BBSRC strategy; economic and social impact). However, currently there is insufficient emphasis placed on these aspects of the research proposal when deciding which applications should be funded. In addition, Ptl statements can be very generic and this makes it difficult for Research Committees to make informed judgements. BBSRC should provide greater guidance to applicants regarding Ptl statements to help address this.

Research Committees' perceptions of the schemes

119. There is a perception among some Research Committee members that the IPA and 'stand-alone' LINK schemes support lower quality research compared with other responsive mode funding. BBSRC should address this perception by publicising the high quality of the research supported through the schemes to Research Committees. The outputs, outcomes and impacts arising from completed projects demonstrate the high standard of research in the IPA and 'stand-alone' LINK schemes' portfolios. Moreover, other data indicate that IPA and 'stand-alone' LINK applications are of a similar standard to other responsive mode applications. For example, the IPA and 'stand-alone' LINK application success rates without applying the uplift are similar to other responsive mode applications, as are the proportions of IPA and 'stand-alone' LINK grants ranked as internationally competitive.

²⁸ All applicants for BBSRC research grant funding are required to submit a Ptl statement which provides details on the activities which will help contribute to potential economic and societal impacts. The scoring criteria for Ptl statements are at www.bbsrc.ac.uk/funding/apply/impact/pathways-to-impact.aspx.

²⁹ BBSRC introduced Ptl statements in 2011. They replaced Impact Plans, which were themselves introduced in 2010. None of the completed grants reviewed for this evaluation included a Ptl statement or Impact Plan in the original application. The importance of Ptl statements in the assessment process has increased since their introduction.

120. Grantholders and applicants were concerned that Research Committees may hold some negative perceptions of the IPA and 'stand-alone' LINK schemes, and that this may affect how these applications are scored.' It was difficult for the Panel to comment on how Research Committees treat IPA and 'stand-alone' LINK applications compared with other responsive mode applications. At the time of the evaluation, a relatively small number of IPA and 'stand-alone' LINK applications had been considered under the current Research Committee structure and there was insufficient data to reach any conclusions. Nevertheless, there was a concern that the success rates for IPA applications varied considerably between individual Research Committees (see section 6.3). BBSRC should provide additional guidance to Research Committees to ensure that they view the IPA and 'stand-alone' LINK schemes as different funding instruments with different objectives, rather than as competitors to other responsive mode funding.

Preferential treatment of IPA and 'stand-alone' LINK applications

121. The effectiveness and appropriateness of the uplift provided to IPA and 'stand-alone' LINK applications are covered in section 6.3 (p. 62).

Feedback to applicants

122. It is important that all applicants for responsive mode funding are provided with feedback from the Research Committee if their proposal is not funded. The quality of this feedback is particularly important for IPA and 'stand-alone' LINK applications because of industry involvement; industry partners will have invested considerable time and effort in developing the application, and their contribution to the project costs indicates that they regard the application to be of high quality and industrially-relevant. There is a risk that industry partners could be discouraged from future participation in the schemes if the feedback does not clearly explain why their application was not funded. BBSRC should provide more detailed feedback for IPA and 'stand-alone' LINK applications compared with other responsive mode proposals. In addition, it may be beneficial for BBSRC to provide feedback directly to industry partners (currently industry partners depend on the academic researcher to communicate the feedback).
123. Research Committees are only able to discuss a subset of all responsive mode applications in detail because of time constraints. In general, only responsive mode applications which fall within or close to the likely funding range are discussed in detail. However, all IPA applications which score above the international quality threshold are discussed, including those which are not likely to be funded. All 'stand-alone' LINK applications are discussed. This is commendable as there is the potential for detailed feedback to be provided to applicants.
124. BBSRC normally only provides feedback on applications that are not funded, although feedback for funded applications can be provided at the Research Committee's request. For the IPA and 'stand-alone' LINK schemes there are potential benefits in providing feedback for funded applications. IPA and 'stand-alone' LINK applications can be funded lower down the rank order than other responsive more applications because of the uplift (although they are still ranked as internationally competitive). This could lead to a higher proportion of IPA and 'stand-alone' LINK grants experiencing experimental, methodological or technological issues compared with other responsive mode applications. BBSRC should ensure that Research Committees provide feedback to successful IPA and 'stand-alone' LINK applicants where appropriate, and that any

potential issues with the science identified by the referees or Committee members are addressed by the applicants.

Transparency

125. Grantholders and applicants commented that the IPA and 'stand-alone' LINK application and assessment processes were not sufficiently transparent. For example, greater clarity was requested on:
- how Research Committees assess IPA and 'stand-alone' LINK applications
 - whether IPA and 'stand-alone' LINK applications are assessed using different criteria to other responsive mode applications
 - the mechanisms by which IPA and 'stand-alone' LINK applications are advantaged in the assessment process
 - the success rates of IPA and 'stand-alone' LINK applications
 - the extent to which BBSRC expects IPA and 'stand-alone' LINK applications to be aligned to industry interests or objectives
 - the aims and objectives of the IPA and 'stand-alone' LINK schemes

In some areas, the limited information provided by BBSRC had contributed to misconceptions about the schemes within the research community.

'Stand-alone' LINK application and assessment processes

126. In general, the issues identified with the IPA and 'stand-alone' LINK schemes' application and assessment processes were relevant to both schemes. However, there were some specific issues which were only applicable to the 'stand-alone' LINK scheme: 'in-kind' contributions; the potential benefits of an outline application stage; and Research Committee expertise.
127. The 'stand-alone' LINK scheme requires a 50% industry partner contribution towards project costs which can be in cash or 'in-kind'. It is important that Research Committees are able to assess the value of 'in-kind' contributions and determine whether they represent a genuine contribution toward the cost of the project. This is often challenging as applicants may overstate the value of the contributions or include items that are not in the spirit of the scheme rules. For example, applicants may overvalue access to data, equipment or facilities, or include the costs of 'business as usual' activities as contributions to the project. 'In-kind' contributions which are primarily attributable to prior investment from the industry partner can be particularly problematic.
128. BBSRC should seek to reduce the number of contentious 'in-kind' contributions included on 'stand-alone' LINK applications. The Je-S guidance should be adjusted to ensure that applicants explain how they determined the value of 'in-kind' contributions within the 'justification of resources' section of the application. Reviewers should be encouraged to comment on the value for money of 'in-kind' contributions as part of the peer-review process. BBSRC should also develop a set of criteria for determining which types of 'in-kind' contributions are acceptable.
129. Industry partners commit considerable time and resources to developing 'stand-alone' LINK applications. It can be very disappointing and frustrating for the industry partner if their application is not funded, especially as they were willing to commit to 50% of the project costs. BBSRC should consider introducing an outline application process for the

'stand-alone' LINK scheme. This would ensure that industry does not invest time developing applications which are not likely to be funded. It would also allow for iteration, improving the overall quality of 'stand-alone' LINK applications. Moreover, it could help with demand management if the number of 'stand-alone' LINK applications increases.

130. 'Stand-alone' LINK applications tend to be for strategic or applied research although this is not a requirement. They are also more likely to be aligned with the interests of industry compared with other responsive mode funding because of the 50% industry partner contribution towards project costs. As such, BBSRC should examine whether the current Research Committee structure provides the most appropriate expertise for the assessment of 'stand-alone' LINK applications. BBSRC should consider assessing 'stand-alone' LINK applications through a separate Research Committee whose membership is more familiar with industrially-relevant research.

6.3 IPA and 'stand-alone' LINK application uplifts

131. BBSRC attaches particular weight to IPA and 'stand-alone' LINK applications, and they are advantaged in the assessment process provided that they meet a quality threshold:

- **IPA scheme:** all international quality IPA applications are subject to an uplift. The current mechanism³⁰ adjusts the position in the rank order list at which IPA applications are funded, so that they are funded further down the list compared with other responsive mode grants. The uplift provided to IPA applications is equivalent to a nominal increase in success rate of 20%³¹. For example, if the success rate for a particular funding round was 22%, any IPA application that ranked in the top 42% of applications would be funded (22% + 20% uplift).
- **'stand-alone' LINK scheme:** applications receive a very strong uplift in the assessment process because of the substantial level of industry contribution towards the project costs. Normally, any 'stand-alone' LINK application ranked as internationally competitive is funded, provided that it is a genuine collaborative effort between academia and industry.

The uplift provided to IPA and 'stand-alone' LINK applications means that other responsive mode applications which were ranked more highly are not funded as a result.

³⁰ The mechanism for preferentially funding IPA applications has developed over the lifetime of the IPA scheme. When the scheme was originally introduced, the preferential funding mechanism was based on a fixed quality threshold. Any IPA application that scored above the international quality threshold was funded.

³¹ BBSRC set the current uplift at 20% following an analysis of application success rate data. The 20% figure was chosen to ensure that the number of IPA projects did not change substantially after the change in preferential funding mechanism. The 20% uplift was not expected to increase the IPA application success rate by 20%; the analysis suggested that a 20% nominal uplift should increase the IPA success rate by approximately 10%. Although the current uplift level has not changed since 2006, it is not fixed. If BBSRC considered that too few or too many IPA grants were being funded, the uplift could be adjusted.

Effectiveness of the uplifts

132. The uplifts provided to IPA and 'stand-alone' LINK applications are achieving their objectives and have resulted in higher success rates compared with other responsive mode applications. For example, under the current Research Committee structure IPA applications had a 12% higher success rate than other responsive mode applications; the figure for 'stand-alone' LINK applications was 65%. Many IPA and 'stand-alone' LINK projects would not have been funded without the uplift. For example, under the current Research Committee structure, 44% and 83% of IPA and 'stand-alone' LINK projects, respectively, would not have been funded.
133. The effect of the uplift on IPA applications was not the same across all Research Committees (under the current and former Research Committee structures). This is a concern and BBSRC should ensure that IPA application success rates are similar for all the Research Committees; the remits of individual Committees are sufficiently broad for this to be appropriate. As a first measure, BBSRC should monitor IPA success rates for individual Committees over three-year periods (to reduce any fluctuations caused by small numbers of applications). If the success rates are too low or too high, then intervention may be necessary.

IPA application and 'stand-alone' LINK success rates, with and without applying the uplift					
	IPA with uplift	IPA without uplift	non-IPA	Effect of uplift on IPA success rate	Difference between IPA and non-IPA success rate
Former Committee structure (2004-8)	46%	26%	23%	+ 20%	+ 23%
2004-5	60%	25%	25%	+ 35%	+ 35%
2006-8	41%	26%	22%	+ 15%	+ 19%
Current Committee structure (2009-10)	33%	20%	21%	+ 13%	+ 12%
	sa-LINK with uplift	sa-LINK without uplift	non-sa-LINK	Effect of uplift on sa-LINK success rate	Difference between sa-LINK and non-sa-LINK success rate
Current Committee structure (2009-10)	86%	14%	21%	+ 72%	+ 65%

The success rate data presented here are calculated by number of individual project applications (i.e. component grants of a joint project are considered to be a single application). The data are for the Autumn 2004 round through to the Winter 2010 round. The dataset includes 9384 responsive mode applications; 6960 submitted under the former Research Committee structure and 2424 submitted under the current structure. Data refer to funding decisions at the time. The analysis does not account for any subsequent changes to the list of funded grants. The 2004-05 IPA data refer to applications assessed using the previous uplift mechanism based on the international quality threshold.

Appropriateness of the uplifts

134. The uplifts provided to IPA and 'stand-alone' LINK schemes remain appropriate and should be retained. IPA and 'stand-alone' LINK projects have produced high-quality outputs and impacts, and there was no evidence that the uplifts had resulted in low quality research being supported. It is important for industry-facing schemes to have higher success rates compared with other research grant funding. This encourages industry participation as companies will not invest time in developing collaborative research proposals which have little likelihood of being funded. Higher success rates also incentivise academic researchers to seek partnerships with industry and make it easier for them to convince industry to collaborate. Moreover, the uplifts acknowledge that IPA and 'stand-alone' LINK applications face additional challenges in the assessment process (see section 6.2).
135. The IPA and 'stand-alone' LINK application uplifts can create tensions within Research Committees and with other applicants for responsive mode funding. There are greater tensions regarding the 'stand-alone' LINK scheme uplift and Research Committees are particularly concerned about this. Nevertheless, it is appropriate to provide 'stand-alone' LINK applications with a very strong uplift because of the 50% industry contribution towards project costs and the significant industry commitment to the research that this represents. The uplift also recognises that the 'stand-alone' LINK scheme is a very different funding instrument to basic research funding through responsive mode.
136. The closure of the themed LINK programmes is likely to place increased demand on the 'stand-alone' LINK scheme, and this will create further tension regarding the uplift. BBSRC should monitor demand for the 'stand-alone' LINK scheme over the next year. In addition, BBSRC should invest the funding previously allocated to the themed LINK programmes into the 'stand-alone' LINK scheme as this will help limit the effect on any increased demand on the overall responsive mode success rate.

6.4 Barriers to participation in the IPA and 'stand-alone' LINK schemes

137. There are several barriers which potentially limit industry participation in the IPA and 'stand-alone' LINK schemes including, for example:
 - the requirement for financial contributions towards project costs
 - the duration of research projects
 - identifying partners with shared research interests
 - awareness of the schemes among academia and industry

Addressing any barriers which limit participation may help to broaden the variety of companies which engage with the schemes (see Chapter 5). This is likely to be most beneficial in the context of the IPA scheme, as new industry partners are more likely to participate in the IPA scheme than the 'stand-alone' LINK scheme in the first instance.

Requirement for financial contributions towards project costs

138. The requirement for a 10% fEC cash contribution towards IPA projects costs is generally appropriate and attractive for industry. It demonstrates the commitment of the industry partner towards the project and helps to justify the uplift provided during the application process. Moreover, it enables BBSRC to leverage its funds against those of the private sector. However, the requirement for financial contributions can be a barrier to participation in the scheme, particularly for SMEs, specific industry sectors, or companies with low profitability.
139. BBSRC should consider relaxing the rules on 'in-kind' contributions within the IPA scheme to encourage greater participation by SMEs. It is recognised that this would present additional challenges in determining the value of such contributions and there would need to be strict criteria on which types of 'in-kind' contributions were permissible. These should be materials or information not readily accessible to academic groups that can impact the relevance and quality of the research performed under the grant. Examples of appropriate contributions would include representative materials, access to databases, and access to equipment and facilities. BBSRC could also consider a lower level of financial contribution for SMEs as a way of encouraging wider participation in the IPA scheme.
140. The requirement for a 50% contribution to towards 'stand-alone' LINK project costs is appropriate. The permissibility of 'in-kind' contributions is essential to enable industry to meet this requirement.

Duration of projects

141. There is a perception within some part of the research community that Research Committees only support responsive mode research projects of three years duration³². This misconception may limit SME participation in the IPA and 'stand-alone' LINK schemes, as such companies may be unwilling or unable to commit to a three-year project. BBSRC should emphasise that shorter projects will be supported through responsive mode (e.g. through some focused dissemination).

Identifying partners with shared research interests

142. The ease with which industry is able to identify academics with shared research interests varies. It can be difficult for some industry companies to identify suitable partners, particularly for SMEs or companies without previous experience of collaborative research. Similarly, many academics find it difficult to identify potential industry partners.
143. The ability to identify partners with shared research interests is a potential barrier to participation in the IPA and 'stand-alone' LINK schemes. BBSRC should consider how it might further facilitate academia-industry introductions. BBSRC's Research and Technology Clubs are a useful mechanism for establishing new partnership links, but are limited to specific sectors. It would be useful for BBSRC to develop other portals through which industry and academia could identify suitable partners. Research Councils are developing a web-based, publicly searchable UK 'Gateway to Research' which will allow ready access to Research Council funded research information and other related data, which should be useful in this context.

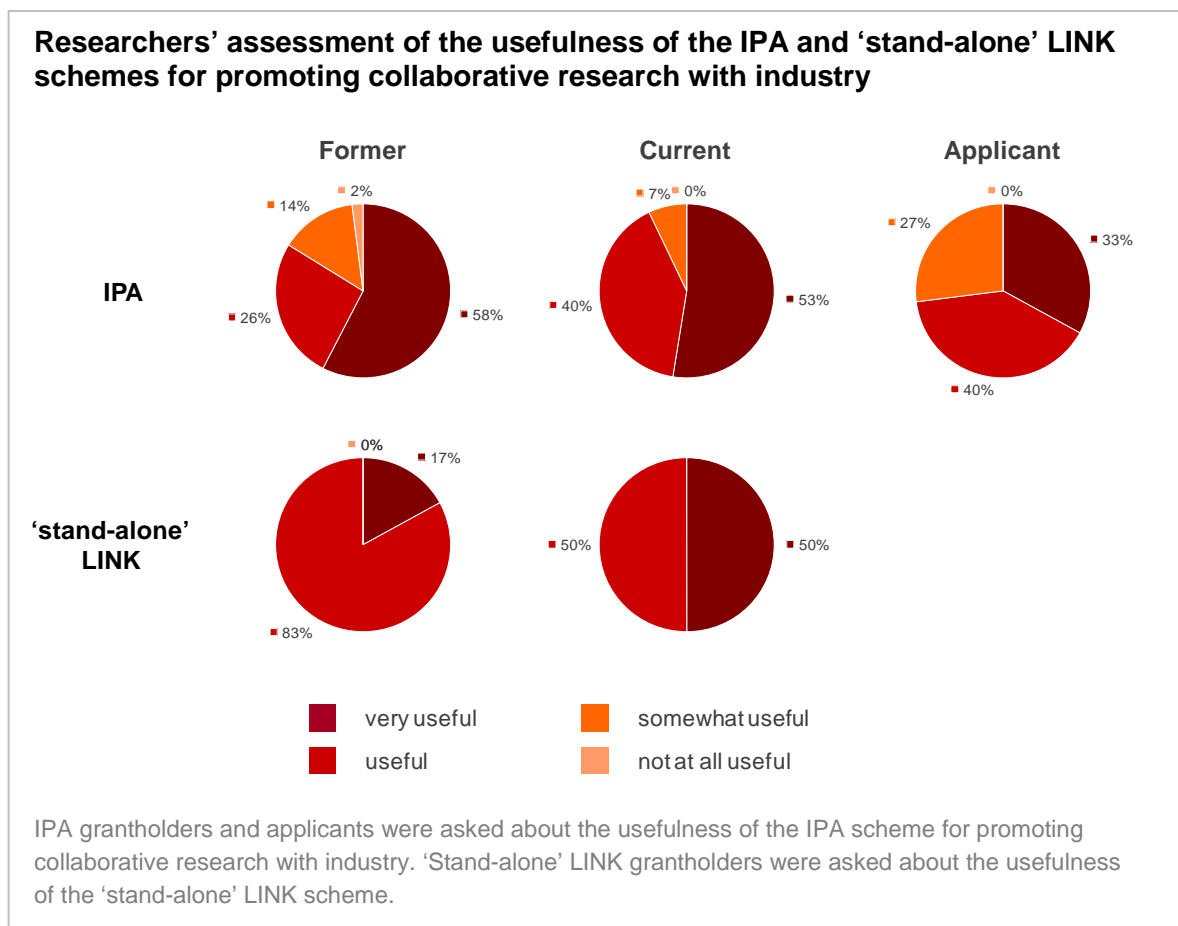
³² Responsive mode supports projects of up to five years duration; this includes short duration activities such as small pilot projects or proof of concept studies, which are often less than two years in duration.

Awareness of the IPA and stand-alone LINK schemes

144. There is a lack of awareness of the IPA and 'stand-alone' LINK schemes among the research community and UK industry, and this may limit participation in the schemes. BBSRC should publicise the success of the IPA and 'stand-alone' LINK schemes more widely. For example, BBSRC should develop publicity materials which demonstrate the benefits of the schemes to industry, including case studies and testimonials; these should highlight projects where the academia-industry interaction has worked well and explore the reasons for this. BBSRC should also publicise the high quality of the research supported through the schemes and the benefits of participation to academic researchers (e.g. the impact on career paths, a catalyst to further collaboration).

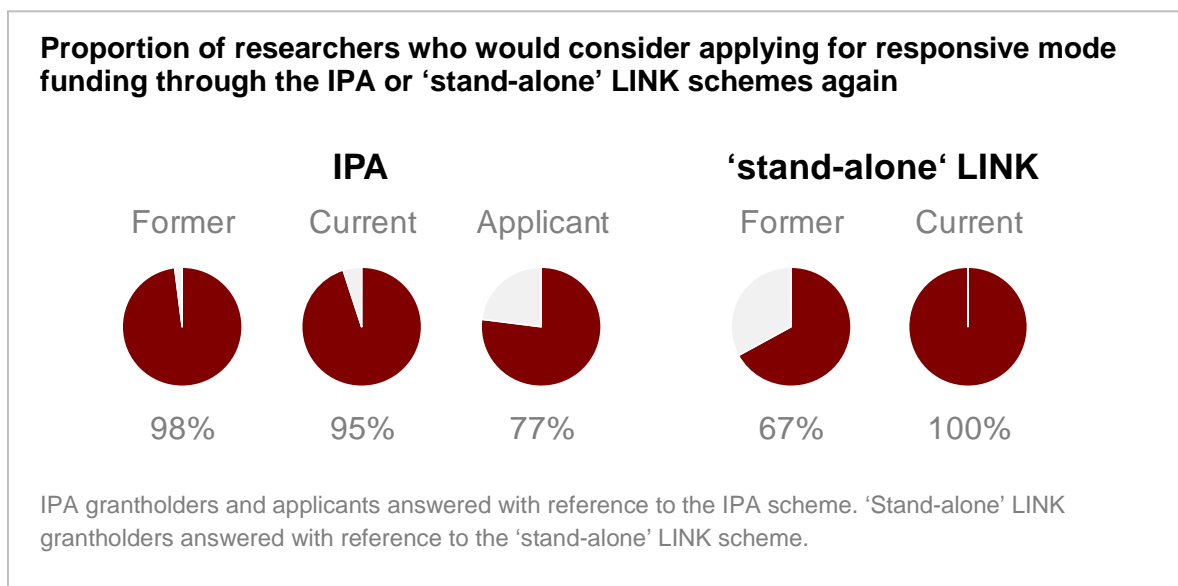
6.5 Promoting academia-industry collaborations

145. IPA and 'stand-alone' LINK schemes are very valuable for promoting collaborative research between industry and academia. The majority of researchers stated that the IPA and 'stand-alone' LINK schemes were useful for promoting collaborative research with industry and that the schemes had a positive influence on their decision to develop a collaborative research proposal.



6.6 BBSRC's support for collaborative research with industry

146. BBSRC supports collaborative research and training with industry through a number of mechanisms. The IPA and 'stand-alone' LINK schemes are important parts of BBSRC's overall support for academia-industry collaboration, but it is very beneficial that other funding mechanisms are also supported (e.g. Research and Technology Clubs, CASE studentships); individual companies have specific needs and preferences and this will influence the schemes they choose to participate in. Moreover, it should be noted that other BBSRC funding does not preclude industry involvement in the research and this should be encouraged.
147. Overall, researchers held positive views of the IPA and 'stand-alone' LINK schemes and a very high proportion would consider applying to the schemes again.



7. Conclusions and future perspectives

Summary

- the IPA and ‘stand-alone’ LINK schemes are effective mechanisms for supporting high-quality collaborative research with industry
- the schemes have distinct but complementary roles within the BBSRC collaborative research portfolio
- the schemes are making important contributions to BBSRC’s overall strategy for working with business
- BBSRC should continue to support the IPA and ‘stand-alone’ LINK schemes
- BBSRC’s investments in collaborative research support important UK industry sectors and benefit the UK economy

148. The IPA and ‘stand-alone’ LINK schemes are effective mechanisms for supporting collaborative research with industry. They help to ensure that high-quality, industrially-relevant research is supported within the BBSRC research portfolio and they encourage academia and industry to develop collaborative research projects. Academia and industry both benefit from their participation in the schemes. Moreover, the schemes leverage substantial financial and ‘in-kind’ support from industry and are good value for money for BBSRC.

149. The quality of the research supported by the IPA and stand-alone LINK schemes is generally very high. The research projects are of a similar standard to the wider responsive mode portfolio, although the outputs and outcomes reflect the more strategic and applied nature of the research. IPA and ‘stand-alone’ LINK projects have delivered, or have strong potential to deliver, economic and societal impacts. Industry partners have had an important role in realising the impact from the research and the schemes have accelerated the exploitation of BBSRC-funded research by encouraging industry involvement at an early stage. The level of exploitation is generally higher than within the wider responsive mode portfolio. However, it is important to recognise that the delivery of economic impact of research is ultimately determined by the market rather than the activities of grantholders or BBSRC.

150. The IPA and ‘stand-alone’ LINK schemes have fostered successful academia-industry partnerships, many of which continued after the grant ended. For a small number of research projects, the interactions with industry partners were less successful than expected. The issues which affected academia-industry interactions were usually associated with the industry partner (e.g. a change in company priorities) and were outside grantholders’ or BBSRC’s control. Nevertheless, BBSRC could help mitigate some issues through closer monitoring of IPA and ‘stand-alone’ LINK projects.

151. The schemes support research from across the BBSRC remit with a particular emphasis on agriculture and bioscience underpinning health. They provide strong support for strategic and applied research and this helps to balance the responsive mode portfolio. The overall balance and coverage of the portfolio is driven by industry, which is appropriate given the industry-facing nature of the schemes. However, some

types of companies are underrepresented (e.g. SMEs, particular industry sectors, companies with low profitability) and there is scope to widen industry participation in the schemes. BBSRC should consider how it might adapt the schemes to address any barriers which limit participation by SMEs and other underrepresented industry.

152. The schemes' application and assessment processes are generally effective but there are some tensions and scope for improvement. The schemes are embedded within the responsive mode funding mechanism and in general this is positive and beneficial. However, Research Committees are less comfortable assessing IPA and 'stand-alone' LINK applications compared with other responsive mode proposals, and there are tensions comparing strategic and applied research with basic research. The uplifts provided to IPA and 'stand-alone' LINK applications are effective and should be retained, although there are concerns that IPA application success rates vary between individual Research Committees.
153. BBSRC supports collaborative research with industry through a variety of funding mechanisms. This is appropriate as individual companies have specific needs and preferences which influence the schemes and programmes they choose to participate in. The IPA and 'stand-alone' LINK schemes have distinct but complementary roles within BBSRC's collaborative research portfolio; the IPA scheme supports more speculative research whereas the 'stand-alone' LINK scheme supports pre-competitive research which is closer to market. It is encouraging that many companies choose to participate in the IPA and 'stand-alone' LINK schemes. This demonstrates that the schemes are meeting their needs and is a further indicator of the high quality of science supported.
154. The IPA and 'stand-alone' LINK schemes are successful schemes which are making important contributions to BBSRC's overall strategy for working with business. They support high-quality research, encourage academia-industry partnerships, and facilitate the exploitation and commercial application of publicly-funded research. Moreover, the shared risk and reward offered by the schemes is very attractive to industry partners. The bioscience industry is dependent on research, but is not always able to fund all of its own research needs.
155. It is vital that BBSRC continues to invest in collaborative research, including the IPA and 'stand-alone' LINK schemes. BBSRC's investments in the IPA and 'stand-alone' LINK schemes are producing very good outcomes and achievements. The research and knowledge exchange supported through the schemes are underpinning important UK industry sectors and will ultimately produce substantial benefits to the UK economy and society.