



# Two Decades of the Small Business Research Initiative (SBRI)

Insights from evaluations and comparison with the US Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programmes

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This note provides insights into the performance of the UK Small Business Research Initiative (SBRI), nearly two decades after its creation, based on selected evaluations and studies. It also provides a brief comparison with the US Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programmes, and highlights key opportunity areas to enhance the impact of UK SBRI.

The contributors to the note are: Jennifer Castaneda-Navarrete, Carlos López-Gómez

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## **Executive Summary**

The UK Small Business Research Initiative (SBRI) is a procurement programme that promotes innovation through providing firms with research contracts to develop solutions that address public-sector needs and societal challenges. SBRI was established in 2001 in the UK, inspired by the US Small Business Innovation Research (SBIR) programme. Since its inception, SBRI has awarded over £500 million in R&D contracts. SMEs account for around 70% of applicants and 60% of the awarded contract value. Approximately half of the applicants are located in the South of England, accounting for a similar proportion of contracted value.

An evaluation conducted in 2017 by the Manchester Institute of Innovation Research estimates that every £1 awarded through SBRI has produced a benefit of at least £2.4 to the UK economy. According to recent evaluations, the outputs and impacts of SBRI on companies' performance include: increased turnover and employment; the creation of new firms; higher equity investment; accelerated introduction of new products; access to new markets; and skills development. For the government, benefits including access to new technologies, products and solutions, as well as efficiency savings, have been reported. However, evaluations have found that SBRI funding has not been as effective as expected in leading to the commercialisation of new products or technologies.

US SBIR was originally established in 1982 to address two identified shortcomings in the US funding landscape. The first shortcoming was the low participation rate of small businesses in federal R&D funding. The second was that federal government R&D needs were not being addressed by universities and large businesses. In 1992 a complementary programme was created, the Small Business Technology Transfer (STTR), seeking to foster technology transfer through cooperative R&D between small businesses and research institutions. In recent years, the SBIR and STTR programmes are often brought together under the brand "America's Seed Fund".

A distinctive characteristic of the US system is that, through the Small Business Innovation Development Act, participating federal agencies are obligated to commit a fixed proportion of their extramural R&D budget to SBIR and STTR. Agencies with a budget greater than \$100 million per year are required to commit a minimum of 3.2% of their extramural R&D budget to SBIR awards. Agencies with a budget greater than \$1 billion per year are required to commit 0.45% of their extramural research budget to STTR awards.

SBIR remains the largest innovation programme for small businesses in the United States, with a budget approximately seven times larger than that of STTR. In 2017, \$2.7 billion was delivered through SBIR, while \$368 million was delivered through STTR. US SBIR has inspired similar initiatives around the world, in countries including The Netherlands, Finland, Ireland and the UK.

## **Opportunity areas for SBRI**

Based on the evidence reviewed, opportunity areas for UK SBRI were identified in four key dimensions: *(i) policy goals; (ii) management and coordination; (iii) funding;* and *(iv) monitoring and evaluation.* 

## i. Policy goals

- There appear to be opportunities to more clearly outline a process to define the policy goals for each public organisation using SBRI. Crucially, there is a need to clearly establish whether the programme is to be used to enable the development of new technologies (strategic goals) or to support existing technologies (general goals).
- As discussed in Sections 2 and 3, UK SBRI has primarily adopted a *general* approach, while US SBIR has adopted a more *strategic* approach to public procurement of innovation. In 2016, around two-thirds of SBRI contracts were estimated to have been directed at operational challenges and one-third at policy challenges.

• A more strategic approach might require translating identified innovation challenges into functional specifications (such as new or improved levels of technology performance) that would become the stretch goals of funded projects. Evidence suggests that this translation would require specialised technological expertise and markets that, if not available within government, could be gathered through focus groups and networks of experts.

## *ii. Management and coordination*

- Although some flexibility is recommended in research procurement programmes to reflect the missions of each particular agency, recent evaluations have highlighted opportunities for SBRI to more systematically share effective practices in order to improve programme outcomes. Dialogue among procurement offices in different agencies, and coordination with those in charge of national innovation programmes and industrial strategies, could help to exploit complementarities.
- The impact of SBRI might be enhanced by complementing it with technical and advisory support. In the US, recent evaluations have highlighted that some federal agencies in the US have been able to enhance the effectiveness of SBIR by complementing it with: pre-proposal technical consultations, commercialisation assistance, mentoring, technology acceleration, incubator programmes and networking activities.
- The role of programme managers has been emphasised across evaluations. Managers with strong backgrounds in the commercialisation of technology and knowledge of other business support measures are found to be better positioned to support specific company outcomes and overall programme goals.

### iii. Funding

- Adopting a strategic approach requires long-term funding. The 2017 independent evaluation by David Connell (Judge Business School, University of Cambridge) suggested the establishment of a centralised fund, including a Phase 3 award for commercialisation (as already provided by UK SBRI Healthcare) and agency management costs (as generally provided in US SBIR). Connell suggested that the fund should be overseen by a National SBRI Board comprising public and private actors.
- Increasing the value of Phase 2 contracts has been identified as an effective way to enhance companies' achievements. US SBIR introduced this change in 2011, resulting in more favourable evaluations thereafter.

## iv. Monitoring and evaluation

- In contrast with US SBIR/STTR, UK SBRI lacks a centralised database for the programme. Evaluations suggest that building a publicly available database containing standardised information from the different SBRI programmes could not only improve the transparency of the programme but also help to inform programme design and management.
- Recent studies of UK SBRI have emphasised the need for an improved evaluation framework. Monitoring and evaluation are also often mentioned in evaluations of US SBIR programmes as areas for improvement. In US SBIR evaluations, particular emphasis has been placed on the need to improve metrics and monitoring of long-term outcomes, such as commercialisation.

A key limitation of this note is that it has relied primarily on existing evaluations and studies rather than on primary research. Future work could focus on characterising projects funded by UK SBRI in terms of their technology focus areas and their contribution to particular innovation goals of funding agencies, in comparison with US SBIR. It would be interesting, for example, to better understand the extent to which research funded by SBRI in one technology has supported the scale-up of other technologies. Finally, future work could be undertaken to better understand the role of technology diffusion programmes, such as the Small Business Technology Transfer (STTR), in complementing and enhancing the impact of technology development programmes such as US SBIR and UK SBRI.

## Table 1. Key characteristics of UK SBRI and US SBIR and STTR

	UK	US		
	Small Business Research	Small Business Innovation	Small Business Technology	
Establishment		1982	1992	
Aims	"Bring together government challenges and ideas from business to create innovative solutions."	<ul> <li>"Stimulate technological innovation;</li> <li>Meet federal government R/R&amp;D needs;</li> <li>Foster and encourage participation in innovation and entrepreneurship by women and socially and economically disadvantaged persons; and</li> <li>Increase private-sector commercialisation of innovations derived from federal R/R&amp;D funding."</li> </ul>	"Stimulate a partnership of ideas and technologies between innovative small business concerns (SBCs) and Research Institutions through Federally-funded research or research and development (R/R&D)."	
Participating agencies	<ul> <li>12 public organisations.</li> <li>Coordination by Innovate UK.</li> </ul>	<ul> <li>11 federal agencies.</li> <li>Coordination by the US Small Business Administration (SBA).</li> </ul>	<ul> <li>5 federal agencies.</li> <li>Coordination by the US Small Business Administration (SBA).</li> </ul>	
Budget	<ul> <li>From 2001 to 2017, £500m has been delivered in SBRI R&amp;D contracts.</li> <li>£107m in 2017/2018.</li> <li>From 1990 to 2017, \$44.6 has been delivered throu SBIR obligations.</li> <li>\$2.7b in 2017.</li> </ul>		<ul> <li>Federal agencies with extramural R&amp;D budgets exceeding \$1b are required to obligate a minimum of 0.45% of their extramural R&amp;D budgets for STTR.</li> <li>From 2000 to 2017, \$4b has been delivered through STTR obligations.</li> <li>\$368m in 2017.</li> </ul>	
Key contributors	Innovate UK, the Ministry of Defence, Health (including the NHS), and ex-DECC have accounted for 80% of the total contract value.	DoD and HHS account for over 70% of total SBIR expenditure.	DoD and HHS account for over 70% of total STTR expenditure.	
Average value of contracts	<ul> <li>Phase 1: £50k-£100k</li> <li>Phase 2: £100k-£800k</li> </ul>	k-£100k• Phase 1: \$100k-\$225k• Phase 1: \$100k-\$225k0k-£800k• Phase 2: \$750k-\$1,500k• Phase 2: \$750k-\$1,500k		

Source: Compiled from selected evaluations and studies (see list of references).

 Table 2.
 Strengths and weaknesses of US SBIR and UK SBRI identified in recent evaluations

	UK Small Business Research Initiative (SBBI)	US Small Business Innovation Research (SBIR)		
Key strengths	<ul> <li>Evaluations suggest that by providing 100% funding, the programme allows companies to invest in riskier projects.</li> <li>SBRI allows recipient companies to demonstrate revenue flow from commercial contracts (rather than grants), which helps them build a track record to pursue future opportunities.</li> <li>Retention of IP by SBRI awardees.</li> <li>SMEs particularly welcome not requiring matched funding.</li> </ul>	<ul> <li>Ring-fenced funding.</li> <li>Topics of calls for applications are defined to contribute to the agency's missions and to support the development of emerging technologies.</li> <li>Agencies tend to have specialised programme managers with strong backgrounds in the commercialisation of technology.</li> <li>SBIR outcomes have been enhanced by the provision of complementary support, either as part of the programme or as part of other federal and state programmes.</li> </ul>		
Key weaknesses	<ul> <li>Lack of a systematic approach to select competition themes.</li> <li>Unclear whether programme is intended to pursue the development of new technologies (strategic goals) or to support existing technologies (general goals).</li> <li>Large number of contracts that are too small, according to evaluations.</li> <li>Lack of single integrated database of SBRI applicants or winners.</li> <li>Departments have no obligation to share data with Innovate UK.</li> <li>Evaluations suggest the need for a clearer monitoring and evaluation approach.</li> <li>Limited advisory support for navigating procurement and commercial stages.</li> <li>Less favourable perception amongst senior budget holders in Departments outside BEIS.</li> </ul>	<ul> <li>Information collected on the projects is not always used to inform programme management.</li> <li>Monitoring and evaluation metrics and practices provide limited understanding of the long-term impacts.</li> <li>Established contractors tend to dominate SBIR contracts.</li> </ul>		

Source: Compiled from selected evaluations and studies (see list of references).

# **Section 1: Introduction**

Countries have traditionally supported innovation activities through supply-side measures, which focus on strengthening the capabilities and linkages of innovation actors. Examples of these policies include: training support, R&D grants, networking activities and advisory services. In recent decades, these efforts have been complemented by innovation policies from the demand side, which have become increasingly popular.

Demand-side innovation measures start from the identification of potential buyers of R&D outputs and the definition of their needs. The UK Small Business Research Initiative (SBRI), the US Small Business Innovation Research (SBIR) programme and the Small Business Technology Transfer (STTR) programmes, reviewed in this note, are examples of demand-side innovation policy instruments. Specifically, they fall under the category of pre-commercial procurement programmes, defined as "particular types of public procurement that involve the purchase of expected research results".<sup>1</sup>

Public procurement programmes can be broadly distinguished according to the final user of R&D outputs and the policy goal of the programme from both technology and market perspectives, as described in Table 3.

User of R&D output	Policy goals (technology perspective)	Policy goals (market perspective)			
Direct – used by	General – focus on technologies that are very	Creation – established market for the			
government body	close to the market, which might require	technology that, being procured, does			
procuring research.	simple adaptions and/or additional	not yet exist.			
Cooperative – used by	functionalities.	Escalation – further development of the			
government and other	<b>Strategic</b> – focus on technologies that require	existing market.			
actors.	additional levels of performance or	Consolidation – when technical			
Indirect – not used by	functionality; advancements in technology	standards or performance criteria are			
government.	supported would enable development in	standardised in order to achieve "critical			
	other technologies.	mass" of demand within the public			
		sector.			

#### Table 3. Types of public procurement for innovation programmes

Source: Policy Links, based on Edquist et al. (2015) and Edler et al. (2005).

In terms of the intended users of R&D outputs, public procurement for innovation can be classified as: i) *direct*, when the research output is used by the contracting public organisation; ii) *cooperative*, when the research output is used by both the contracting public organisation and other actors; and iii) *indirect*, when the government coordinates the research procurement but the user is a different actor.

In terms of technology development goals, public procurement for innovation can be classified as: *general*, when it addresses technologies very close to the market or available off-the-shelf that might require simple adaptions or additional functionalities; or *strategic*, when it supports more complex adaptations, the diffusion of emerging technologies or the development of new technologies.

Finally, from a market perspective, public procurement for innovation can be focused on the development of a new market (*creation*); further development of existing markets (*escalation*); or the coordination and concentration of demand within the public sector (*consolidation*).

This note is structured as follows. The second section reviews key characteristics and results from selected evaluations of UK SBRI. The third section presents a brief overview of the US Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR), paying particular attention to themes of relevance to UK SBRI. The note concludes by summarising key opportunity areas identified from the review.

<sup>&</sup>lt;sup>1</sup> Rigby, J. (2013). *Review of Pre-commercial Procurement Approaches and Effects on Innovation Compendium of Evidence on the Effectiveness of Innovation Policy Intervention*. Manchester Institute of Innovation Research. Manchester Business School, University of Manchester.

# Section 2: The UK Small Business Research Initiative (SBRI)

## 2.1 Programme goals and features

The UK Small Business Research Initiative (SBRI) is a procurement programme that seeks to promote innovation through providing firms with contracts to develop solutions that address public-sector needs. This ranges from solutions to operational and management problems, to more general innovations that address policy problems where the market fails to deliver.<sup>2</sup>

For the public sector, the programme aims to offer "access to new technologies, products and solutions to improve its cost effectiveness and address policy challenges, while supporting a longer-term, and more strategic, approach to procurement more generally". For UK businesses, it seeks to "provide product development contracts from lead customers that are focused on real market needs".<sup>3</sup>

UK SBRI was first launched in 2001, with the aim of reproducing, as far as possible, the US Small Business Innovation Research (SBIR) programme.<sup>4</sup>

SBRI funds 100% of the cost of a feasibility study for a particular technology in Phase 1 of the programme; and the cost of development of a prototype in Phase 2 of the programme. Phase 1 contracts are normally between £50k and £100k and last six months. In general, the average value of Phase 2 contracts has been much higher (around £360k) than Phase 1 contracts (£58k).<sup>5</sup>

Box 1 describes the key steps involved in SBRI's management.

#### Box 1. SBRI's management steps

**Step 1. Definition of Scope** – Definition of challenges and procurement specification (technologies, sectors, timescales, costs).

**Step 2. Competition Phase 1 (Feasibility)** – Preparation, launch, promotion, applications assessment and contracts awarded.

**Step 3. Execution Phase 1** – Firms undertake work and report. Possible commercial outputs from firms that exit SBRI at the end of Phase 1.

**Step 4. Competition Phase 2 (Prototype)** – Preparation, applications assessment and contracts awarded.

**Step 5. Execution Phase 2** – Firms undertake work and report.

Step 6. Open Procurement – Product or service developed, procurement of goods and services.

<sup>&</sup>lt;sup>2</sup> Manchester Institute of Innovation Research/ERC/OMB (2015). *A Review of the Small Business Research Initiative. Final Report*. Manchester Institute of Innovation Research with the Enterprise Research Centre and OMB Research Ltd. Evaluation commissioned by Innovate UK.

<sup>&</sup>lt;sup>3</sup> Connell, D. (2017). Leveraging Public Procurement to Grow the Innovation Economy. An Independent Review of the Small Business Research Initiative. Final Report and Recommendations. BEIS., p. 7.

<sup>&</sup>lt;sup>4</sup> Sainsbury, D. (2007). *The Race to the Top. A Review of Science and Innovation Policy*.

<sup>&</sup>lt;sup>5</sup> Manchester Institute of Innovation Research/ERC/OMB (2015). *Op. cit.,* p. 37.

SBRI was relaunched following a review in 2008.<sup>6</sup> Since then, Innovate UK has played an important role in coordinating and supporting the programme. Innovate UK's responsibilities include promoting it to public-sector bodies and helping them to set up competitions, marketing them to businesses and, where appropriate, helping to manage them.

As a result of an additional review conducted by David Connell<sup>7</sup> (Judge Business School, University of Cambridge) in 2017, the UK government decided to refocus SBRI, with the intention of aligning it with the Industrial Strategy's Grand Challenges. A first step in this direction was the launch of GovTech Catalyst in 2018, with funding of up to £20m over three years. Figure 1 presents a timeline of the key milestones of the programme.



#### Figure 1. SBRI timeline

Source: Policy Links, based on Connell (2017), Manchester Institute of Innovation Research/ERC/OMB (2015) and Sainsbury (2007).

## 2.2 Funding

Upon its creation in 2001, SBRI established a target of 2.5% of external government R&D to be spent on contracting SMEs. In March 2005 the 2.5% target was made mandatory in an effort to encourage departmental spending with SMEs.<sup>8</sup>

However, this mandatory target was removed when SBRI was relaunched in 2008.<sup>9</sup> In 2013, SBRI's budget was increased in key departments. The following departments were given expenditure targets (2014/15 target in brackets): MOD (£100m), Health (£60m), Transport (£14m), Home Office (£14m),

<sup>&</sup>lt;sup>6</sup> Sainsbury, D. (2007). <u>The Race to the Top. A Review of Science and Innovation Policy</u>.

<sup>&</sup>lt;sup>7</sup> Connell, D. (2017). *Op. cit.* 

<sup>&</sup>lt;sup>8</sup> Sainsbury, D. (2007). *Op. cit.* 

<sup>&</sup>lt;sup>9</sup> Connell, D. (2017). *Op. cit.* 

Department for Energy and Climate Change (£6m), and Department for Food and Rural Affairs (£6m).<sup>10</sup> However, these targets were not generally achieved. The programme reached its highest annual expenditure in 2014/15 but has decreased since. In 2015/16 spending was 24% below its peak the previous year.<sup>11</sup>

In addition, funding emphasis was switched "from R&D to departmental procurement budgets" after a Cabinet Office review of SBRI in November 2014. A likely result of this shift in funding emphasis is the larger proportion of projects funded to address operational challenges in comparison with those funded to address policy challenges. <sup>12</sup> In 2016, around two-thirds of contracts were estimated to have been directed at operational challenges and one-third at policy challenges.<sup>13</sup>

Since its inception, SBRI has awarded over £500 million in R&D contracts.<sup>14</sup> SMEs account for around 70% of applicants and 60% of the contracted value.<sup>15</sup> Geographically, around half of the applicants are located in the South of England, and this region makes up a similar proportion of the contracted value.<sup>16</sup> Over the period 2011–14 applicant firms were mainly from three sectors: information and communication technologies (29.6%); professional, scientific and technical activities (26.3%); and administrative and support service activities (12.5%). The proportion of applicants in manufacturing was 8.8%.<sup>17</sup>

A total of 20 public organisations have used SBRI to address their needs; however, four of them – Innovate UK, the Ministry of Defence, Health (including the NHS), and ex-DECC – represent 80% of the total contract value.<sup>18</sup>

## 2.3 Insights from evaluations - impact

## It is estimated that for every £1 awarded through SBRI at least £2.4 is returned to the UK economy.<sup>19</sup>

Table 4 summarises the positive outcomes and impacts identified from SBRI evaluations. For firms, these include: the creation of new firms; a rise in equity investment; and an increase in sales turnover and employment. There is less evidence on the effects on government, but evaluations suggest efficiency savings, effectiveness gains and the addressing of market failures, such as the lack of commercial funding. However, evaluations have found that the role of SBRI-funded projects in product procurement by sponsoring departments is still limited. Reasons for this include the small size of research contracts constraining procurement feasibility, administrative barriers and long-term impacts that evaluations have not captured.<sup>20</sup>

<sup>&</sup>lt;sup>10</sup> Manchester Institute of Innovation Research/ERC/OMB (2017). <u>SBRI Review – BEIS Evidence Document. Additional and</u> <u>updated findings to the Manchester/ERC/OMB SBRI Evaluation</u>. Department for Business, Energy and Industrial Strategy.

<sup>&</sup>lt;sup>11</sup> Connell, D. (2017). *Op. cit.* 

<sup>&</sup>lt;sup>12</sup> Connell, D. (2017). *Op. cit., p. 40.* 

<sup>&</sup>lt;sup>13</sup> Connell, D. (2017). *Op. cit.* 

<sup>&</sup>lt;sup>14</sup> Innovate UK (2018). <u>SBRI - more than £1 billion pounds in value to UK economy</u>.

<sup>&</sup>lt;sup>15</sup> Nationally, SMEs represent 99.9% of all businesses in the UK (BEIS, 2019).

<sup>&</sup>lt;sup>16</sup> Business located in the South of England (including London) represent 44.2% of all businesses in the UK (BEIS, 2019).

<sup>&</sup>lt;sup>17</sup> Manchester Institute of Innovation Research/ERC/OMB (2015). Op. cit.

<sup>&</sup>lt;sup>18</sup> Ibid.

<sup>&</sup>lt;sup>19</sup> Innovate UK (2018). *Op. cit.* 

<sup>&</sup>lt;sup>20</sup> Connell, D. (2017). *Op. cit.* 

### Table 4. Summary of SBRI positive effects

Actor	Outputs	Impacts		
	<ul> <li>Increased scale of projects;</li> </ul>	<ul> <li>Creation of new firms;</li> </ul>		
	<ul> <li>New product development;</li> </ul>	<ul> <li>Rise in equity investment;</li> </ul>		
	<ul> <li>Improved credibility;</li> </ul>	<ul> <li>Increase in sales turnover (12.7%);</li> </ul>		
	<ul> <li>Accelerated route to market;</li> </ul>	<ul> <li>Higher employment levels (56% of</li> </ul>		
Firms	<ul> <li>Access to new markets;</li> </ul>	respondents).		
	<ul> <li>Skills development;</li> </ul>			
	<ul> <li>Development of new relations/</li> </ul>			
collaboration with companies in the				
	same and related sectors.			
<ul> <li>Provision of cost-effective solutions;</li> </ul>		<ul> <li>Efficiency savings;</li> </ul>		
	<ul> <li>Provision of funding and a phased</li> </ul>	<ul> <li>Greater effectiveness.</li> </ul>		
Government	mechanism for the development of			
	technologies for which commercial			
	funding is not yet available.			

Source: Policy Links, based on Connell (2017) and Manchester Institute of Innovation Research/ERC/OMB (2017, 2015).

## 2.4 Insights from evaluations - opportunity areas

Evaluations of SBRI have identified four main areas for improvement: (i) policy goals; (ii) management and coordination; (iii) funding; and (iv) monitoring and evaluation (Table 5).

Area	Findings from evaluations	<b>Recommendations from evaluations</b>
Policy goals	• SMEs are asked to tender for specific pieces of research, many of which are concerned with the development of policy, rather than being asked to bring forward research projects in scientific or technical areas where the government department wants to see research take place.	<ul> <li>SBRI should fulfil departmental objectives and provide valuable support to early-stage high-technology companies.</li> <li>Departments should update and specify upfront, on a fixed and regular basis, the technological areas in which they would like to see projects.</li> </ul>
Programme management and coordination	<ul> <li>Wide variation in management practices.</li> <li>Lack of central and, on occasion, departmental ownership.</li> <li>Competitions have often been designed on an ad hoc basis, with themes suggested by senior officials rather than using a systematic process.</li> <li>Programme management teams sometimes lack the appropriate skills.</li> <li>Reliance on Innovate UK to carry out many of the competition management tasks on behalf of the sponsor, resulting in some cases in limited departmental ownership.</li> <li>Larger SBRI programmes tend to have management teams that have been in place for several years, with clear strategies and processes.</li> <li>There is currently no dedicated network for UK local authorities to share effective practices.</li> </ul>	<ul> <li>Conduct departmental programmes on a long-term, systematic basis.</li> <li>Embed open innovation processes, including systematic identification and definition of challenges. Involve multifunctional teams, including users, decision-makers and budget-holders, from problem definition to product testing and first deployments.</li> <li>Organise regular challenge announcements on a six-monthly cycle to increase firms' awareness of the programme.</li> <li>Experience-sharing and collaborative procurement could help to increase participation in SBRI among UK local authorities.</li> </ul>

## Table 5. Opportunity areas identified from evaluations

Area	Findings from evaluations	Recommendations from evaluations
	<ul> <li>Contract values are sometimes considered to</li> </ul>	<ul> <li>Establish a central five-year budget fund.</li> </ul>
	be too low to make a real difference to a	<ul> <li>Include a funding component for</li> </ul>
	company's ability to take a project forward.	department or agency programme
	Around half of departmental SBRI	management costs where appropriate.
	programmes have average contract values	<ul> <li>Establish a National SBRI Board to oversee</li> </ul>
50	below the minimum guideline for individual	the fund, comprising officials bringing
	projects (£250k for Phase 2).	commercial, innovation and operational
Idir	• SBRI budgets are currently entirely the	perspectives from both the public and the
Fur	responsibility of spending departments and	private sector.
	agencies, and in some cases set on an annual	• Ensure that SBRI contracts are large enough
	basis. This is in contrast to the US SBIR	to enable companies to achieve
	programme, where they are defined by law.	procurement and commercialisation.
	• Focus of procuring off-the-shell by senior	Include a Phase 3 of funding where     appropriate (as SPRI Healthcare has done)
	• Local governments are constrained by limited	• Provide information on other available
	budgets to participate in SBRI	forms of husiness support
	• There is no single integrated database of SBPI	Pequire SBPI programmes receiving central
Ę	annlicants or winners	funding to provide details of awards
atio	• Departments have no obligation to share data	including recipients contract amounts and
oring and evalua	with Innovate IJK. This situation contrasts	summary project descriptions through a
	with US SBIR, where agencies are required to	publicly searchable database.
	publish information on award winners.	<ul> <li>Include future monitoring information</li> </ul>
	project objectives and contract amounts.	obligations in contracts with companies.
	• SBRI management data has not been	• Share data collected by sponsoring
nite	consistently collected in a standardised	departments with the central SBRI
Mo	format by sponsoring public-sector bodies.	administration body.
		• Develop and commit to an evaluation plan.

Source: Policy Links, based on Connell (2017), Local Government Association (2017), Manchester Institute of Innovation Research/ERC/OMB (2017, 2015) and Sainsbury (2007).

## 2.5 Insights from evaluations – perceptions

According to the evaluations reviewed, the key strengths of UK SBRI, perceived by firms, include:

- Making R&D projects more feasible thanks to the provision of 100% funding;
- Limited administrative bureaucracy;
- Retention of IP, allowing companies to sell applications to other customers;
- Market pull implicit in SBRI and the fact that there is potential for a first customer for the resulting product;
- Interest created in their markets as a result of SBRI publicity.

Key areas of improvement of UK SBRI, perceived by firms, include:

- Weak pull through to procurement of successful product developments; very few projects are taken through to Phase 2;
- Final operational testing and adoption stages of the SBRI process remain problematic across many departments;
- Limited advisory support for navigating the procurement and commercial stages;
- Delayed payments can affect cash flow and the ability to retain high-quality staff for small companies;
- Feedback on unsuccessful proposals is received online, with little or no scope to discuss the decision further.

Box 2 presents quotes from innovation actors captured in recent evaluations of the programme. Firms and research organisations highlight the relevance of UK SBRI for SMEs, who particularly welcome receiving revenue from contracts (as opposed to grants) and not requiring matched funding. Although departmental SBRI management teams tend to regard it as a "valuable way of identifying and addressing the challenges facing departments", perception of SBRI are less favourable amongst senior budget holders.

Box 2. Examples of perceptions of innovation actors on SBRI

"Many departments see it [SBRI] as BEIS's job to fund innovation in businesses, rather than theirs. Given other pressures on their budgets, and for very understandable reasons, they mainly expect to **buy innovative products off-the-shelf** as and when they become available, rather than fund developments which may not ultimately be successful."

(Connell, 2007, p. 55)

"SBRI has been a very effective way to identify and **engage with new suppliers** with novel solutions to our needs."

(Geraint West, Director of National Marine Facilities, National Oceanography Centre)

"For **small innovative companies**, being awarded a contract from real customers can help their own feasibility as functional companies, including by **demonstrating a revenue flow**. Unlike funding from many innovation grants, the contracts awarded by SBRI cover full costs and **do not require matched funding** from another source, factors which are appealing to small companies."

(Royal Academy of Engineering)

"The overall consensus is that **SBRI has been significantly underutilised**. Action needs to be taken to increase the use of SBRI across all appropriate government departments and agencies. SBRI appears to operate in a largely one-directional manner, requiring the identification of problems by government departments and agencies for which they have an appetite for innovative solutions. Forums in which companies and entrepreneurs can present innovative ideas should be encouraged."

(Royal Academy of Engineering)

"Many **SMEs** rely on grant funding for their innovation activities. SBRI as a full-cost contract brings a different mind-set to the SME and moves it **from dependency towards maturity**, with focused deliverables. Equity investors generally seek companies with demonstrable **revenues from contracts**. The ability to demonstrate such revenues, including from SBRI, increases the likelihood of being able to **raise private funding**."

(Association for Innovation, Research and Technology Organisations)

Source: Connell (2017) and Manchester Institute of Innovation Research / ERC/OMB (2017).

## Section 3: The US Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programmes

## 3.1 Programme goals and features

The Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programmes seek to support small business R&D activities and incentivise the commercialisation of their research outputs.<sup>21</sup> SBIR and STTR allocate federal research funds through a competitive awards-based system. In recent years, the SBIR and STTR programmes are often brought together under the brand "America's Seed Fund".

SBIR and STTR have the following goals:

- To stimulate technological innovation;
- To meet federal government R/R&D needs;
- To foster and encourage participation in innovation and entrepreneurship by women and socially and economically disadvantaged persons; and
- To increase private-sector commercialisation of innovations derived from federal R/R&D funding.<sup>22</sup>

Additionally, the statutory objective for the STTR programme is "to stimulate a partnership of ideas and technologies between innovative small business concerns (SBCs) and Research Institutions through Federally-funded research or research and development (R/R&D)."<sup>23</sup>

SBIR programme operations are decentralised to agencies and sub-agencies throughout the federal government. Eleven federal agencies participate in the SBIR Program:

- Department of Agriculture (USDA);
- Department of Commerce (DOC);
- Department of Defense (DoD);
- Department of Education (ED);
- Department of Energy (DOE);
- Department of Health & Human Services (HHS);
- Department of Homeland Security (DHS);
- Department of Transportation (DOT);
- Environmental Protection Agency (EPA);
- National Aeronautics & Space Administration (NASA); and
- National Science Foundation (NSF).

From these, DoD, DOE, HHS, NASA and NSF also participate in STTR.

The Office of Investment and Innovation at the US Small Business Administration (SBA) oversees both programmes. The SBA serves as the coordinating body for the 11 federal participating agencies, with extramural budgets for research and development in excess of the expenditure established in the *Small Business Innovation Development Act* (SBAct). This includes providing policy guidance, monitoring agency performance, analysing programme data and reporting on the programme to Congress.<sup>24</sup>

<sup>&</sup>lt;sup>21</sup> Small businesses are defined in the US as those employing fewer than five hundred people.

<sup>&</sup>lt;sup>22</sup> Small Business Administration (2018). SBIR AND STTR Annual Report. Fiscal Year 2017.

<sup>&</sup>lt;sup>23</sup> National Academies of Sciences, Engineering, and Medicine (2016). STTR: <u>An Assessment of the Small Business</u> <u>Technology Transfer Program</u>. Washington, DC: The National Academies Press.

<sup>&</sup>lt;sup>24</sup> Ibid.

The Small Business Innovation Research (SBIR) programme started as a pilot at NSF in the late 1970s. It was rolled out to other federal agencies and formally established in 1982, under the Small Business Innovation Development Act (SBAct) in 1982.25

SBIR was designed to encourage the participation of small businesses in federal R&D funding and, at the same time, to address federal R&D needs that were not covered by universities and large businesses. This was either because the size of the market was not attractive enough or because R&D needs were distant from their core research interests.<sup>26</sup>

In 1992, seeking to bridge the gap between basic research and commercialisation of research outputs, the Small Business Technology Transfer (STTR) programme was created by the Small Business Research and Development Enhancement Act of 1992. Established first as a pilot, it sought to incentivise the collaborative research and technology transfer between not-for-profit research organisations and small businesses.27

One of the main differences between SBIR and STTR is that the latter requires a non-profit research institution partner and allows the principal investigator to be employed by either the research institution or the small business. Table 6 summarises the key differences between the two programmes.

	SBIR STTR					
Partnering requirement	Permits partnering	Requires a non-profit research institution partner				
		PI may be employed by either the				
Principal	Primary employment (> 50%) must	research institution partner or small				
investigator	be with the small business	business				
	May sub-contract up to:					
Work	33% (Phase 1)	Minimum: 40% small business				
requirement	50% (Phase 2)	30% research institution partner				
Program size	3.2% (FY19 -\$3.28b)	0.45% (FY19 -\$453m)				
Majority VC						
ownership	Allowed by some agencies	Not allowed				
Participating	11 agencies	5 agencies				
agencies	(extramural R&D budget > \$100m)	(extramural R&D budget > \$1b)				

## · ....

Source: SBA (2020).

## 3.2 Funding

The SBAct requires participating agencies to allocate a certain percentage of their extramural R&D budget to fund small business R&D activities through the SBIR and STTR programmes. For Fiscal Year 2017 (FY17), federal agencies with extramural R&D budgets exceeding \$100 million were required to obligate a minimum of 3.2% of their FY17 extramural R&D budgets for SBIR awards to small businesses. Similarly, participating agencies with extramural R&D budgets exceeding \$1 billion were required to obligate a minimum of 0.45% of their extramural R&D budget through STTR awards.<sup>28</sup> Each agency

<sup>&</sup>lt;sup>25</sup> National Academies of Sciences, Engineering, and Medicine (2020). *Review of the SBIR and STTR Programs at the* Department of Energy. Washington, DC: The National Academies Press.

<sup>&</sup>lt;sup>26</sup> Ibid.

<sup>&</sup>lt;sup>27</sup> National Academies of Sciences, Engineering, and Medicine (2016). Op. cit.

<sup>&</sup>lt;sup>28</sup> Small Business Administration (2018). Op. cit.

administers its own individual programme within the guidelines established by Congress and the Policy Directives established by the SBA.<sup>29</sup>

Table 7. Three-phase model of SBIR/STTR					
	Phase 1	Phase 2	Phase 3		
	Establish technical merit,	Continue R&D from	Allow small businesses to		
	feasibility and commercial	Phase 1, with	pursue future		
Obiestive	potential of proposed	funding based on	commercialisation objectives		
Objective	effort and assess the	results achieved	through alternative agency		
	performance of a small	during that time	funding mechanisms;		
	business		SBIR/STTR do not fund Phase 3		
Eligible applicants	Small business concerns	Phase 1 awardees	Phase 1/2 awardees		
Typical maximum	\$150,000	\$1,000,000	N/A		
award amount					
Typical award	SBIR: 6 months	2 years	N/A		
duration	STTR: 1 year				

SBIR and STTR are structured in three phases, as shown in Table 7.

Source: Rozansky (2019) and Small Business Administration (2018).

SBIR is the largest innovation programme for small businesses in the US.<sup>30</sup> In contrast with UK SBRI, US SBIR has a central portal for accessing award and performance information: SBIR.gov. From 1990 to 2017, \$44.6 billion was delivered through SBIR obligations. In FY17 the total SBIR obligations of participating agencies amounted to \$2.7 billion (Figure 2). STTR awards amounted to around 10% of SBIR value. In FY17 the total STTR obligations of participating agencies amounted to \$368 million.



Source: SBA. SBIR Dashboard.

Awards are made either as contracts or as grants, depending on the agency. Similar to the UK case, a few agencies make up most of SBIR's expenditure. DoD and HHS accounted for 76% of the total SBIR expenditure in 2017. As in the UK, the contracts of Phase 2 projects are considerably larger than for Phase

<sup>29</sup> Ibid.

<sup>&</sup>lt;sup>30</sup> National Academies of Sciences, Engineering, and Medicine (2020). *Op. cit.* 

1 projects. Phase 1 awards range from \$100k to \$225k, while Phase 2 awards range from \$750k to \$1,500k.<sup>31</sup> Table 8 presents the awards and value granted through SBIR and STTR by the main federal agencies in FY17.

SBIR					STTR	
Agency	Awards	Budget (millions USD)	Percent of total budget	Awards	Budget (millions USD)	Percent of total budget
DOD	2,378	1,153.20	43.1%	392	160.5	43.6%
HHS	1,165	885.7	33.1%	231	126.7	34.4%
DOE	462	223.7	8.4%	75	33.2	9.0%
NSF	346	174.4	6.5%	66	21.9	5.9%
NASA	470	155.8	5.8%	83	26.1	7.1%
Other	273	80.6	3.0%	0	0	0.0%
Total	5,094	2,673.41	100.0%	847	368.5	100.0%

### Table 8. SBIR and STTR awards and budget (FY17)

Source: SBA. SBIR Dashboard.

## 3.3 Lessons from SBIR studies and evaluations<sup>32</sup>

Considering the large size of SBIR and the similarities with the UK SBRI programme, this section focuses on the lessons identified in SBIR evaluations.

## **Definition of topics**

• Topics of calls for applications are defined as contributing to agency missions, as well as to supporting the development of emerging technologies:

"Each Mission Directorate provides a representative to the SBIR program, each of whom is responsible for ensuring that SBIR topics meet the mission needs of the particular Mission Directorate."<sup>33</sup>

"Navy Program Executive Offices (PEOs) and Headquarters (HQ) directorates are invited to prepare R&D needs statements. These must address clearly identified technological gaps in critical Navy Research and Development (R&D) or acquisition programs, as well as other Navy objectives." <sup>34</sup>

"(...) new topics are published every six months. Discussion within the agency begins several months earlier, seeking to identify emerging areas of technology."<sup>35</sup>

#### Management

- Agencies tend to have specialised programme managers with strong backgrounds in the commercialisation of technology (e.g. Technology Infusion Managers in NASA, Program Directors in NSF and Technical Points of Contact in DoD). They provide technical advice on the operation of the programme, information on complementary programmes and connections with other firms, universities, national labs and other research organisations.
- Evaluations have highlighted the importance of disseminating best practices.

<sup>&</sup>lt;sup>31</sup> Small Business Administration (2018). *Op. cit.* 

<sup>&</sup>lt;sup>32</sup> See list of references.

<sup>&</sup>lt;sup>33</sup> National Academies of Sciences, Engineering, and Medicine (2016). <u>SBIR at NASA</u>. Washington, DC: The National Academies Press., p. 34.

 <sup>&</sup>lt;sup>34</sup> National Research Council (2014). <u>SBIR at the Department of Defense</u>. Washington, DC: The National Academies Press, p.
 171.

<sup>&</sup>lt;sup>35</sup> National Academies of Sciences, Engineering, and Medicine (2015). <u>SBIR at the National Science Foundation</u>. Washington, DC: The National Academies Press, p. 25.

## Programme design

- SBIR outcomes have been enhanced by the provision of complementary support as part of the programme or other federal and state programmes, including:
  - Commercialisation assistance (usually provided by third-party sub-contractors) and training;
  - Pre-proposal technical consultations, "Phase 0" grants for assistance in proposal preparation;
  - o Business development assistance;
  - o Matching funds for covering patent and equipment costs;
  - Outreach mechanisms to match companies with resources at universities and federal laboratories;
  - Technology accelerator and incubator programmes.
- The US SBIR approach recognises that technology development is not a linear process. It allows for flexibility in the phased design of the programme:
  - Phase 1 awardees are eligible for Phase 2 awards from other agencies;
  - Phase 2 awardees are eligible for a second Phase 2 award;
  - Companies can skip Phase 1 and apply directly for Phase 2 funding;
  - DoE has a Phase 0 pilot programme;
  - Some agencies, such as NIH and DoD, have a fast-track programme that allows companies to apply for Phase 1 and Phase 2 simultaneously to avoid delaying the project between phases;
  - There are various types of "Post Phase Program" (Post Phase 2 bridge funding and Phase 3 awards) designed to bridge the funding gap between the end of SBIR Phase 2 and the start of commercial revenue or investment.

#### Funding

- The value of grants and contracts has been increased to ensure that the amounts are large enough for companies to achieve significant results;
- Increasing funding available for commercialisation assistance and in earlier stages (Phase 1);
- Expanded management resources (through provisions permitting the use of up to 3% of funds for management purposes).

#### **Monitoring and evaluation**

- Evaluations have emphasised the need to improve programme metrics, particularly long-term outcomes such as commercialisation;
- Although participating agencies are obligated to collect information about the projects in a standardised manner, evaluations have recommended the adoption of information management systems for data collection. This is done in order to take advantage of the information for programme management and monitoring.

#### Reach

• Evaluations have highlighted the need to facilitate the participation of businesses that are new to the programme, since established contractors tend to dominate contracts. Some measures suggested in this regard have been the provision of information to prospective applicants on potential R&D partners and encouraging prime contractors to work with SBIR firms to commercialise new technologies.

# Section 4. Conclusions

This brief note has summarised insights into the performance of the UK Small Business Research Initiative (SBRI), nearly two decades after its creation, based on the available evaluations and studies. It also provides a brief overview of the US Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programmes, and it highlights key opportunity areas to enhance the impact of UK SBRI.

The Small Business Research Initiative (SBRI) is a pre-commercial procurement programme that promotes innovation through providing firms with contracts to develop solutions that address public-sector needs and societal challenges. SBRI was established in 2001 in the UK, inspired by the US Small Business Innovation Research (SBIR) programme.

US SBIR seeks to encourage the participation of small businesses in federal R&D funding and, at the same time, to address federal R&D needs that are not covered by universities and large businesses. It operates closely with US STTR, which supports technology transfer between not-for-profit research organisations and small businesses. Both SBIR and STTR follow a phased design. Phase 1 grants awards for assessing the feasibility of projects, Phase 2 grants awards for developing prototypes and Phase 3 provides commercialisation support and advice.

Since its inception, UK SBRI has awarded over £500 million in R&D contracts. According to an evaluation conducted in 2017 by the Manchester Institute of Innovation Research, every £1 awarded through SBRI resulted in a benefit of at least £2.4 to the UK economy. However, the extent to which SBRI-funded projects have resulted in product procurement and commercialisation is still limited. Based on the evidence reviewed, opportunity areas for SBRI were identified in four key dimensions: *(i) policy goal; (ii) programme management and coordination; (iii) funding; and (iv) monitoring and evaluation.* 

A key limitation of this note is that it has relied primarily on existing evaluations and studies rather than on primary research. Future work could focus on characterising projects funded by UK SBRI in terms of their technology focus areas and their contribution to particular innovation goals of funding agencies, in comparison with US SBIR. It would be interesting, for example, to better understand the extent to which research funded by SBRI in one technology has supported the scale-up of other technologies. Finally, future work could be undertaken to better understand the role of technology diffusion programmes such as the Small Business Technology Transfer (STTR), in complementing and enhancing the impact of technology development programmes such as US SBIR and UK SBRI.

## References

- Connell, D. (2017). <u>Leveraging Public Procurement to Grow the Innovation Economy. An Independent</u> <u>Review of the Small Business Research Initiative</u>. Final Report and Recommendations. BEIS.
- Department for Business, Energy & Industrial Strategy (2019). <u>Business population estimates for the UK</u> <u>and the regions 2019</u>. Statistical Release.
- Edler, J. (2016). "The impact of policy measures to stimulate private demand for innovation". In Edler, J., Cunningham, A., and Shapira, P. *Handbook for Innovation Policy Impact*, Ch. 10, Edward Elgar: Cheltenham, pp. 318–354.
- Edler, J., Ruhland, S., Hafner, S., Rigby, J., Georghiou, L., Hommen, L., Rolfstam, M., Edquist, C., Tsipouri, L., and Papadakou, M. (2005). *Innovation and public procurement. Review of issues at stake*. ISI Fraunhofer Institute Systems and Innovation Research, Karlsruhe.
- Edquist, Ch., Vonortas, N., Zabala-Iturriagagoitia, J. M., and Edler, J. (2015). *Public Procurement for Innovation*. Cheltenham: Edward Elgar Publishing Limited.
- Innovate UK (2018a). Annual Report & Accounts 2017/18.

Innovate UK (2018b). SBRI - more than £1 billion pounds in value to UK economy.

- Local Government Association (2017). <u>Encouraging innovation in local government procurement.</u> National Advisory Group report. London.
- Manchester Institute of Innovation Research/ERC/OMB (2017). <u>SBRI Review BEIS Evidence Document.</u> <u>Additional and updated findings to the Manchester/ERC/OMB SBRI Evaluation</u>. Department for Business, Energy and Industrial Strategy.
- Manchester Institute of Innovation Research/ERC/OMB (2015). <u>A Review of the Small Business Research</u> <u>Initiative. Final Report</u>. Manchester Institute of Innovation Research with the Enterprise Research Centre and OMB Research Ltd. Evaluation commissioned by Innovate UK.
- National Academies of Sciences, Engineering, and Medicine (2020). <u>Review of the SBIR and STTR</u> <u>Programs at the Department of Energy</u>. Washington, DC: The National Academies Press.
- National Academies of Sciences, Engineering, and Medicine (2016). STTR: <u>An Assessment of the Small</u> <u>Business Technology Transfer Program</u>. Washington, DC: The National Academies Press.
- National Academies of Sciences, Engineering, and Medicine (2016). <u>SBIR at NASA</u>. Washington, DC: The National Academies Press.
- National Academies of Sciences, Engineering, and Medicine (2016)<u>. SBIR/STTR at the Department of</u> <u>Energy</u>. Washington, DC: The National Academies Press.
- National Academies of Sciences, Engineering, and Medicine (2015). <u>SBIR at the National Science</u> <u>Foundation</u>. Washington, DC: The National Academies Press.
- National Academies of Sciences, Engineering, and Medicine (2015). <u>SBIR/STTR at the National Institutes</u> <u>of Health</u>. Washington, DC: The National Academies Press.
- National Research Council (2014). <u>SBIR at the Department of Defense</u>. Washington, DC: The National Academies Press. <u>https://doi.org/10.17226/18821</u>.
- Rigby, J. (2013). *Review of Pre-commercial Procurement Approaches and Effects on Innovation Compendium of Evidence on the Effectiveness of Innovation Policy Intervention*. Manchester Institute of Innovation Research. Manchester Business School, University of Manchester.
- Rozansky, R. (2019). <u>Becoming America's Seed Fund: Why NSF's SBIR Program Should Be a Model for the</u> <u>Rest of Government</u>. ITIF.
- Sainsbury, D. (2007). *The Race to the Top. A Review of Science and Innovation Policy*.
- Small Business Administration (2020). Leveraging America's Seed Fund.
- Small Business Administration (2018). SBIR AND STTR Annual Report. Fiscal Year 2017.
- Small Business Administration (2014). <u>The Small Business Innovation Research (SBIR) & Small Business</u> <u>Technology Transfer (STTR) Program Interagency Policy Committee. Report to Congress. SBIR/STTR</u> <u>Commercialization</u>. September 15, 2014.

# About us

Cambridge Industrial Innovation Policy is based at the Institute for Manufacturing (IfM), a division of the University of Cambridge's Department of Engineering. CIIP brings together the Centre for Science, Technology & Innovation Policy (CSTI) at the Institute for Manufacturing, the Policy Links Unit from IfM Engage, and the Babbage Policy Forum.

Cambridge Industrial Innovation Policy, 17 Charles Babbage Road, Cambridge, CB3 0FS, United Kingdom

ciip.group.cam.ac.uk





