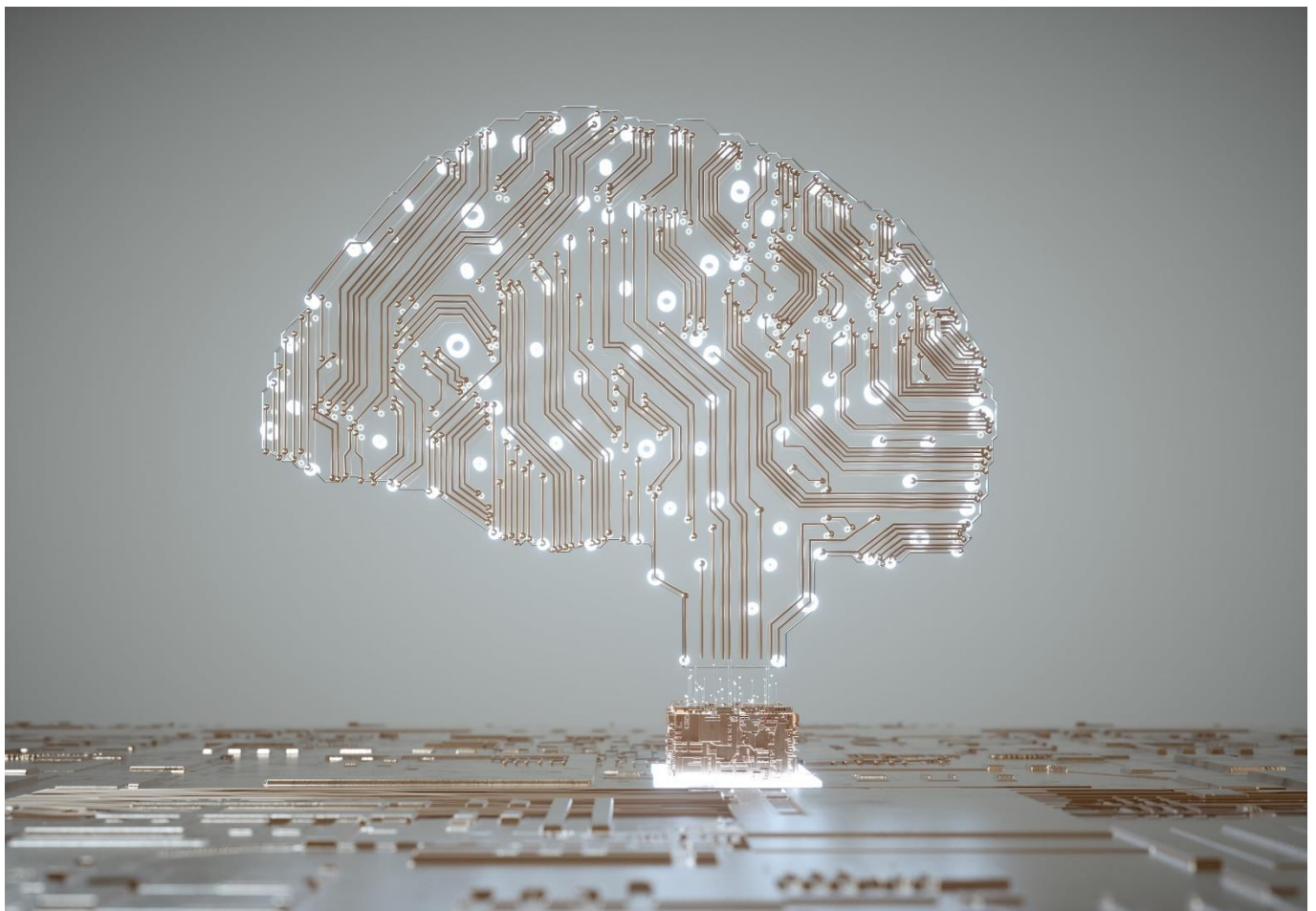



An Evaluation of the Small Business Research Initiative



SBRI Government challenges.
Ideas from business.
Innovative solutions.

An Evaluation of the Small Business Research Initiative



Prepared by:

Steer Economic Development
61 Mosley Street
Manchester M2 3HZ

+44 (0)161 261 9154
www.steer-ed.com

Prepared for:

UK Research & Innovation (UKRI)
58 Victoria Embankment
London
EC4Y 0DS

Our ref: 238-578-01

Steer Economic Development has prepared this material for UK Research & Innovation (UKRI), with inputs from Professor Mark Hart (Deputy Director, Economics and Strategy Group (ESG) at Aston Business School), Geoff White Inc, Velocius Intelligientia Ltd & QA Research. This material may only be used within the context and scope for which Steer Economic Development has prepared it and may not be relied upon in part or whole by any third party or be used for any other purpose. Any person choosing to use any part of this material without the express and written permission of Steer Economic Development shall be deemed to confirm their agreement to indemnify Steer Economic Development for all loss or damage resulting therefrom. Steer Economic Development has prepared this material using professional practices and procedures using information available to it at the time and as such any new information could alter the validity of the results and conclusions made.

Contents

Executive Summary	5
The Scope & Objectives of SBRI	5
Overall Effectiveness & Efficiency of SBRI	5
Overview of SBRI	6
Firm Level Impacts	6
Innovation Impacts	7
Public Sector Impacts	8
Perceptions of SBRI	10
Summary of Recommendations	10
1 Introduction	12
Purpose	12
Introducing the SBRI model	12
Building on the Existing Evidence Base	13
Structure of the Report	17
2 Context, Rationale & Objectives	18
Introduction	18
Context	18
Rationale & Objectives	23
Summary Assessment of Context, Rationale & Objectives	29
3 Adoption, Engagement & Implementation	30
Introduction	30
Characterisation of SBRI	30
SBRI Process	37
Key Success Factors & Learning Lessons	39
SBRI Model Variants	42
Perspectives on Challenges & Barriers to More Widespread SBRI Adoption	43
4 Impacts	46
Introduction	46
Business Impacts	46
Public Sector & Societal Impacts	59
5 Conclusions & Recommendations	67
Overarching Conclusions	67
Conclusions Against the Evaluation Objectives	67
Hypothesis Assessment	69
Recommendations	73

Executive Summary

The Scope & Objectives of SBRI

SBRI is the UK's interpretation of the European Union (EU)'s 'pre-commercial procurement' (PCP) mechanism, primarily targeted at SMEs. It was established by the UK Government in 2001 with a view to emulating the well-regarded US Small Business Innovation Research (SBIR) programme introduced in 1982. The SBRI's objectives were and remain twofold¹:

- 1. Stimulate innovation in the economy by supporting firms to develop and commercialise new technology-based products and solutions; and**
- 2. Provide government departments and their agencies with new, cost-effective, technical, and scientific options and solutions.**

SBRI competitions are run by commissioning authorities (a diverse range of public sector departments and agencies across the UK) to achieve the above aims, through acquiring R&D services from a number of providers who develop, in competition, alternative solutions to address public sector challenges.

Overall Effectiveness & Efficiency of SBRI

The evidence suggests that SBRI is effective in bringing about business growth, public service improvements and societal benefits, by catalysing business innovation.

Where SBRI has been championed and embedded in government departments and agencies, it has encouraged innovation in addressing public sector challenges and brought about improved public services, reduced public sector costs, and increased societal benefits.

In so doing, it has also catalysed firms to take on risks, to design, develop and commercialise new products and services, and to grow their businesses.

SBRI has provided 'win-win' outcomes for the public and private sectors and done so by offering good value for money, generating a benefit cost ratio (BCR) in the range of 1.53 to 4.07 based on firm level benefits alone. Taking account of the non-quantified benefits public sector and societal impacts would further improve this value for money outcome.

*SBRI challenges provide good value for money to the UK taxpayer, with a **benefit cost ratio of 1.53-4.07** from quantified firm level impacts alone. Taking account of the non-quantified benefits public sector and societal impacts would further improve this value for money outcome.*

But it has not done this as intensively or as extensively as it could. There is scope for a significant scaling up of the benefits that it could generate for both the public and private sectors and for the economy and the health of society more generally (whilst still providing good value for money).

¹ Innovate UK (2020), 'SBRI – Transport Priorities Review for UKRI Report'
<https://www.gov.uk/government/publications/sbri-transport-priorities-review-for-ukri-report>

Overview of SBRI

A total of £788million has been awarded through SBRI competitions between 2008 and 2020. There has been a clear upward trend in the take-up of SBRI over this time-period, indicating the impact of its relaunch in 2008 and the profile and fresh impetus it was given in the 2013 Spring Budget.

There is a diversity of delivery models and resourcing arrangements for SBRI adoption and deployment. This reflects the huge variations in the scale of resource and expertise across SBRI sponsor departments.

The Ministry of Defence (MOD) and Defence and Security Accelerator (DASA), the Devolved Administrations (DAs) and the NHS account for 65% of SBRI competitions to date, with MOD and DASA alone running 36% of all competitions.

The majority of SBRI competitions are Phases 1 (Feasibility) and Phase 2 (Prototype/Product Development), with only a very limited number of formal Phase 3 SBRI competitions.

93% of all competition applicants are based in the UK. 85% of applicants are private companies, while around 9% are academic organisations and 2% are not-for-profits. Of the private firm applicants, micro firms make up 40%, followed by small firms, 23%, and large firms, 14%. Medium sized enterprises constitute the smallest proportion at just 8% of total applicants.

A high proportion of applicants are based in the South of England, 45%, following by the Midlands, 22%, and then the North, 16%. Scotland, Wales, Ireland, and international applicants each make up 5% or less of total SBRI applicants.

Firm Level Impacts

SBRI can and does have positive impacts on participating business performance. It does so by prompting firms to push at the boundaries of risk and uncertainty that constrain what they could normally do. A significant majority of firms reported that SBRI enabled them to explore and develop innovation in ways that would not otherwise have happened – either not at all, or not at the same scale, pace and/or quality.

In doing so, SBRI enabled firms to hire/retain staff to conduct project development, provided a possible route to procurement and commercialisation, and gave them the opportunity to develop and sell the solution or derivative products/services to a wider market.

As might be expected, the innovative solutions developed through SBRI funding did not always turn out as successes. But they proved to be successful enough to generate substantial impacts on business performance overall compared with what otherwise would have happened. According to the businesses themselves, SBRI funding induced an additional and cumulative increase in turnover of over £1bn. A high proportion of these benefits was represented by a limited number of participating businesses, with turnover impacts being more frequently claimed by young, small firms in the professional or digital sectors.

The econometric (Counterfactual Impact Evaluation) assessment of the benefits demonstrated a statistically significant impact of SBRI participation on employment to the extent of an average 9.4% increase in headcount over 2019-2020 compared with firms who had not received SBRI funding. No statistically significant impact was found on either turnover or productivity, but this is not an untypical finding, with many factors possibly affecting this outcome including a potential lagged effect noted in the literature, limitations in the numbers of observations, and potentially an effect that is too small to be distinguished from ‘noise’ in the data.

*Firms participating in SBRI competitions experienced an average growth in their organisations at an average **increase in employees of 9.4% in 2019-2020**, compared with firms who had not received SBRI funding.*

A broad range of wider business benefits arising from SBRI can be drawn from across the evaluation evidence. These include: access to new markets and diversification of a firm's offer; increased collaborative relationships with public sector and academia; increased publicity and recognition for a firm's innovation, reinforced by the 'stamp of approval' that working with public departments and academia brings; and attracting follow-on funding to further develop and commercialise their products – nationally and internationally.

Innovation Impacts

SBRI is deployed in many different contexts, stimulating a diverse portfolio of technological innovations and the development of new products and services to address wide-ranging public-sector challenges and societal needs. Examples of the breadth of innovations SBRI has enabled are outlined below.

COVID-19 Speed Cleaning Ambulances (2020)

Challenge Owner: Welsh SBRI Centre of Excellence on behalf of Welsh Ambulance Service



The COVID-19 outbreak placed immense pressure on the Ambulance Service. Ambulances need to be thoroughly cleaned once a patient with suspected COVID-19 has been transported, leaving ambulances off the road and out of use. Hygiene Pro Clean developed an effective decontamination system that uses ultrasonic atomisation to kill COVID-19 at pace without damage to the ambulance equipment.

Metal Extraction from Water Flows (2015)

Challenge Owner: Natural Resources Wales, Welsh Government



This competition aimed to assess cost effective technologies to remediate pollution from metal mine sites in steep upland terrain with a lack of infrastructure, such as transport and power. Elentec's solution focussed on electrochemical coagulation to extract metal from polluted water bodies. The solution was successful in field trials and met the needs of a small scale, versatile system, that performed well in extracting metal from the most concentrated discharges in Wales.

Tree Seed Challenge (2019)

Challenge Owner: CivTech Scotland & Forestry Land Scotland



This competition was launched to find new ways to make better use of Scotland's tree seed bank through more efficient tree growing processes. Cumbria Tree Growers developed TreeTapes which adapts the latest technology from the vegetable growing industry to produce tree seedlings, providing a more efficient growing system. The tape is comprised of pockets of coir and peat between layers of biodegradable paper tape to form a ribbon of cells, with a fully automated process for sowing the seeds into.

Child Health – Restoring Function (2017)

Challenge Owner: SBRI Healthcare



This competition was launched to support self-care and independence for children with long term conditions, specifically through restoring limb function. Open Bionics developed their multi-grip myoelectric bionic hand using 3D scanning and printing technology, the Hero Arm, that comes in three sizes to fit children aged 8 – 17 and with customisable prosthetic covers based on popular characters from films such as Iron Man, Frozen and Star Wars.

CRACK IT Challenge 23 – Retina 3D (2016)

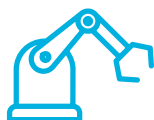
Challenge Owner: National Centre for the Replacement Refinement & Reduction of Animals in Research



This challenge was launched with the aim of establishing a human 3D retinal cell model to replace the use of animals in the discovery and development of new ophthalmologic drugs. Newcell Biotech's Retina In Vitro Model was successfully developed throughout the competition – a human 3D retinal cell model that consists of all the major cell types of the retina.

Last Mile Resupply (2017)

Challenge Owner: Defence and Security Accelerator (DASA)



Defence logistics operations were identified as being inefficient, resource intensive and vulnerable to attack. DASA wanted to develop an innovative, faster, more flexible, and autonomous system. Horiba Mira were already developing their 'Viking' vehicle for MoD/DASA, but through this competition were enabled to develop new autonomous software for their existing Viking product with stealth and AI technology that allows for the off-road routing, navigation of terrain, with reduced risk of detection.

First of a Kind 1 – Demonstrating Tomorrow's Trains Today (2017)

Challenge Owner: Department for Transport



First of a Kind competitions are used by DfT to catalyse transformational innovation and increase commercialisation of new technology in the railways. Transreport developed 'Passenger Assistance' – a smartphone app enabling real-time assistance for rail passengers with specific needs, allowing them to place requests in advance for assistance they may require at stations or in-carriage, reducing the additional difficulties passengers with disabilities face when travelling by train.

Northern Ireland Business Rates (2016)

Challenge Owner: Northern Ireland Department of Economy on behalf of Belfast City Council



Across Northern Ireland, vacant commercial premises are eligible for 100% business rates relief, but inaccuracies in current periodic inspections left premises incorrectly logged as vacant. NQuiring Minds developed a data analytics solution to better inform assessment of occupancy of commercial premises, including by whom and for how long.

Reducing Childhood Obesity (2017)

Challenge Owner: Welsh Government



Childhood obesity increases lifetime risk of many serious health conditions, and across Wales, there is a childhood obesity crisis. Lack of nutritious food and drink options was reported as a key determinant. Bug Farm Foods developed VEXo, a meat alternative product made from insect and plant protein, and Pennotec developed MilaCel, a fat-replacing ingredient made from the cider industry's apple waste to improve the nutritional composition of foods, while having wider environmental sustainability benefits too.

Public Sector Impacts

The biggest challenge for this evaluation (and indeed for previous assessments in the UK, US, and other international literature) is quantifying public sector impacts as these are typically long-term, not monitored systematically by the competition owners, largely conditional on adoption, often indirect and need to account for supplementary funding outside of SBRI.

In the absence of robust data, it has not been possible to quantify public sector impacts. This does not mean that the potential for SBRI to deliver public sector impacts is less important than its potential for firm level impacts. It is simply that these impacts are harder to measure.

The majority of departments/agencies consulted with have not been able to provide data on quantified public sector impacts. In the absence of robust data, it has not been possible to quantify these impacts akin to our approach/findings on firm level impacts. This does not mean that the potential for SBRI to deliver public sector impacts is less important than its potential for firm level impacts. It is simply that these impacts are harder to measure, and, at least in part as a consequence of this, there is less data/evidence available. If these impacts could be quantified and taken into account within cost-benefit calculations, the value for money position of SBRI would be significantly improved.

What evidence does exist suggested the benefits could be considerable in public sector cost savings and, in some cases, the potential to increase public revenue streams. There was also strong qualitative evidence of enhanced customer/user outcomes (e.g. improved health outcomes) generated through higher quality and/or better targeted services which can help to reduce demand for other public services resulting in further, indirect cost savings (e.g. SBRI Healthcare evidence of future cumulative cost savings of £1.2bn-£1.8bn in ten years).

Government departments/agencies that have championed and embedded SBRI in their processes and systems have seen changes in culture and behaviour, encouraging greater levels of innovation in public service design and delivery and stronger collaboration with private sector partners. This has been accompanied by a deeper understanding within the public sector of the incremental nature of innovation and the complexity of the innovation process. It has increased skills and capabilities and enabled departmental/agency teams to better understand and deploy new technologies, such as AI & Big Data, to deliver innovative solutions.

Departments that have championed and embedded SBRI in their processes & systems have seen changes in culture and behaviour, encouraging greater innovation in public service design and delivery.

Qualitative evaluation evidence also identified wide ranging social, economic and environmental impacts having been generated by SBRI, including:

- **Improved health outcomes** – spanning accelerated and more effective diagnosis, improved clinical outcomes as well as wider public health impacts;
- **Environmental sustainability** – supporting net zero ambitions through: deployment of energy efficient technologies; catalysis of more environmentally sustainable behaviour change; and addressing wider environmental issues such as pollution and congestion;
- **Addressing inequalities & improving quality of life** – by improving the quality of services and/or opening up access to these improved services to disadvantaged groups;
- **COVID-19 response & recovery** – generating innovative solutions to aid pandemic response and recovery and supporting wider economic and societal resilience;
- **Animal welfare** - primarily through the NC3R initiatives, reducing the need for and scale of animal testing; and
- **National security & public safety** – modernising and strengthening the armed forces, through DASA's SBRI initiatives, and also through initiatives designed to improve emergency services.

However, the evaluation evidence confirmed the findings of the Connell Review that a more systematic, embedded SBRI programme management process is needed across a wider range of departments and agencies for the full benefits of SBRI to be seen and be realised. SBRI could also be more intensively and effectively adopted even within those departments and agencies that embrace it, for example, by closer alignment between SBRI and mainstream procurement practice.

Perceptions of SBRI

Overall, applicants' experience of SBRI varies depending on department, whether they were successful or unsuccessful, and the stage of the process. However, the vast majority reported positive perspectives regarding the SBRI process.

The key factors apparent in the successful deployment of SBRI competitions include: the ability to adapt the model to a wide range of public sector challenges; the de-risking of the process of developing a new solution for firms; and close engagement, collaboration and greater knowledge sharing between silos to support the creation of a bespoke solution.

The key lessons learned that have emerged include: prominent barriers to procurement and adoption of solutions developed; the need for greater recognition that innovative product/service development is often incremental, taking time to reach commercialisation; SBRI competitions require extensive departmental administrative resource; and challenges are present in scaling up adoption of innovations across the public sector.

There is general consensus that when operationalised, the SBRI model works effectively. It is therefore important to understand why the model has not been more widely adopted.

There is general consensus across stakeholders - both firms and competition promoters – that when operationalised, the SBRI model works effectively over Phases 1 and 2. It is therefore important to understand why the model has not been more widely adopted. There are far reaching challenges and barriers to more widespread adoption of SBRI which include: systemic cultural and structural barriers to innovation across Government; a lack of SBRI leadership, accountability and data; and low levels of awareness of the model and challenges in bridging disconnected innovation, policy, operational and procurement teams.

Summary of Recommendations

The evaluation evidence points towards a set of guiding principles within which to frame recommendations:

- *Capitalise on the opportunity* – SBRI provides a major boost to UK innovative capability and commercialisation to an extent that has already generated a healthy cost-benefit ratio in the use of public funds even when longer-term and wider impacts have not been included in the estimated impacts;
- *No need to reinvent the wheel* – the SBRI model is not broken and does not need fixing, however, it should continue to evolve. The flexibility of SBRI in terms of how it is delivered and for what purposes – spanning both policy and operational goals – is a virtue;
- *Fresh impetus must be sustained* – the key challenge for SBRI is not its operating model or potential for impact, but the limited traction it has had within many parts of the public sector due to the well-recognised structural barriers it faces. A step-change in SBRI profile and deployment is unlikely to happen organically;
- *Carrots and sticks are both required* – drawing on learning from past attempts to raise the profile and take-up of SBRI, it is clear that SBRI's forward strategy must combine and balance incentives and accountability; and
- *Not all departments/agencies are equal in the context of SBRI* – SBRI operates in very different departmental/agency contexts and circumstances. The next phase of SBRI deployment should

therefore seek to target (albeit not exclusively) the department/agencies with the greatest SBRI potential.

Within this framework the following headline recommendations are proposed for SBRI going forward:

- **Strategic leadership & funding** – More extensive and intensive adoption of SBRI would be beneficial and will require leadership from the Centre as well as from within individual departments and agencies. It will also require incentives and resources to overcome entrenched and persistent barriers to innovation;
- **Monitoring & accountability** – SBRI's monitoring framework and the quality of output and outcome data available need to be upgraded, rendered more systematic and consistent to increase understanding, promotion, and take-up of SBRI;
- **Joining up SBRI, keeping its flexibility** – SBRI needs to be maintained as a flexible policy instrument but also needs to be more joined up to share and, where appropriate, transfer and/or roll out good practice across the SBRI 'family'; and
- **Raising awareness, capabilities & capacity** – There is a need to raise understanding of SBRI as a tool for developing innovative public policy and operational solutions through a package of promotional and training activities to address skills and resource gaps and siloed working across procurement, policy, and innovation teams.

These recommendations take into account the current policy and regulatory context for SBRI; not least the need for innovative solutions to drive the post-pandemic recovery and the redrawing of procurement regulations following EU Exit. It seems clear that SBRI could play an augmented role in supporting recovery and improving public services, and in ensuring that public procurement plays an important role in delivering the UK Government's recent Innovation Strategy. With the right combination of leadership, strategy, and funding, SBRI has the potential to positively influence the wider public sector innovation system, not simply operate within it.

1 Introduction

Purpose

- 1.1 In Spring 2020, Steer Economic Development (Steer-ED) and partners including Professor Mark Hart (Deputy Director, Economics and Strategy Group (ESG) at Aston Business School), and specialist survey firm, Qa Research were commissioned by UK Research and Innovation (UKRI), to evaluate the Small Business Research Initiative (SBRI).
- 1.2 This is the final evaluation report, drawing together the different strands of evidence collated over the 18-month evaluation period. It provides analysis, findings, and recommendations structured around a logic model approach, with a clear emphasis on impacts over process.

Introducing the SBRI model

- 1.3 SBRI is the UK's interpretation of the European Union (EU)'s 'pre-commercial procurement' (PCP) mechanism, primarily targeted at SMEs. PCPs are distinguished from other procurement-driven innovation models because of how the commissioning authority "*acquires R&D services from a number of providers who develop, in competition, alternative solution approaches to address one and the same problem of public interest faced by the procurer*"². With SBRI the UK PCP, the term SBRI will be used hereon in, the latter PCP terminology will only be used when referring to generic or EU or wider international countries' practices.
- 1.4 The backstory to SBRI is explored more fully in Section 2. It was established by the UK Government in 2001 with a view to emulating the well-regarded US Small Business Innovation Research (SBIR) programme introduced in 1982. The SBRI's objectives were and remain twofold³:
 - Stimulate innovation in the economy by supporting firms to develop and commercialise new technology-based products and solutions; and
 - Provide government departments and their agencies with new, cost-effective, technical, and scientific options and solutions.
- 1.5 There is significant variation in how different departments and/or procuring agencies refer to, interpret, and deploy SBRI. It is an adaptable and flexible model that can be used by a wide range of departments and agencies to suit their needs. While some departments utilise established SBRI guidance, procedures, and branding, like UKRI and the NHS, others such as the Scottish Government's Civtech Catalyst and Cabinet Offices' GovTech Catalyst have chosen to design and brand their own versions of SBRI in light of their particular circumstances and objectives.

² European Commission (2015), 'Quantifying the impact of PreCommercial Procurement (PCP) in Europe based on evidence from the ICT sector'

https://ec.europa.eu/information_society/newsroom/image/document/2015-44/final_report_published_11779.pdf

³ Innovate UK (2020), 'SBRI – Transport Priorities Review for UKRI Report'

<https://www.gov.uk/government/publications/sbri-transport-priorities-review-for-ukri-report>

- 1.6 In undertaking this evaluation, we have not limited our research to the SBRI brand alone but have sought to draw learning on SBRI in the round, including flexible SBRI models that may adopt different branding in the UK, as well as from international experience as revealed from the literature review (see Appendix E).

Building on the Existing Evidence Base

- 1.7 There is a substantial body of literature on the UK SBRI and the US SBIR and also on procurement-driven innovation policies more generally. The literature review undertaken as part of this evaluation is presented as a standalone output in Appendix E, with key findings integrated throughout this report.
- 1.8 Critically, within the context of this evaluation, the SBRI model was independently evaluated in 2015⁴ by the Manchester Institute for Innovation Research and subsequently the ‘Connell Review’ of SBRI (an Independent Review led by David Connell) was published in 2017⁵, supported by an update of the evidence base by BEIS.
- 1.9 This current evaluation seeks to build on and complement the 2015 evaluation, with a primary, although not exclusive, focus on the period 2015–2020. However, due to the differences in the methods deployed and the relatively limited evidence base and sample sizes upon which the 2015 Study drew, the quantitative impact findings from the two studies are not additive and not directly comparable without adjusting for their differences.

Objectives

- 1.10 The evaluation pursues three main lines of enquiry:
1. An assessment of the impact of SBRI in the round, including an assessment of its impact on the behaviours and attitudes of public sector commissioning departments and agencies relating to demand-led innovation, as well as the cost savings to public bodies resulting from the use of SBRI outputs;
 2. A review of the extent to which participating in SBRI activity helps business participants in bringing to market new products or services, and/or in using new processes which contribute to improved business performance; and
 3. An examination of the extent to which SBRI-funded projects have led to other additional beneficial changes in participating businesses and government departments and/or wider societal impacts.

Approach

- 1.11 The approach deployed for this evaluation is grounded in Green and Magenta Books’ guidance on appraisal and evaluation good practice, adopting a mixed-methods approach designed to test a clear theory of change that underpins and drives the logic model for the evaluation (presented in Appendix A).
- 1.12 The following packages of hypotheses have been developed around the key dimensions of the logic model to provide a clear and testable framework for the evaluation:

⁴Rigby, J., Roper, S., Cunningham, P., Li, Y., Yeow, J., Edler, J., & Cox, D. (2017). ‘A Review of the Small Business Research Initiative. A report commissioned by Innovate UK’

⁵ Connell, David (2017). ‘Leveraging Public Procurement to Grow the Innovation Economy’. London, UK: Department for Business, Energy & Industrial Strategy (BEIS).

Design, strategy, and governance

H1. SBRI is the most appropriate intervention (relative to the other models that exist) to both stimulate innovation in the economy and provide government with new, cost-effective, technical, and scientific options and solutions.

H2. SBRI is viewed in government as a clearly defined mechanism for facilitating public sector innovation via procurement.

H3. SBRI is viewed in government and business as an initiative supporting business innovation.

H4. SBRI has become a primary tool for delivering departmental objectives through innovation.

Delivery, implementation and outputs

H5. SBRI improves the culture, procedures, knowledge, and skills by which public officials assess the challenges they face or might face and procure/manage business innovation to address them.

H6. SBRI helps business to better understand public sector innovation requirements and the nature and extent of skills within government.

H7. SBRI helps businesses to better understand public sector procurement processes for inducing innovation.

H8. SBRI helps businesses to increase TRLs and de-risk innovations in ways that have a stand-alone option value irrespective of eventual adoption and use.

H9. SBRI allows businesses to develop new business models and/or start-ups created to exploit technological advances.

Outcomes, impacts and value for money

H10. SBRI has generated new technologies and innovations that benefit the public sector, taxpayers, citizens, and the community in reduced costs and/or higher quality or new services and better quality of life.

H11. SBRI has generated new technologies and innovation that bring private sector benefits in increased sales and employment, profits, and wages.

H12. SBRI generated wider positive impacts (e.g. intellectual property, spin-offs, enhanced skills) and without significant displacement effects.

H13. SBRI led to sustained and useful interactions between departments and businesses and, to a lesser extent, improved business and HEI collaborations.

H14. SBRI met its objectives with effective and efficient allocation and use of resources, funding and accountability systems and procedures.

H15. SBRI has generated overall returns or total benefit cost ratios that meet or exceed required levels (cost-benefit) and/or value for money in the use of public funds (cost-effectiveness).

- 1.13 A more detailed summary of the hypotheses is presented in Appendix A and the findings from hypothesis testing are set out in the final Section on Conclusions & Recommendations.

Scope & Methods

- 1.14 The evaluation process comprised four core stages:

1. *Data Diagnostic & Framework Development:* An assessment of data adequacy from the UKRI and departmental monitoring datasets, the cleaning and synthesis of available data and the

development of an impact evaluation framework that updates the SBRI logic model⁶ and translates it into a set of testable hypotheses to deploy across the evaluation research;

2. *Research & Instrument Specification*: A review of the available literature (UK and international) and the design of key evaluation tools including the telephone survey sample selection and design for the SBRI beneficiary and non-beneficiary surveys, case study questionnaire and template design and the specification of a matched data counterfactual method;
3. *Evidence Collection & Collation*: Carrying out the computer-assisted telephone interview (CATI) survey with 677 respondents, the selection and undertaking of 12 case studies, the delivery of matched data counterfactual impact evaluation using econometric analysis, and the undertaking of 31 consultations with relevant UKRI & departmental leads an independent experts; and
4. *Analysis & Reporting*: Analysis of findings from the mix of methods outlined above (surveys, counterfactual impact assessment, case studies, literature review and consultations) discretely and collectively, and the testing of the developed hypotheses against these findings.

1.15 Findings from across the various strands of evidence are considered and integrated within each section of the Report. There are significant nuances to each of the evaluation methods, with variations in approach, scope (including study period and quotas), design, and data limitations. Further detail for each of the respective strands of evidence are presented in the following appendices:

- **Impact Evaluation Framework (Appendix A)** – a detailed specification of the impact evaluation framework methodology, including the logic model update and the hypotheses to be tested;
- **Monitoring Data (Appendix B)** – assessment and analysis of the monitoring data used in the evaluation and the associated data limitations;
- **Consultations (Appendix C)** – an overview of the scope and structure of the semi-structured consultations undertaken with operational and strategic leads;
- **Survey (Appendix D)** – explanation of the scope and samples for each of the beneficiary and non-beneficiary surveys, the overview of the methodology underpinning this, alongside an overview of the survey scripts, as well as provision of additional survey analysis and the assumptions made to estimate impacts and value for money;
- **Literature Review (Appendix E)** – an account of the UK and international sources identified and the key findings that emerged from their review;
- **Case Studies (Appendix F)** – full accounts of the 12 case studies which demonstrate the range of SBRI uses across departments and agencies, the innovations and impacts they give rise to, as well as an overview of the methodology for case study selection and fieldwork; and
- **Counterfactual Impact Assessment (Appendix G)** – Professor Mark Hart’s (Deputy Director, Economics and Strategy Group (ESG) at Aston Business School) report, specifying the methodology for the counterfactual analysis, the data limitations, and assumptions made to estimate SBRI impacts.

Key Evaluation Challenges & Limitations

1.16 The evaluation tackled a number of challenges, some more successfully than others. These have shaped and to some degree limited the evaluation process and/or its findings.

⁶ BEIS (2017), ‘SBRI Review – BEIS Evidence Document: Additional and updated findings to the Manchester ERC/OMB SBRI evaluation’

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/662366/SBRI_review_-_BEIS_evidence_document_20171120.pdf

The dispersed and diverse nature of the SBRI model

- 1.17 SBRI is a procurement mechanism interpreted and deployed variably across government departments and agencies. It is not a programme with clearly defined governance and accountability arrangements, objectives, dedicated resources, and target outputs and outcomes. Beyond the advisory and advocacy role of UKRI, providing guidance and support to other public sector bodies to utilise SBRI, there is limited centralised ‘ownership’ of SBRI in the sense of centralised co-ordination and systematic monitoring of its impact across the board or in the sense of adoption and championing of SBRI within individual departments and agencies.
- 1.18 The highly dispersed nature of the model raises significant challenges for an evaluation of this scale in terms of the multifaceted contexts of each department and competition, the availability of data (explored further below) and the targeting of stakeholder engagement.

Performance monitoring data quality and availability

- 1.19 As SBRI is a dispersed procurement mechanism with no set targets or budgets, performance data is not collated centrally across departments and agencies nor even systematically within many individual departments. Data availability is limited and variable in terms of both process and impact, particularly the latter (explored further below). The data challenges and deficiencies around SBRI have been long recognised – highlighted in both the 2015 evaluation and Connell Review – but have not been addressed or corrected.
- 1.20 Currently, UKRI centralises data collection to an extent across SBRI competitions that are UKRI-led and department-led, but it is optional for any department or agency to provide SBRI data to UKRI. As such, there is no single record of SBRI applicants nor is there a single record of SBRI beneficiaries. Challenges around GDPR and the sensitivity of company and competition information add another layer of complexity to data collation. The quality of UKRI held data has been a challenge for the evaluation but one that has been addressed as far as possible. A separate output from the evaluation is a consolidated database of awards for UKRI to use, moving forwards.
- 1.21 Where data is collected centrally, this focuses on competition and applicant descriptive data and funding, i.e. the number and names of applicants, the date of the competition, the location and contact details of applicants, and the total amount of funding awarded. Efforts are made by some – notably SBRI Healthcare, through its annual report – to monitor and quantify impacts in a systematic fashion. However, the overall SBRI performance monitoring evidence base is patchy and low quality – reflecting the absence of clearly defined targets and key performance indicators.

Limitations of evaluation evidence of firm and public sector impact

- 1.22 The data around SBRI impact is highly limited, with data not captured systematically at either firm level or in terms of public sector effectiveness and/or efficiency savings. Firm engagement in the beneficiary survey was lower than originally anticipated and therefore the sample of firms surveyed cannot be taken as representative of the population as a whole. These challenges, alongside the findings and limitations of the econometric counterfactual analysis, are explored in Section 4.
- 1.23 The biggest challenge for this evaluation (and indeed for previous assessments in the UK, US, and other international literature) is quantifying public sector impacts as these are typically long-term, not monitored systematically by the competition owners, largely conditional on adoption, often indirect and need to account for supplementary funding outside of SBRI.
- 1.24 Given these limitations, the causal relationship between SBRI funding and public and private sector impacts is difficult to assess. It was necessary to take a layered approach using evidence from the

econometric counterfactual analysis of impacts, the self-reporting of benefits and additionality from the survey of beneficiaries and non-beneficiaries, and the case studies.

Structure of the Report

1.25 The rest of this report has the following sections:

- **Section 2:** presents the SBRI model's context, rationale, and objectives;
- **Section 3:** details its adoption, engagement, and implementation;
- **Section 4:** assesses its outcomes and impacts; and
- **Section 5:** sets out the conclusions and recommendations from the evaluation.

2 Context, Rationale & Objectives

Introduction

- 2.1 This section sets out the overarching context, rationale, and objectives of the SBRI model and drills down to explore the differing rationales and objectives across individual departments and agencies in deploying the model. It goes on to consider the motives of beneficiary firms in participating in SBRI competitions. The analysis draws together a range of evidence sources, including: The Evaluation Framework (Appendix A); the consultations with SBRI operational and strategic departmental/agency leads (Appendix C); the survey of businesses (Appendix D); and the literature review (Appendix E).

Context

The Emergence of Pre-Commercial Procurement Models

- 2.2 Over the last 30-40 years, governments in an increasing number of countries have sought to use their procurement of R&D goods and services not only to meet societal needs and challenges but also to promote innovation in business by supporting firms to develop and commercialise new technology-based products and solutions, particularly in SMEs. Pre-commercial procurement (PCP) initiatives have been seen as a key vehicle to achieve these objectives.
- 2.3 The SBRI process can be defined by three distinct phases, outlined below. SBRI competitions are often followed by a commercialisation and adoption process to diffuse and implement the new products and service. This commercialisation is commonly referred to as a more formalised Phase 4 across EU literature, though this is distinct to the pre-commercial activity.⁷:
- **Phase 1 - Solution design:** In the design phase, one or more designs can be developed by which the competition aim could possibly be achieved;
 - **Phase 2 - Prototype development:** A draft of the product or service that gives commissioners (and partners) the ability to explore the idea and demonstrate features before investing in the product's complete development; and
 - **Phase 3 - Development of limited volume** test products or services.
- 2.4 The development of many PCP initiatives throughout Europe has largely been following the lead set by the US government which introduced the Small Business Innovation Research (SBIR) programme in 1982. The SBIR was clearly seen as an attractive and effective intervention because it was re-authorised by Congress on a regular basis (in 1992, 2000, 2011 and 2016). This prompted other governments to follow suit and introduce similar policies.
- 2.5 There are, however, important differences between the aims, design, and implementation of SBIR and other PCP initiatives. Figure provides a comparison between the UK SBRI and the US SBIR.

⁷ Bos, L. (2020) European Commission DG CONNECT F3 unit, 'Update on results from completed and ongoing FP7 and Horizon funded pre-competitive contracts (PCPs)' <https://wbc-rti.info/object/news/21377/attach/ResultsEUfundedPCPsstatusAug2020pdf.pdf>

Figure 2-1: Comparing SBIR and SBRI**Comparing SBIR and SBRI**

UK government has not necessarily followed the detail of the US model in its operational mechanisms or even with respect to its primary purposes. It also operates in the different national context of general procurement policies and methods directed at promoting innovation. Key differentials for the UK SBRI compared with the US SBIR⁸ include:

- **Government objectives:** UK SBRI's has an additional and core objective to provide government departments and their agencies with new cost-effective, technical, and scientific solutions;
- **Business demographics:** Despite its title, the UK SBRI can engage any organisation including businesses of any size, pre-start-ups, universities, and charities, whereas the target businesses of the SBIR are small firms defined as being for-profit companies with 500 employees or less and at least 51% commercially owned by US citizens or permanent residents;
- **Commercialisation support:** UK SBRI is clearly focussed on Phase 1, concept development/feasibility studies and a Phase 2, prototype development. The US SBIR places far greater emphasis on Phase 3, commercialisation phase (though these are not funded from the SBIR budget). By comparison, the UK SBRI does not have a consistent Phase 3 and it is only available in some areas for an extended field trial/research study to robustly evaluate an emerging technological solution;
- **Budget/resourcing:** The budget for the US SBIR is set by United State Congress requiring all federal departments and agencies with external R&D budgets that exceed \$100m to allocate a portion of those budgets to SBIR activities. This target portion was set at 3% in 2016 and this is a mandatory requirement. Whilst the UK SBRI budget was set at 2.5% of external R&D to be spent with SMEs with an overall target of £50m, this is not a mandatory requirement; and
- **Data and monitoring:** US SBIR competitions are required to share data centrally and information is then published on a free public database, contrasting with less centralised and systematic monitoring data capture, and reporting of SBRI competitions in the UK.

Source: Steer-ED, 2021

- 2.6 As outlined in Section 1, PCPs are distinguished from other procurement-driven innovation programmes because of the distinct characteristic that the commissioning authority “*acquires R&D services from a number of providers who develop in competition alternative solution approaches to address one and the same problem of public interest faced by the procurer*”⁹ with any intellectual property rights granted to or shared with the providers.
- 2.7 Drawing on findings from the literature review, it is useful to distinguish PCP programmes from, and not conflate with, the following:
- **Public procurement of innovative solutions (PPI)** where commissioning authorities act as lead customer by procuring innovative solutions (not the R&D to develop them) that are newly arriving on the market but not yet available on a large-scale commercial basis;
 - **Exclusive R&D services** procurement by which all benefits accrue exclusively to the commissioning authority and R&D costs are fully remunerated by them;
 - **Innovative partnerships** that combine the purchase of R&D services and the subsequent supply of commercial volumes of the end-products/services into one procurement procedure; and
 - **Competitive dialogue:** a process in two parts by which the commissioner talks to potential suppliers about the specification and terms and conditions and, after the dialogue closes, a

⁸ US SBIR Objectives <https://www.sbir.gov/about>

⁹ Bedin, S. et al for the European Commission: DG Communications Networks, Content & Technology (2015). ‘Quantifying the Impact of Pre-Competitive Procurement (PCP) in Europe based on Evidence from the ICT Sector’ https://ec.europa.eu/information_society/newsroom/image/document/2015-44/final_report_published_11779.pdf

second part when the normal procurement conditions apply with no dialogue between contractor and bidders.

The Evolution of SBRI in the UK

- 2.8 The UK Government established the SBRI in 2001 with a view to emulating the perceived success of the US SBIR. Take-up of the programme was initially low with activity mostly concentrated within two Research Councils, Biotechnology and Biological Sciences Research Council (BBSRC) and Engineering and Physical Sciences Research Council (EPSRC). Despite some recognised successes, both research councils discontinued their SBRI programmes in 2006 following a decision by Research Councils UK that funding businesses was outside a Research Council's statutory authority. In the 2005 Spring Budget, a commitment to deliver £100m of R&D SBRI contracts a year was set out through targeted spend across key departments. However, in practice, with no allocated funding for departments to progress this activity and no accountability or monitoring of SBRI activity, SBRI failed to gather sustained momentum and there was limited SBRI take-up across different departments at this point.
- 2.9 SBRI was relaunched in 2008 with resources committed from the Technology Strategy Board (TSB - now Innovate UK) and the Department of Trade and Industry to support SBRI take-up (although there were still no clear targets set for this). Two SBRI pilots were initially launched, on Defence and Health, jointly funded by TSB. These pilots and the wider centralised funding pot helped to seed SBRI within a number of government departments and increased SBRI related capacity and capability within the TSB team.
- 2.10 Fresh impetus for the SBRI model was given in the 2013 Spring Budget to elevate the profile and take up of SBRI, establishing an initial target of £100m spend across departments, increasing to £200m in the following year. However, no centralised funding was provided to incentivise take-up and the spend targets were not actively monitored.

“...the way in which SBRI has been funded and managed varies widely across Government and there is a lack of central, and sometimes departmental, ownership. It is effectively an ‘orphan policy’”. Connell Review, 2017

- 2.11 The 2017 Connell Review further examined the challenges, opportunities, and impact of SBRI, providing a series of recommendations geared towards embedding the model across government in a ‘substantive, enduring and effective manner’¹⁰. It is notable that many of the issues and challenges surrounding SBRI, identified by both the 2017 Review (and the previous, 2015 Evaluation), persist today. They include, for example: cultural barriers and risk aversion in government procurement; disconnect across procurement, policy and innovation teams; lack of leadership, capability, expertise and awareness; lack of incentive and resource to unlock and enable innovation; poor quality data and evidence of impact. These recurring themes, and more besides, are explored in detail in subsequent sections of this report.
- 2.12 It is also notable that the key recommendations from the Connell Review, although generally deemed to have been well received at the time, have largely not been implemented. Timing is likely to have been an important factor here, with Government resource, and in particular BEIS (UKRI's sponsor Department), focussed on Brexit negotiations and subsequently COVID-19 response and

¹⁰ Connell, David (2017). ‘Leveraging Public Procurement to Grow the Innovation Economy’. London, UK: Department for Business, Energy & Industrial Strategy (BEIS).

recovery. However, in the absence of a renewed policy emphasis to address these persistent issues and challenges, it is not surprising that SBRI remains (as Connell described it) as an ‘orphan policy’.

- 2.13 In spite of these challenges, SBRI take-up has grown, and a range of alternative delivery models has emerged (explored more fully in later sections of this report), reflecting the flexibility of the mechanism and the different needs of sponsor agencies/departments. However, whilst all government departments have engaged with SBRI in some form, take-up has been highly variable across the public sector as a whole and the SBRI model has remained at the margins of procurement and innovation agendas.
- 2.14 UKRI’s role, seeded via the TSB investment (outlined above), has been to act as an advocate, champion and source of expertise and good practice for SBRI across different central and devolved nation departments and agencies. In some instances, this relationship is more intensive, with UKRI developing and delivering competitions on the behalf the department or agency. In other instances, the relationship is lighter touch with UKRI providing advice to departments/agencies to run and deliver their own competitions. These relationships have also varied over time as some partners – notably DASA, SBRI Healthcare and agencies within the devolved nations – became less dependent on UKRI as they have built up internal capacity and capability around SBRI.
- 2.15 The Ministry of Defence, through its innovation arm (the Defence and Security Accelerator (DASA), and the NHS, through its SBRI Healthcare platform, are the most significant adopters of SBRI. This reflects their status as large spending departments with greater emphasis on, and capacity for, innovation and R&D, relative to other government departments (excluding BEIS and UKRI)¹¹. It is no coincidence that these departments comprised the lead SBRI pilots when the model was relaunched in 2008.

The Current Policy Context

- 2.16 It is important to highlight the following recent contextual developments which have direct consequences for SBRI.

BREXIT and flexibility in procurement regulations

- 2.17 The UK Government procures tens of billions of pounds of goods and services every year. This underlying context has been, and continues to be, a constant. Within established/emerging regulatory frameworks, the public sector can choose what, how and who it procures and following the UK’s exit from the European Union there is potential for increased flexibility in public procurement. SBRI models are again in the spotlight; HMG’s Procurement Green Paper published in December 2020 stressed the importance of PCP initiatives and referenced the SBRI model as a more creative and effective way for public procurement to engage with industry. The recently published Procurement Green Paper (2020) set out proposals to establish a more innovation-friendly culture in procurement across the public sector with an emphasis on early development and the outlining of challenges rather than overly prescriptive product or service requests.

Innovation Strategy and changing attitudes towards risk

- 2.18 UK Government is also in the process of redefining its approach to the innovation agenda, with publication of the UK Innovation Strategy (July 2021) which points towards an enhanced potential

¹¹ Office for National Statistics (2021), ‘Research and development expenditure by the UK government: 2019’ <https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgovernmentexpenditureonscienceengineeringandtechnology/2019>

role the SBRI model could play within the UK's innovation ecosystem. It highlights the importance of *“(using) the weight of public sector procurement to drive innovation... (and ensuring) that government procurement is proactive and long-term, signalling to industry our direction of travel and providing a route to market for innovative new products and services. This will be aided by ongoing government procurement reform post-EU Exit that aims to simplify the process, increase flexibility and enable public bodies to procure more innovative solutions from industry”*.¹²

- 2.19 Alongside the new Innovation Strategy, the March 2020 Budget confirmed the government's commitment to an £800 million investment in the creation of a new research funding body, the Advanced Research and Invention Agency (ARIA), based on the principles of the US Advanced Research Projects Agency (ARPA) now renamed DARPA (Defence Advanced Research Projects Agency). ARIA will have a high-risk research focus, designing and delivering focus on projects with potential to produce transformative technological change, or a paradigm-shift in an area of science. While it is anticipated that most programmes may fail in achieving their ambitious aims, those which succeed could have profound and positive impact on society. The ARIA proposals provide a clear signal of the acceptance of the risk of 'failure' as essential to the innovation process which potentially indicates a shift in culture within public institutions which align to SBRI principles.

Mission orientated approaches triggered by COVID-19 and Net Zero

- 2.20 The importance and potential power of public sector procurement has been drawn into sharp focus during the COVID-19 pandemic. The success of the Vaccines Task Force in supporting vaccine development and securing vaccine supply and the separate procurement of PPE supplies clearly highlight the value and impact of a co-ordinated and mission orientated approach to public procurement. According to the latest House of Commons report¹³ into the lessons learnt from the COVID-19 response, the vaccine programme demonstrated the success of a systems approach rather than centralised command and control. The report expresses concern that the systems model adopted is at risk of being eroded by incorporation into the normal entropy process of Whitehall.
- 2.21 At the more micro level, challenge based SBRI mechanisms have been deployed by UKRI and other departments, as part of the UK Government's overall COVID-19 response and recovery funds. UKRI's Innovation 'Fast Start' programme was initiated to develop innovative and ambitious ideas to significantly address the needs of society or industry resulting from the pandemic.
- 2.22 Subsequently, the Sustainable Innovation Fund was launched, reflecting the increased emphasis on the Net Zero agenda, triggered, in part, by the pandemic. Its aim is to support *“cutting-edge companies of all sizes recover, grow, and drive recovery...supporting new green innovations... unleashing the sustainable industries of the future along the way.”* Again, these initiatives highlight the potential power of a cross-departmental, mission orientated approach to problem solving and the role SBRI can play in stimulating private sector engagement in innovation.

¹²Department for Business, Energy & Industrial Strategy (2021), 'UK Innovation Strategy: Leading the future by creating it' https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005000/uk-innovation-strategy.pdf

¹³ House of Commons, Health and Social Care, and Science and Technology Committees (2021), 'Coronavirus: lessons learned to date' <https://committees.parliament.uk/publications/7497/documents/78688/default/>

Rationale & Objectives

- 2.23 The rationale for SBRI is best understood as a risk managed approach to test and trial new technologies aimed at solving public challenges¹⁴ where uncertainties about long term future technological trajectories are very high¹⁵. Such problems arise where private and public sectors are locked into previous technological trajectories by significant past investments, where there is inadequate business capacity for learning about new technological options, and where networks and regulatory and other regimes are built around established practice and incremental change but not geared for disruptive technologies.
- 2.24 SBRI is designed to overcome barriers to innovation, particularly amongst SME's, through the creation of demand with public sector lead customers for new products, and the provision of incentives and information for research to enable and catalyse increased innovative capabilities and investment within both public and private sectors.¹⁶
- 2.25 As outlined in the Logic Model (Appendix A), the SBRI model's objectives are to:
- Provide government departments and their agencies with new, cost-effective, technical, and scientific options and solutions to their policy or operational needs and challenges; and
 - Stimulate innovation in the economy by supporting firms to develop and commercialise new technology-based products and solutions.
- 2.26 The rationale and objectives have remained constant in the period in view for this evaluation. These overarching SBRI model objectives provide a framework for individual SBRI sponsors to develop more detailed and 'SMART' programme and project level objectives and targets for each competition.
- 2.27 The absence of any central and/or departmental level targets around take-up and impacts makes it difficult to evaluate the effectiveness of SBRI as there is no definition of what success looks like. This lack of targets and the consequent gaps in monitoring and accountability arrangements has implications for the take-up, deployment and understanding of SBRI, and these issues will be revisited in subsequent Sections of the report.
- 2.28 Through the consultations and survey process, a number of key considerations around the rationale, objectives and motivations of public partners and participant firms have been identified and these are outlined below.

Public sector solutions as the primary motivator for instigating an SBRI competition

"We use SBRI to find solutions where conventional approaches aren't working. The fact that we can support firms to innovate and grow while answering a defined public sector need makes it a win win." Departmental consultee

¹⁴ Connell, David (2017). 'Leveraging Public Procurement to Grow the Innovation Economy'. London, UK: Department for Business, Energy & Industrial Strategy (BEIS).

¹⁵ Smits and Kuhlmann (2004), 'The rise of systemic instruments in innovation policy'
<https://research.utwente.nl/en/publications/the-rise-of-systemic-instruments-in-innovation-policy>

¹⁶ Ibid

- 2.29 Across the public sector organisations consulted through the evaluation, there was consensus that the primary motivation for instigating an SBRI competition was to find a new technological solution to address a specific operational need and/or policy challenge.
- 2.30 Most of the SBRI leads recognised the potential value of SBRI stimulating SME growth and innovation activity more generally, and its role as part of a wider innovation ecosystem. But this was very much regarded as secondary to its main purpose of finding innovative solutions to pressing operational and policy needs. This can be contrasted with the balance of emphasis within the US SBIR.
- 2.31 UKRI is an exception in that it places greater priority on firm level innovation and growth. This is not surprising given the agency's remit, but it is helpful to acknowledge the differentiation in UKRI's perspective from other departments.
- 2.32 Whilst there was a clear consensus around the primacy of public impact, the twin objectives are seen as mutually reinforcing, with no trade-off between them, repeatedly referred to as a win-win.

"We wanted to get beyond the usual suspects within our supplier base and tap some truly innovative technology." Case Study consultee

- 2.33 Alongside, or as part of, the primary public impact motivation, a range of inter-related sub-rationales for deploying SBRI were also identified. These included a desire to:
- Diversify existing supplier bases and provide access to fresh thinking and new technological solutions within SME firms;
 - Re-orientate thinking and approaches to a particular issue and explore market solutions for addressing public needs;
 - Employ a mechanism that could help circumvent 'red tape' and help to, more efficiently, identify a solution; and
 - Take advantage of a tried and tested model with established processes, guidance and wrap around support.

A flexible model - demand and/or supply side driven?

"SBRI adds another layer to the innovation ecosystem and doesn't require match funding like an R&D grant so can be accessed by a wider range of SME's." Departmental consultee

- 2.34 At a headline level¹⁷, SBRI competitions can be divided into two broad categories:
1. A Lead Customer Approach - where sponsor departments have a direct intention to procure the solution to address an identified operational requirement developed by firms at the end of the SBRI process; and
 2. Stimulating Innovation Approach – where the sponsor department has no commitment to procuring the firm's solution but where, if left to itself, the market is not expected to deliver solutions in a given policy area.

¹⁷ There is greater nuance and variance sitting beneath these two primary categories, including for example private partner led approaches, and the diversity of models is explored more fully in Section 3.

- 2.35 The first category – the Lead Customer Approach – fully aligns with the demand side principles of PCP. This focus on increasing the demand for R&D is what most clearly distinguishes the approach from supply side interventions, such as grants, tax credits, provision of business support and innovation facilities, which reduce costs and remove barriers for firms to undertake R&D activities.
- 2.36 The second category – Stimulating Innovation – aligns less clearly to demand side PCP principles. Whilst the majority of consultees were supportive of the flexibility of the model, which they perceived to be a virtue, the deployment of a procurement mechanism, where there is no commitment to procure raises important questions. This ambiguity contributes towards confusion from participant firms around the purpose and likely outcome of a given competition and risks sustaining the lack of clarity and understanding around SBRI, more generally.

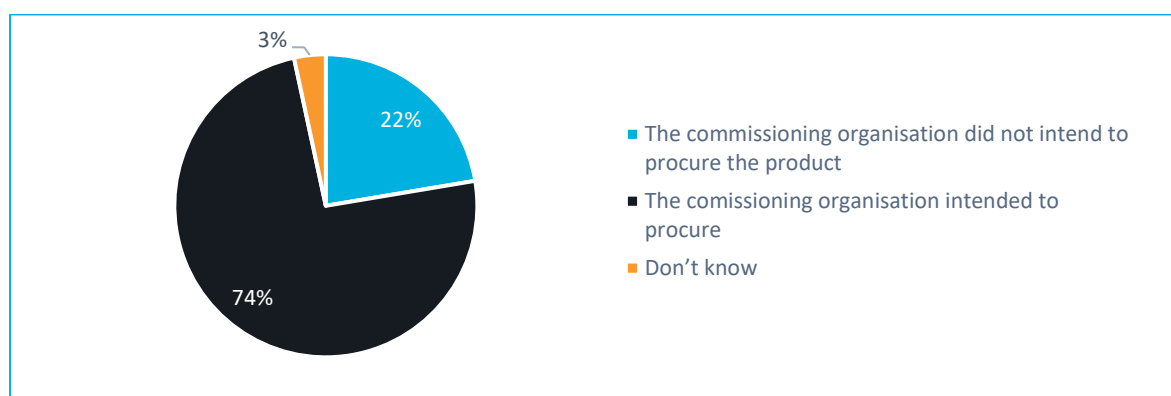
“We’ve never used SBRI as a procurement tool, the objective is to stimulate innovation.”
Departmental consultee

- 2.37 This ambiguity is reflected within the wider literature with debate around whether PCP programmes should be classified as demand-side procurement initiatives at all or simply recognised as supply-side interventions alongside R&D subsidies. This is because PCP initiatives often aim to provide R&D-based solutions to existing challenges but without identifying a buyer for further uptake, articulation, and diffusion of any innovation¹⁸. Commercialisation, therefore, may not be regarded as part of the PCP process, instead, following as a separate PPI process. Crucially, If PCP initiatives are being seen as supply side interventions (like R&D subsidies) and not as part of, or integrated systemically into, the mainstream procurement process, it may impact take-up of PCP at a meaningful level. The European Commission suggested that PCP can only be integrated into a broader policy instrument mix, shortening time to market, and encouraging market acceptance of new solutions if it is seen as part of a coordinated policy and procurement framework.¹⁹
- 2.38 In terms of the split between categories, the available monitoring data does not capture which category competitions sit within and the information is not available to review and categorise competitions in this way. However, the survey of participating businesses provides some insight here, albeit based on their perception about procurement commitment, not the sponsor department itself. Firms surveyed were asked whether they thought that the commissioning organisations intended to procure the innovation. Figure 2-2 highlights that between a quarter and one fifth of respondents perceived that their competition’s lead department did not intend to procure the competition’s end product. However, complexities in lead departments’ intention to procure should be noted, such as instances where a department is aiming to stimulate the development of a solution that will ‘indirectly’ be commercialised by the department, such as procured by an organisation in their direct supply chain.

¹⁸ Edquist, C and Zabala-Iturriagagoitia, J. M. (2015). ‘Pre-Commercial Procurement: a demand or supply policy instrument in relation to innovation?’ R&D Management, 45(2). <https://onlinelibrary.wiley.com/doi/abs/10.1111/radm.12057>

¹⁹ European Commission (2008), ‘Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe’. SEC (2007) 1668. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0799:FIN:EN:PDF>

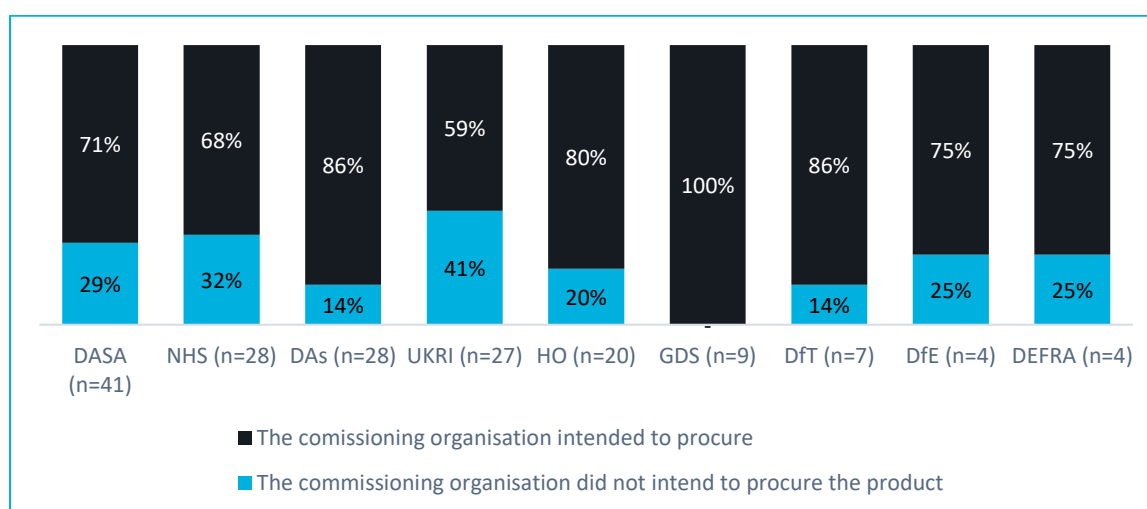
Figure 2-2: Percentage of respondents by whether they perceived their competition's lead department intended to procure the competition's end product or not



Source: Beneficiary and Non-Beneficiary Survey Q22 (n=237)

2.39 Figure 2-3 summarise the responses, by department. This highlights the variations in intentions across Departments indicating that the Devolved Administrations (DAs), the Department for Transport (DfT) and the Government Digital Service (GDS) had higher rates of instances where the challenge owner intended to procure, whilst challenges led by the NHS and UKRI were deemed to have lower rates of intention to procure.

Figure 2-3: Percentage of respondents by whether they perceived their competition's lead department intended to procure the competition's end product or not (by selected lead department)



Source: Beneficiary and Non-Beneficiary Survey: Lead department & Q22

2.40 There is a potentially important implication that flows from this for the assessment of SBRI impacts on business performance. Where there is no commitment on the part of the commissioning department or agency to procure the outcome of the contract (even if successful), then the business concerned will have to explore its traditional or alternative routes to market. This is likely to increase the lag between completion of an SBRI contract and commercialisation.

Variation between departmental R&D processes and the nature of solution sought

"SBRI competitions will play out differently depending on what problem is being solved and for which department." Departmental Consultee

2.41 The rationale and objectives for deploying SBRI will be shaped by the operating context of an individual department's established R&D processes and its regulatory considerations. These contexts vary hugely, for example, between the NHS and the Home Office, or DASA and Defra. Within individual Departments, the rationale and intention for deploying SBRI may also vary from competition to competition depending on the nature of the solution being sought.

2.42 The NHS provides a clear illustration of the unique operating contexts of an individual department with its clear differentiation between clinical and non-clinical innovation adoption processes. Previous evaluations have highlighted that digital technologies have been adopted more quickly than 'breakthrough' medical device innovations due to the lengthy clinical trials required for the latter, highlighting:

- A lack of clear guidance on how to achieve the clinical validation required for adoption into the NHS. RAND's surveys of SBRI Healthcare applicants²⁰ found that complex and bureaucratic procurement systems and shortage of resources to complete development and obtain regulatory approvals left many companies having finished the competition but still requiring further support to reach adoption; and
- PA Consulting's research²¹ found that significant additional work is required after the competition that companies need to undertake before the NHS adopts their products and services including regulatory approvals.

"The cost of translating innovation into a clinical environment is prohibitive for an SBRI competition but it can seed something that may one day be adopted" Departmental consultee

2.43 Consultations with departmental leads also highlighted that clinically related SBRI competitions within the NHS are generally at a relatively early R&D stage, not further down the innovation pipeline at regulation, procurement or adoption stages. The costs associated with these later stages can be prohibitive and firms progressing down the pipeline will likely require funding support from other health programmes and/or secure private investment. The onus is on the firm to take forwards the prototype resulting from SBRI, secure additional funding/investment and navigate the innovation pipeline process without support from the SBRI process.

2.44 Consultees also highlighted that this issue of adoption is not specific to SBRI, but the NHS more generally. This reflects both the complex, multi-phase and highly regulated clinical adoption processes and the dispersed nature of the NHS commissioning landscape which does not comprise a single lever, but a patchwork of national, regional and local agencies and decision points.

²⁰ RAND Europe (2017), 'The SBRI Healthcare Programme: An evaluation of programme activities, outcomes and impacts: 2017' <https://sbrihealthcare.co.uk/wp-content/uploads/2018/09/SBRI-Healthcare-impact-review-e.pdf>

²¹ PA (2018), 'SBRI HEALTHCARE: A review of the benefits of the Small Business Research Initiative in Healthcare: 2018' <https://sbrihealthcare.co.uk/wp-content/uploads/2018/09/SBRI-Healthcare-impact-review-e.pdf>

Firm motivations for engaging in SBRI

“The funding is nice to have, but it’s the prospect of securing a public sector contract that really matters. Those doors aren’t usually open for a small business like ours.” Firm consultee

- 2.45 Table 2-1 below, summarises a selection of survey responses from firms in terms of their main motivations for applying for SBRI. This highlights that firm’s primary motivations around technology and prototype development and product commercialisation align closely to SBRI’s overarching purpose and objectives. Only a small proportion of respondents stated, ‘access to funding’ as their main motivation, indicating that SBRI is not perceived simply as a ‘route to cash’. Other reasons, such as seeking new skills and collaboration benefits were also cited by a small number of consultees.

Table 2-1: Main motivation for applying to SBRI (single choice only, % of respondents, n=662)

Motivation	Percentage of Respondents
Development of new technology	24%
Development of a new prototype	22%
Commercialisation of a new product	15%
Increased current or planned investment in R&D	8%
Solving societal or governmental problems	4%
The de-risking of the innovation process or technological development	4%
Additional sales to new customers/markets, existing customers/ markets or public sector	3%
Access to funding	2%

Source: Beneficiary and Non-Beneficiary Survey: Q19

- 2.46 Motivations across different types of applicants varied, with public sector organisations far more likely to be motivated by collaboration opportunities (20%), third sector organisations by a desire to solve societal challenges (18%) and academic organisations more likely to be motivated by the early stages of technology development rather than prototype development or commercialisation.
- 2.47 Findings from across several case studies highlighted that firms were attracted to SBRI by the potential for securing a public sector contract, clearly aligning to the lead customer approach outlined above. Critically, for some firms, SBRI represents an important and unique route to market which otherwise would not be accessible, and this provides the incentive to invest in R&D.

Summary Assessment of Context, Rationale & Objectives

Context, Rationale & Objectives Assessment

- SBRI followed the lead set by the US SBIR programme, however there are fundamental differences between the models. The differences include UK SBRI being focussed on generating public sector solutions; not being mandated or centrally funded; largely focussed on concept and prototype development and not commercialisation; having a non-targeted, non-centralised and non-systematic approach to data collection and monitoring.
- Since 2001 there have been a number of attempts by UK Government to launch and relaunch SBRI initiatives. Whilst take-up has persisted and SBRI has been used, in some form, by wide ranging government departments/agencies, SBRI has remained at the margins of procurement and innovation agendas, across the public sector as a whole,
- DASA and SBRI Healthcare platforms are the most significant adopters of SBRI, reflecting their status as large spending departments with greater emphasis on, and capacity for, innovation and R&D.
- Shifts in policy and macro context around, for example, BREXIT and the procurement Green Paper, recent and emerging Innovation Strategy and mission orientated approaches to problem solving triggered by COVID-19 and Net Zero, have important implications for SBRI. Within this context, the rationale and objectives for the SBRI remain relevant and are being drawn into even sharper focus.
- In designing and running competitions, the emphasis from sponsor departments/agencies is on generating new technological solutions to address a specific operational need and/or policy challenge.
- There is some debate and confusion around whether SBRI is a demand or supply-side mechanism. It is deployed flexibly by departments, primarily as a procurement tool, where the 'lead customer' has the direct intention to procure the solution, but also as a tool to stimulate innovation within a given policy area, but where the sponsor department has no intention to procure.
- The rationale and objectives for deploying SBRI will be shaped by the operating context of an individual department's established R&D processes and its regulatory considerations. Within individual Departments, the rationale and intention for deploying SBRI may also vary from competition to competition depending on the nature of the solution being sought.
- Firms' primary motivations for engaging in SBRI competitions around technology and prototype development and product commercialisation align closely to SBRI's overarching purpose and objectives. For some, SBRI represents an important and unique route to market which otherwise would not be accessible, providing firms with the incentive to invest in R&D.

3 Adoption, Engagement & Implementation

Introduction

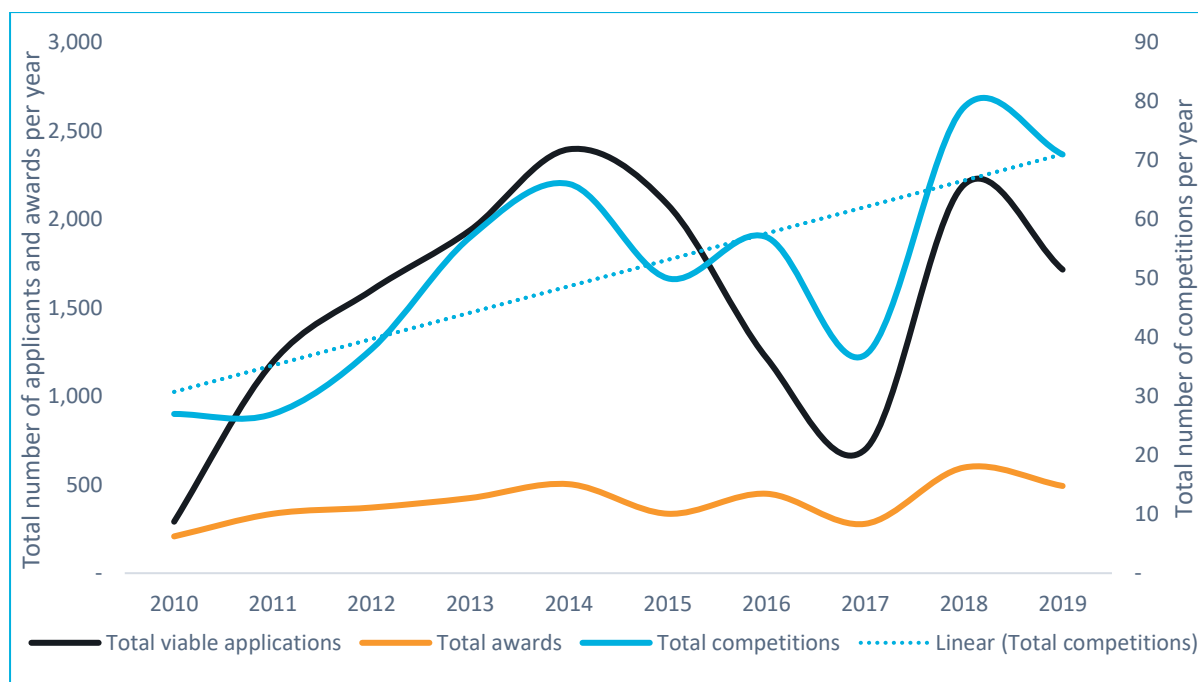
- 3.1 This section draws on insights from the monitoring data, survey findings, case studies and departmental consultations. It presents:
- A characterisation of SBRI in terms of its adoption and use by different departments and agencies, over time, and also in terms of the scale and type of organisations that apply to SBRI competitions;
 - A high-level overview of the SBRI implementation process and applicant perspectives on this; and
 - Insights into the variant models of SBRI that have emerged in recent years and some strategic stakeholder perspectives on barriers to wider adoption of the SBRI model.

Characterisation of SBRI

SBRI Competitions & Awards

- 3.2 Figure 3-1 profiles the number of SBRI competitions, applicants, and awards since SBRI's relaunch in 2008. This clearly illustrates the trend of increased SBRI deployment over the time period. There was a drop in the number of competitions in 2017, but the number of competitions per annum rose to 79 in 2018. The 2020 data is partial as our data sample for this evaluation stops in April 2020 at the end of FY19/20, and therefore not plotted in Figure 3-1.
- 3.3 Unsurprisingly, the total number of applicants has held a very similar trajectory to the total number of competitions over time with an increasing trendline and a considerable drop in 2017. The number of awards has also increased overtime but to a lesser extent than that of competitions and applicants – the proportion of applicants awarded has fluctuated significantly overtime, with peaks of 43% of applicants awarded in 2017 and 38% in 2009 and 2016, ranging to as few as 18% of applicants awarded in 2010 and 2015. On average across all departments, 26% of the total competition applicants are awarded funding.

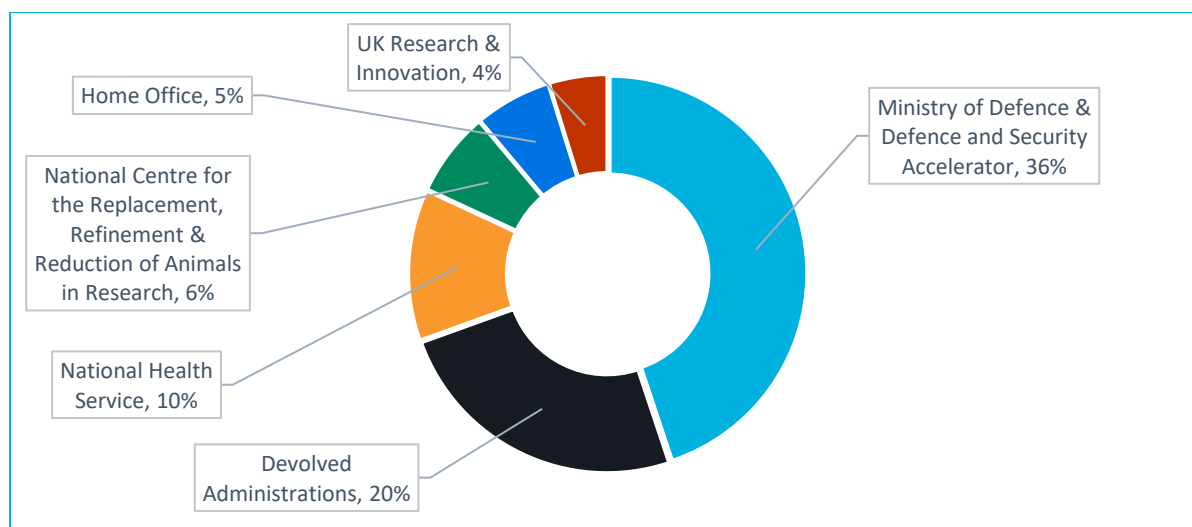
Figure 3-1: Total competitions, applicants and awards over time (2009 – 2019)



Source: UKRI SBRI Master Monitoring Dataset, 2020 [NB. data ends at the end of Q1 2020]

- 3.4 In total, the amount awarded to SBRI competitions between 2008 and 2020 is £788million, as recorded in the UKRI competitions dataset. The annual total awarded peaked in 2019 at £157million. To put this in context, it should be noted that this level of SBRI spend equated to just 0.4% of the UK government's 2019 net expenditure on R&D (£38.5billion).
- 3.5 Figure 3-2 highlights the variation in scale of SBRI adoption across departments and the concentration of SBRI use within a small number of sponsor departments/agencies. The Ministry of Defence (MOD) & Defence and Security Accelerator (DASA), the Devolved Administrations (DAs) and the NHS account for 65% of SBRI competitions to date, with MOD & DASA alone running 36% of all competitions. The National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs)²², the Home Office and UKRI are also notable adopters of SBRI.

²² CRACK It Challenges which employ the SBRI model are a major focus of NC3R activity aligning to the NC3R mission to pioneer better science including through supporting the discovery and adoption of predictive, reproducible and cost-effective alternatives to the use of animals.

Figure 3-2: The top six department/agencies that have run the highest proportions of total SBRI competitions

Source: UKRI SBRI Master Monitoring Dataset, 2020

- 3.6 The amount awarded to successful applicants ranges by department, competition, and competition phase. The average award value across all departments, phases and competitions on record between 2008 and Q1 2020 is £177k. In line with the large numbers of competitions run, MOD & DASA and the NHS have some of the highest levels of total SBRI funding awarded of all departments and agencies. The total values awarded by each department vary, due to different numbers of competitions run, different average award values, and different numbers of awards made. These statistics for each department are included in Appendix B.

SBRI Competition Phasing

- 3.7 Competitions typically (over 75% based on data made available to the evaluation) comprise the following two phases:
- **Phase 1: Feasibility Studies** – for successful applicants to test the feasibility of the solutions they proposed in their application. The total value of competition awards for Phase 1 feasibility testing has amounted to £344m between 2008 and Q1 2020, with 3,562 successful applicants receiving an average award value of £97k; and
 - **Phase 2: Product Development** – for successful applicants taken forward from Phase 1 to then develop their solutions in Phase 2. For Phase 2, the average award values are higher, at £493k, resulting in a total value of Phase 2 awards to date at £420m from 852 Phase 2 awards made.
- 3.8 Some competitions (23%) are run as single phase – either Phase 1 or Phase 2 – processes, with an even smaller proportion (just 8 of a total 578 competitions assessed) incorporating a formalised or standalone Phase 3:
- **Phase 3: Operational Testing & PPI** – contracts have ranged from £300k-£7.7m to support awardees with final testing and procurement of their products. The small number of projects participating in Phase 3 have higher average award values again, of almost £650k, resulting in a total value of Phase 3 awards to date of £23m.
- 3.9 Table 3-1 provides a summary breakdown of competitions by the different Phases of the PCP process.

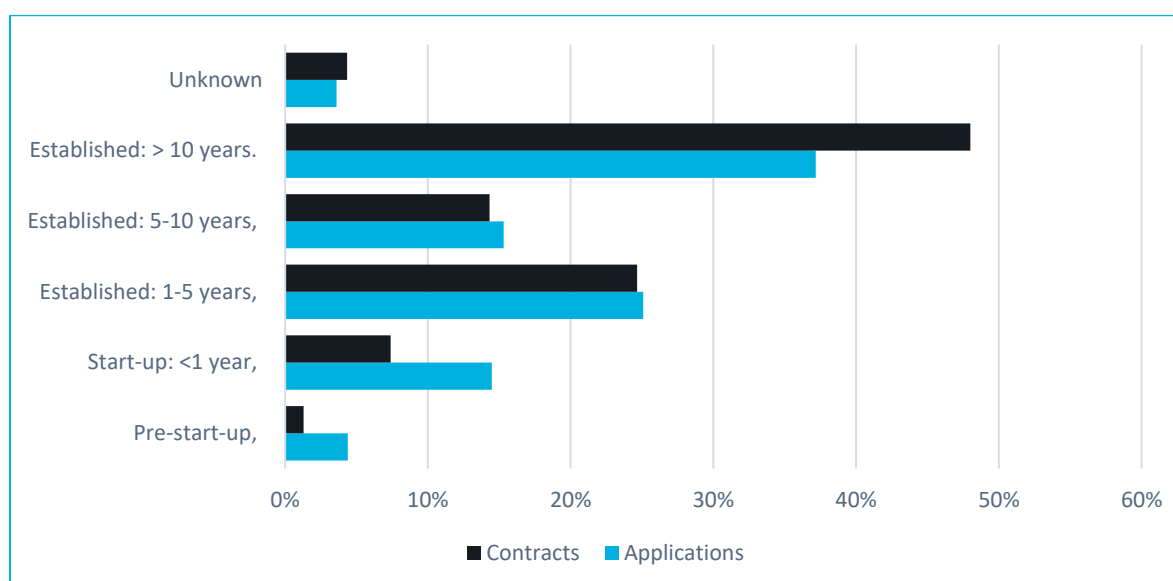
Table 3-1: Breakdown of competitions by SBRI Phase

Phase of the SBRI Process	Total number of competitions	%
Competition didn't run*	9	1%
Phase 1 Only	89	15%
Two Phases	437	76%
Phase 2 Only*	36	6%
Phase 3 Only*	4	1%
Three Phases	3	1%
Total	578	

Source: UKRI SBRI Master Monitoring Dataset, 2020

Characteristics of SBRI Applicants & Awards

- 3.10 According to the monitoring data, 93% of all competition applicants are based in the UK. 85% of applicants are private companies and make up the same proportion of awarded contracts. 9% are academic organisations, 2% are not for profits and less than one per cent are public sector organisations.
- 3.11 As highlighted in Figure 3-3, 37% of applicants are long-established firms of greater than 10 years. These firms make up nearly half of all awarded contracts (48%) compared to just 4% of firms applying to SBRI competitions at pre-start up stage who are awarded only 1% of contracts.

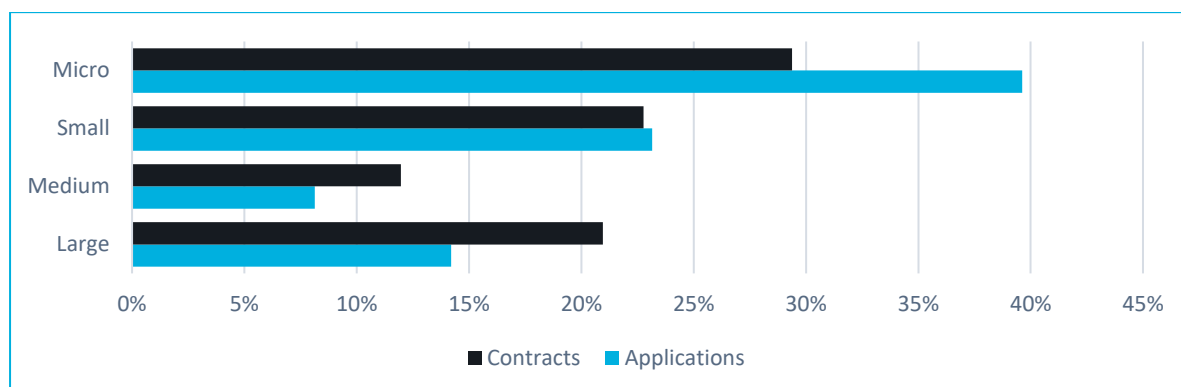
Figure 3-3: Age of applicant organisation

Source: UKRI SBRI Master Monitoring Dataset, 2020

- 3.12 Figure 3-4 highlights the split in firm characteristics, by size. Micro firms (those with less than 10 employees) make up 40% of all SBRI applicants, and this is followed by small firms (those with greater than 10 but less than 50 employees), 23%, and large firms (those with greater than 250 employees), 14%. Medium sized enterprises (those with between 50 and 250 employees) constitute the smallest proportion at just 8% of total applicants.
- 3.13 Although micro firms make up nearly half of all applicants (40%), just under a third of contracts (29%) awarded go to micro companies. 23% of contracts are awarded to small firms, 21% to large

firms and 12% to medium sized firms. This indicates that large firms have greater success in securing contracts relative to other firms, likely reflecting their greater experience and capacity in navigating public sector funding/bidding processes.

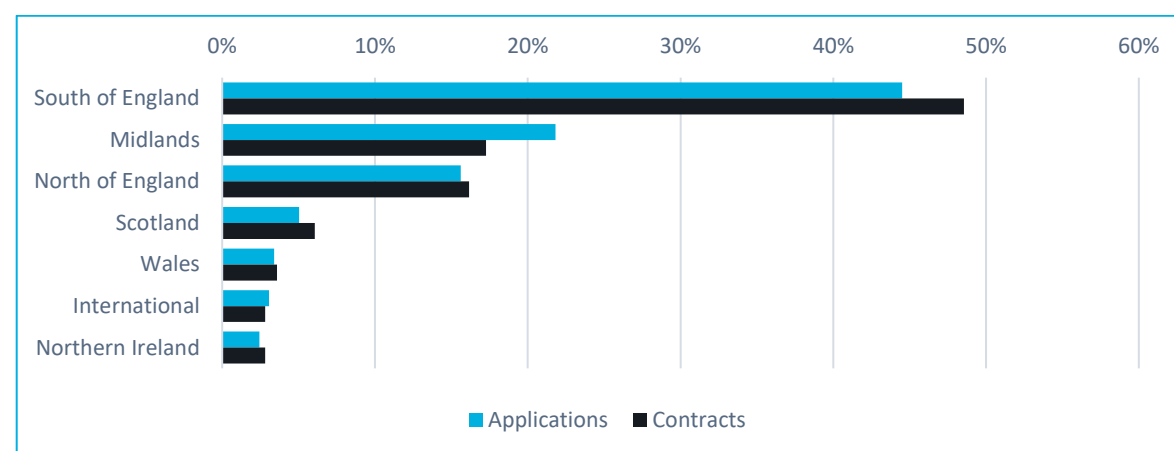
Figure 3-4: Size of private sector applicant firms (% of applicants, by size) & size of firms awarded contracts (% of contracts awarded, by size)



Source: UKRI SBRI Master Monitoring Dataset, 2020

- 3.14 In terms of the location of beneficiary firms, Figure 3-5 clearly shows that a high proportion of applicants are based in the South of England, following by the Midlands and then the North. Scotland, Wales, Ireland and international applicants each make up 5% or less of total SBRI applicants. A similar trend can be seen for number of contracts awarded.

Figure 3-5: Number of applicants by region (% of applicants and contracts)



Source: UKRI SBRI Master Monitoring Dataset, 2020

Characteristics of SBRI Competitions and Innovations

- 3.15 SBRI is deployed in diverse contexts, stimulating a wide array of technological innovations. Whilst it is not possible to convey the full breadth and reach of SBRI by means of summary statistics, our case studies can provide illustrative examples broad scope of competitions and the innovative solutions being developed. Twelve case study summary vignettes are presented below, with the impacts of these innovations explored in Section 4, and standalone write-ups provided in Appendix F.



COVID-19 Speed Cleaning Ambulances (2020)

Challenge Owner: Welsh SBRI Centre of Excellence on behalf of Welsh Ambulance Service

The COVID-19 outbreak placed immense pressure on the Ambulance Service. Ambulances need to be thoroughly cleaned once a patient with suspected COVID-19 has been transported, leaving ambulances off the road and out of use. Hygiene Pro Clean developed an effective decontamination system that uses ultrasonic atomisation to kill COVID-19 at pace without damage to the ambulance equipment.



Artificial Intelligence Fracture Diagnosis (2019)

Challenge Owner: NHS Grampian Health Board, NHS Scotland, and One North East

This competition sought to address local NHS worker shortages of radiologists, through using AI to reduce the time required to identify fractures and to improve health outcomes through faster diagnoses. Bering LTD and SeeAI both used computing and machine learning expertise to develop prototypes that use AI to detect fractures and enable faster diagnoses.



Metal Extraction from Water Flows (2015)

Challenge Owner: Natural Resources Wales, Welsh Government

This competition aimed to assess varying small to medium size cost effective technologies to remediate pollution from metal mine sites in steep upland terrain with a lack of infrastructure, such as transport and power. Elentec's solution focussed on electrochemical coagulation to extract metal from polluted water bodies. The solution was successful in field trials and met the needs of a small scale, versatile system, that performed well in extracting metal from the most concentrated discharges in Wales.



Tree Seed Challenge (2019)

Challenge Owner: CivTech Scotland & Forestry Land Scotland

This competition was launched to find new ways to make better use of Scotland's tree seed bank, through more efficient tree growing processes. Cumbria Tree Growers developed TreeTapes which adapts the latest technology from vegetable growing industry to produce tree seedlings, providing a more efficient growing system. The tape is comprised of pockets of coir and peat between layers of biodegradable paper tape to form a ribbon of cells, with a fully automated process for sowing the seeds into.



Child Health – Restoring Function (2017)

Challenge Owner: SBRI Healthcare

This competition was launched to support self-care and independence for children with long term conditions, specifically through restoring limb function, after being identified as a priority unmet need that required innovative solutions. Open Bionics developed their multi-grip myoelectric bionic hand using 3D scanning and printing technology, the Hero Arm, that comes in three sizes to fit children aged 8 – 17 and with customisable prosthetic covers based on popular characters from films such as Iron Man, Frozen and Star Wars.



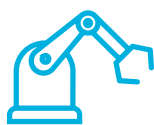
CRACK IT Challenge 23 – Retina 3D (2016)

Challenge Owner: National Centre for the Replacement Refinement & Reduction of Animals in Research

This challenge was launched with the aim of establishing a human 3D retinal cell model to replace the use of animals in the discovery and development of new ophthalmologic drugs, where previously there were no adequate in vitro models available. Newcell Biotech's Retina In Vitro Model was successfully developed throughout the competition – a human 3D retinal cell model that consists of all the major cell types of the retina.

Last Mile Resupply (2017)

Challenge Owner: Defence and Security Accelerator (DASA)



Defence logistics operations were identified as inefficient, resource intensive and vulnerable to attack. DASA wanted to develop an innovative, faster, more flexible, and autonomous system. Horiba Mira were already developing their 'Viking' vehicle for MoD/DASA, but through this competition were enabled to develop new autonomous software for their existing Viking product with stealth and AI technology that allows for the off-road routing, navigation of terrain, with reduced risk of detection.



First of a Kind 1 – Demonstrating Tomorrow's Trains Today (2017)

Challenge Owner: Department for Transport

First of a Kind competitions are used by DfT to catalyse transformational innovation and increase commercialisation of new technology in the railways. Transreport developed 'Passenger Assistance' – a smartphone app enabling real-time assistance for rail passengers with specific needs, allowing them to place requests in advance for assistance they may require at stations or in-carriage, reducing the additional difficulties passengers with disabilities face when travelling by train.



Northern Ireland Business Rates (2016)

Challenge Owner: Northern Ireland Department of Economy on behalf of Belfast City Council

Across Northern Ireland, vacant commercial premises are eligible for 100% business rates relief, but inaccuracies in current periodic inspections left premises incorrectly logged as vacant. NQuiring Minds developed a data analytics solution to better inform assessment of occupancy of commercial premises, including by whom and for how long. This involves data scraping to collate and analyse multiple data sources to generate a more accurate and up to date list of commercial premises liable for rates.



Reducing Childhood Obesity (2017)

Challenge Owner: Welsh Government

Childhood obesity increases lifetime risk of many serious health conditions, and across Wales, there is a childhood obesity crisis. Lack of nutritious food and drink options was reported as a key determinant. Bug Farm Foods developed VEXo, a meat alternative product made from insect and plant protein, and Pennotec developed MilaCel, a fat-replacing ingredient made from the cider industry's apple waste to improve the nutritional composition of foods, while having wider environmental sustainability benefits too.



GovTech Catalyst & Seafood Innovation Fund (2017-2021)

Challenge Owners: BEIS, Government Digital Service & Centre for Environment, Fisheries, & Aquaculture Science

GovTech Catalyst has consisted of 15 challenges over three years, run on behalf of multiple different departments. Seafood Innovation Fund has run two competitions employing a very similar competition model. Innovations emerging from these challenges have included the development of wearable products to track firefighters' movements within buildings, to hybrid generators for aquaculture farms.



Cancer Innovation Challenge (2017)

Challenge Owner: DataLab, Digital Health & Care Institute, & Stratified Medicine Scotland

This challenge focussed on finding new approaches to record and integrate cancer Patient Reported Outcome Measures (PROMs). My Clinical Outcomes adapted a web platform for collecting and using PROMs, previously not used in oncology, which captures and makes available real-time data from patients throughout treatment and follow-up, to support prioritisation of care for those most in need, and to better understand variation in outcomes across all patients.

Key Messages – Characterisation of SBRI Competitions & Applicants

- There has been a clear upward trend in the take up of SBRI over the time period, indicating the impact of its relaunch in 2008 and the profile and fresh impetuous it was given in the 2013 Spring Budget.
- A total of £788million, has been awarded through SBRI competitions between 2008 and 2020.
- The Ministry of Defence (MOD) & Defence and Security Accelerator (DASA), the Devolved Administrations (DAs) and the NHS account for over 60% of SBRI competitions to date, with MOD & DASA alone running 35% of all competitions.
- Competitions typically (over 80% based on data made available to the evaluation) comprise Phases 1 (Feasibility) and Phase 2 (prototype/product development) with only a very limited number of formal Phase 3 SBRI competitions.
- The total value of competition awards for Phase 1 is £344m, with over 3,500 beneficiaries receiving an average award value of £96k. On average, around 25% of Phase 1 firms are shortlisted to Phase 2 with average awards of £492k, resulting in a total value of Phase 2 awards to date at £420m across 854 participants.
- 91% of all competition applicants are based in the UK. 85% of applicants are private companies, while around 9% are academic organisations, two per cent are not for profits and less than one per cent are public sector organisations.
- Micro firms make up 40% of all SBRI applicant, and this is followed by small firms, 23%, and large firms, 14%. Medium sized enterprises constitute the smallest proportion at just 8% of total applicants.
- A high proportion of applicants are based in the South of England, following by the Midlands and then the North. Scotland, Wales, Ireland and international applicants each make up 5% or less of total SBRI applicants.

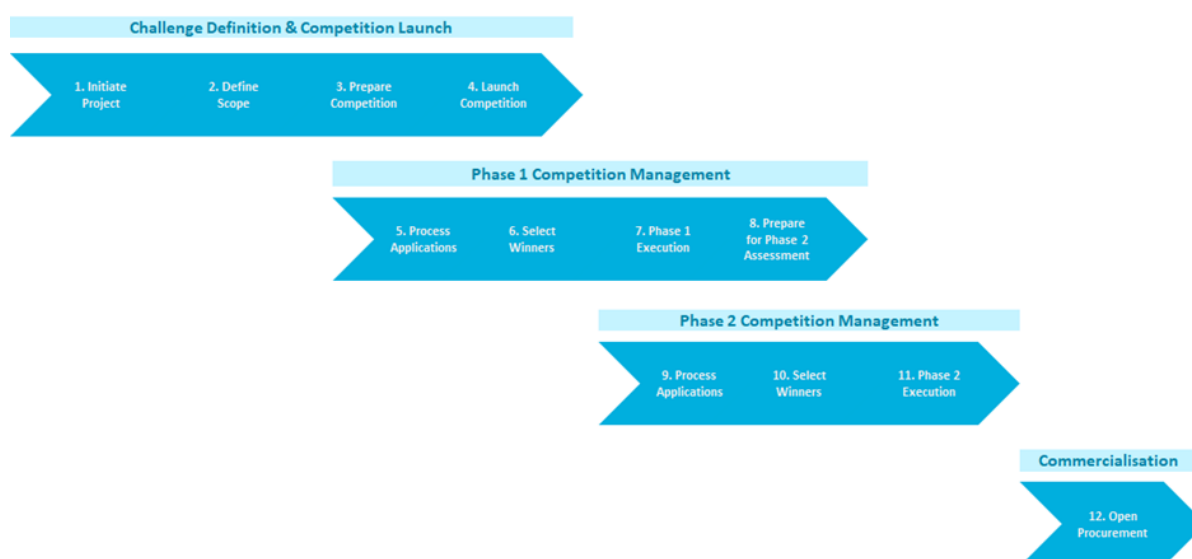
SBRI Process

- 3.16 The brief for this study was to conduct an impact evaluation, therefore, a detailed process evaluation has not been undertaken. However, the SBRI process was briefly reviewed to provide a better understanding of the way the SBRI model has been designed, modified and used in order to generate the intended positive impacts.

SBRI Competition Delivery

- 3.17 The delivery of a standard 2-Phase SBRI competition can be summarised in twelve key steps, with most departments and agencies recognising and following this process from challenge definition and competition launch, to competition management of Phase 1 then Phase 2.

Figure 3-6: SBRI 2-Phase Competition Delivery Key Steps



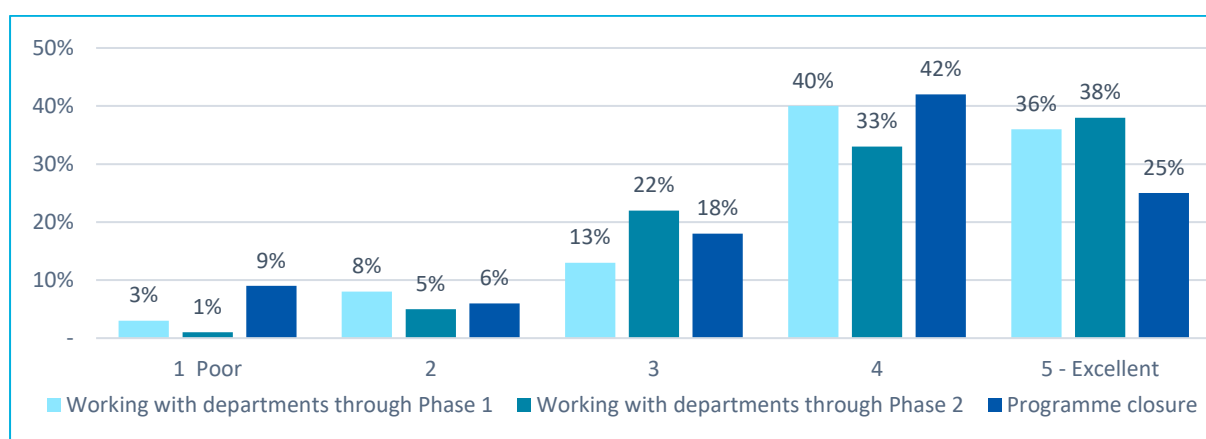
Source: Steer-ED, 2021

- 3.18 The initial step is for the department/agency in question to define the problem or challenge for which a solution is being sought and for this to be clearly articulated through an SBRI competition. An open call for applicants is then launched, applications received, processed and evaluated and winners selected. Phase 1 competitions typically comprise an intensive 6–8-week feasibility process, at the end of which a short-list of successful organisations progress into Phase 2. Timelines for Phase 2 vary significantly from 6 months - 24 months+. More intensive timelines have also been deployed, as evidenced by the Ambulance Sanitisation Case Study which saw overall SBRI timelines condensed to just 6 weeks²³, as the Welsh Ambulance Service sought an efficient solution to sanitising ambulances in respond to the COVID-19 pandemic. SBRI is a flexible approach, where departments and agencies can adapt timescales to meet the needs of their organisation in order to deliver the best results.
- 3.19 Steps 1 to 11 are reasonably consistently present across departments and agencies' 2-Phase SBRI competition delivery. The inclusion of a Step 12 will depend on whether the sponsor department/agency is pursuing a lead customer approach (as outlined in Section 2) or not, and/or whether further product support/development is required, either through a formal Phase 3 or beyond the scope of SBRI, to reach a point of commercialisation.

Some Applicant Perspectives on the SBRI Process

- 3.20 For those involved, SBRI competitions are regarded highly with the vast majority of those applicants surveyed and consulted reporting positive perspectives with regards to the process. Departments and agencies find the model is highly flexible and can be adapted to suit the departmental challenges in hand. Overall, applicants' experience of SBRI varies depending on department, whether they were successful or unsuccessful and the stage of the process.
- 3.21 Figure 3-7 shows that 76% of all beneficiaries surveyed had positive views of working with departments through Phase 1, 71% through Phase 2 and 67% at programme closure. Across all applicants surveyed, 53% reported positive perspectives on the application process, and 45% regarding the selection and award process. Unsurprisingly, beneficiaries provided more positive responses around the application, selection and award process than non-beneficiaries.

Figure 3-7: How did applicants find the following stages of the pre-commercial procurement process?

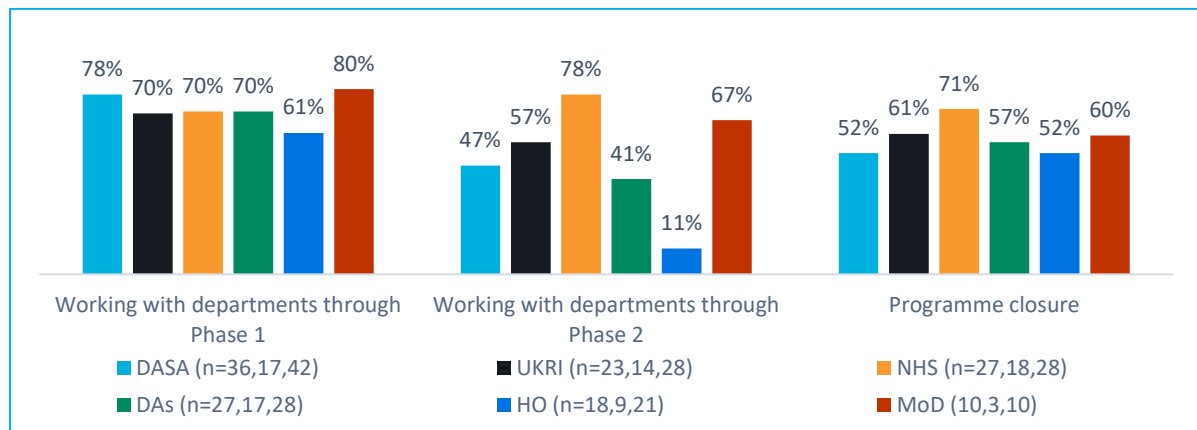


Source: Beneficiary and Non-Beneficiary Survey: Q44

²³ This was achieved by repurposing an existing 'off the shelf' solutions and testing products in the context of disinfecting ambulances at pace, as opposed to using the model to develop a completely bespoke product where a potential solution isn't already on the market.

3.22 Figure 3-8, below, shows the variation in applicants' experience of the SBRI across different departments. This reinforces the relatively positive views of Phase 1 over Phase 2 experiences, and also highlights the strong performance of NHS across both Phases and programme closure, and MoD/DASA in Phase 2. It should be noted sample sizes of respondents to the below questions are small and findings should be read with this in mind.

Figure 3-8: Proportion of survey respondents who reported having good or excellent perspectives on Phase 1, 2 and Programme Closure by Selected Lead Department



Source: Beneficiary and Non-Beneficiary Survey: Q44 & lead department. Only departments with 10 or more respondents included.

Key Success Factors & Learning Lessons

3.23 The twelve case studies spanned a wide range of departments, agencies, geographies and time periods. These revealed a number of recurring factors that help to explain what it is about SBRI that works well, though they also exposed some key challenges with the SBRI process that provide insight into learning lessons for its future design and implementation.

Figure 3-9: Key Success Factors

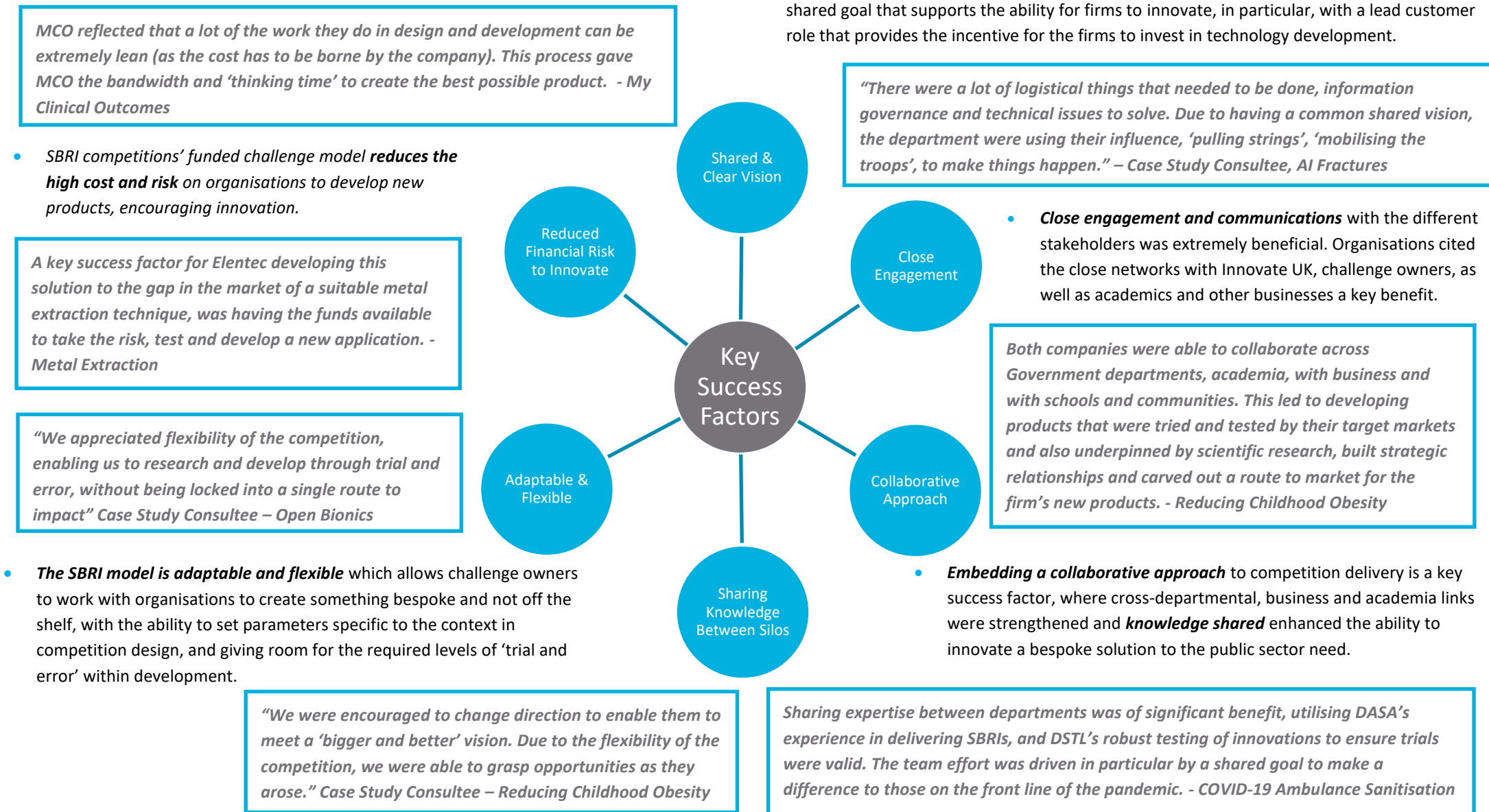


Figure 3-10: Learning Lessons



Key Messages – SBRI Processes & Success Factors

- Of all applicant organisations surveyed, the vast majority reported positive perspectives regarding the SBRI process. Overall, applicants' experience of SBRI varies depending on department, whether they were successful or unsuccessful and the stage of the process.
- The key factors apparent in the successful deployment of SBRI competitions include the ability to adapt the model to co-own a shared vision for creating a bespoke solution to a public sector challenge, where the process of developing a new product or service is de-risked for firms, with close engagement, collaboration and greater knowledge sharing between silos to do so.
- The key lessons learned that have emerged include: prominent barriers to procurement and adoption of solutions developed; the need for greater recognition that innovative product/service development is often incremental, taking time to reach commercialisation; SBRI competitions are reported to be resource intensive; and challenges are present in scaling up adoption of innovations across the public sector.

SBRI Model Variants

3.24 As highlighted previously, there is significant variation around how different departments and/or procuring agencies refer to, interpret, and deploy SBRI. It is an adaptable and flexible model that can be used by a wide range of departments and agencies to suit their need, with established guidance and procedures. The InnovateUK SBRI team are involved in supporting SBRI competitions run across the UK, helping departments to develop their own programmes using SBRI and providing adaptable templates. While some departments utilise established SBRI guidance, procedures, and branding, like UKRI and the NHS, others such as the Scottish Government's Civtech Catalyst, and Cabinet Offices' GovTech Catalyst, have chosen to design and brand their own versions of SBRI in light of their particular circumstances and objectives.

3.25 As SBRI has become more widely used, and better established in certain areas, there has been a growth of its flexible use in recent years. The case studies highlighted a range of alternative characteristics or principles which shape the design and implementation of SBRI programmes and competitions within individual sponsor agencies. Over and above the headline 'lead customer' and 'policy innovation' approaches, outlined in Section 2. Key variant characteristics include the following:

- **Wrap around, commercialisation support** – programmes designed to provide additional support to firms in bringing their products to markets with support embedded to help secure procurement contracts and/or wider commercialisation of the emerging innovative solution. The CivTech model, for example, uses SBRI and incorporates an intensive accelerator phase which culminates in a demo day to industry leaders. This is followed by a post-accelerator stage, including additional funding and advice to support firms with commercialisation;
- **Cross-cutting mission oriented** – programmes designed with a cross-departmental thematic focus to harness collective efforts and drive widespread innovation and change. The GovTech model, with a clear focus on public sector digital transformation, provides a good example of this mission-based approach. UKRI's SIF model, with its focus on COVID-19 recovery and net zero agendas provides a further example of how SBRI is being deployed to identify innovative solution to cross departmental 'grand challenges'; and
- **Private sector 'lead customers'** – programmes designed to position a specific private firm, not the sponsoring public agency, as the prospective procurer of the innovative solution. For example, each competition within the NC3R model is designed in collaboration with industry and sponsored by private sector partners who offer in-kind support and feedback to developing products throughout. The UKRI-led Sustainable Innovation Fund (introduced in Section 2) provides a further variant of this approach, inviting consortium bids to include both innovating SMEs alongside private sector partners as prospective lead customers/procurers.

- 3.26 Alongside these variants in competition scope and design, the case studies also highlighted the diversity of delivery models and resourcing arrangements for SBRI adoption and deployment. This reflects the variations in the scale of resource and expertise around SBRI across departments.
- 3.27 The DASA model, for example, comprises relatively large scale SBRI investment, supported by a dedicated in-house team embedded within a wider innovation accelerator agency. The DASA SBRI team has become sufficiently well established to run SBRI competitions on behalf of other Departments, including the Home Office and DfT. By contrast, the DfH outsources its SBRI Healthcare platform to a private firm to deliver competitions on its behalf. Other departments run SBRI competitions themselves on an ad hoc basis and/or draw on support from the IUK SBRI team to run competitions on their behalf.

Perspectives on Challenges & Barriers to More Widespread SBRI Adoption

- 3.28 There is general consensus across stakeholders - both firms and competition promoters - that when operationalised, the SBRI model works effectively over Phases 1 and 2. It is therefore important to understand why the model has not been more widely adopted.
- 3.29 The barriers to more widespread adoption of SBRI were explored through extensive consultations with senior level departmental leads and representatives from the Cabinet Office, BEIS Innovation Strategy team and UKRI. The findings are summarised below with many of them echoing barriers identified previously in both the 2015 evaluation, the Connell Review and wider literature.

Systemic Cultural & Structural Barriers to Innovation within Government

“It’s the lack of appetite for innovation across Government that’s the real issue, not the SBRI model”. Departmental consultee

- 3.30 Adoption and take-up of SBRI needs to be understood within the context of the wider systematic barriers to public sector innovation that persist across Government departments and agencies. Consultees highlighted that outside of the MoD, DoH, and UKRI there is very limited budget and resources within departments dedicated to innovation.
- 3.31 Consultees highlighted that departments are acting perfectly logically in defaulting to buying ‘off the shelf’ solutions, as opposed to embracing SBRI, as there is no incentive to innovate. Consultees stated that departments are judged on their ability to spend their budgets and are not rewarded for saving money - indeed, it is likely that their budgets will be reduced if they are successful in delivering targets more efficiently.

“The fear of failure is rife across Whitehall; we can’t be seen to be wasting money on things that might not work.” Departmental consultee

- 3.32 Consultees also pointed towards the widespread cultural aversion to risk taking across Whitehall. This extends well beyond procurement teams to the senior leadership of Government departments and stems from a ‘fear of failure’ and the potential repercussions for individuals or departments should things go wrong. Concerns around public perceptions of wasting money perpetuates this risk averse culture.

Lack of Leadership, Accountability & Data

“If we were really serious about SBRI then we would mandate it like they do in the US and hold departments to account.” Departmental consultee

- 3.33 Whilst acknowledging that UKRI has acted as a champion of SBRI, several consultees pointed towards a lack of senior level leadership across Government as a key barrier to more widespread take-up. Over the years the SBRI model has been relaunched and given fresh impetus on more than one occasion. However, there has been limited ‘follow through’ in terms of maintaining its profile across Government departments and agencies, providing dedicated resources and/or holding departments to account.
- 3.34 As highlighted in Section 2, this approach contrasts strongly with the US, where the SBIR model is mandated and transparently monitored, by the US Small Business Administration, with all contracts collated into a single, publicly available database. There was a previous attempt in the UK to establish a 10% procurement target for SBRI, but this rapidly fell away as there was no leadership or governance mechanism to hold departments to account.
- 3.35 Alongside this lack of leadership across Government departments and agencies, SBRI suffers from a lack of senior level leadership within individual departments, too. In line with the findings of the 2015 Evaluation, several consultees stated that responsibility for using SBRI was generally at relatively low levels of seniority in departments and not generally considered by departments as a policy tool that could be used strategically.

“The lack of data is a real problem in making the case for SBRI – we really struggle to demonstrate its impact and value.” Departmental Consultee

- 3.36 As highlighted in previous Sections of the report, SBRI is a dispersed procurement mechanism with no targets against which to assess performance. As a consequence, performance data is not collated centrally or systematically within individual departments. Data availability is limited and variable in terms of both process and impact, particularly the latter.
- 3.37 Consultees highlighted that this lack of data and evidence served to perpetuate the vicious circle created by: a lack of leadership and accountability; resulting in the absence of clearly defined targets and key performance indicators; resulting in poor quality data and evidence, undermining the case for stronger leadership and take-up of SBRI.

Low Levels of Awareness & Siloed Working

“Even now, 20 years on from being launched in the UK, a lot of procurement professionals either don’t know about or don’t properly understand SBRI.” Departmental Consultee

- 3.38 Though PCP is highlighted, the SBRI name has not been explicitly mainstreamed within the Procurement Playbook²⁴. Consultees highlighted that limited progress had been made in embedding the SBRI brand, since it was relaunched a decade or so ago, stating that levels of awareness across the procurement profession remained low. This is not necessarily a failing of the model itself, but a reflection of the lack of profile, leadership, resource and accountability (as outlined above) attached to it.
- 3.39 Consultees also pointed towards the shifts in procurement regulation, following the UK's exit from the EU, as providing a real window of opportunity to raise the profile, awareness and understand of PCP models including, but not constrained to, SBRI.

“It can be a real challenge making SBRI work as you need to bridge across siloed teams who bring very different goals and perspectives.” Departmental consultee

- 3.40 Several consultees pointed towards the relatively low level of understanding and awareness across procurement professionals being compounded by the disconnect that often exists across innovation, policy, operational and procurement teams within sponsor departments. Consultees highlighted that stakeholders often operate in siloed teams that can be ‘speaking different languages’ in terms of their professional backgrounds, areas of expertise and objectives.
- 3.41 Consultees also emphasised the challenge for SBRI competitions in balancing the desire for cutting edge innovation with practical, operational and policy requirements and the vital importance of securing input and buy-in from across all stakeholders in the early stages of competition design.

Key Messages – SBRI Model Variants and Strategic Stakeholder Perspectives

- There is significant variation in how different departments and/or procuring agencies refer to, interpret, and deploy SBRI. It is an adaptable and flexible model that can be used by a wide range of departments and agencies to suit their needs.
- There has been a growth in using SBRI flexibly in recent years, including: provision of wraparound commercialisation support; cross cutting mission orientated competitions; and private sector lead customers assuming the role of the prospective procurer of the innovative solution
- Alongside these variants in competition scope and design, case study analysis has also highlighted the diversity of delivery models and resourcing arrangements for SBRI adoption and deployment. This reflects the huge variations in the scale of resource and expertise around SBRI across departments.
- There are far reaching challenges and barriers to more widespread adoption of SBRI which include: systemic cultural and structural barriers to innovation across Government; a lack of SBRI leadership, accountability, and data; and low levels of awareness of the model and challenges in bridging disconnected innovation, policy, operational and procurement teams.

²⁴ Cabinet Office and Government Commercial Function (2021), ‘The Sourcing and Consultancy Framework Playbooks’ <https://www.gov.uk/government/publications/the-sourcing-and-consultancy-playbooks>

4 Impacts

Introduction

- 4.1 This Section brings together quantitative and qualitative evidence from across the evaluation evidence base to assess the additionality and impacts of SBRI on participating firms, departments and wider third-party impacts.
- 4.2 The Section, first, considers business impacts, primarily in terms of turnover and employment growth, and assesses the potential Value for Money associated with these. It goes on to assess public sector and wider societal impacts, which due to data constraints are largely considered from a qualitative perspective, drawing primarily from our case studies and the wider literature.

Business Impacts

- 4.3 The assessment of business impacts combines multiple strands of evidence comprising: findings from the econometric counterfactual impact assessment (CIE); self-reported findings from the beneficiary survey on key growth metrics and wider qualitative firm level impacts; and an assessment of firm level impacts across the 12 case studies.
- 4.4 As highlighted in Section 1, the limitations of data quality create significant challenges for evaluating impacts and these challenges have been increased by relatively low sample sizes resulting from lower than anticipated response rates to the business survey and findings from the econometric analysis which are limited by the number and time-period of observations available for analysis. Further detail on the methods deployed and samples assessed is provided in Appendix D (business survey) and Appendix G (the counterfactual impact assessment).
- 4.5 SBRI is expected to have a positive impact on businesses through various channels:
- In the short-term, SBRI funding is a source of revenue, allowing firms to hire or maintain staff to conduct the project development;
 - In the medium-term, SBRI provides a route to public-sector procurement, normally by the agency operating the competition; and
 - In the longer-term, it is expected that the product (and other similar products developed alongside or following from the original prototype) will be marketed to wider audiences. The relationships, skills and experience developed as part of the SBRI project will contribute to this wider development and sales, resulting in longer-term increases in revenue, additional staff to support expanded revenue streams, productivity (sales per head), and ultimately the firm's Gross Value Added (GVA, calculated as wages plus profits).
- 4.6 In terms of analysing business impact, we therefore look to quantify and monetise impacts of the programme in terms of **employment**, **turnover** and ultimately **GVA**. In the analysis that follows, we generate two different value-for-money estimates for the programme: the first, using the business survey, is based on self-reported impacts on turnover which are then translated to GVA; the second, using the econometric analysis, is based on an observed higher employment growth rate amongst firms awarded SBRI funding, again translated into GVA.

Using the Business Survey to Derive a Turnover-based Value-for-money Metric

- 4.7 The survey of business participants (both beneficiary and non-beneficiary) sought to capture further information from firms on the impacts of SBRI participation on firm performance, and the mechanisms by which these impacts occurred. A total of 677 SBRI applicants were interviewed, of which 237 were beneficiaries and 425 non-beneficiaries²⁵. Appendix D outlines the scope, method and survey design including details on sampling as well as the underlying additional data benchmarks and assumptions used to assess impact.

Gross Impacts

- 4.8 Businesses involved in SBRI-funded projects were asked to give a broad indication of the impact of participation on business performance to date in terms of the major variables highlighted at the opening of this chapter (employees, revenue and profits). In gross terms (that is, before adjusting for additionality or other factors, which follows in the analysis below) firms reported the following:
- **Employees:** 42% of respondents stated their current levels of employment are higher than they otherwise would have been (either 'significantly higher' or 'somewhat higher') as a result of participating in SBRI. 55% stated there was no effect on employment, and a small minority (3%) stated a negative impact;
 - **Profits:** 21% of respondents stated that their current levels of profits are higher than they otherwise would have been (either 'significantly higher' or 'somewhat higher') as a result of participating in SBRI; and
 - **Turnover:** 31% of respondents reported that the SBRI-funded product/prototype had been 'procured' – either by the commissioning department/agency, or by somebody else. A total of £139 million in additional turnover was claimed to have been generated from participation in SBRI. This revenue was concentrated across a relatively small proportion of respondents – with only 31% reporting any impact, and a small minority of these responsible for most of the reported value. The average increase in turnover per firm, per year, is estimated to be £168k, as shown in Table 4-1.

Table 4-1: Estimated turnover impacts

Total increase in turnover reported	[A]	£139m
Total beneficiaries surveyed	[B]	237
Average increase in turnover per firm	[A]/[B]	£587k
Average number of years since competition	[C]	3.50
Average increase in turnover per firm, per year	[A]/[B]/[C]	£168k

Source: Business Survey

- 4.9 In terms of what drives these impacts, the distribution of turnover generation across the different types of customer (whether private sector, public sector or other) is shown in Figure 4-1. When comparing those who claimed that SBRI participation impacted their turnover 'significantly' or 'somewhat' against those who claimed SBRI participation 'had no effect on [turnover]', we see the following:

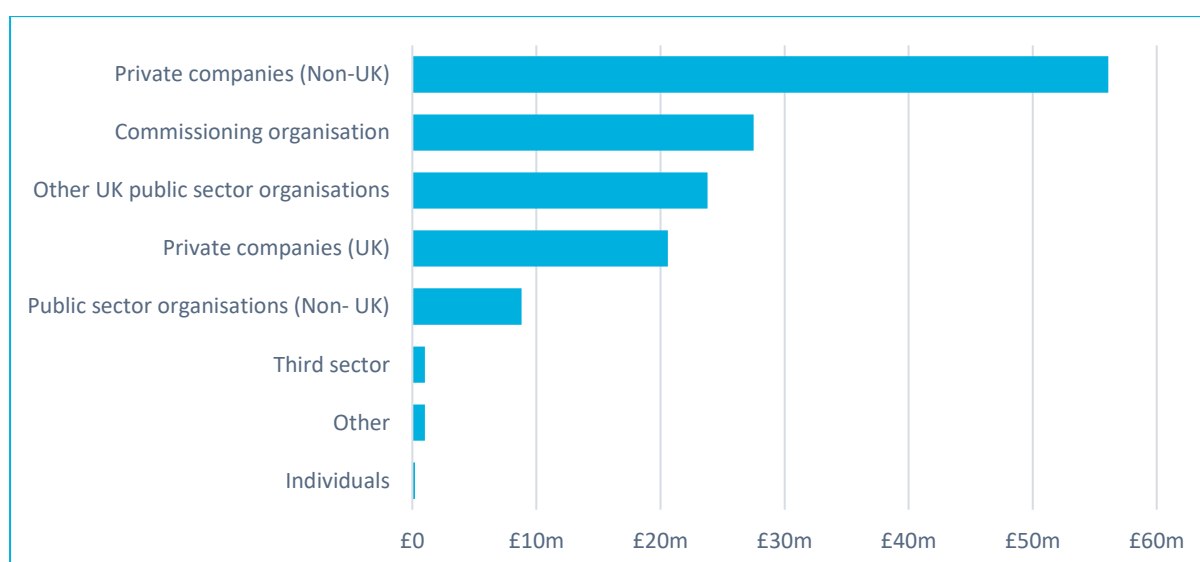
²⁵ A further 15 respondents were classified as neither beneficiary nor non-beneficiary, due to incomplete data collected at the pilot stage.

- Turnover impacts were more frequently claimed amongst younger, smaller firms (although not micro firms); and those in the sectors ‘professional, scientific & technical’ and ‘information & communication’; and
- Turnover impacts were less frequently claimed amongst older, larger firms and amongst those in the education sector.

4.10 We conjecture that these results are driven by the fact that for larger firms and those with higher turnover, impacts derived from the SBRI project likely represent a smaller proportion of total firm turnover/activity (for example, a turnover impact of £200k would be considered more ‘significant’ to a company with an annual turnover of £100k than to a company with an annual turnover in the millions). The sectors cited (professional/scientific and ICT) may also be better positioned to develop commercial revenue streams than others, such as the education sector, might be.

4.11 When looking across departments, there was no notable difference in turnover impacts between commissioning departments, or according to whether or not, in the applicant’s view, the department intended to procure the final product.

Figure 4-1: Turnover generated (£m), by purchasing organisation type



4.12

Source: Business Survey

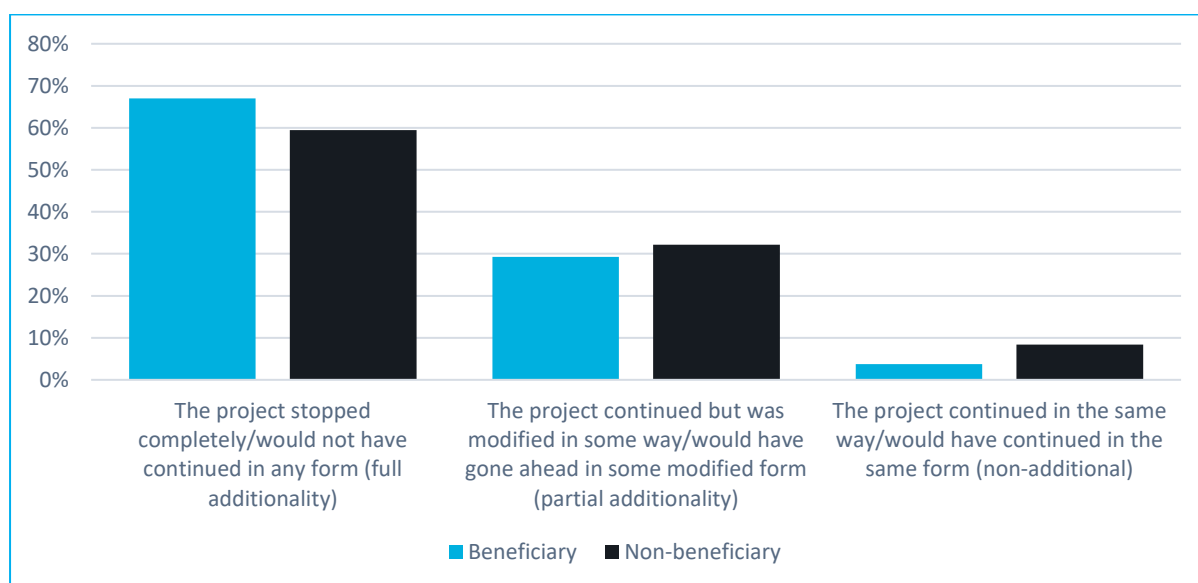
Net Additional Impact Calculation: Part 1 – Accounting for Deadweight

4.13 The extent to which SBRI made things happen that would not otherwise have occurred was generally claimed to be high, meaning deadweight is perceived to be low. Of the 237 SBRI beneficiaries surveyed, 60% claimed that the project would not have proceeded at all (in any form) without SBRI. Indeed, of the 425 non-beneficiaries surveyed, nearly the same proportion (59%) stated that the project had *not proceeded in any form* after the SBRI application was unsuccessful.

4.14 ‘Partial additionality’ was claimed by 26% of beneficiaries – that is, it was expected that the project *would* have been undertaken in the absence of funding, but only in some reduced form – slower, smaller, or reduced in some other way. 32% of the non-beneficiaries reported that the project had indeed proceeded without SBRI in a reduced form.

4.15 A remaining 4% of beneficiaries expected the project would have continued in the same way in the absence of funding. Amongst non-beneficiaries 8% reported that in the absence of SBRI funding, the project had nonetheless continued to the same scope, scale and time frames. These figures are presented in Figure 4-2.

Figure 4-2: In the absence of SBRI funding, what would have happened to the project (beneficiaries, inner circle) / what happened to the project (non-beneficiaries, outer circle)?



Source: Business survey, 2021

- 4.16 In order to generate a robust estimate of the value for money of the programme, the estimated turnover impacts must be adjusted to take into account this evidence of partial/non-additionality. Since the non-beneficiary responses provide observable estimates of the likelihood that a project would not have gone ahead (and are also less likely to be subject to bias than asking an awardee to report on what would have happened in the absence of funding), we use here the *non-beneficiary* deadweight reported to adjust turnover impacts. Fully additional projects are assumed to generate 100% of claimed impacts, partial additionality is assumed to reduce net impacts by 50%, and non-additional projects are assumed to have zero benefits. The gross turnover impact of £168k per year (as shown in Table 4-1) therefore becomes a gross additional turnover impact of **£127k per firm per year**²⁶.

Net Additional Impact Calculation: Part 2 - Estimating Future Impacts

- 4.17 Beneficiaries were asked whether reported revenue impacts were mostly in the past, for the current year only, or expected to persist into the future. Responses are shown in Annex D. Amongst those who were able to respond (51 did not answer this question), the majority reported that the effects are expected to increase in the future, for four to six years in most cases, and beyond ten years in some. Summarising these results, beneficiaries reported that turnover impacts are expected to persist for a further 4.04 years²⁷ on average beyond what has already been accrued since the award. (NB: The same analysis was conducted for the reported persistence of employment effects, with an average duration of 3.37 years. This figure has been used to inform assumption around the econometric analysis described below).

²⁶ Calculated as follows: Gross additional turnover = (£168k x 1.0 x 59.5%) + (£168k x 0.5 x 32.0%) + (£168k x 0.0 x 8.5%) = £127k

²⁷ This was calculated using mid-points for the time intervals, assuming zero future effects for those who claimed that impacts have occurred in the past and are not expected to persist further, and (conservatively) assuming only 10 years of persistence for those who responded with an expectation of 10+ years.

- 4.18 Using the above findings regarding the persistence of effects, we therefore estimate a total ‘lifecycle’ gross additional turnover impact of **£928k per firm**. This is made up of:
- An estimated £443k per firm in gross additional turnover, already experienced by survey respondents; and
 - A further £127k per firm per year projected forwards over 4.04 years, with a standard discount rate of 3.5% applied to these future benefits.

Net Additional Impact Calculation: Part 3 - Accounting for Displacement and Multipliers Effects

- 4.19 *Displacement* effects occur when the funded/supported activities take the place of other productive activities which would have taken place either by the funded firm (i.e. substitution of other activities), or by other firms within the market. This evaluation was not able to provide direct evidence of the scale of displacement effects. However, qualitative evidence collected as part of the evaluation suggests that SBRI funding was used to develop highly innovative products and services which would result in relatively low levels of product market displacement. The 100% funded (i.e. no match required) nature of the contracts would also likely result in low levels of substitution within firms.
- 4.20 Nonetheless, we choose to take a conservative approach and reduce the estimated programme benefits in recognition of the possible displacement effects. We have opted to use a displacement figure of 24.5%, drawing on a 2009 additionality study for BIS.²⁸
- 4.21 *Multiplier effects* are used to represent the propagation of benefits from a scheme through to other areas of the economy. The Green Book (2020) advises that multiplier effects should only be applied in place-based assessments (that is, at regional or local spatial areas). Following this guidance and given that SBRI is a UK-wide initiative, we do not here apply multipliers to the estimated programme impact.
- 4.22 After applying a 24.5% displacement effect, the estimated impact of £928k per firm therefore reduces to **£701k per firm**.

Total firm level impacts and Value for Money

- 4.23 The estimated turnover benefit was then multiplied by the total population of treated firms to estimate an overall impact of the SBRI programme. Since the business survey primarily focused on firms treated during the period 2015 to 2018, and only on a subset of departments’ competitions, the total number of firms treated within these constraints was considered. A total of 1,454 beneficiary firms were considered relevant. Multiplying the estimated treatment effects across this population of treated firms gives a **total net additional turnover impact of £1.02bn**.
- 4.24 To estimate the value for money of the programme, it was necessary to gather the SBRI-related costs associated with these 1,454 firms. Monitoring data collected from departmental records indicates the total funding allocation distributed to these 1,454 firms, had a total value of £340.8m. In the absence of data on running/administration costs, we assume an additional 10% of funding allocation to account for SBRI administration. On this basis, **the estimated total cost of treating these 1,454 firms was £374.8m**.

²⁸ This displacement assumption mirrors the assumption within the 2015 SBRI evaluation undertaken by Manchester Business School.

As a final step in the analysis, turnover impacts are converted into an estimated GVA impact. This is achieved using the average turnover to GVA ratios for the sectors of interest²⁹, weighted according to the sectoral composition of surveyed beneficiaries³⁰. On this basis, the total £1.02bn in turnover impacts is expected to result in £575m in increased GVA. When compared to the estimated programme costs of £374.8m, this gives an **overall SBRI BCR of 1.53**.

Counterfactual Impact Assessment

- 4.25 An econometric impact analysis was undertaken by the Enterprise Research Centre (ERC) at Aston Business School. Full details of the methodology and results can be found in Appendix G. In brief, the following was undertaken:

Data Preparation

- 4.26 A dataset of SBRI beneficiaries and non-beneficiaries (that is, those who had applied to an SBRI competition but were unsuccessful) was compiled via departmental data requests and compilation of the UKRI scheme archives. Basic information about applicants was included in the dataset: SBRI competition applied for, organisation name, address and company registration number (CRN). The dataset covered competition from a wide range of different government departments, and competitions running between 2011 and 2019.
- 4.27 Using secure methods to ensure data anonymity, applicants were identified within the Office for National Statistics (ONS) Business Structure Database (BSD). A longitudinal version of the BSD was compiled by the ERC for study purposes, making it possible to track the applicant firms through time.
- 4.28 A total of 316 SBRI beneficiaries and 565 non-beneficiaries were successfully matched to the longitudinal BSD and available for econometric analysis.

Modelling

- 4.29 Ordinary Least Squares (OLS) modelling was undertaken. OLS was selected because it provides a computationally simpler model than treatment effects models, particularly where there are a limited number of variables, as was the case for this analysis.
- 4.30 Three different outcome variables were modelled: employment growth, turnover growth and productivity growth. Independent variables included in the model were: firm size, age, ownership, prior growth and productivity level, alongside inclusion of a dummy variable for SBRI award. Control variables for two-digit SIC group and Government Office Region (GOR) were also included.
- 4.31 Models were run to compare the applicant population against both the non-beneficiary population, and also a control group of firms with similar characteristics to SBRI beneficiaries randomly selected from the BSD. While the non-beneficiary population provided an attractive option for use as a control group (since firms could be expected to be similar to beneficiary firms in all ways except the outcome of the competition), in reality it was found that there were significant differences between the beneficiary and non-beneficiary population, with beneficiaries on average substantially smaller (in terms of both employment and turnover) than non-beneficiaries. This limits the validity of modelling undertaken with the non-beneficiary population. The randomly selected control group provides a set of firms with more similar observable characteristics (in terms of size, turnover, growth rates and so on), however there will also likely be unobservable differences which cannot be

²⁹ Reported in the ONS dataset: Demand of products - The 'Combined Use matrix' - Intermediate demand (2018)

³⁰ Giving an overall GVA:turnover ratio of 56.4%

accounted for in the modelling. The ideal counterfactual would be a group of ‘near-miss’ applicants, however the information and sample sizes were not available to permit this kind of modelling.

- 4.32 A range of different time periods were considered in the modelling, including various different time periods for both treatment and effect, with the longest treatment period being 2011-2018 (thus encompassing all treated firms available in the dataset) and the shortest being 2011-2015 (this excludes many valuable data points, since most of the firms in the dataset were treated post 2015, however has the advantage of being able to model the effects of the programme over a five-year time period, from 2015 to 2020).

Results

- 4.33 The outcomes from all models are included in Annex G. In Table 4-2 below we summarise the coefficients on the SBRI participation dummy variable (that is, the estimated impact on firms of having been an SBRI funding recipient) for all 42 models run using the BSD random selection control group. These are presented in terms of the three different outcome variables modelled: employment growth, turnover growth and productivity growth, across the different time periods considered for both the outcome variable and the treatment period.
- 4.34 The models which use the largest number of observations are those which cover the largest treatment period, 2011-2018 (meaning that no observations are excluded on the basis of when the contract award was received), and the outcome variable uses only the most recent growth metrics, 2019-2020 (meaning that no observations are excluded on the basis that they were treated after/during the growth period). Outcomes from these models are highlighted in green in Table 4-2.
- 4.35 **The models demonstrate a statistically significant impact of SBRI participation on employment growth, but no statistically significant impact on either turnover or productivity.** It is not untypical, in the wider literature, that productivity and turnover effects are observed some time after employment effects. For example, the most recent impact report for the Goldman Sachs 10,000 Small Businesses Programme (2018) found that productivity gains were observed four to five years after participating in the programme³¹; and Turner, Roper and Hewitt-Dundas (2020) found that the relationship between innovation and productivity/employment had differing effects in the short-term compared to four years later³². Although our modelling did permit coverage of lags of four years or more, this was only possible with a relatively small sample size. For example, modelling firms treated during 2011-2018 for growth from 2019-2020 allowed inclusion of 173 treated firms, whereas limiting to only firms with four or more years since treatment (i.e., treatment occurring 2011-2015, for outcome growth over the period 2019-2020) restricted the number of treated firm observations to just 70. It is therefore not surprising that, given this low number of treated firms, a statistically significant result could not be obtained. Similarly, while the sample size was much more favourable for the extended time period, in this sub-sample many firms had only received treatment one year previously, and therefore it is also not surprising that turnover or productivity effects were not yet evident.
- 4.36 The employment growth effect is seen in 11 of the 14 models run for employment growth, and non-significant results are produced only when significant numbers of observations are excluded (by focussing on only firms treated prior to 2017). Based on the largest number of observations

³¹ <https://www.goldmansachs.com/citizenship/10000-small-businesses/UK/news-and-events/building-business-britain-f/report.pdf>

³² Turner, Joanne, Stephen Roper, and Nola Hewitt-Dundas. "Pathways to efficiency, pathways to growth: Evidence from the UK innovation survey." Research Paper 83 (2020).

available, the model estimates a treatment effect of 9.44%. **In other words, firms that received an SBRI contract award during the period 2011 to 2018 grew on average 9.44% more in headcount terms from 2019 to 2020 than comparable firms who had not received (nor applied for) an SBRI contract.**

- 4.37 The average firm size in 2019 amongst the treated firms in the dataset was 119 employees. **Headcount growth of 9.44% therefore implies an additional 11 employees per firm as a result of involvement in SBRI.**

Table 4-2: SBRI award dummy coefficients, with standard errors, for models using the BSD random selection control group. Coefficients from models using a range of different treatment periods and outcome variable periods are shown.

Treatment Period	Growth period (outcome variable)				
	2019-2020	2018-2020	2017-2020	2016-2020	2015-2020
Outcome variable: Employment Growth					
2011-15	0.0315	0.155**	0.125	0.163*	0.229**
	(0.0466)	(0.0778)	(0.0796)	(0.0901)	(0.0935)
2011-16	0.0532	0.219***	0.178**	0.208***	
	(0.0412)	(0.0680)	(0.0696)	(0.0790)	
2011-17	0.0764**	0.232***	0.188***		
	(0.0382)	(0.0626)	(0.0643)		
2011-18	0.0944**	0.242***			
	(0.0372)	(0.0605)			
Outcome variable: Turnover Growth					
2011-15	-0.202*	-0.178	-0.0795	-0.430**	-0.0103
	(0.108)	(0.145)	(0.151)	(0.198)	(0.205)
2011-16	-0.112	0.148	0.0571	-0.112	
	(0.0947)	(0.132)	(0.138)	(0.177)	
2011-17	-0.0427	0.169	0.104		
	(0.0882)	(0.122)	(0.126)		
2011-18	0.0647	0.178			
	(0.0880)	(0.117)			
Outcome variable: Productivity Growth					
2011-15	-0.181**	-0.299**	-0.215*	-0.534***	-0.281
	(0.0901)	(0.127)	(0.128)	(0.161)	(0.174)
2011-16	-0.137*	-0.0772	-0.151	-0.282*	
	(0.0811)	(0.114)	(0.116)	(0.145)	
2011-17	-0.108	-0.0730	-0.122		
	(0.0752)	(0.106)	(0.107)		
2011-18	-0.0373	-0.0828			
	(0.0743)	(0.101)			

Source: Professor Mark Hart (Deputy Director, Economics and Strategy Group (ESG) at Aston Business School) CIE Report (See Appendix G), 2021. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Value for Money

- 4.38 The econometric analysis gives an estimated employment growth of 11 additional employees per firm over a one-year period. As described above, the respondents to the business survey reported that employment impacts, even for competitions which happened some time ago, are expected to persist for several years into the future – on average, effects are expected to persist a further 3.37 years into the future. For the purpose of generating a value for money estimate, we therefore assume that the 11 additional employees per firm would be sustained for three years (we round down, for prudence) across all treated firms.
- 4.39 Our presumption is that this expansion in employment will result in generation of additional Gross Value Added contributions to the economy, which come about through the placement of individuals into more economically productive jobs than would otherwise have been the case. To estimate the value of these additional jobs, we apply a weighted average GVA/head figure based on the sectoral distribution of beneficiary respondents from the business survey. This is then multiplied across the dataset of treated firms which was collected for the econometric analysis and compared to the total SBRI-related costs for these firms³³. The calculations are summarised in Table 4-3 below. The **estimated BCR according to this approach is 4.07**.³⁴

Table 4-3: Calculation of benefit cost ratio based on econometric analysis results

Description	Calculation	Figure
Number of treated firms in dataset compiled for econometric analysis (prior to cleaning/matching)	[A]	410
Average number of additional employees per firm, per year (source: 9.44% effect size, estimated from the econometric analysis)	[B]	11.2
Estimated persistence of employment effects (source: beneficiary survey)	[C]	3
Gross Value Added per worker (source: Business Register and Employment Survey 2019, GVA and employment counts per SIC07 code, weighted according to the sectoral distribution reported by beneficiary survey respondents)	[D]	£65,229/annum
Discounted future income stream, applying a 3.5% discount rate and projecting GVA per worker forward according to persistence impact	[E] = [D]*[C], with 3.5% discounting applied	£189k/employee
Estimated total benefit per firm	[F] = [E]*[B]	£2.12m
Total value across firms in econometric analysis dataset	[G] = [F]*[A]	£870m
Programme costs across firms in econometric analysis dataset (source: monitoring data, plus a 10% uplift to account for programme administration costs)	[H]	£214m
Benefit Cost Ratio	[G]/[H]	4.07

Source: Steer-ED Analysis building on the CIE Report (See Appendix G) & utilising ONS 2019 BRES & GVA datasets

³³ This is calculated using the award values where known, filling with average award values where unknown, and applying a 10% uplift to award costs to account for programme administration costs.

³⁴ Note that unlike the analysis based on survey estimates, it was not necessary to apply multipliers/adjustments to account for additionality, displacement or deadweight to the results of the econometric analysis, since these are already accounted for within the econometric approach.

Reflections on VfM Analysis

- 4.40 The analysis collected here, while reliant on a number of important assumptions, provides evidence of a strong BCR for the SBRI model. Based on quantification of **firm impacts alone**, the estimated BCR is in the interval **1.53 to 4.07**. It is important to recognise that this does not take into account non-quantified benefits including wider firm-level benefits (outlined below), and critically, public sector and societal impacts, explored qualitatively later in this Section, meaning that these estimated BCR figures are significant under-estimates of the total impact of the programme.
- 4.41 The VfM modelling makes use of two different data sources – self-reported impacts from the business survey, and observed impacts from the Counterfactual Impact Evaluation. The latter found evidence of employment growth only, while in the former interviewees reported quantitative estimates of turnover generated by participation in SBRI, alongside reporting that participation in SBRI had resulted in significant growth in employment and productivity too. This self-reported evidence provides support for the argument that SBRI results positive productivity benefits for firms, but that these could not be observed in the CIE data due to data limitations such as time lags and insufficient observations.
- 4.42 It is also helpful to contrast findings with The University of Manchester’s 2015 evaluation³⁵ which calculated a BCR in the interval 1.63 to 2.40. This was based on self-reported turnover impacts (the lower-bound) and turnover impacts generated via econometric analysis (the upper-bound). In terms of self-reported turnover and persistence, the figures generated by the University of Manchester were similar to (though somewhat lower than) what has been presented here. The University of Manchester, however, chose to apply a multiplier of 1.56 to account for multiplier effects. As discussed, it was not deemed appropriate to apply a multiplier in this analysis, since these are designed for use in studies of regional rather than national programmes.
- 4.43 It should also be noted that the University of Manchester study excluded the Ministry of Defence from its analysis, since no competition/award details could be provided by the Ministry of Defence at that time. The study was also limited in terms of the period of time covered, with coverage limited to competitions occurring between September 2010 and September 2012, and a total of 48 beneficiaries surveyed. In contrast, this study provides evidence based on a total of 237 surveyed beneficiaries, with competitions run by a wide range of government departments (including the Ministry of Defence), over a time period from financial year 2012/13 to 2018/19. It can therefore be concluded that this study contributes significant additional evidence, in terms of breadth and strength of evidence, on the impact of the SBRI programme.
- 4.44 The most notable limitation of the evidence presented here is the absence of statistically significant turnover impacts from the econometric analysis, which does not align with the self-reported evidence or with the University of Manchester’s findings. Limited data availability and sample sizes meant that the econometric analysis could not be performed over a longer period to show effect sizes over time – instead, the analysis examined a relatively short time period from treatment to impact, which was insufficient to gather statistically significant evidence of turnover impacts (despite firms’ self-reports to say these had occurred/been observed).

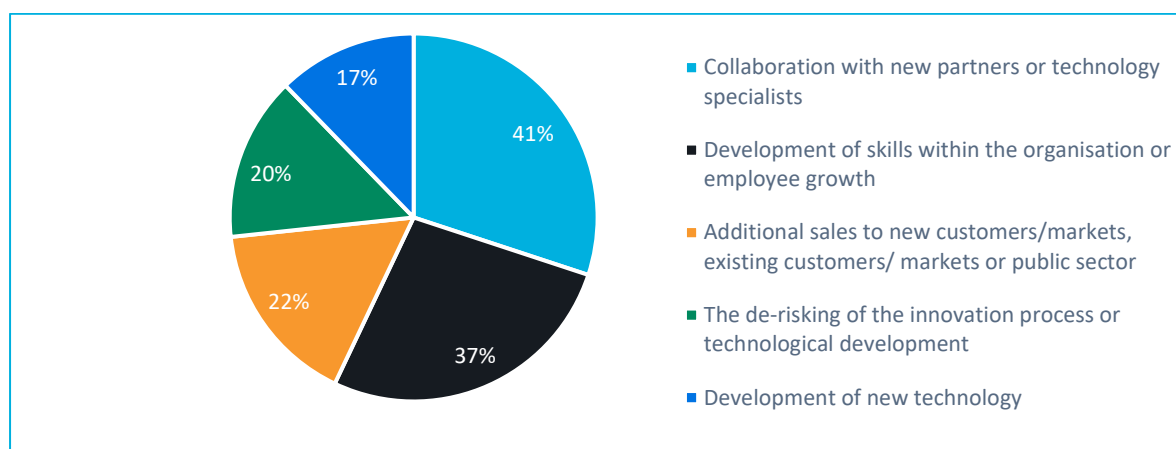
Wider Firm-Level Benefits

- 4.45 Over and above the impacts of SBRI on firm growth metrics, survey respondents were asked whether their involvement in pre-commercial procurement had benefitted the organisation in any other ways. Figure 4-3 summarises these responses which highlight, in particular, benefits arising

³⁵ Rigby, J., Roper, S., Cunningham, P., Li, Y., Yeow, J., Edler, J., & Cox, D. (2017). A Review of the Small Business Research Initiative A report commissioned by Innovate UK

through collaboration with new partners and technology specialists and the impacts SBRI has on augmenting workforce capabilities through increased skills development.

Figure 4-3: “Has your experience in the Pre-Commercial Procurement programme benefited your organisation in any other ways?” Top 5 answers (% of respondents, multiple choice permitted, n=237)



Source: Beneficiary and Non-Beneficiary Survey: Q31

4.46 Alongside the impacts on core growth metrics, considered through the CIE and survey analysis, the case studies provide evidence of a package of potential wider benefits to firms generated SBRI. Drawing from a range of the case studies (full case study write-ups are presented in Appendix F) the case study summaries overleaf exemplify the broad range of business benefits arising from SBRI, which can be summarised to include:

- The ability to develop, test and demonstrate new products with the buyer involved from the outset;
- Greater access to new markets and diversification of a firm’s offer;
- The ability to commercialise newly developed products and services, bringing in increased sales revenues and enabling business growth;
- Increased collaborative relationships with public sector and academia;
- Increase in capacity and resource through the funding which enabled firms to innovate new products with reduced levels of risk;
- Funding and activities which provided greater resilience for some firms in the context of COVID-19 response and recovery;
- Increased publicity and recognition for a firm’s innovation, reinforced by the ‘stamp of approval’ that working with public departments and academia brings; and
- Attracting follow-on funding to further develop and commercialise their products, nationally and internationally.

COVID-19 Speed Cleaning Ambulances: Hygiene ProClean's Decontamination System (2020)

Challenge Owner: Welsh SBRI Centre of Excellence on behalf of Welsh Ambulance Service

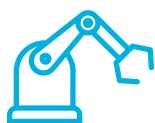


The competition enabled HPC to develop their existing atomising deep cleaning technology for the new application of ambulance sanitisation. This opened doors to new public service markets for HPC and facilitated their collaboration with multiple key government stakeholders.

The procurement of the solution by WAST and the potential to expand across other ambulance trusts across the UK has secured HPC a strong growth trajectory, with plans to more than double their annual turnover and employee count in the next year. To date, the firm has employed two new service engineers, office staff and expanded into new premises.

Last Mile Resupply: Horiba Mira's Viking Unmanned Ground Vehicle (2017)

Challenge Owner: Defence and Security Accelerator (DASA)



Through the competition Horiba Mira developed their technology to advance the Viking UGV further than its initial design plans. It would not have been possible to justify this level of investment without the prospect of a lead customer at the end of the process.

This supported the retention and expansion of the firm's autonomy expertise within the defence side of the business which has become an increasingly attractive and profitable market proposition. SBRI has contributed to the firm's revenue growth with the £2.3m sale of three Viking vehicles to DASA, and employment growth with the firm's engineering team expanding from 10 to 17 employees, with ambitions to expand further.

First of a Kind 1 – Demonstrating Tomorrow's Trains Today: Transreport's Passenger Assist System (2017)

Challenge Owner: Department for Transport



Transreport were able to trial, finalise and commercialise their Passenger Assist app, procured by the Rail Delivery Group with a multi-million-pound contract. It is being rolled out across England to support disabled access across the rail network.

The recognition and funding provided by DfT increased the attractiveness of the product to private investors, enabling the firm to leverage further investment.

Transreport have grown their employee base to more than five times its size at the competition outset, from 4 to 24 employees and 7.5 times the firm's annual turnover, increasing from £134k to £1m. The firm are opening a Glasgow office to expand work into Scotland.

Metal Extraction from Water Flows: Elentec's Electrochemical Coagulation (2015)

Challenge Owner: Natural Resources Wales, Welsh Government



Elentec's have developed an electrochemical coagulation solution to extract metal from polluted water bodies at metal mine sites. The solution is now market ready and beginning sales to both mine operators and local governments in the UK and abroad.

This has enabled Elentec to secure follow-on EU funding to collaborate internationally to develop their solution further. Through participating in the competition, Elentec were provided an opportunity to venture into a new market area and explore new business models as a result, as well as collaborate with other businesses and academia, and now have plans to grow their employee count over the next year.

CRACK IT Challenge 23 – Retinal 3D: Newcells Biotech's Retina In Vitro Model (2016)

Challenge Owner: NC3Rs



Newcells Biotech developed a proof of concept during the challenge, benefitting from close relationship with the sponsor companies and ability to utilise their testing facilities. As a result of the product developed as part of the competition, the firm experienced revenue growth of £465,000 in FY20-21 and projected sales for FY21-22 of £1m, as well as creating seven additional jobs to date with a further four to five employees expected to be recruited to work in this team over the next year. The

competition supported increased revenue from other products due to the close relationships built with industry leads, as well as helping to leverage greater public investment to continue research and development work in this space.

Northern Ireland Business Rates: NQuiring Minds' Belfast Business Rates Maximisation (2016)

Challenge Owner: Northern Ireland Department of Economy on behalf of Belfast City Council



Through the competition, NQuiring Minds developed a derivative of their data analytics solution to assess commercial premises' vacancy statuses and are marketing this to prospective new local government clients. NQuiring Minds has doubled in staff and revenue in the period following the Business Rates SBRI, to which the competition funding and BCC's subsequent service licence contributed directly. NQuiring Minds have benefitted from increased profile stemming from competition media coverage and developed a strong relationship with the City Council. and other partners involved in the initiative.

Child Health – Restoring Function: Open Bionics' Hero Arm (2017)

Challenge Owner: SBRI Healthcare



Open Bionics have developed a world first, award winning, affordable, multi-grip, bionic prosthesis for people with upper limb deficiencies. The firm have leveraged over £5million of public and private sector investment to support the development of Hero Arm, and despite not being procured by the NHS, Open Bionics filed four new patents, achieved EEA and USA approval and the Hero Arm is now available in private markets in the UK, across the EU, Russia, USA and Australia. 65 patients globally now have the Hero Arm. The firm has grown significantly, with eight times increase in revenue from £100k to £800k, and over three times growth in number of employees, from 10 to 35.

Reducing Childhood Obesity: Bug Farm Foods' VEXo & Pennotec's MilaCel (2017)

Challenge Owner: Welsh Government



Participation in the competition de-risked the innovation process for both firms, through offsetting the costs of investment in R&D. The competition enabled both firms to access entirely new markets through cross-sector collaboration, market research and relationship building. Both firms were supported to take their business in a new direction to access higher value markets through developing new products, and the competition contributed to their businesses' growth including Bug Farm Foods' revenue from sales of their new VEXo product and Pennotec's employment growth by an additional 1.5FTEs bringing in engineering and food technology expertise.

Cancer Innovation Challenge: My Clinical Outcomes' Platform (2017)

Challenge Owner: DataLab, Digital Health & Care Institute, and Stratified Medicine Scotland



Through participation in the SBRI competition, new opportunities have been created through their digital platform design work. My Clinical Outcomes progressed platform design work with 5 Scottish Health Boards and NHS Ayrshire and Arran procured the firm to deliver the platform for £10k per annum. The firm also developed relationships with clinicians as a result of this competition which are having lasting benefits. Further, they secured new deals for the provision of platforms with healthcare providers elsewhere in the UK, resulting in an additional £84k annual income.

Key Messages for firm level impacts

- SBRI has a positive impact on businesses growth through various channels which include providing: revenue allowing firms to hire or maintain staff to conduct the project development; a route to public-sector procurement and commercialisation; and the opportunity to develop and sell the solution or derivative products to the wider market.

Self-reported impacts

- The extent to which SBRI made things happen that would not otherwise have occurred was generally claimed to be high. This means the deadweight associated with SBRI is perceived to be low with 92% of beneficiaries reporting full or partial additionality.
- SBRI has generated significant turnover impacts for a relatively small, concentrated proportion of firms, with a small minority of these responsible for most of the reported value.
- Turnover impacts were more frequently claimed amongst young, small firms in the professional or digital sectors, and less frequently claimed amongst older, larger firms and those in the education sector. There was no notable difference in turnover impacts between commissioning departments, or according to whether or not, in the applicant's view, the department intended to procure the final product.
- On average, firms report turnover impact of £127k per firm per year with the majority reporting that these effects are expected to persist in the future, for four to six years in most cases, and beyond ten years in some.
- This equates to a lifecycle net additional turnover impact of £701k per firm. Multiplying the estimated treatment effects across the relevant population of treated firms gives a total net additional turnover impact of £1.02bn, equating to £575m in increased GVA.

CIE

- The CIE models demonstrate a statistically significant impact of SBRI participation on employment growth, but no statistically significant impact on either turnover or productivity.
- Firms that received an SBRI contract award during the period 2011 to 2018 grew on average 9.44% more in headcount terms from 2019 to 2020 than comparable firms who had not received (nor applied for) an SBRI contract.
- Based on average firm headcount, this equates to an additional 11 employees per firm as a result of involvement in SBRI.

Value for Money

- Bringing together the self-reported and CIE findings, the estimated BCR for firm impacts alone is in the interval 1.53 to 4.07, representing a strong BCR and good VfM outcome.
- It is important to recognise that this does not take into account non-quantified public sector and societal impacts.

Wider business benefits

- Over and above the quantifiable firm level impacts SBRI delivers a broader range of wider business benefits, including: greater access to new markets and diversification of a firm's offer; increased collaborative relationships with public sector and academia; increased publicity and recognition for a firm's innovation reinforced by the 'stamp of approval' that working with public departments and academia brings; and attracting follow-on funding to further develop and commercialise their products, nationally and internationally.

Public Sector & Societal Impacts

Scope & Data Limitations

- 4.47 Alongside the firm level impacts assessed above, SBRI seeks to deliver public sector and wider societal impacts. Indeed, as outlined in Section 2, procuring innovative policy and operational solutions is the primary motivation for sponsor departments/agencies for deploying SBRI and this represents a central component of the overarching rationale and objectives of the model.
- 4.48 Public sector and wider societal impacts vary significantly by department and by competition scope and objectives. Such impacts might range, for example, from digital transformation solutions geared towards improving the efficiency of operating systems to net zero or health related solutions that will result in wider societal impacts. There is additional variation and complexity in the scale and

timeframes in which these impacts are realised, as they materialise as a result of the adoption and diffusion of the newly developed solutions.

- 4.49 As highlighted in Section 1, the biggest challenge for this evaluation (and indeed for previous assessments in the UK, US, and other international literature) is quantifying public sector impacts as these are typically long-term, not monitored systematically by the competition owners, largely conditional on adoption, often indirect and need to account for supplementary funding outside of SBRI.
- 4.50 The extent to which public sector SBRI impacts are monitored varies across departments/agencies. SBRI Healthcare, for example, places significant emphasis on tracking and quantifying SBRI's public sector and health impacts over time and this good practice is explored in more detail below.
- 4.51 However, consultations with departments/agencies undertaken as part of this evaluation have highlighted how the challenges associated with identifying, quantifying and monitoring public sector impacts persist and prevail for most. Albeit with some notable exceptions, it is clear that the depth and breadth of evaluation evidence around public sector impacts is limited across SBRI in the round. Consultees acknowledged this as an important gap in their SBRI evidence base and expressed an aspiration to address this gap, however, in the majority of cases no formal evaluation had taken place and the scope for doing this was highly constrained by limited budgets being allocated for monitoring and evaluation.
- 4.52 Within this context it is perhaps not surprising that UKRI do not collate or capture any public sector impacts within their central monitoring database and the majority of departments/agencies consulted with have not been able to provide data on quantified public sector impacts. In the absence of robust data, it has not been possible to quantify these impacts akin to our approach/findings on firm level impacts.
- 4.53 This does not mean that the potential for SBRI to deliver public sector impacts is less important than its potential for firm level impacts. It is simply that these impacts are harder to measure, and, at least in part as a consequence of this, there is less data/evidence available. Critically, our Case Studies provide important evidence and insights into the range in scope of public and societal impacts delivered by SBRI, and these are explored in detail below.

Case Study Evidence

- 4.54 The Case Studies provide important evidence of the wide-ranging public sector and societal wider impacts being delivered through SBRI. Table 4-4 overleaf provides a summary of these impacts, and the potential impacts, that were reported with respect to each of the individual case studies.
- 4.55 Although these impacts will vary depending upon the context and scope of competitions, the following types of public and societal impacts have been synthesised from across case study findings:

Public Sector Impacts

- 4.56 The key categories of public sector impact evidenced by the case studies comprise:
- *Operational efficiencies* - generating public sector cost savings and potentially increasing revenue streams, resulting from services being delivered differently;
 - *Enhanced quality of services* – resulting in enhanced customer/user outcomes;
 - *Reducing demand for public services* - resulting from improved customer/user outcomes (e.g. improved health outcomes) which reduce demand for public services and generate savings;
 - *Cultural and behaviour change* - encouraging greater levels of innovation in public service design and delivery and stronger collaboration with public and private sector partners; and

- *Driving up skills and capabilities* – around identifying, understanding, and deploying new technologies, including AI & Big Data, to deliver innovative solutions.

Wider societal impacts

4.57 Wider societal impacts are driven by a combination of the public sector impacts (outlined above) and the mission orientated nature of some SBRI competitions, as described in previous sections of this report. Key categories societal evidenced through the case studies comprise:

- *Improved health outcomes* – spanning accelerated and more effective diagnosis, improved clinical outcomes as well as wider public health impacts;
- *Environmental sustainability* - supporting net zero ambitions through: deployment of energy efficient technologies; catalysing more environmentally sustainable behaviour change; and addressing wider environmental issues such as pollution and congestion;
- *Addressing inequalities & Improving quality of life* – by improving the quality of services and/or opening up access to these improved services to disadvantaged groups;
- *COVID-19 response and recovery* – generating innovative solutions to aid pandemic response and recovery and supporting wider economic and societal resilience;
- *Animal welfare*- primarily through the NC3R initiatives, reducing the need and scale of animal testing; and
- *National security and public safety*– modernising and strengthening the armed forces, through DASA’s SBRI initiatives, and also through initiatives designed to improve emergency services.

4.58 It is important to recognise that the scope of societal impacts identified through the evaluation will be constrained by the nature of the case study competitions and the breadth of sponsor departments/agencies reflected within the package of case studies. This did not include, for example, any education or justice related SBRI initiatives. Therefore, SBRI is likely to have delivered a broader set of societal impacts than those captured above, and has the potential to do so, moving forwards.

Table 4-4: Case Studies Public Sector Impacts Summary

Case Study	Public Sector & Wider Impacts
<p>1. COVID-19 Speed Cleaning Ambulances: Hygiene ProClean's Decontamination System (2020) Challenge Owner: Welsh SBRI Centre of Excellence (Welsh Ambulance Service)</p>	<ul style="list-style-type: none"> • Reduction in the time it takes to disinfect an ambulance by 86% to just 20 minutes. This in turn reduced the amount of time ambulances need to spend off the road and increased the number of ambulances available to support patients in need. • The solution also reduced the cost of cleaning an ambulance by 82%, saving the ambulance service in Wales money. • Improved cleaning standards and processes for infection control were embedded as a result of the collaboration. • There is further potential for these gains in effectiveness and efficiency to be spread across all UK public services that require decontamination of facilities and equipment.
<p>2. Artificial Intelligence Fracture Diagnosis: SeeAI and Bering LTD's AI Fracture Prototypes (2019) Challenge Owner: NHS Grampian Health Board, NHS Scotland, and One North East</p>	<ul style="list-style-type: none"> • Potential to improve health outcomes through a faster diagnosis and more efficient service. Typically, it could take 2 weeks from x-ray to diagnosis using the current pathway, whereas the diagnosis of x-rays using these methods is instant. • Potential to relieve pressure on radiologists by taking away one of their more mechanistic but time-consuming tasks for simpler injuries. This means that radiologists can concentrate on more life threatening and complex diagnoses such as MRIs for strokes, and on patient wellbeing/quality of care. • This SBRI competition has paved the way for NHS Grampian to use this same tool to bring forward similar innovations that solve NHS challenges, a further SBRI is currently being run at the Innovation Hub and a number of other challenges for further SBRI competitions are currently being reviewed by the Scottish Government.
<p>3. Child Health – Restoring Function: Open Bionics' Hero Arm (2017) Challenge Owner: SBRI Healthcare</p>	<ul style="list-style-type: none"> • 65 patients have now been supported worldwide, each with their own success stories of how the Hero Arm has transformed their day-to-day lives through this improved patient care. • The Hero Arm is building confidence and independence for people with upper limb deficiencies, through the technology itself and through the wider ethos of the Hero Arm of disabilities as superpowers. • There are also prospects of NHS cost savings and efficiency gains if the Hero Arm is adopted in the future.
<p>4. Tree Seed Challenge: Cumbria Tree Grower's TreeTape (2019) Challenge Owner: CivTech Scotland & Forestry Land Scotland</p>	<ul style="list-style-type: none"> • Whilst this technology is in early stages of trialling and testing, the anticipated impacts are substantial, including increased rates of germination of tree seed, increased productivity rates, increased quality of product, and lower production costs. • With these developments, the solution has the potential to improve forestry sector profitability and growth as a whole as the new technology is utilised and contribute to national and international carbon reduction targets and the net zero agenda.
<p>5. GovTech Catalyst & Seafood Innovation Fund Challenge Owners: BEIS, Government Digital Service & Centre for Environment, Fisheries, & Aquaculture Science</p>	<ul style="list-style-type: none"> • Monmouthshire County Council's competition aimed at reducing rural isolation has resulted in development of apps that help address loneliness, and a product is expected to be procurable in the short to medium term. • For Mid-West Wales Fire & Rescue, the SBRI solution will be an attractive proposition for Fire & Rescue services across the UK – contributing to tactical decision-making and reducing risk to life for both firefighters and civilians. More widely, there may be other similar benefits outside the Fire & Rescue service – for example if the product is also purchased by counterterrorism or military units. • For the Seafood Innovation Fund, new products have been developed which will have benefits for the seafood sector and wider society – such as decarbonisation benefits, animal welfare, and industry competitiveness. These benefits will only be realised, however, if the products being developed are procured by industry.

<p>6. Metal Extraction from Water Flows: Elentec's Electrochemical Coagulation (2015)</p> <p>Challenge Owner: Natural Resources Wales, Welsh Government</p>	<ul style="list-style-type: none"> • The development of multiple new technologies to the problem, with Elentec's solution capable of achieving 99.5% metal extraction from polluted waters in inaccessible locations. • This offers the potential to reduce pollution, positively impacting the local ecology and landscapes. • Supported the advancement of Wales in becoming a Centre for Excellence in Metal Mine Pollution technologies, with increased knowledge sharing and capability building locally, across the UK and internationally.
<p>7. Reducing Childhood Obesity: Bug Farm Foods' VEXo & Pennotec's MilaCel (2017)</p> <p>Challenge Owner: Welsh Government</p>	<ul style="list-style-type: none"> • Both firms were enabled to create new food technologies that improve the nutritional composition of ingredients that are on their way to adoption in schools and into the wider food manufacture supply chain, with potential to soon be on supermarket shelves. • These products have positive impacts for public health, improving children's diets and as such, could have a material positive effect on long-term health outcomes. • Both solutions have environmental sustainability at the core of their product design and encourage transition away from carbon intensive livestock farming.
<p>8. Last Mile Resupply: Horiba Mira's Viking Unmanned Ground Vehicle (2017)</p> <p>Challenge Owner: Defence and Security Accelerator (DASA)</p>	<ul style="list-style-type: none"> • Potential to save lives - reducing risks both for logistics personal and through provision of 'better' logistics to support battlefield personnel. • Allowing for the redeployment of tasks – in the context of a shrinking army, facilitating the restructuring and redeployment of some of the c. 1/3 army personnel tied up in logistics to increase combat personnel. • Open up army to technology and innovation – which can be developed into other aspects of military operations, beyond logistics.
<p>9. Northern Ireland Business Rates: NQuiring Minds' Belfast Business Rates Maximisation (2016)</p> <p>Challenge Owner: Northern Ireland Department of Economy on behalf of Belfast City Council</p>	<ul style="list-style-type: none"> • More sophisticated and accurate approach to determining the occupancy status of commercial premises across the city. This enables a more targeted and efficient approach to property inspections, and this change in behaviours has reduced the costs/resources associated with collecting rates, whilst at the same time increasing the revenue being generated. • Findings from the pilot work which indicate that approximately 25% of properties that were said to be vacant or underoccupied, were in fact occupied and liable for business rate payments. It is estimated that correcting for these inaccuracies could increase BCC's rates revenue by c. £0.5m per annum. • Cultural impacts on BCC in term of embracing big data and innovative approaches to problem solving at the corporate level.
<p>10. Cancer Innovation Challenge: My Clinical Outcomes' Platform (2017)</p> <p>Challenge Owner: DataLab, Digital Health & Care Institute, and SMC</p>	<ul style="list-style-type: none"> • The product supported the continuity of cancer treatment and care throughout the COVID-19 pandemic (to March 2021) through reducing the need for face-to-face consultations. • This comprised some 23 clinical teams across 8 health boards engaging with the platform across 12 cancer types. • This continuity of treatment and care has provided important health and wellbeing impacts for patients in highly distressing circumstances.
<p>11. First of a Kind 1 – Demonstrating Tomorrow's Trains Today: Transreport's Passenger Assist System (2017)</p> <p>Challenge Owner: Department for Transport</p>	<ul style="list-style-type: none"> • Disabled passengers historically faced major barriers to using the rail network, and Transreport's app tackles many of these barriers and is designed to support inclusivity for 14 million disabled rail users in the UK. • Rollout of the Passenger Assist app across the UK has resulted in clear benefit to rail users across the UK, increasing the accessibility of the railways, helping disadvantaged groups to make use of the public transport network, increasing flexibility for disabled people in planning their journeys, a better journey experience and lower risk of problematic journeys. • This first round of FOAK was a success and paved the way for many subsequent rail innovation competition rounds responding to industry's challenges.

**12. CRACK IT Challenge 23 – Retina 3D:
Newcells Biotech’s Retina In Vitro
Model (2016)**

Challenge Owner: NC3Rs

- This product will make an important contribution towards the NC3Rs core aim in **replacing, refining, and reducing the use of animals in research and testing.**
- The product developed will **replace the use of animals in ophthalmology R&D projects** and consequently reduce animal testing for rodents and rabbits.

Evidence from the Literature

4.59 It is also important to consider evidence of public and societal impacts from our review of the literature. Our key findings highlight:

- There is a striking imbalance observable in the literature between the extensive evidence available on benefits to the private sector (although not necessarily in robust quantitative form) and the limited evidence on benefits to the public sector made possible by the innovation facilitated by SBRI or equivalent programmes. Indeed, there is little material on the form these public sector benefits might take and how they might be evaluated and measure;
- The 2015 SBRI evaluation concluded that government was likely to benefit from the SBRI programme. It cited the extent of the savings indicated (but not demonstrated) in the review by the Office of Health Economics of the SBRI Healthcare programme. However, it acknowledged that the evidence in this regard was limited and observed that government departments had not gathered information systematically on the benefits to them and therefore in a way that would support a sound measure of additional benefits (or costs). The report suggested that more work was needed to assess the likely extent of savings; and
- Neither Connell (2017) nor BEIS (2017) was able to provide evidence on public sector benefits arising from the SBRI. In part this may be because the programme was assessed as not being embedded systematically and fully across government departments and its implementation inadequately accompanied by rigorous management and monitoring information.

4.60 As highlighted above, SBRI Healthcare has one of the more well-developed evaluation mechanisms, with Annual Reviews conducted each year (Figure 4-4 summarises key findings from the 2019-20 Review) that measure the level of investment and the outputs and outcomes of this. Further, SBRI Healthcare has commissioned independent evaluations that have gathered quantitative and qualitative assessment of the competitions' impacts:

- RAND (2017)³⁶ reported that 86% (38 out of 44) of participating businesses claimed that their innovation had generated or would generate net cost savings for the NHS. 15 of these respondents provided estimates of expected cost savings per annum as part of the earlier HEE survey. Of those 15, most expected their innovation to generate annual cost savings to the NHS in the tens of millions of pounds; and
- PA (2018) estimated the following public sector savings from the sample of eight SBRI Healthcare projects it reviewed:

Figure 4-4: SBRI Healthcare Annual Review 2019-20 Key Findings

SBRI Healthcare Annual Review 2019-20

Inputs

- Over **£99m+** invested
- **217** products supported

Outputs

- **107** IP granted
- **412** collaborations established
- **3418** sites accessed through trials or sales
- **1,255** jobs created/retained

Outcomes

- **£290m+** private investment leveraged
- **68** companies with commercial revenues
- **29** products exported
- **50** companies with sales in the NHS
- **>4.4m** patients involved through sales and trials

Impact

- Improving patient care
- Increasing efficiency and cost savings
 - **£19m** for annual cost saving for NHS
 - **£30m** annual savings to wider public sector
- Enabling NHS to access innovation
- Supporting UK economic growth

³⁶ David Connell, PA Consulting, RAND (2018) SBRI Healthcare The Impact & Opportunity Review

- Savings to date in the range of £13.1m to £18.6m for the NHS in England and £11.5m to other UK public sector organisations.
- Annual recurring savings currently running at £19.1m per year, including £14.4m for the NHS in England, and this is forecast to increase as adoption spreads.
- An assessment of longer-term impacts was made in PA (2018) based on company responses to SBRI Healthcare surveys supplemented by its reports of significant subsequent transactions. It estimated cumulative future savings to the NHS enabled by the SBRI Healthcare portfolio to be of the order of £350m-£480m in 5 years (2022), rising to between £1.2bn-£1.8bn in 10 years.
- It found that these savings are largely from digital technology solutions, not medical technology breakthroughs, as the latter face lengthy and complex clinical trials, and must navigate a complex regulatory landscape, which creates a barrier to adoption.

4.61 A number of other departments/agencies do point towards evidence of public impacts; for example, CivTech have reported benefits to public sector organisations and citizens from their challenges amounting to £4.2m-£16.4m per challenge over 10 years, averaging £644k spend per challenge.³⁷ However, this (and other similar) estimates are generally captured in promotional materials designed to showcase SBRI, not published evaluations.

Key Messages for public sector and societal impacts

Public sector & wider societal impacts

- There are many wide-ranging stories that illustrate the potential that SBRI competitions have to give rise to significant impacts to the public sector and wider society. Critically, our Case Studies provide important evidence of the breadth of these impacts.
- However, due to the lack of evidence and data provided by departments/agencies and the gaps in evidence within the wider literature, it has not been feasible to conduct a wholesale quantification of the public and wider societal impacts of SBRI.
- This does not mean they are less important than firm level impacts, it is simply that they are harder to measure. Indeed, procuring innovative policy and operational solutions is the primary motivation for sponsor departments/agencies for deploying SBRI.
- Key categories of public sector impact arising from our case studies comprise:
 - *Operational efficiencies*
 - *Enhanced quality of services*
 - *Reducing demand for public services*
 - *Cultural and behaviour change*
 - *Driving up skills and capabilities*
- Key categories of wider societal impact arising from our case studies comprise:
 - *Improved health outcomes*
 - *Environmental sustainability*
 - *Addressing inequalities & Improving quality of life*
 - *COVID-19 response and recovery*
 - *Animal welfare*
 - *National security and public safety*

³⁷ CivTech Programme Presentation - Closing Remarks with Mark Elliot, Director, CivTech Programme.

5 Conclusions & Recommendations

- 5.1 This final section draws together the different strands of evaluation evidence to demonstrate the effectiveness and efficiency of SBRI and to recommend ways in which its success can be scaled up.

Overarching Conclusions

- 5.2 Where SBRI has been championed and embedded in government departments and agencies, it has encouraged innovation in addressing public sector challenges and brought about improved public services, reduced public sector costs and increased public benefit.
- 5.3 In so doing, it has also helped participating firms to take on risks, to design, develop and commercialise new products and services, and to grow their businesses. It has provided ‘win-win’ outcomes for the public and private sectors and done so by offering good value for money.
- 5.4 But it has not done this as intensively or as extensively as it could. There is scope for a significant scaling up of the benefits that it could generate for both the public and private sectors and for the economy and the health of society more generally (whilst still providing good value for money). This section summarises what the barriers are to the more intensive and wider deployment of SBRI.

Conclusions Against the Evaluation Objectives

- 5.5 These general conclusions are developed further against each of the evaluation objectives.

Evaluation Objective 1: An assessment of the impact of SBRI in the round, including an assessment of its impact on the behaviours and attitudes of public sector commissioning departments and agencies relating to demand-led innovation, as well as the cost savings to public bodies resulting from the use of SBRI outputs.

- 5.6 Government departments/agencies that have championed and embedded SBRI in their processes and systems have seen changes in cultural and behaviour, encouraging greater levels of innovation in public service design and delivery and stronger collaboration with private sector partners. This has been accompanied by a deeper understanding within the public sector of the incremental nature of innovation and the complexity of the innovation process. It has increased skills and capabilities and enabled departmental/agency teams to better understand and deploy new technologies, such as AI & Big Data, to deliver innovative solutions.
- 5.7 However, the evaluation evidence confirmed the findings of the Connell Review that a more systematic, embedded SBRI programme management process is needed across a wider range of departments and agencies for the full benefits of SBRI to be seen and be realised. SBRI could also be more intensively and effectively adopted even within those departments and agencies that embrace it – e.g. by closer alignment between SBRI and mainstream procurement practice.
- 5.8 The mix of evaluation evidence pointed to the nature and extent of the benefits that can come from a determined commitment at high official level within departments/agencies to adopt SBRI and make it work to secure innovative policy and operational solutions, but hard evidence on these benefits proved difficult to find and was rarely volunteered during the course of the evaluation. What evidence does exist suggested the benefits could be considerable in public sector cost savings

and, in some cases, the potential to increase public revenue streams. There was also strong qualitative evidence of enhanced customer/user outcomes (e.g. improved health outcomes) generated through higher quality and/or better targeted services which can help to reduce demand for other public services resulting in further, indirect cost savings (e.g. SBRI Healthcare evidence of future cumulative cost savings of £1.2bn-£1.8bn in ten years).

Evaluation Objective 2: A review of the extent to which participating in SBRI activity helps business participants in bringing to market new products or services, and/or in using new processes which contribute to improved business performance

- 5.9 The evaluation evidence was clear and emphatic on this. SBRI can and does have positive impacts on participating business performance. It does so by prompting firms to push at the boundaries of risk and uncertainty that constrain what they could normally do. A significant majority of firms reported that SBRI enabled them to explore and develop options in ways that would not otherwise have happened at all or at the same scale, pace and/or quality. It allowed them to hire/retain staff to conduct project development, provided a possible route to procurement and commercialisation, and gave them the opportunity to develop and sell the solution or derivative products to a wider market.
- 5.10 As might be expected, the innovative solutions developed through SBRI funding did not always turn out as successes. But they proved to be successful enough to generate substantial impacts on business performance overall compared with what otherwise would have happened. According to the businesses themselves, SBRI funding induced an additional and cumulative increase in turnover of over £1bn. A high proportion of these benefits was represented by a limited number of participating businesses with turnover impacts being more frequently claimed by young, small firms in the professional or digital sectors.
- 5.11 The econometric (CIE) assessment of the benefits demonstrated a statistically significant impact of SBRI participation on employment to the extent of an average 9.4% increase in headcount over 2019-2020 compared with firms who had not received SBRI funding. No statistically significant impact was found on either turnover or productivity but a lagged effect here is to be expected especially when measured over one or two years.

Evaluation Objective 3: An examination of the extent to which SBRI-funded projects have led to other additional beneficial changes in participating businesses and government departments and/or wider societal impacts

- 5.12 There is a broad range of wider business benefits arising from SBRI according to the mix of evaluation evidence. These include: access to new markets and diversification of a firm's offer; increased collaborative relationships with public sector and academia; increased publicity and recognition for a firm's innovation, reinforced by the 'stamp of approval' that working with public departments and academia brings; and attracting follow-on funding to further develop and commercialise their products – nationally and internationally.
- 5.13 Wider social, economic and environmental impacts have been generated by SBRI according to the evaluation case studies as follows:
- *Improved health outcomes* – spanning accelerated and more effective diagnosis, improved clinical outcomes as well as wider public health impacts;
 - *Environmental sustainability* – supporting net zero ambitions through: deployment of energy efficient technologies; catalysis of more environmentally sustainable behaviour change; and addressing of wider environmental issues such as pollution and congestion;
 - *Addressing inequalities & Improving quality of life* – by improving the quality of services and/or opening up access to these improved services to disadvantaged groups;

- *COVID-19 response and recovery* – generating innovative solutions to aid pandemic response and recovery and supporting wider economic and societal resilience;
- *Animal welfare*- primarily through the NC3R initiatives, reducing the need for and scale of animal testing; and
- *National security and public safety* – modernising and strengthening the armed forces, through DASA’s SBRI initiatives, and also through initiatives designed to improve emergency services.

5.14 It did not prove possible to quantify the public sector and wider business and social benefits. However, just setting the estimated direct benefits to participating businesses (in the form of additional gross value added) against the SBRI costs provides a benefit cost ratio (BCR) in the range of 1.53 to 4.07. That is without taking account of the non-quantified benefits including wider firm-level benefits, and critically, public sector and societal impacts. Therefore, on the evidence of this evaluation, SBRI represents good value for money to the taxpayer.

Hypothesis Assessment

5.15 As outlined in Section 1, we developed a set of hypotheses aligned to the logic model to provide a clear and testable framework for the evaluation. Table 5-1 below drills down beneath the overarching study objectives to provide a detailed assessment of our evaluation evidence against each package of hypotheses.

Table 5-1: Hypotheses Assessment

Hypotheses	Evidence Assessment
Design, strategy and objectives	
<ul style="list-style-type: none"> • H1. SBRI is the most appropriate intervention to both stimulate innovation in the economy and provide government with new, cost-effective, technical, and scientific options and solutions. • H2. SBRI is viewed in government as a clearly defined mechanism for facilitating public sector innovation via procurement. • H3. SBRI is viewed in government and business as an initiative supporting business innovation. • H4. SBRI has become a primary tool for delivering departmental objectives through innovation. 	<ul style="list-style-type: none"> • Case study and consultation evidence indicates that SBRI is recognised by many as a unique mechanism for delivering a ‘win-win’ of public sector innovation and firm level innovation and growth. In designing and running competitions, the emphasis from sponsor departments/agencies is on generating new technological solutions to address a specific operational need and/or policy challenge. • It is clear from the literature that since 2001 there have been a number of attempts by UK Government to launch and relaunch SBRI initiatives. Whilst take-up has persisted and SBRI has been used in some form in a wide range of departments/agencies, it has generally remained at the margins of procurement and innovation agendas across the public sector as a whole. • However, monitoring data demonstrates a clear upward trend in the take-up of SBRI over the time period, indicating the impact of its relaunch in 2008 and the profile and fresh impetus it was given in the 2013 Spring Budget. Case study and consultation findings also highlighted that there has been a growth of variant delivery models in recent years including: provision of wraparound commercialisation support; cross cutting mission orientated competitions; and private sector lead customers assuming the role of the prospective procurer of the innovative solution. • It is clear from the monitoring analysis, consultations, case studies and literature that MoD/DASA and SBRI Healthcare platforms are the most significant adopters of SBRI (accounting for approximately 50% of all competitions to date), reflecting their status as large spending departments with greater emphasis on, and capacity for, innovation and R&D. • Consultations highlighted a debate within the literature around whether SBRI is a demand or supply-side mechanism. It is deployed flexibly by departments, primarily as a procurement tool, where the ‘lead customer’ has the direct intention to procure the solution, but also as a tool to stimulate innovation within a given policy area, where the sponsor department has no intention to procure. • The case studies and consultation findings have demonstrated that the rationale and objectives for deploying SBRI will be shaped by the operating context of an individual department’s established R&D processes and its regulatory considerations. Within individual departments, the rationale and intention for deploying SBRI may also vary from competition to competition depending on the nature of the solution being sought. • Consultations reinforced the findings in the literature that there are far-reaching challenges and barriers to more widespread and intensive adoption of SBRI which include: systemic cultural and structural barriers to innovation across government; a lack of SBRI leadership, accountability and data; low levels of awareness of the model; and challenges in bridging often disconnected innovation, policy, operational and procurement teams. • Shifts in the policy and macro context around, for example, EU Exit and the procurement Green Paper, recent and emerging Innovation Strategy and mission orientated approaches to problem solving triggered by COVID-19 and Net Zero, have important implications for SBRI. Within this context, the rationale and objectives for the SBRI remain relevant and are being drawn into even sharper focus.

Delivery, implementation and outputs

- **H5. SBRI improves the culture, procedures, knowledge, and skills by which public officials assess the challenges they face or might face and procure/manage business innovation to address them.**
 - **H6. SBRI helps business to better understand public sector innovation requirements and the nature and extent of skills within government.**
 - **H7. SBRI helps businesses to better understand public sector procurement processes for inducing innovation**
 - **H8. SBRI helps businesses to increase TRLs and de-risk innovations in ways that have a stand-alone option value irrespective of eventual adoption and use**
 - **H9. SBRI allows businesses to develop new business models and/or start-ups created to exploit technological advances.**
- Case study and consultation findings demonstrate that, where SBRI has been championed and better embedded within sponsor departments/agencies, it has resulted in cultural and behavioural change, encouraging greater levels of innovation in public service design and delivery and stronger collaboration with public and private sector partners. However, generally, it appears that SBRI could be better embedded and championed within departments/agencies at a senior level and in their procurement management process if it is to improve innovative behaviour.
 - Where this has happened, SBRI has increased skills and capabilities, enabling departmental/agency teams to better understand and deploy new technologies, such as AI & Big Data, to deliver innovative solutions.
 - Survey findings indicate that firms' primary motivations for engaging in SBRI competitions around technology and prototype development and product commercialisation align closely to SBRI's overarching purpose and objectives. For many participating firms it is clear that SBRI represents an important and unique route to market which otherwise would not be accessible, providing firms with the incentive to invest in R&D.
 - The case study and survey evidence has demonstrated the following package of business benefits arising from SBRI:
 - The ability to develop, test and demonstrate new products with the buyer involved from the outset;
 - Greater access to new markets and diversification of a firm's offer;
 - The ability to commercialise newly developed products and services, bringing in increased sales revenues and enabling business growth;
 - Increased collaborative relationships with public sector and academia;
 - Increase in capacity and resource through the funding which enabled firms to innovate new products with reduced levels of risk;
 - Funding and activities which provided greater resilience for some firms in the context of COVID-19 response and recovery;
 - Increased publicity and recognition for a firm's innovation, reinforced by the 'stamp of approval' that working with public departments and academia brings; and
 - Attracting follow-on funding to further develop and commercialise their products, nationally and internationally
 - Applicants' experience of SBRI varies depending on department, whether they were successful or unsuccessful and the stage of the process. However, the vast majority reported positive perspectives regarding the SBRI process.
 - Synthesising case study findings, the key factors apparent in the successful deployment of SBRI competitions include the ability to adapt the model to co-own a shared vision for creating a bespoke solution to a public sector challenge and close engagement, collaboration and greater knowledge sharing.
 - Case study lessons also include: prominent barriers to procurement and adoption of solutions developed; the need for greater recognition that innovative product/service development is often incremental, taking time to reach commercialisation; SBRI competitions require extensive departmental administrative resource; and challenges are present in scaling up adoption of innovations across the public sector.

Outcomes, Impact and Value for Money

- **H10. SBRI has generated new technologies and innovations that benefit the public sector, taxpayers, citizens, and the community in reduced costs and/or higher quality or new services and better quality of life.**
 - **H11. SBRI has generated new technologies and innovation that bring private sector benefits in increased sales and employment, profits, and wages.**
 - **H12. SBRI generated wider positive impacts (e.g. intellectual property, spin-offs, enhanced skills) and without significant displacement effects.**
 - **H13. SBRI led to sustained and useful interactions between departments and businesses and, to a lesser extent, improved business and HEI collaborations.**
 - **H14. SBRI met its objectives with effective and efficient allocation and use of resources, funding and accountability systems and procedures.**
 - **H15. SBRI has generated overall returns or total benefit cost ratios that meet or exceed required levels (cost-benefit) and/or value for money in the use of public funds (cost-effectiveness).**
- From across the literature, case studies and consultations, it is apparent that SBRI has catalysed the development of a vast array of innovative technologies and solutions and many of these have delivered public sector operational efficiencies, improved the quality of public services and/or brought wider societal impacts. Case study evidence indicates that these impacts include: improved health outcomes, contribution to net zero and broader environmental sustainability agenda, addressing inequalities and improving quality of life for disadvantaged groups; and supporting COVID-19 response and recovery.
 - Due to the lack of evidence and data provided by departments/agencies and the gaps in evidence within the wider literature, it has not been possible to quantify the public and wider societal impacts of SBRI.
 - Survey evidence indicates SBRI having high levels of additionality, with the vast majority of firms reporting that SBRI made things happen that would not otherwise have occurred and/or would not have happened at the same scale, pace and quality. These findings around low levels of deadweight are reinforced by our case study evidence.
 - Turnover impacts are most apparent from the self-reported survey evidence which found that SBRI has generated significant turnover impacts for a relatively small, concentrated proportion of firms, with a small minority of these responsible for most of the reported value. For those firms reporting on impacts, this equates to a lifecycle net additional turnover impact of £701k per firm. Multiplying the estimated treatment effects across the relevant population of treated firms gives a total net additional turnover impact of £1.02bn, equating to a £575m in increased GVA.
 - The CIE models demonstrate a statistically significant impact of SBRI participation on employment growth, but no statistically significant impact on either turnover or productivity. Firms that received an SBRI contract award during the period 2011 to 2018 grew on average 9.44% more in headcount terms from 2019 to 2020 than comparable firms who had not received (nor applied for) an SBRI contract. Based on average firm headcount, this equates to an additional 11 employees per firm as a result of involvement in SBRI.
 - Case study evidence also highlights firm level impacts in terms of both turnover and employment growth arising in a small number of firms, alongside a wider range of business benefits outlined in the assessment of Hypothesis 2 above. These business benefits include the development of new and derivative technologies, products and services, and associated intellectual property, on the back of SBRI. Some business also reported new or improved relationships with academic R&D partners and prospective public sector clients.
 - Case study and consultation findings provide evidence that where multiple partners have been engaged, SBRI has catalysed collaboration and improved relationships across public sector partners. These findings also provide evidence of SBRI helping to bridge silos within individual public sector organisations.
 - Drawing on consultation and survey findings and the wider literature, the SBRI model and its implementation processes are widely recognised by sponsor departments/agencies and beneficiary businesses to be effective and fit for purpose. By contrast, the associated monitoring arrangements for SBRI are widely recognised to be deficient and this serves to undermine understanding and accountability of the model and its more widespread deployment.
 - The Value for Money analysis of the self-reported and CIE findings generates a BCR between 1.53 to 4.07, representing a good VfM outcome. Critically, that this does not take into account the non-quantified public sector and societal impacts and the actual BCR is therefore likely to be substantially higher.

Recommendations

5.16 The following are the headline recommendations following from the evaluation conclusions:

- **Strategic Leadership and Funding:** More extensive and intensive adoption of SBRI would be beneficial and will require leadership from the Centre as well as from within individual departments and agencies. It will also require incentives and resources to overcome entrenched and persistent barriers to innovation;
- **Monitoring and Accountability:** SBRI's monitoring framework and the quality of output and outcome data available need to be upgraded, rendered more systematic and consistent to increase understanding, promotion, and take-up of SBRI;
- **Joining up SBRI, keeping its flexibility:** SBRI needs to be maintained as a flexible policy instrument but also needs to be more joined up to share and, where appropriate, transfer and/or roll out good practice across the SBRI 'family'; and
- **Raising awareness, capabilities, and capacity:** There is a need to raise understanding of SBRI as a tool for developing innovative public policy and operational solutions through a package of promotional and training activities to address skills and resource gaps and siloed working across procurement, policy and innovation teams.

5.17 Before drilling down into each of these specific themes, it is helpful to highlight our set of guiding principles, which have provided an overarching framework within which these themes and accompanying recommendations have been developed. These principles are as follows:

- *Capitalise on the opportunity* – SBRI provides a major boost to UK innovative capability and commercialisation to an extent that has already generated a healthy cost-benefit ratio in the use of public funds even when longer-term and wider impacts have not been included in the estimated impacts;
- *No need to reinvent the wheel* – the SBRI model is not broken and does not need fixing, however, it should continue to evolve. Over the decades, and in particular over the last three to five years SBRI has been deployed with increasing flexibility by departments/agencies. The flexibility of SBRI in terms of how it is delivered and for what purposes – spanning both policy and operational goals – is a virtue. Champions and users of SBRI must build on and embrace existing good practice from across the 'family' of SBRI models and tailor competitions, resources, and support services so that they are both context specific and offer the best opportunity for success;
- *Fresh impetus must be sustained* – the key challenge for SBRI is not its operating model or potential for impact, but the limited traction it has had within many parts of the public sector due to the well-recognised structural barriers it faces. A step-change in SBRI profile and deployment is unlikely to happen organically. These issues have persisted for many years and been highlighted in previous evaluations. Centralised impetus (i.e. cross-government backing) has been stop-start over the years, but has been impactful in seeding SBRI, in particular within the two original pilots (NHS and DASA). These pilots highlight that SBRI is not necessarily a quick win. It takes time to build up capacity and capability and therefore in order for SBRI to move into the mainstream of public procurement any fresh impetus provided from the Centre must not only be well targeted but sustained over time;
- *Carrots and sticks are both required* – drawing on learning from past attempts to raise the profile and take-up of SBRI, it is clear that SBRI's forward strategy must combine and balance incentives and accountability. Sufficient incentive is required to overcome the well-recognised barriers to SBRI adoption, in terms of the lack of incentives to innovate and drive efficiency and a pervasive risk-averse culture, and a more robust monitoring and accountability framework is required to measure performance and impact and to help ensure follow through on commitments; and

- *Not all departments/agencies are equal in the context of SBRI* – SBRI operates in very different departmental/agency contexts and circumstances. The model can be most readily deployed by departments/agencies with the largest R&D budgets and the associated capacity, capability and appetite for innovation. The relatively strong SBRI credentials of the NHS and DASA are a case in point. The next phase of SBRI deployment should therefore seek to target (albeit not exclusively) the department/agencies with the greatest SBRI potential.

5.18 Alongside these guiding principles, our recommendations have also taken into account the current policy and regulatory context for SBRI; not least the need for innovative solutions to drive the post-pandemic recovery and the redrawing of procurement regulations following EU Exit. It seems clear that SBRI could play an augmented role in supporting recovery and improving public services, and in ensuring that public procurement plays an important role in delivering UK Government's recent Innovation Strategy. With the right combination of leadership, strategy and funding, SBRI has the potential to positively influence the wider public sector innovation system, not simply operate within it.

Strategic Leadership & Funding

5.19 Public sector innovation and procurement are cross-governmental agendas. SBRI requires leadership from the Centre as well as from within individual departments and agencies. It also requires incentivisation and resource to overcome the entrenched and persistent barriers to innovation. We recommend the following:

- *Cabinet Office leadership* - the Cabinet Office is best placed to assume cross-governmental leadership for SBRI and secure political (i.e., government minister) and senior civil service sponsors to lead and oversee the next phase of SBRI;
- *A new wave of SBRI Champions* – a small number of (approximately five to eight) departments/agencies should be identified and supported to accelerate and significantly increase SBRI take-up and deployment. Focus should be given to high spending departments/agencies and those with substantial Research & Development budgets and build on existing SBRI activities within departments/agencies. Prime candidates would include BEIS, DfT and large Combined Authorities. The DoH, DASA, and the devolved nations could also be targeted as providing opportunities to further develop and mainstream their relatively well established SBRI capacity/capabilities. The expectation would be for participating agencies to design and deliver a package of SBRI activities, not a single competition. This initiative would require detailed development in terms of requirements for dedicated leadership, resource and monitoring;
- *Centralised Funding Pot* – in order to overcome the well-recognised barriers to SBRI adoption, in terms of the lack of incentives to innovate and drive efficiency and a pervasive risk-averse culture a centralised, multi-year funding pot should be established (as advocated by the Connell Review) and be jointly administered by Cabinet Office and UKRI. The precise details of this funding pot will need to be commensurate with the scale of ambition for SBRI. We recommend that this should: run for a minimum of three years; incorporate a proportion of revenue funding to enable departments/agencies to dedicate resource and build capacity; and ringfence a substantive proportion of the funding pot for the Champions initiative but remain open to bids/engagement from across Government; and
- *Enhanced UKRI role* – building on UKRI's existing central advocacy and advisory role, the Agency is well placed to work in partnership with Cabinet Office to design and implement the agreed strategy for SBRI moving forwards. Within the context of the recommendations flowing from this evaluation this would include, for example, the design and administration of the Champions initiative, funding pot and monitoring arrangements. UKRI's existing SBRI resource is already

operating at full capacity and any augmented role would require additional and commensurate funding and resource.

Targets, Monitoring & Accountability

5.20 As has been highlighted in the 2015 evaluation, the 2017 Connell Review and the findings from this evaluation, SBRI's monitoring framework and the quality of data available are deficient and this serves to undermine understanding, promotion and take-up of SBRI. On this basis we recommend the following:

- *Centralised, published database of SBRI contracts* – data should be systematically captured across all SBRI related contracts let across Government and at a minimum include: name and scope of competition and details of sponsor agency; timing and level of award by phase; and firm level details – size, location, sector and geography. All issues arising from GDPR should be addressed through standardised contractual commitments to enable the required level of data sharing. In line with the transparent approach of the US SBIR, this database should be published and regularly updated;
- *Centralised database of solutions procured following-on from SBRI contracts* - data should be systematically captured on all procurement contracts which follow on from SBRI competitions (that is, instances where the sponsor, or other public department/agency procures one or more of the innovative solutions arising from a competition). Alongside the published data on SBRI contracts (outlined above), this should include: the value and length of the contract; the scope and quantum of goods/services procured; alongside up to date contact details for the provider (allowing the database to act as a relationship management tool);
- *Monitoring public sector and societal impacts* - a more systematic approach is required to monitoring and measuring public sector impacts. The scope of these will vary significantly by department/agency and the nature of the innovative solution being sought. The Champions initiative could provide a mechanism for encouraging and developing new and/or more robust approaches to monitoring. As part of the case for procuring and adopting an innovative solution via SBRI, sponsor departments/agencies should seek to assess the potential routes to impact and scope of anticipated benefits and how/if these could be quantified. Where the potential for substantial impacts (for example efficiency savings and/or quality of services) are identified, these should be captured and reviewed over time and, where possible, quantified over time. Departments/agencies should capture this evidence/data in a format that can be readily shared for purposes of evaluation; and
- *Monitoring firm level impacts* - a more systematic approach is required to monitoring and measuring firm level impacts. The primary, but not exclusive, focus of this should be on firms whose innovative solutions have been procured (i.e. those captured in the procurement contracts database above). These firms should be surveyed annually on a rolling basis for a period of 3 years. The CIE undertaken as part of the project should also be updated and interrogated on a rolling basis.

Defining Competition Scope & Maximising Opportunity for Impact

SBRI is currently deployed within different contexts, for different purposes and through a range of delivery models. Moving forwards, it will be important to share and, where appropriate, transfer and/or roll out good practice across the 'family' of SBRI models and competitions. Whilst SBRI's flexibility is a virtue, it will also be important to guard against generating confusion arising within firms and public agencies. On this basis we recommend the following:

- *More clearly define the type and purpose of specific SBRI competitions* – draw a clearer distinction between SBRI competitions where a lead customer is in place and those that are

seeking to stimulate but not procure an innovation solution. The balance of emphases across firm, public, and societal impacts will vary by competition type and monitoring arrangements should be clearly tailored and aligned accordingly;

- *Encourage firms with high potential for impact to participate in SBRI* - our evidence indicates that turnover impacts were more frequently claimed amongst young, small firms in the professional or digital sectors, and less frequently claimed amongst older, larger firms. The increased potential for impact of these firms should be reflected in the marketing of SBRI competitions and potentially through bid assessment;
- *Supporting firms to commercialise innovations* – further consideration should be given to how best to support participating firms to commercialise their innovative solutions. In the first instance, two alternative approaches could be explored. Firstly, assess the existing and extensive ecosystem of business support and commercialisation advice/services with a view to understanding how SBRI could be better integrated within it. This should include, for example, UKRI's The Edge initiative. Secondly, review the performance, impact and transferability of existing SBRI delivery models (e.g. Civitech, GovTech, NC3R) which already incorporate additional elements of commercialisation support;
- *Review performance of private sector lead customer approach* - UKRI should review the performance, success, and transferability of different models such as NC3R's private sector lead customer approach and the ongoing UKRI-led Sustainability Innovation Fund which has invited consortium bids to include private sector partners as prospective lead customers/procurers; and
- *Develop cross-cutting mission-oriented approaches* – whilst continuing to deploy SBRI for the wide range of departmental/agency specific policy and operational goals, consideration should also be given to designing and implementing SBRI competitions with a cross-departmental thematic focus to harness collective efforts and drive widespread innovation and change. This mission orientated would build on good practice arising from existing delivery models (e.g. GovTech) and could dovetail with and/or be delivered in isolation of the Champions proposal. This approach would require centralised leadership and co-ordination through the Cabinet Office and UKRI and commensurate levels of funding and resources.

Raising Awareness, Capabilities & Capacity

5.21 There is a need to raise levels of awareness and understanding of SBRI as a procurement mechanism and also as a tool for developing innovative public policy and operational solutions. This should capitalise on the increased profile around procurement mechanisms following the UK's exit from the EU (and the publication of the HMG's Procurement Green Paper 2020, outlined in Section 2) and upcoming procurement reform. The proposed Strategic Leadership & Funding recommendations, outlined above, will raise the profile of SBRI and will need to be underpinned by a package of promotional activities to maximise reach. Capabilities and capacity around SBRI vary significantly between public agencies and there is a need to address skills and resource gaps and siloed working across procurement, policy, and innovation teams. On this basis we recommend the following:

- *Maintain and expand practitioner network* – the existing SBRI practitioner network provides the opportunity for sharing good practice, advice and expertise. This network should be retained and expanded to incorporate departments/agencies participating in the Champions initiative. As part of this, stronger relationships and greater levels of knowledge and data sharing between UKRI and all sponsors should be developed;
- *International knowledge transfer* – the benefit and viability of establishing a knowledge transfer network with the US SBIR and other OECD PCP practitioners should be explored with a view to sharing good practice and inspiring strategic-level leaders/sponsors, Champions and other departments/agencies. As part of this process, a more detailed comparative international review

of SBIR related models could be undertaken to systematically assess good practice and transferability to the UK; and

- *'Re-boot' of SBRI* – the profile of SBRI and potential new wave of SBRI Champions could be raised via an official cross-government 'reboot' with an associated package of events and promotional materials comprising differentiated content for different audiences. Audiences will range from strategic, ministerial level sponsors through to policy and procurement officers. These materials should clearly highlight the rationale, barriers and potential impact of SBRI, drawing on the findings of this evaluation.

Control Information

Prepared by

Steer Economic Development
61 Mosley Street
Manchester M2 3HZ
+44 (0)161 261 9154
www.steer-ed.com

Prepared for

UK Research & Innovation (UKRI)
58 Victoria Embankment
London
EC4Y 0DS

Steer ED project number

238-578-01

Author/originator

Steer Economic Development

Other contributors

Geoff White Inc
Qa Research Ltd
Professor Mark Hart, Deputy Director, Economics and Strategy
Group (ESG) at Aston Business School
Velocius Intelligentia Ltd

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Our offices

Manchester

61 Mosley Street
Manchester, M2 3HZ
+44 (0)161 261 9140

Leeds

67 Albion Street
Leeds, LS1 5AA
+44 (0)113 389 6400

London

28-32 Upper Ground
London, SE1 9PD
+44 (0)20 7910 5000