

# Annex 3: Case Studies of SBRI Participants

Case studies were identified from companies attending the SBRI Review Workshop in London on 27 Jan 2017 and all volunteered to take part in the workshop and be subject of a case study.

### Case Study 1: Patientrack

#### **The Company**

Patientrack has developed an always-on, active safety and communication system for managing patient care in hospitals. The system captures and tracks medical data from both existing and new sources, uses innovative algorithms to automatically calculate early warning scores and alerts clinicians directly so that they can intervene when necessary. The system integrates with existing data collection processes, hospital procedures and communication systems to enable efficient adoption and effective use.

The company was set up in 2009 with the intention and ambition to become an international business of scale. It is a small SME with 10 staff. The company was established in the UK due to what was seen as a significant market opportunity in terms of size, openness to technology-based solutions and experience with (manual) 'adverse outcome avoidance' systems.

#### **SBRI Participation**

Patientrack participated in a SBRI competition launched in October 2013 by **the Department of Health** in collaboration with the National Institute for Health Research (NIHR) and Devices for Dignity Healthcare Technology Co-operative (D4D HTC) to find innovative technology based solutions in Kidney Care. The scope of the call included the need for *novel diagnostics and device platforms for disease prevention, improved diagnosis and monitoring of acute kidney injury (AKI) or chronic kidney disease (CKD)*.

Patientrack were one of 14 companies winning projects in Phase 1 and went on to win a Phase 2 project to develop the technology further during 2015/16 receiving **£365K in support via SBRI** (£100k for Phase 1, £265k for Phase 2).

As many as 100,000 deaths in secondary care settings are associated with acute kidney injury (AKI) each year, according to NHS England. Many more patients go on to endure prolonged hospital admissions and to suffer from secondary chronic conditions. Identified as one of two national clinical priorities for 2015-16, AKI is a chief concern for hospitals across the country.

Often caused by stress on the kidneys due to other illnesses or infection, or the side effects of some drugs, more than a third of AKI cases occur after admission to hospital, with the elderly especially at risk. It affects as many as one in five emergency admissions to hospital and costs the NHS as much as £620m per year; more than breast cancer or skin and lung cancer combined.<sup>1</sup>

#### **Outputs, outcomes and impacts of SBRI Participation**

In 2013 Patientrack had a small number of early customers in the UK using its Early Warning System (EWS). The SBRI funding enabled Patientrack to focus on a new area of healthcare in collaboration with Western Sussex Hospitals NHS Foundation Trust. Working with consultants in renal health and analysts at the University of Southampton, the company were able to incorporate new predictive analytics to identify potential acute kidney injury (AKI) into their early-warning system and independently verify and validate its performance in the clinical environment in the Trust's hospitals. The positive findings of a comparison study of two hospitals, one with and one without the AKI early-warning system, are due to be published in an academic journal in the coming months. Once published this will give the company a powerful platform to promote and sell the product. SBRI has provided Patientrack not only with a new module to add to their existing product but also a platform for standalone single-condition products (for AKI and other healthcare conditions in the future) that will help them grow their customer base, particularly in the cash-constrained NHS where a modular approach offers an alternative route to sales. The AKI module is already being implemented by a small number of their existing customers with expected growth to new customers in the coming months and years.

Patientrack was established with an organic growth plan based on increasing its products and widening its geographic markets. SBRI has supported product development in a new application area and has enabled the company to move forward faster along their development roadmap.

### Strengths of SBRI

- **Resources and time to develop and test innovative ideas:** Patientrack's managing director reports that the AKI early-warning system is very unlikely to have been developed without SBRI support. Firstly SMES do not have the 'bandwidth' to monitor the wide variety of calls for public funding and SBRI provides a simple and clear route focused on real market needs. Secondly it is challenging for an SME to find resources of several £100ks to direct at the R&D required to undertake product development in a new area.
- **SBRI was 'right-sized':** It had limited administrative bureaucracy, was focused on a clear high-level challenge and rigorous in its approach to selection and funding. The collaboration on the funding side between the Department of Health, National Institute for Health Research (NIHR) and Devices for Dignity ensured that a real need was addressed and provided links to clinical practice and patient experience. All three organisations were involved in project reviews providing sufficient feedback and guidance without undue interference. In addition, winning an SBRI competition provides added confidence to the company that the challenge they wish to address is real and their solution (potentially) appropriate.
- **Capitalising on strong UK assets:** The managing director views the SBRI support as having enabled the joining together and 'unlocking' of business, NHS and academic assets to develop, test and validate an innovative solution. Patientrack believes that SBRI has not only enhanced the company's reputation but, by extension, the reputation of UK healthcare SMEs.

### Weaknesses of SBRI

- **Support for the procurement stage:** For Patientrack, the remaining challenge is selling to the NHS. The company believes more SBRI funding is not the issue, but practical support to identify and approach suitable hospitals to conduct further trials would be extremely valuable. This might include, for example, funding for the hospitals to support the trials (e.g. to free up staff resources).

### Case Study 2: nquiringminds

#### **The Company**

**nquiringminds** is a digital technology company specialising in smart cities, cyber security, data analytics and the Internet of Things (IoT).<sup>2</sup> It has developed the Trusted Data Exchange (TDX), which combines IoT and big data streams into a single secure, shareable database. This secure middleware<sup>3</sup> speeds up and provides security assurances for IoT device development, data analysis, data sharing and ultimately decision-making. The company was established in 2010, initially as an R&D consultancy providing solutions in cybersecurity and web technology to large businesses using the background and experience of the company's founders. It has since developed into a company offering broader product and services in IoT and big data.

#### **SBRI Participation**

**nquiringminds** participated in two SBRI competitions:

- **Future Cities Solutions** run by **InnovateUK** in July 2013 that aimed to stimulate solutions in three areas where UK cities face many of the same challenges: energy, data and transportation. The company was one of 16 companies winning projects in Phase 1 and one of four in Phase 2, receiving **£1,096k of SBRI support** (£100k for Phase 1, £996k for Phase 2).
- **Business Rates Optimisation**, led by **Belfast City Council** in partnership with the Future Cities Catapult in July 2016 that aimed to use technology to maximise revenue from business rates to enable the council can provide better services to the community. The company was one of four companies winning projects in Phase 1 and one of two in Phase 2. The Phase 2 project is currently underway and when it is completed **nquiringminds** will have received **£70k of SBRI support** (£5k for Phase 1, £65k for Phase 2).

#### **Outputs, outcomes and impacts of SBRI Participation**

**nquiringminds** had not previously worked for public sector clients and the challenge presented in the Future Cities competition appealed to them. The SBRI competition provided funding to support R&D and provided detailed knowledge of a new and potentially large market – both in terms of market needs and how they operate. The company views this market knowledge as a key outcome of the SBRI projects, equally important as the technical achievements.

The funding supported the development of an Open City Data Platform that enables data harvesting, sharing and analysis and the development of web and mobile applications that support decision-making and public service delivery. The company was able to develop a core new product - the Trusted Data Exchange (TDX) – that enables different stakeholders from different organisations to share and collaborate on data in a trusted environment. This product is somewhat 'ahead of market readiness' and therefore the company has developed smaller versions for three niche application areas where there is a clear need: optimising revenue from business rates; revenue planning; and social care optimisation and planning. The SBRI funding enabled the company to offer free trials to three local authorities to validate and demonstrate system performance with real end-users.

While the Future Cities SBRI Phase 2 project was running, Belfast City Council launched an SBRI competition focused on business rates optimisation and **nquiringminds** was successful in both Phase 1 and Phase 2. These are much smaller and shorter projects than those under Future Cities and Belfast City Council expects to procure an operational solution at the end of the Phase 2. This is providing an opportunity to utilise the general purpose technology developed under the Future Cities competition (the TDX) to meet a specific public sector need. Without the prior SBRI projects the company would not have had the product in place nor been aware of the Belfast City Council competition.

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<sup>2</sup> The Internet of Things (IoT) is a computing concept that describes a future where everyday physical objects will be connected to the Internet and be able to identify themselves to other devices

<https://www.techopedia.com/dictionary>

<sup>3</sup> Middleware is a software layer situated between applications and operating systems

<https://www.techopedia.com/dictionary>

SBRI enabled **nquiringminds** to grow from a 2 person company to a 12 person company as a direct result of the SBRI funding. It has enabled them to build a skilled team, develop a core new product, create intellectual assets (patents have been applied for) and enter new public sector markets. The founder reports that none of this would have happened without SBRI and the company would have most likely remained as a consultancy business serving its customers in the private sector. The company has committed revenues with local authorities (or with their subcontracted service providers) for the year ahead that will enable them to retain their current headcount and are recruiting to meet their growth aspirations.

### Strengths of SBRI

- **Funding model:** The 100% funding levels, IP ownership and contract format (rather than a grant) are attractive to small companies. The R&D required to develop a new product is highly risky and small companies rarely have the resources, time or money, to invest in activities with such uncertain outcomes.
- **Addressing identified public sector needs:** A considerable strength of SBRI is its administrative processes that assess proposals and review and measure success against a real and defined public sector need. In addition to providing funding, SBRI provides confidence in innovative ideas, both for the company itself and for potential customers. It provides the opportunity to work on a real public sector challenge and gain access to the challenge 'owners' to better understand their needs, methods of working and constraints. For **nquiringminds** the national SBRI 'brand' helped give local authorities with some confidence in the company – in its technology and its likely survival (councils are reluctant to work with companies that may not be able to complete the development process).

### Weaknesses of SBRI

- **Lack of link to customer (for some competitions):** A weakness of the Future Cities SBRI Competition was that the sponsor, InnovateUK, was not the ultimate customer and therefore could not provide detailed market knowledge. Projects are stronger where the monitoring officer is the end-customer or problem 'holder', in this case someone within a local authority. Nevertheless the company were able to work around this by using SBRI funding and utilise the SBRI 'brand' to conduct trials in three local authorities. Likewise SBRI projects would benefit from assistance in their later months to meet potential customers, in particular to gain understanding of their procurement processes.
- **Public funding cycles can slow the product development process:** **nquiringminds** experienced a nine month break in the development process between Phase 1 and 2 when the fund holder needed to wait for a new public sector financial year to begin before allocating Phase 2 funds.

### **Case Study 3: The Imagination Factory**

#### **The Company**

The Imagination Factory is a product design engineering agency with a business model that combines consultancy (fees for design services) alongside developing their own IP-based products. The company was founded in 2010 in order to respond to a design competition run by UK Sport prior to the London 2012 Olympics. The Imagination Factory continued on a part-time basis consulting with UK Sport on various small ventures until in 2015 the company began to operate as a full-time agency.

#### **SBRI Participation**

The company has bid into 6 SBRI competitions and was successful in three:

- **Detection of Clandestines** run by the **Home Office's Centre for Applied Science and Technology (CAST)** and **Border Force** in October 2014 that aimed to achieve a step-change in UK Border Security through new technologies for detecting people hidden in hard-sided vehicles. The company was successful at Phase 1 and Phase 2, receiving **£97k of SBRI support** (£27k for Phase 1, £70k for Phase 2).
- **Predictable and optimised braking challenge** run by **Future Railway** working closely with the Railway Safety and Standards Board (RSSB) in October 2014 that addressed predictable and optimised braking for rail vehicles. The company was successful at Phase 1 and Phase 2 is currently underway, receiving **£1,107k of SBRI support** (£133k for Phase 1 and £974k for Phase 2).
- **Solar Powered Irrigation Pump** run by **Department for International Development (DFID)** in September 2015 that aimed to develop an affordable solar-powered irrigation pump that can be deployed to developing regions around the world, particularly Sub-Saharan Africa. The company was successful at Phase 1 and currently live on Phase 2 is currently underway, receiving **£299k of SBRI support** (£49k for Phase 1, £250k for Phase 2).

#### **Outputs, outcomes and impacts of SBRI Participation**

The SBRI competitions provided opportunities for a small design agency to work on specified challenges and develop their IP /product portfolio. The company had not worked for the public sector before and the competitions exposed them to new markets - not only the specific challenge they faced but also their ways of working.

The Border Force competition resulted in a prototype product that enables existing Border Force CO<sub>2</sub> sensors used to detect concealed people in soft-sided trucks to be used with hard-sided trucks without causing any damage. The company has applied for a patent and contract manufacturers have been identified to produce the product. Border Force has recently placed an order for the product and the company is responding. The Border Force market itself is limited (there are fixed number of CO<sub>2</sub> sensors in use to which it can be added) but the SBRI process has exposed the company to other organisations with similar needs at borders, ports and in the shipping sector and they are exploring opportunities for wider application of the IP developed under SBRI.

The Future Railway/RSSB SBRI Phase 2 project is still underway - developing a railtrack treatment system that has wider applications beyond the original challenge. The company is developing IP and exploring commercialisation options and routes to market for the railway and other markets. The SBRI challenge 'owner' RSSB (Future Railway is no longer in existence) is not the actual customer for the product in the railway market and the company is exploring licensing to larger companies in the railway supply chain and/or creating a spin-out company.

The DFID SBRI competition is still underway. The Imagination Factory was one of two companies selected to move to Phase 2 (out of the six companies in Phase 1) with each taking a very different approaches to solar powered water pumps. There is a large potential market for these pumps although the customers will not be DFID itself.

SBRI funding has enabled The Imagination Factory to grow from one person (full-time equivalent) to six people at the current time and 10 by the end of the year. SBRI represents a significant proportion of their turnover in the last three years (as much as 80% in some years) and this has been a 'game-changer' for the company. The funding provides resources to build high quality experienced design/engineering teams along with the time and, importantly, the stability in a small company to explore ideas, develop IP, prototypes and products and investigate commercialisation business models.

### Strengths of SBRI

- **Funding model:** 100% funding and IP ownership is a key advantage of SBRI. It provides stable resources for a small company to build a team of high quality people (both in terms of freeing up existing staff and recruiting experienced designers/engineers who are in demand and difficult for a small company to recruit) and the time to innovate.
- **Advantages over commercial product development funding:** SBRI is different to third-party commercially funded product development, where a staged development process can stop development projects if they fail to meet success criteria at each stage, but do not suit more exploratory innovation projects where a number of concepts may need to be explored, validated and tested before a solution is found.
- **Exposure to new challenges and new markets:** The SBRI process, when done well, enables small companies to develop a deep understanding of both the specific challenge and the wider issues of a new customer / group of customers as well as providing an understanding of how the public sector operates. Border Force, for example, took SBRI participants to a busy port to see the challenge in the working environment to ensure the solution developed would be fit-for-purpose. This enabled the company to fully understand the challenge and identify other applications for the solution being developed. RSSB held an initial briefing event where experts from the rail industry were available to explain the challenge (including previous unsuccessful solutions) and answer queries. It also provided opportunities for partnerships to develop among the potential bidders. InnovateUK and the KTNs have also provided opportunities to showcase the company, raising awareness of its products and enhancing its reputation.

### Weaknesses of SBRI

- **Payment arrangements:** The payment arrangements vary with department running the competitions but quarterly payment in arrears and delayed payment is problematic for small companies. SBRI projects can represent a relatively large portion of revenue and therefore affect cash flow and the ability to retain high quality staff.
- **Variability in the skills and experience of departmental project officers:** The relationship with the department owning the SBRI challenge can affect the quality of the project outputs. This relationship is very dependent on the skills, experience and attitude of the project officer. A particular issue is a lack of experience of procuring R&D/innovation projects – this can lead to a very contractual approach to the SBRI project rather than focusing on developing a solution. In addition, projects work better when the project officer is, or is closely linked to, the end-user who will procure the solution.
- **Public funding cycles can slow the product development process:** The Imagination Factory experienced an 11 month delay between Phase 1 and Phase 2 in the railways projects.
- **Variability in the scope of the challenge.** A well scoped challenge, balancing sufficient specificity but without 'baking in' the preferred solution, is essential to creating the space to develop an innovative solution. The company has experienced a variety of challenge specification and believes there is room for improvement and the application of good design principles to scoping challenges (such as the method currently being deployed by InnovateUK (<https://www.gov.uk/government/publications/funding-competition-design-foundations-2017-round-1>)).

### **Case Study 4: University of Durham**

#### **The Recipient**

The Innovative Computing Group at the School of Engineering & Computing Sciences at Durham University addresses methods for representing, processing, communicating and reasoning about information, and the role of the human, in both natural and engineered computing systems.

#### **SBRI Participation**

The university research group participated in a SBRI competition launched in June 2013 by the **Defence Science and Technology Laboratory (Dstl)** supporting the development of innovative sensing for asset protection (known as SAPIENT - Sensing for Asset Protection with Integrated Electronic Networked Technology). The call was seeking autonomous systems to detect, track and alert potential attacks on key national infrastructures. The research group was successful at Phase 1 and Phase 2 receiving a total of **£318k in support via SBRI** (£78k for Phase 1, £240k for Phase 2 for the research group as part of a larger collaboration).

#### **Outputs outcomes and impacts of SBRI Participation**

The University of Durham research group focused on potential attacks from pedestrians on key infrastructures. SBRI funding supported the development of an autonomous surveillance sensor based on thermal imaging that could detect and track people and their movements. Under Phase 1 they developed the outputs of previous research to build a software demonstrator of the autonomous sensor. Under Phase 2 several successful Phase 1 projects, addressing different aspects of the challenge, were brought together along with a system integrator (the defence technology company QinetiQ) to collaborate and produce a robust physical demonstrator system. At the end of Phase 2 the system was demonstrated to 50-60 key defence and security experts. In early 2016 Dstl supported a follow-on development phase (Phase 3) tasking the Phase 2 consortium to develop a larger-scale demonstrator with increased functionality that included surveillance of vehicles as well as people (with another larger-scale system demonstration).

The SBRI funding enabled the research group to take a concept previously demonstrated in the laboratory (at Technology Readiness Level TRL2) to a *component and/or breadboard validation in relevant environment* (TRL5)<sup>4</sup> as well as generating intellectual property and a publication. As a university, the route to commercialisation is via licensing of the IP, and while the SBRI process run by Dstl included demonstrations to defence contractors and end-users, it has not as yet led to any licence agreements. However the Phase 3 project has only recently finished and the IP has broad applications, so the university hopes there will be interest in the future. The research group has already applied the IP to research on autonomous vehicles for a major automotive manufacture, generating £200k in new research income to the North East region.

#### Strengths of SBRI

- **Funding applied research:** As a research group focused on applied research SBRI fills a funding gap not supported by the traditional university sources of funding. Research Councils will not generally fund research directed at technology development above TRL3 (proof of concept). In addition SBRI provides a simple route for purchasing specialist equipment to support such research that is otherwise much more complex via other funding programmes.
- **Application process:** The application is effective and efficient. It asks the right questions at the right level of detail and is not onerous for applicants.

#### Weaknesses of SBRI

- **Does not support postgraduate research skills development:** Individually the Phase 1 and Phase 2 projects are too short to support industry-facing PhD studentships (who might then be employed by the 'challenge-owning' sectors or may be directly embedded with industry collaborators following an industrial-CASE type model) and the break between the Phases means a PhD student cannot be taken on solely based on winning a Phase 1 project as continuity of funding is a key limiting factor.

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<sup>4</sup> Technology Readiness Levels (from TRL1 - *basic principles observed* to TRL 9 - *actual system proven through successful mission operations*) are commonly used in the defence and aerospace sectors.



- **Electronic application forms are not compatible with all operating systems and browsers:** The application forms should be based on open document formats to ensure accessibility for all bidders.

### Case Study 5: Dolaugu

#### **The Company**

Dolaugu is a small R&D consultancy founded in 2011 based on product development and commercialisation via licensing and contract manufacturing.

#### **SBRI Participation**

Dolaugu participated in a SBRI competition launched in September 2015 by the **Department of Culture, Media and Sport (DCMS)** to generate new innovative solutions to address the problem of nuisance calls. The company was successful at Phase 1 and Phase 2 receiving a total of **£80k in support** (£25k for Phase 1, £55k for Phase 2). The Phase 2 project will be completed at the end in March 2016.

#### **Outputs, outcomes and impacts of SBRI Participation**

The SBRI funding enabled the company to focus efforts on a challenge that the founder had already been thinking about conceptually. The 'Natcha' system is a hardware and software system that uses artificial intelligence to identify, intercept and end nuisance telephone calls. Phase 1 enabled the concept to be demonstrated and Phase 2 will result in 20 prototypes ready for testing with end-users in their homes. A testing schedule is planned for the period immediately after Phase 2 is completed, followed by small-scale contract manufacturing of up to 2,000 units by the end of 2017. A manufacturing partner has been identified and production will be financed by advance purchase via an online kickstarter campaign.

#### Strengths of SBRI

- **Funding model:** The Natcha system is a hardware and software product and these generally take longer to develop and cost more than software-only solutions. SBRI funding at 100% changes the product and business development path entirely. It has allowed the company to design and implement an efficient product development plan to take the innovative idea forward. It has enabled an effective product development team to be built quickly and provided funds for hardware components. Without SBRI funding the product would not have been developed.

#### Weaknesses of SBRI

- None were specified